生存圏アジアリサーチノード活動報告

Humanosphere Asia Research Node Activity Report

ARN 2021

生存圏アジアリサーチノード
Humanosphere Asia Research Node

Table of contents

1. Preface

Director of RISH
Masato Shiotani

Today's global society faces increasing hazardous events, which threaten the existence of humankind. Global warming is becoming tangible due to the massive consumption of fossil resources, and, consequently, weather disasters are intensified; man-made environmental pollution is widely spreading; and infectious diseases are becoming highly prevalent across countries because of the long-distance movement of trade goods and human beings. Thus, these events become globalized and self-aggravating. Embedded in Earth systems, including human activities, these problems are complex in nature; therefore, deepening academic knowledge in a specific area cannot answer them. For resolution, we need to integrate our expert knowledge in various areas with an interdisciplinary view.

In 2016, Research Institute for Sustainable Humanosphere (RISH), Kyoto University launched a new program called the Humanosphere Asia Research Node (ARN) to strengthen the hub functions of international collaborative research and fostering talented people who expand the field of Humanosphere Sciences internationally. We hope to cultivate people with not only high expertise but also an international perspective on the various global issues we are now facing. ARN's activities in the past include the following: 1) an ARN joint laboratory was founded in Indonesian Institute of Sciences (LIPI) jointly with Japan-ASEAN Science, Technology and Innovation Platform (JASTIP) project; 2) a series of symposia on Humanosphere Science: the 1st ARN Symposium in Penang, Malaysia in collaboration with Universiti Sains, Malaysia (USM), the 2nd one in Uji, Japan, the 3rd one in Taichung, Taiwan in collaboration with National Chung Hsing University (NCHU), the 4th one in Nanjing, China in collaboration with Nanjing Forestry University (NFU), and the 5th one online due to COVID-19 outbreak; 3) a number of RISH Open Seminars were delivered and broadcasted live to selected foreign research organizations via web conferencing service; 4) a server mirroring system of "Humanosphere Science Database" was installed in Indonesia; 5) and a lecture and practical training course on atmospheric science were offered. ARN also served as a co-organizer for the International Workshop on Bioresources and Biodiversity at Uji, Kyoto (with the JASTIP), and "Humanosphere Science School 2016/2017/2018/2019" in Indonesia.

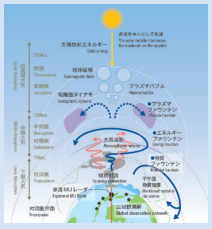
The Equatorial Atmosphere Radar (EAR), which is a VHF atmospheric radar located in West Sumatra, Indonesia, has been operated since 2001. To exchange information on a wide range of research results from the EAR and related facilities during 20 years, and to further strengthen the international network, RISH and Research Organization for Aeronautics and Space (LAPAN), National Agency of Research and Innovation (BRIN) jointly held "6th Asia Research Node Symposium on Humanosphere Science", "LAPAN/BRIN-Kyoto University International Symposium for Equatorial Atmosphere", and "INternational Conference on Radioscience, Equatorial Atmospheric Science and Environment (INCREASE)" in September 20-21, 2021. Due to the unfolding coronavirus (COVID-19) outbreak and travel restrictions, the symposium was held as an online event without physical attendance. A total of 533 participants, including 47 students, attended the symposium.

This booklet is a report of the 6th ARN Symposium in 2021. We will continue to actively expand on educational and research activities in collaboration with the Humanosphere Science community with an effort to scientifically demonstrate the landmarks in mankind's path toward the construction of a sustainable Humanosphere. We look forward to your valuable assistance, support and participation.

Director of RISH, Kyoto University
Masato Shiotani

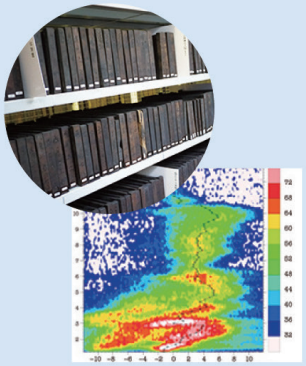
2. Humanosphere Asia Research Node

Cooperative Study of the "Equatorial Fountain"



Cooperative Research on the Sustainable Production and Utilization of Tropical Biomass in Relation to Environmental Conservation

International Cooperative Studies Using the Database for Humanosphere Science



Research Institute for Sustainable Humanosphere (RISH), Kyoto University

In 2016, RISH initiated a new program named “Humanosphere Asia Research Node (ARN)”, thereby strengthening the hub functions of international collaborative research and fostering innovation in Humanosphere Science with the ultimate goal of delivering solutions on a global scale. ARN’s achievements included the following: 1) an ARN joint laboratory at the Indonesian Institute of Sciences (LIPI) was founded jointly with the Japan-ASEAN Science, Technology and Innovation Platform (JASTIP) project; 2) a number of RISH Open Seminars were delivered and broadcast live via web conferencing to selected foreign research organizations; 3) a server mirroring system for the “Humanosphere Science Database” was installed in Indonesia; 4) and a lecture and practical training course on atmospheric science was offered. ARN also served as a co-organizer for the International Workshop on Bioresources and Biodiversity in Uji, Kyoto (with the JASTIP), and the “Humanosphere Science School” in Indonesia. ARN held the 1st Asia Research Node Symposium on Humanosphere Science in Penang, Malaysia in February 2017, and the 2nd Symposium in Uji, Kyoto in July 2017, at which more than 30 speakers from Japan and all over the world were invited. With these ARN activities, RISH is in a perfect position to pursue the integration of different research disciplines and to promote the internationalization of Humanosphere Science.

Strengthening the hub functions of international collaborative research and fostering the work of people who sustain and expand humanosphere science to find global-scale solutions.

ARN & JASTIP Joint Laboratory

ARN serves as a network hub that connects research between ASEAN and Japan through joint laboratories in Indonesia and also provides an opportunity for various research institutes in Japan to access ARN’s overseas facilities. In addition, ARN highly encourages overseas researchers to conduct collaborative research using domestic facilities under the joint usage platform it promotes.

Capacity Building

ARN supports the career development of young researchers and engineers by offering opportunities for collaborative research and involvement in international schools in Indonesia and other Asian countries. With ARN’s support, these young scientists can grow into future leaders in various fields of Humanosphere Science.

Practical training on atmospheric science in Indonesia

The 1st ARN Symposium on Humanosphere Science (February 20-21, 2017/Penang, Malaysia)

The 2nd ARN Symposium on Humanosphere Science (July 19-21, 2017/Uji, Kyoto)

Humanosphere Science School 2017, The 7th International Symposium for Sustainable Humanosphere (November 1-2, 2017/Bogor, Indonesia)

URL **Humanosphere Asia Research Node** http://www.rish.kyoto-u.ac.jp/asiaresearchnodes_e/

Contact Research Institute for Sustainable Humanosphere (RISH), Kyoto University
Gokasho, Uji, Kyoto 611-0011, Japan
+81- (0) 774-38-3346 E-mail: webmaster@rish.kyoto-u.ac.jp

3. 6th ARN Symposium

(The 448th Symposium on Sustainable Humanosphere)
The 6th Asia Research Node Symposium on Humanosphere Science
jointly with
LAPAN/BRIN-Kyoto University International Symposium for Equatorial Atmosphere
International Conference on Radioscience, Equatorial Atmospheric Science and Environment
September 20-21, 2021
Online

Greetings

Mamoru Yamamoto, Chair

The Humanosphere Asia Research Node (ARN) aims to strengthen its function as a hub for international collaborative research and foster innovation in the field of humanosphere science, with the ultimate goal of delivering solutions to global-scale problems. ARN integrates our various facilities and human networks in ASEAN region and Japan for consolidating the international collaborative research on “Sustainable Humanosphere”.

To share the concept and recent advances of Humanosphere Science, thereby fostering students and young researchers who will sustain and expand the new science, the series of ARN symposia were held in Penang of Malaysia, Uji of Japan, Taichung of Taiwan, and Nanjing of China in 2017-2019. In 2020, the 5th ARN symposium was held as an online event without physical attendance due to the COVID-19 outbreak and travel restrictions. The 6th ARN symposium was also held as an online event in September 20-21, 2021. This symposium was jointly held with LAPAN/BRIN-Kyoto University International Symposium for Equatorial Atmosphere, and INternational Conference on Radioscience, Equatorial Atmospheric Science and Environment (INCREASE) as 20th anniversary of the Equatorial Atmosphere Radar (EAR), which has been operated by RISH and Research Organization for Aeronautics and Space (LAPAN), National Agency of Research and Innovation (BRIN) in West Sumatra, Indonesia since 2001.

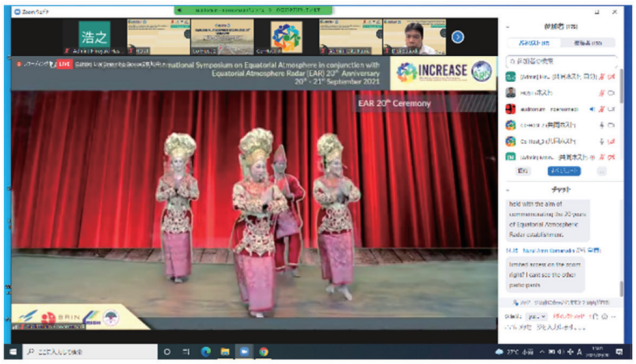
At the EAR 20th ceremony before the symposium, Prof. Masato Shiotani, Director of RISH and Prof. Erna Sri Adiningsih, Acting Head of LAPAN/BRIN gave the welcome address. After that, Prof. Nagahiro Minato (President of Kyoto University), Mr. Makoto Ueki (Representative of MEXT), Mr. Andri Warman (Regent of Agam District, West Sumatera), Prof. Kazuo Shiokawa (President of SCOSTEP), Prof. Suharso Monoarfa (Minister of BAPPENAS), and Prof. Laksana Tri Handoko (Chairman of BRIN) gave the congratulatory speech. Prof. Mamoru Yamamoto (Vice Director of RISH) presented EAR and Future Project.

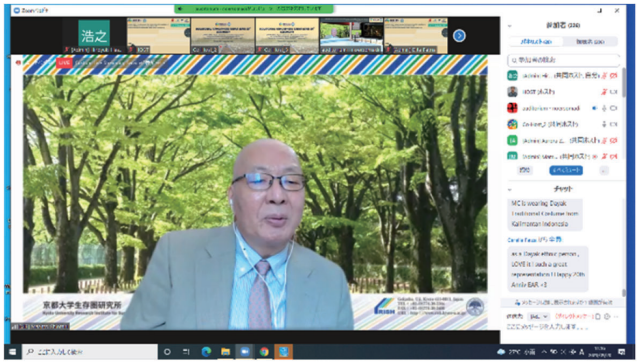
The symposium featured 3 keynote and 11 invited speeches and 174 oral presentations. It covered scientific and technological advances principally in the fields of radio atmospheric science and engineering, agricultural life science, and wood and timber science and engineering, together with other related sciences contributing to creating “Sustainable Humanosphere”.

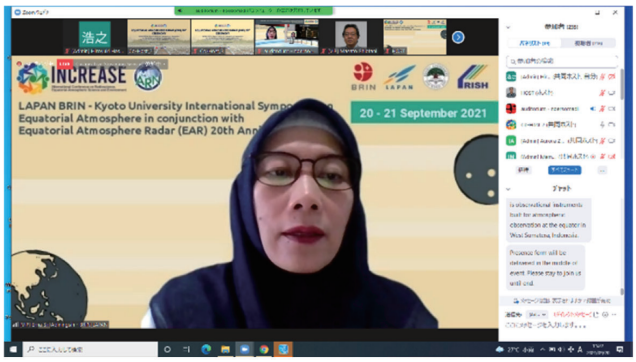
A total of 533 participants, including more than 90% of foreigners, attended the symposium, which was deemed a great success. With sincere gratitude to all participants and organizers, we sincerely hope that our work can further our understanding of the differences and difficulties in the world, and accelerate the formation of a Sustainable Humanosphere.

6th ARN Symposium Organizing Committee


INCREASE
EQUATORIAL ATMOSPHERE RADAR (EAR) 20th CEREMONY
LAPAN BRIN - Kyoto University International Symposium on Equatorial Atmosphere in conjunction with Equatorial Atmosphere Radar (EAR) 20th Anniversary
Monday, 20th September 2021
organized by:


INCREASE
EAR 20th Ceremony




INCREASE
20 - 21 September 2021

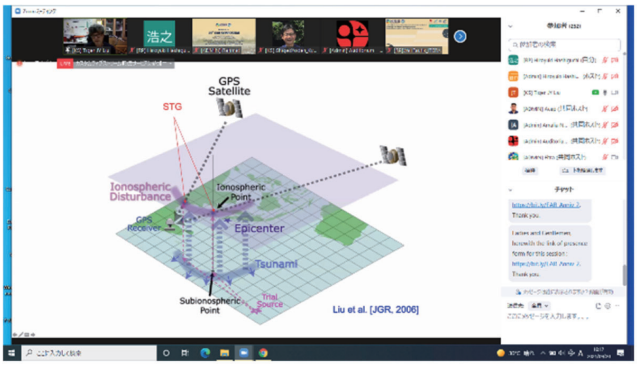

Ladies and gentlemen, I am Makoto Ueki, Scientific Research Institutes Division, Research Promotion Bureau, Ministry of Education, Culture, Sports, Science and Technology (MEXT).

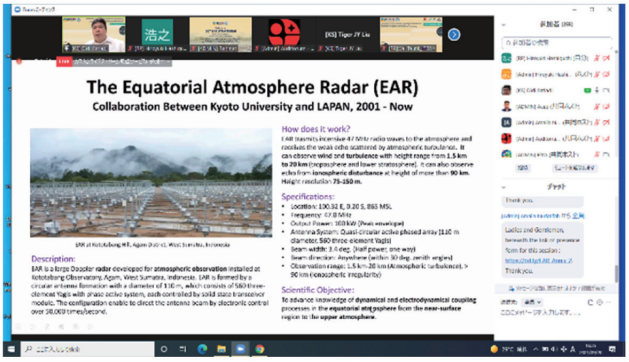

Equatorial Atmosphere Radar and Future Project
Mamoru Yamamoto
Professor/Vice director
RISH, Kyoto University

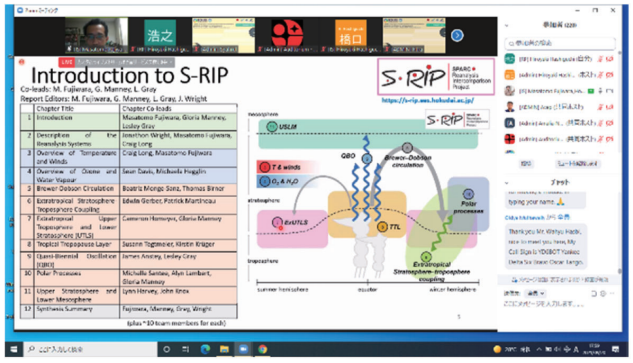

INCREASE
Welcome to:
20th EAR SYMPOSIUM
Monday, 20th September 2021
01.30 p.m. Western Indonesian Time
LAPAN BRIN - Kyoto University International Symposium
on Equatorial Atmosphere in conjunction with
Equatorial Atmosphere Radar (EAR) 20th Anniversary
organized by:

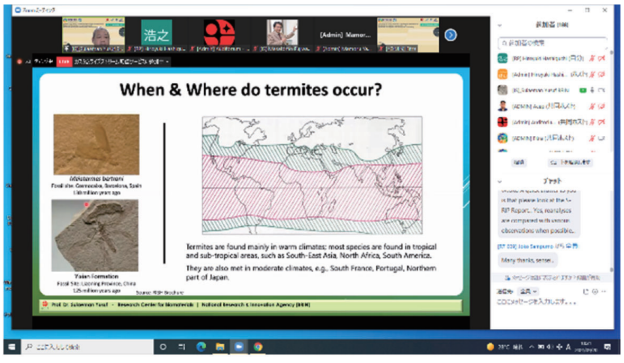

INCREASE
Symposium

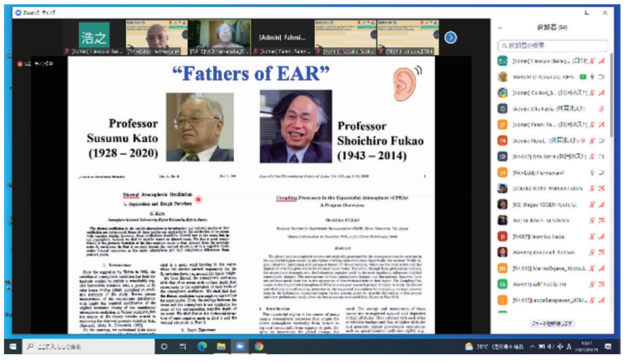

0. Congratulations on the 20th anniversary of the EAR
The 20th anniversary of
Equatorial Atmospheric Radar (EAR)
Japan-Indonesia collaborative study of equatorial atmosphere
– 20 years of the Equatorial Atmosphere Radar and beyond –
(LAPAN)
https://ear20.lapan.go.id/pdf/brochure20210913upload.pdf
August 23, 2001


GPS Satellite
STG
Ionospheric Disturbance
Ionospheric Point
GPS Receiver
Epicenter
Tsunami
Initial Source
Subionospheric Point
Liu et al. [JGR, 2006]


The Equatorial Atmosphere Radar (EAR)
Collaboration Between Kyoto University and LAPAN, 2001 - Now
How does it work?
Specifications:
Description:
Scientific Objective:


Introduction to S-RIP
Co-leads: M. Fujiwara, G. Manney, L. Gray, J. Wright
Report Editors: M. Fujiwara, G. Manney, L. Gray, J. Wright
S-RIP


When & Where do termites occur?
Termites are found mainly in warm climates; most species are found in tropical and sub-tropical areas, such as South-East Asia, North Africa, South America.
They are also met in moderate climates, e.g., South France, Portugal, Northern part of Japan.


"Fathers of EAR"
Professor Susumu Kato (1928 – 2020)
Professor Shoichiro Fukao (1943 – 2014)


INCREASE
LAPAN BRIN - Kyoto University International Symposium on
Equatorial Atmosphere in conjunction with
Equatorial Atmosphere Radar (EAR) 20th Anniversary
20 - 21 September 2021

The 6th Asia Research Node Symposium on Humanosphere Science
jointly with
LAPAN/BRIN-Kyoto University International Symposium for Equatorial Atmosphere
International Conference on Radioscience, Equatorial Atmospheric Science and Environment

September 20 (Mon)
02:00UTC(9:00WIB)- **Ceremony for EAR 20th Anniversary**
Chairs: Fadli Nauval and Christine Cecylia Munthe

Welcome Performance

Indonesian National and Japan National Anthem

Welcome Speech
Masato Shiotani
Director of Research Institute for Sustainable Humanosphere (RISH), Kyoto University

Erna Sri Adiningsih
Acting Head of Research Organization for Aeronautics and Space (LAPAN), BRIN

Congratulatory Speech
Nagahiro Minato (video message)
President of Kyoto University

Makoto Ueki (video message)
Director of Scientific Research Institutes Division, Research Promotion Bureau, Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Andri Warman
Regent of Agam District, West Sumatera

Kazuo Shiokawa
President of Scientific Committee on Solar Terrestrial Physics (SCOSTEP)

Kaoru Sato (video message)
President of Meteorological Society of Japan

Suharso Monoarfa (video message)
Minister of National Development Planning (BAPPENAS)

Laksana Tri Handoko
Chairman of National Research and Innovation Agency (BRIN)

Future Project
Mamoru Yamamoto
Vice Director of RISH, Kyoto University

Congratulatory Address and Press Conference
M. Shiotani, L. T. Handoko, E. S. Adiningsih, M. Yamamoto, and Halimurrahman
Didi Satiadi (moderator)

06:30UTC(13:30WIB)- **Keynote Speech**
Chair: Erma Yulihastin

Dynamical Influence of the Stratosphere on the Tropical Troposphere
Shigeo Yoden
Institute for Liberal Arts and Sciences, Kyoto University

Equatorial Ionospheric Weather Observed by FORMOSAT-3/COSMIC and FORMOSAT-7/COSMIC-2
Jann-Yenq Liu (Tiger)
National Central University, Taiwan

The Past and Future Use of the Equatorial Atmosphere Radar in Atmospheric Research in Indonesia
Didi Satiadi
Research Center for Atmospheric Science and Technology, LAPAN, BRIN

08:10UTC(15:10WIB)- **Invited Speech**
Chair: Noersomadi

Observations of Turbulent Mixing in Tropical Tropopause Layer (TTL)
Hiroyuki Hashiguchi
Research Institute for Sustainable Humanosphere (RISH), Kyoto University

Small Satellite Research and Development and Its Applications in Indonesia
Wahyudi Hasbi
Research Center for Satellite Technology, LAPAN, BRIN

Overview of the SPARC Reanalysis Intercomparison Project (S-RIP) during 2013-2021
Masatomo Fujiwara
Faculty of Environmental Earth Science, Hokkaido University

How Climate Change Drives Global Termite Distribution and Invasiveness
Sulaeman Yusuf
Research Center for Biomaterials, LIPI, BRIN

September 21 (Tue) 01:30UTC(8:30WIB)-

Room 1 (SRIKANDI)
Chairs: Yudha S. Djamil, Saipul Hamdi, and Sayanta Ghosh

(Invited Speech)
Atmospheric Environmental Research by Analyzing the Character of Indonesian Ozone Profile Using AQUA_AIRS Data
Ninong Komala

R1-001
Decline of Surface Global Solar Radiation at Palembang City of Indonesia Correlated to Smoke Event in 2019
Saipul Hamdi, Sumaryati and Syahril Rizal

R1-002
Langley Plot and Lambert-Beer Law in Retrieving Solar Radiation at the Top of Atmosphere
Jamrud Aminuddin, Zaroh Irayani, Abdullah Nur Aziz, Laras Toersilowati and Soni Aulia Rahayu

R1-003
Development of Solar Radiation Observation System Using RTL-SDR
Didik Septian Pangestu, Rizal Suryana and Sofyan Basuki

R1-004
Diurnal Variation of Fine Particulate Matter in Indonesia Based on Reanalysis Data
Nani Cholianawati

R1-005
Simulation and Evaluation of PM2.5 in the City of Palangkaraya Using the Model WRF-Chem
Waluyo Eko Cahyono, Prawira Yudha Kombara, Emmanuel Adetya and Wilin Julian Sari

R1-006
Air Quality in the Bandung Basin of Indonesia as Measured by Passive Sampler
Wiwiek Setyawati, Dyah Aries Tanti and Asri Indrawati

R1-007
Estimating the Impact of Spatio-Temporal Land Cover Changes on Air Quality Using Satellite Data in Beas Valley, Himachal Pradesh, India
Sayanta Ghosh, Renu Lata, Isha Thakur and J. C. Kuniyal

R1-008
Effect of Meteorology Parameters on Air Pollutant Standard Index in Urban Area (Case Study in Jakarta)
Dessy Gusnita

R1-009
Ozone Variability at 10 hPa in Indonesia Based on MERRA2 Data
Prawira Yudha Kombara and Ninong Komala

R1-010
Characteristics of Acid Deposition in Urban and Sub-Urban Area
Asri Indrawati, Dyah Aries Tanti, Wiwiek Setyawati, Sumaryati Sumaryati, Indra Chandra and Atep Radiana

R1-011
Analysis and Verification of Fire Danger Rating System (FDRS) Parameters in Land and Forest Fire in West Kalimantan in 2019 and Its Relationship with Hotspots and Rainfall
Jihan Putri Amelia, Zadrach Ledoufij Dupe and Indah Prasasti

R1-012
Direct Effect of Aerosol Respect to Radiation Budget on Forest Fire Event in Sumatera Region
Prawira Kombara, Waluyo Eko Cahyono, Wilin Julian Sari, Emmanuel Adetya and Rosida Rosida

R1-013
Smoke Propagation during Fire Season in Kalimantan and Sumatra in 2015 and 2019
Sumaryati, Dita Fatria Andarini, Nani Cholianawati and Asri Indrawati

R1-014
Influence of Local Wind Respect to the PM2.5 Dispersion in Bandung Basin
Prawira Yudha Kombara and Nani Cholianawati

R1-015
Correlation Investigation between Aerosols Variability, Forest Fire and Meteorological Variables during Summer Monsoon in Riau Province, Indonesia
Wilin Julian Sari, Waluyo Eko Cahyono, Rahaden Bagas Hatmaja, Prawira Yudha Kombara and Emmanuel Adetya

R1-016

The Projections of Urban Climate Change Using Conformal Cubic Atmospheric Model (CCAM) in Bali – Indonesia

Laras Toersilowati, Bambang Siswanto, Edy Maryadi, Indah Susanti, Mamat Suhermat, Adi Witono, Hidayatul Latifah, Sinta Berliana Sipayung, Amalia Nurlatifah, Jamrud Aminuddin and Fildzah Adany

R1-017

Climate Change and Drought: A Perspective on Rainfall and Water Deficits in Java and Bali

Indah Susanti, Sinta Berliana Sipayung, Edy Maryadi, Amalia Nurlatifah, Hidayatul Latifah, Bambang Siswanto, Adi Witono, Lilik Slamet S. and Martono

R1-018

The Impact of Climate Change to Meteorological Drought in Yogyakarta

Sinta Berliana Sipayung, Indah Susanti, Edy Maryadi, Amalia Nurlatifah, Hidayatul Latifah, Bambang Siswanto, Adi Witono, Laras Tursilowati, Mahmud Mahmud and Mamat Suhermat

R1-019

Outstanding Issues in the Future Climate Projection over Indonesia

Yudha Djamil, Tri Hadi, Wirid Birastri and Xianfeng Wang

R1-020

The Effect of Land Change on Urban Heat Island: Case Study of Bekasi Regency

Feri Nugroho, Ayub Sugara and Ayi Priana

R1-021

Characteristic of Precipitable water Vapour in 2017-2019 over Bandung Estimated by GPS data

Atep Radiana, Saipul Hamdi, Arif Aditya, Fahmi Rahmatia and Syafrijhon

R1-022

Chemical Characteristics of Rainwater in Bandung and Kototabang

Fandy Balbo, Rusmawan Suwarman and Arika Indri Dyah Utami

R1-023

Comparison of PM10 Parameters Pre and Post Social Restrictions during the COVID-19 Pandemic in Serpong

Hendri Satria and Dewi Tamara Qothrunada

R1-024

Investigation of Air Pollution during the COVID-19 Pandemic in Padang City: Correlation of Specific Pollutants with Daily Case and the Effect of Social Restrictions

Putri Nilam Sari, Nofriya and Alberth Christian Nahas

R1-025
Impact of Tourism and Anthropogenic Activities on Air Quality: A Brief Study during Lockdown in 2nd Wave of COVID-19 Pandemic in Kullu Valley of North Western Himalayas
Isha Thakur, Renu Lata, Sayanta Ghosh and J. C. Kuniyal

R1-026
The Global Atmospheric Condition during the COVID-19 Pandemic
Yuliana

R1-027
Correlation of Forest and Land Fires in Sumatra to Natural and Anthropogenic Forcing Using CMIP5 Data
Lesi Mareta, Alfiah Rizky Diana Putri and Ridlo Wahyudi Wibowo

Room 2 (SADEWA)
Chairs: Wendi Harjupa, Noersomadi, and Ulung Jantama Wisha

(Invited Speech)
Mechanisms of Diurnal Precipitation over Sumatra: Measurement and Climate Model Perspectives
Marzuki, Helmi Yusnaini, Fredolin Tangang, Robi Muharsyah and Mutya Vonnisa

R2-001
GSMAP Seasonal Rainfall Verification over Western Java
Arifatus Hikmah Rusmanansari, Rusmawan Suwarman, Yudha Setiawan Djamil and Yan Firdaus

R2-002
Evaluation of GPM IMERG Products for Extreme Precipitation over Indonesia
Ravidho Ramadhan, Robi Muharsyah, Marzuki, Helmi Yusnaini, Mutya Vonnisa and Hiroyuki Hashiguchi

R2-003
Estimating Rainfall Data Using Tropical Rainfall Measuring Mission (TRMM) Data: Study Case in Pesawaran Meteorology and Geophysics Agency
Ali Rahmat and Fajar Setiawan

R2-004
Intraseasonal Change of the Diurnal Cycle of Precipitation over Sumatra from IMERG Observation
Helmi Yusnaini, Marzuki, Harmadi and Mutya Vonnisa

R2-005
Evaluation of GPM IMERG Rainfall Products over Indonesia at Multiple Spatiotemporal Scales

Ayu Putri Ningsih, Robi Muharsyah, Marzuki, Helmi Yusnaini, Mutya Vonnisa and Ravidho Ramadhan

R2-006
Correcting Bias GPM IMERG Precipitation over Brantas Watershed, Indonesia

Rana Hapsari, Arno Kuntoro, Widyaningtias, Edi Riawan, Mohammad Farid and Mohammad Adityawan

R2-007
Impacts of the QBO on MJO-Related Rainfall over Maritime Continent

Aldiatama Jumanissaba, Sandro W. Lubis and Sonni Setiawan

R2-008
Impact of MJO on the Distribution of Extreme Rainfall over Indonesia During IOD and ENSO Condition

Wendi Harjupa, Trismidianto, Risyanto, Elfira Saufina, Fadli Nauval, Dita Fatria Andarini, Teguh Harjana, Marzuki and Eddy Hermawan

R2-009
The Influence of Boreal Summer Madden-Julian Oscillation on Precipitation Extremes in Indonesia

Fadhlil Rizki Muhammad, Sandro Wellyanto Lubis and Sonni Setiawan

R2-010
Convectively Coupled Equatorial Waves Triggering Torrential Rainfall Events over Sumatra, Indonesia

Muhamad Reyhan Respati, Sandro W. Lubis and Sonni Setiawan

R2-011
The Madden-Julian Oscillation Forcing on the Diurnal Variation of Turbulence Kinetic Energy in the Tropical Tropopause Layer Observed with Equatorial Atmosphere Radar

Noersomadi

R2-012
Kelvin Wave Activity in the UTLS over the Maritime Continent from GPS RO Measurements

Diah A. Tiyas, Sandro W. Lubis and Sonni Setiawan

R2-013
Changes in Diurnal Cycle of Rainfall over the Western Maritime Continent Associated with Cold Surge and the Madden-Julian Oscillation
Aldi Krismon, Muhammad Rais Abdillah and Nurjanna Joko Trilaksono

R2-014
On the Mechanism of Anomalously Wet and Cold Weather over Java in the Month of June
Suaydhi

R2-015
Impact of La Niña to the River Discharge Variability in the Upper Citarum Watershed
Edi Rikardo Sinaga, Rusmawan Suwarman, Edi Riawan, Yogi S.M Simanjuntak and Yudha S. Djamil

R2-016
Atmospheric Methane Variability during Upwelling Events in the Southern Coast of Java, Indonesia
Rahaden Bagas Hatmaja, Wilin Julian Sari, Fildzah Adany and Prawira Yudha Kombara

R2-017
Mindanao Current, Its Variations and Reaction to the El Niño-Southern Oscillation (ENSO) Event
Yusuf Jati Wijaya, Ulung Jantama Wisha and Yukiharu Hisaki

R2-018
Comparative Analysis of Upwelling Characteristics in Northeast and Southwest of Indonesian Seas Area
Sigit Kurniawan Jati Wicaksana and Iis Sofiati

R2-019
Atmospheric Response to the Southern Java Upwelling Variability Associated with Indian Ocean Dipole Event
Rahaden Bagas Hatmaja, Christine Cecylia Munthe, Erma Yulihastin and Kadiman Erfitra Pramudia

R2-020
Vulnerability of the Bengkalis Coastal Areas to Exposure to Rob Flood and Its Impact based on Spatial Modeling
Giant Amor, Muhammad Hanif, Rizki Atthoriq Hidayat Thoriq, Arie Yulfa and Poppy Indrayani

R2-021
Modeling the Generation of Tidal Bore at the Estuary of Rokan River, Indonesia
Ulung Jantama Wisha, Yusuf Jati Wijaya, and Yukiharu Hisaki

R2-022
Analysis Vulnerability Disaster of Landslide in Lantan Village North Batukliang District Central Lombok Regency Using Geoelectric Data and Sentinel Image Data
Syarifatul Ulfah, Marzuki and Adi Susilo

R2-023
Tsunami Impact Assessment for Coastal City in Cilacap, Indonesia: A Geospatial Approach
Ranie Dwi Anugrah and Stevani Anggina

R2-024
Quantifying Rainfall Uncertainties from TRMM Satellite Estimation over Ciliwung Basin
Muhammad Ridho Syahputra, Faiz R. Fajary, Muhammad Rais Abdillah, Edi Riawan, Rusmawan Suwarman and Hengki Eko Putra

R2-025
Atmospheric El Niño Precursors over the Maritime Continent
Wildan Novrizal, Faiz R. Fajary and Nurjanna Joko Trilaksono

R2-026
Identification of Shoreline Changes in Padang City from 2000-2020 Using Modified Normalized Difference Water Index Method and Use of Digital Shoreline Analysis System
Beben Graha Putra, Arie Yulfa and Siti Khofifah

Room 3 (SANTANU)
Chairs: Jezzel Rabe, Kharisma Aprilina, and Arif Wicaksono

(Invited Speech)
Precision Heat Monitoring in Agriculture Using Fuzzy Logic Model
Nnamdi Uzoukwu and Acep Purqon

R3-001
The Intersection of Environmental Science and Social Science in the Sustainability Innovation
Budi Harsanto

R3-002
Implementation of Environmental Policy on Oil Palm Plantations Related to ISPO in Eastern Part of South Sumatra Province
Nurul Amri Komarudin, Hariyadi and Tania June

R3-003
Microclimate and Its Impact on Hotel Building Energy Saving Performance in the Tropical Coastal City
Bangun I.R. Harsritanto, Dany Perwita Sari and Jeanny Laurens Pinassang

R3-004
Determination of Stunting Priority Locations and Regional-Based Stunting Management Strategies in Serang City
Erti Nurfindarti and Nugrahana Fitria Ruhyana

R3-005
Electrodeposition of Cu Layer with Mangrove Bark Extract Additive as an Inhibitor for the Application of Anti-Corrosion Coating
Dahyunir Dahlan, Muhammad Frassetia Lubis and Dwi Puryanti

R3-006
Reducing Sugars Production from Oil Palm Empty Fruit Bunches (OPEFB) by Combined Dilute Acids-Hydrothermal Pretreatment
Fahriya Puspita Sari, Fitria Fitria, Sita Heris Anita, Maulida Oktaviani and Widya Fatriasari

R3-007
The Relationship between Climate Variables and Rice Productivity from the Aquacrop Simulation in the Clustering Area from the Results of the K-Means Method in Java Island, Indonesia
Kharisma Aprilina, Ardhasena Sopaheluwakan, Armi Susandi, Hastuadi Harsa, Utoyo Ajie Linarka and Rian Anggraeni

R3-008
The Impact of Climate Change on Effectivity of Biocontrol in The Arabica Coffee Landscape
Siska Rasiska, Pampang Parikesit and Iwan Setiawan

R3-009
Zone of Biodiversity Extinction in Tropical Marine Ecosystems in Sumatra Island Using Climate Change Scenarios
Muhammad Hanif, Rizki Atthoriq Hidayat, Giant Amor and Luhur Moekti Prayogo

R3-010
Biomonitoring of Polycyclic Aromatic Hydrocarbons in the Ambient Air Using Plants: A Review
Desy Sulistiyorini

R3-011
Description of Macroscopic and Microscopic Alternaria porri on Shallots (Alium ascolonicum L) in Enrekang Regency
Hikmahwati, Muhammad Rifqy Aulia, Harli A Karim, Nur Ilmi and Agus Riandi

R3-012
Increasing Rice Yield by Soil Tillage System and Water Management
Nourma Al Viandari, Anicentus Wihardjaka, Heru Bagus Pulunggono and Suwardi

R3-013
Water Quality Assessment for Submarine Groundwater Discharge (SGD) Pollution in the Coastal Area of Krakas Beach, North Lombok, Indonesia
Wisnu Arya Gemilang, Ulung Jantama Wisha and Hendra Bakti

R3-014
Spatial Distribution of Nutrient Export from the Catchment Area of Lake Rawapening
Nunung Nugroho

R3-015
Prototype of Flood Monitoring System Based on River Turbidity Using Optical Fiber Sensor and Raspberry Pi 3 B+
Muhamad Iqbal, Aldo Novaznursyah Costrada and Harmadi

R3-016
Public Urban Park Quality Assessment Using Fuzzy C Means Classification of Land Surface Temperature and Social Indicators
Arif Wicaksono

R3-017
ETA Concept Program for Reducing Green House Effect in Indonesia Industrial Scale with IoT Integrated
Riki Purnama Putra, Roprop Latiefatul Millah and Shidiq Andhika

R3-018
Utilization of Agroindustrial by Product for Bioinsecticide Production
Kirana Sasmitaloka, Mulyorini Rahayuningsih and Titi Sunarti

R3-019
Characterization of Novel Multi-Pulpose Oil Extracted from Asiatic Softshell Turtle and Its Palm Oil Alduteration Analysis Employing Fourier Transform Infrared (FTIR) Spectroscopy
Andi Tenri Nurwahidah, Septiana Indratmoko, Nida Churin Aini and Akhmad Berryl Widyartha

R3-020
Moringa Oleifera as a Feed Ingredient in Broiler Diets
Jezzel Rabe, Katherine Caga-Anan, Fretchie Nebre, Rhona May Gerondio and Karyn Chrislene Vitor

R3-021
PCR Column Contamination Gave False Positive Result for Cherax Quadricarinatus Densovirus (CqDV) in Sf 9 Cell Cultures
Dewi Syahidah, Jennifer Elliman and Leigh Owens

R3-022
Fighting COVID-19 Using Herbal Medicine According to Local Plant Diversity
Enung Nurhotimah

R3-023
Resistance Induction of Sweet Corn to Helminthosporium Turcicum Using Biochar Application
Desty Aulia Putrantri, Suskandini Ratih Dirmawati, Agus Karyanto, Darwin Pangaribuan and Ainin Niswati

R3-024
The Sustainable Digital-Farming Framework Using an Interdisciplinary Approach
Agusriandi and Hikmahwati

Room 4 (SRIRAMA)
Chairs: Wojciech Szkolka, Mariko Ogawa, and Eddy Hermawan

(Invited Speech)
EAR Construction Motivation Revisited: Indonesian Coastline Representing Earth
Manabu D. Yamanaka

R4-001
Effects of El-Nino and La-Nina on the Velocity Potential at 200 hPa over Maritime Continent
Eddy Hermawan, Tyo Maulana and Rahmat Gernowo

R4-002
Analysis of Prediction of the Occurrence of Rainfall Events Associated to ENSO Phenomenon Using Simple Logistic Model over Eastern Indonesia
Fadli Nauval, Elfira Saufina, Dita Fatria Andarini, Risyanto Risyanto, Trismidianto Trismidianto, Wendi Harjupa, Teguh Harjana, Marzuki and Eddy Hermawan

R4-003
The Response of Rainfall in Sumatera to Indian Ocean Dipole Phenomenon
Fahmi Rahmatia, Listi Restu Triani and Amalia Nurlatifah

R4-004
The Relation Between ENSO and IOD with the Rainfall Events over Indonesian Maritime Continent Based on TRMM Precipitation Data
Teguh Harjana, Anis Purwaningsih, Trismidianto, Wendi Harjupa, Fadli Nauval, Dita Fatria Andarini, Elfira Saufina, Arief Suryantoro and Eddy Hermawan

R4-005
Investigation of Atmospheric Reanalysis Convective Parameters and Overshooting Cloud Top in Hail Events Over Java Island
Bony Septian Pandjaitan

R4-006
The Impact of Vertical Velocity Parameter Conditions and Its Relationship with Another Weather Parameters in the Hail Event
Nadine Ayasha

R4-007
Characteristics of Hail-Producing Convection in Bandung, Indonesia as Derived from Himawari-8 High Resolution Data
Hiromitsu Ikeda, Shoichi Shige, Kazumasa Aonashi, Hitoshi Hirose, Atsushi Hamada, Nurjanna Joko Trilaksono, Rahma Yanti, Dinda Shabrina Medyani and Prawira Yudha Kombara

R4-008
Rainfall Nowcasting with Rain Scanner Images in Bandung
Syukri Darmawan, Edy Maryadi, Annida Rahmawati, Asif Awaludin, Tiin Sinatra and Fadli Nauval

R4-009
Examining the Characteristics and Dynamics of Quasi-Linear Convective System (QLCS) Using Weather Radar Data and Numerical Weather Model in North Sumatra Region
Immanuel Jhonson Arizona Saragih, Wiliam Wiliam and Imma Redha Nugraheni

R4-010
Study on Diurnal Variation of Rainfall Observed by X-Band Polarimetric Radar in Peatlands over Bengkalis Island, Eastern Sumatra, Indonesia
Mariko Ogawa, Manabu Yamanaka, Awaluddin Awaluddin, Arief Darmawan, Albertus Sulaiman, Reni Sulistyowati, I Dewa Gede Arya Putra and Osamu Kozan

R4-011
Variation of the Wind Profiles in the Tropical Tropopause Layer Associated with QBO-MJO Connection
Arlif Nabilatur Rosyidah, Nurjanna Joko Trilaksono and Noersomadi

R4-012
Determining Quantitative Precipitation Estimation (QPE) through Comparison of the Z-R Relation Algorithms on Convective and Stratiform Rain in Parts of East Java
Laode Bangsawan, Retnadi H. Jatmiko and Emilya Nurjani

R4-013
The Diurnal Evolution of Tropospheric Winds and Its Variability in Response to Large-Scale Phenomena - An Analysis Based on Equatorial Atmospheric Radar Data
Wojciech Szkolka and Dariusz Baranowski

R4-014
Evaluation of the Surface Wind Speed, Shear of Wind Speed, Shear of Wind Direction and Richardson Number at Soekarno Hatta Airport Using Wyoming Radiosonde Data
Ina Juaeni, Ridho Pratama, Wendi Harjupa, Elfira Saufina, Dita Fatria Andarini and Ibnu Fathrio

R4-015
The Average Cloud Base Height in Kototabang 2016-2018 (Comparison between Ceilometer, Radiosonde and Himawari-8)
Ridho Pratama, Muhammad Fadhlan Putranto, Fahmi Rahmatia, Ina Juaeni, Risyanto, Wendi Harjupa and Marzuki

R4-016
Atmospheric Residual Layer Height Variations in Clear and Rainy Days Based on High-Resolution Radiosonde and Global Positioning System Radio Occultation Data
Resa Pratikasari, Nurjanna J. Trilaksono and Noersomadi

R4-017
The Influence of Borneo Vortex on Rainfall Variability over Western Indonesian Maritime Continent
Dita Fatria Andarini, Fadli Nauval, Elfira Saufina, Risyanto, Trismidianto, Wendi Harjupa, Teguh Harjana, Marzuki and Eddy Hermawan

R4-018
Analysis of Multi-Scale Atmospheric Phenomena and Parameters Triggering Seroja Tropical Cyclone and Its Effect to Extreme Rainfall over Nusa Tenggara Timur
Luthfiyah Jannatunnisa and Trismidianto

R4-019
Evolution of Mesoscale Convective Complex and Its Atmospheric Conditions During Heavy Rain in Bandung, 22 February 2018
Fauziah Fangia and Trismidianto

R4-020
Trend Analysis of Precipitation and Temperature at Annual and Seasonal Time Scale over Semarang of Central Java
Ilham Fajar Putra Perdana and Niken Astrid Septyar

R4-021
Comparison of Atmospheric Dynamics Conditions, Rainfall and Rainy Days with Historical Data during Flood Events in North Buton on 18 and 22 June 2021
Dewi Tamara Qothrunada, Hendri Satria and Bowo Parkoso

R4-022
The Different Atmospheric Conditions Associated with Northerly Surge, Borneo Vortex and Madden-Julian Oscillation during the Extreme Rainfall Cases in Early 2021 over the Western Part of the Maritime Continent
Anis Purwaningsih

R4-023
Quasi-Linier Convective System (QLCS) Characteristics in Jakarta, West Java and Banten during 2018
Ilham Fajar Putra Perdana, Carrin Avisha Tambunan, Elang Sinaran Damai, M. Isa Al Anshory, Imma Redha Nugraheni, and Gumilang Deranadyan

R4-024
The Evaluation of Rapidly Developing Cumulus Area Model in Detecting Rain in Bandung Basin
Aulia Azura, Wendi Harjupa, Muhammad Rais Abdillah and Muhammad Fadhlan Putranto

R4-025
Intraseasonal and Interannual Variability of Cumulonimbus Cloud over the Maritime Continent
Suaydhi and Gammamerdianti

R4-026
Analysis of Changes in Convective Activities in the Event of Heavy Rain in Jakarta Using Himawari-8 Data and the RDCA Index (Case Study: Flood in Early January 2020)
Lutvi Andriani, Wendi Harjupa, Muhammad Rais Abdillah and M. Fadhlan Putranto

Room 5 (SEMAR)
Chairs: Yoshikatsu Ueda, Juliet Berdera, and Subyakto

(Invited Speech)
Biomass Utilization in Tropical Area for Sustainable Development
Toshiaki Umezawa

R5-001
Thermal Properties of Acetylated Starch-Chitosan Based Bioplastic Film
Yeyen Nurhamiyah, Firda Aulya Syamani, Wida Banar Kusumaningrum and Nanang Masruchin

R5-002
Correlation Between Radiation Measurement on The Field Slopes Using KURAMA (Kyoto University Radiation Mapping System) and Environmental Radioactivity in the Soil Depth Direction
Yoshikatsu Ueda, Naoto Nihei, Ratanaporn Norarat and Minoru Tanigaki

R5-003
Enhancing Visible Light Adsorption of TiO_2/Ti Photocatalyst by Co-Doping Cr and N Elements and Its Application in Tetracycline Photoelectrochemical Degradation
Akhmad Berryl Widyartha, Muhammad Nurdin, La Ode Ahmad Nur Ramadhan, Andi Tenri Nurwahidah and Thamrin Azis

R5-004
A Systematic Review: Environmental Quality and Exposure to Ammonia Concentration from the Processing of Natural Rubber to Crumb Rubber
Nurul Amri Komarudin, Ashemir B Velaco, Elsera Br Tarigan and Yahya Shafiyuddin Hilmi

R5-005
Effect of Precipitation Time on the Physicochemical Properties of Modified Sago Starch
Riska Surya Ningrum, Fadia Idzni Rodhibilah, Dewi Sondari, Sudarmanto Sudarmanto and Dwi Ajias Pramasari

R5-006
Evaluation of Land Suitability for Orange Plants (Citrus Sinensis L.) Post Eruption of Mount Sinabung, Karo District, North Sumatera
Nur Indah Kartika Sani, Gusnidar, Frisa Irawan Ginting, Ahmad Yasir, Ahmad Fanani and Dian Fiantis

R5-007
Properties of Moulding Products from Sorghum Bagasse Combined with Alang-Alang Leaves, Sengon Wood or Bamboo Using Citric Acid-Sucrose
Subyakto, Eko Widodo, Triyati, Naomi Damaria Lidya Andini Hutauruk, Rabiyah Al Adawiyah and Kenji Umemura

R5-008
Strategies for Improving the Quality of Sorghum Bagasse-Acacia Wood-Based Particleboard
Yuliati Indrayani, Sasa Sofyan Munawar and Jamaluddin Jamaluddin

R5-009
Technological Properties of Formaldehyde Free Adhesives Based on Oxidized Starch Mixed with Different Cross-linkers for Plywood
Apri Heri Iswanto and Muhammad Adly Rahandi Lubis

R5-010
Preliminary Study on The Utilization of Sugarcane Trash and Corncob for Xylo-oligosaccharides and Xylose Production through Dilute Acid Hydrolysis
Thesalonica Yohana, M. Zuvan Maulana Fahrezi, Riska Surya Ningrum, Dwi Ajias Pramasari, Riksfardini Annisa Ermawar, Dewi Sondari and Euis Hermiati

R5-011
The Geochemical Properties of Volcanic Materials: After a Year Mt. Sinabung Eruption
Saftia Laila Rajmi, Gusnidar, Retno Leodita Lubis, Frisa Irawan Ginting, Fakhrijal Rizki Hidayat, Aldi Nanda Armer, Hazi Zulhakim, Novika Yulanda, Ichsan Faisal Syukri and Dian Fiantis

R5-012
Feasibility Test of Using Disposable Baby Diaper Waste as Raw Material for Fiberboard
Sri Purwati, Djoko Sihono Gabriel and Kurnia Wiji Prasetiyo

R5-013
Influence of Different Pretreatment Methods and Yeast Strains on Xylitol Production from Sugarcane Trash Hemicellulose Hydrolysate
Maulida Oktaviani, Fahriya Sari, Benjarat Bunterngsook, Euis Hermiati, Verawat Champreda and Takashi Watanabe

R5-014
The Morphological Features of Sensilla on Non-Olfactory Organs in the Soldier Caste of Subterranean Termite Coptotermes spp.
Bramantyo Wikantyoso, Setiawan Khoirul Himmi, Tomoya Imai, Toshimitsu Hata and Tsuyoshi Yoshimura

R5-015
Land Snail Species from Rice Paddies in Tagum City (Philippines)
Jeaneth Molano and Karyn Chrislene Vitor

R5-016
Intertidal Arthropods of Pantukan, Davao de Oro, Philippines
Juliet Berdera, Jean Amor Jamero, Reyna Jane Gontinas, John Gary Tejano and Karyn Chrislene Vitor

R5-017
Effects of Air-fine Bubbles Water on Cultivated Shiitake Mushroom in Thailand
Rattanaporn Norarat, Wichet Thipprasert, Vishnu Thonglek and Nantinee Srijumpa

R5-018
Reduction of Copper and Lead Metal Content in Gonggong Snails Using Lime
Fitrah Amelia, Ramses and Ismarti

R5-019
Environmental Impact Analysis through Heavy Metals Contained Sago Starch
Ikhsan Nazar Arrahman

R5-020
Assessment of the Geochemical Weathering Indices of Volcanic Soil After the Eruption from Mount Sinabung in 2020
Retno Leodita Lubis, Juniarti, Saftia Laila Rajmi, Aldi Nanda Armer, Novika Yulanda, Fakhrijal Rizki Hidayat, Hazi Zulhakim, Ichsan Faishal Syukri, Frisa Irawan Ginting and Dian Fiantis

R5-021
Effect of Community-Based Total Sanitation Program with Diarrhea Incidents in Children under Five
Fenita Purnama Sari Indah

R5-022
Mass Wasting Affected Area Mapping Based on Relative Difference of Normalized Difference Vegetation Index Using Google Earth Engine in Nusa Tenggara Timur (Case Study: Tropical Cyclone Seroja, 3 April 2021)
Bayu Nugraha and Nadhilah Humairah Salwa Salsabil

Room 6 (JATAYU)
Chairs: Tatsuhiro Yokoyama, Yuichi Otsuka, and Prayitno Abadi

(Invited Speech)
Impacts of the 2019 Antarctic Stratospheric Sudden Warming Event on the Equatorial Thermosphere and Ionosphere
Yasunobu Miyoshi and Yosuke Yamazaki

R6-001
Ionospheric Observation Using Equatorial Atmosphere Radar (EAR) Kototabang for the 26 December 2019 Annular Solar Eclipse Research
Agri Faturahman, Varuliantor Dear, Jiyo Harjosuwito, Afrizal Bahar, Asnawi Husin and Rezy Pradipta

R6-002
Study of the Characteristics of Ionospheric F layer above Kototabang during Flare Event on August 9, 2011
Muly Prety Mahayu, Ednofri and Alfiah Rizky Diana Putri

R6-003
Long-Term Analysis of Electron Density Observed by the MU Radar and Auto-Scaled Ionosonde Data
Masuda Shuto, Yokoyama Tatsuhiro and Yamamoto Mamoru

R6-004
Exploring an Extension of Space Situational Awareness in Southeast Asian Region Utilizing EAR Observation data
Afrizal Bahar, Varuliantor Dear, Asnawi Husin, Jiyo Harjosuwito, Agri Faturahman and Rezy Pradipta

R6-005
Scintillation Drift Velocity Observed by Closely-Spaced GPS Receivers in Indonesia
Yuichi Otsuka and Prayitno Abadi

R6-006
Estimation of Geomagnetic Storm of Solar Cycle 24 Based on Solar Wind and Magnetic Field Parameters
Anwar Santoso and Dyah Rahayu Martiningrum

R6-007
The Equatorial Spread-F Occurrence as Functions of Solar Activity, Geomagnetic Activity, and Evening Upward Plasma Drift Analyzed by Logistic Regression
Prayitno Abadi, Gilland F. P. Achyar, Dyah R. Martiningrum, Reza R. Septiawan, Umar A. Ahmad and Septi Perwitasari and Punyawi Jamjareegulgarn

R6-008
The Characteristic of Ionospheric Plasma around a Bias Spacecraft in Space
Nizam Ahmad

R6-009
Morphological of E-F Region Field Aligned Irregularities in Low Latitude
Dyah Rahayu Martiningrum, Prayitno Abadi, Anwar Santoso and Mamoru Yamamoto

R6-010
Impact Of Plasma Depletion on The Occurrence of Scintillation in the Minimum Years Phase of Solar Cycle 23
Ednofri

R6-011
Simulation of Solar Flare Mechanism Based on Ideal Magnetohydrodynamics State by Disrupting the Stability of Magnetic Field Due to the Plasma Momentum Injection
Ni'Matus Sholikhah and Bambang Setiahadi

R6-012
The Characteristics of Solar Flare and CMEs that Caused SPE during Solar Cycle 24
Neflia Neflia

R6-013
Flare Potentiality Associated to Different Sunspot Groups During Solar Cycle 24 Observed by LAPAN Pasuruan
Amatul Firdausya N. Cahyaningtyas, Siska Filawati and Silvi Oktavia Hanum

R6-014
Optimization of Array System Configuration Using the Smoothed-Pad Algorithm
Mario Batubara, Timbul Manik, Musthofa Lathif and Peberlin Sitompul

R6-015
Solar Wind Speed Time-Series Forecasting Based on Long Short-Term Memory (LSTM) Neural Network Model
Tiar Dani, Rhorom Priyatikanto, Anton Winarko and Gerhana Puannandra Putri

R6-016
A Review of Observations of Equatorial Gravity Waves in the Mesosphere and Thermosphere Using an Airglow Imager at Kototabang, Indonesia
Kazuo Shiokawa and Yuichi Otsuka

R6-017
Continuum Study on Uranus at the Millimeter/submillimeter Wavelength with ALMA Data
Farahhati Mumtahana and Taufiq Hidayat

R6-018
The Implementation of API Gateway Architecture on Space Weather Information System
Yoga Andrian, Ahmad Zulfiana Utama and Rizal Suryana

R6-019
Risk Management of Spaceport in Indonesia: Vurnerability Level of Spaceport Biak
Intan Perwitasari and Stevani Anggina

R6-020
Automatic True Color Composites Generation Based on NOAA JPSS Satellites Data
Karunika Diwyacitta, Andy Indradjad and Budhi Gustiandi

R6-021
Utilization Of VIRRS Imagery in Analyzing Light Pollution as the Threat Towards Bird Performance in the Region of Medan, North Sumatra, Indonesia
Rizki Atthoriq Hidayat, Muhammad Hanif, Giant Amor and Hafizurrahman H

R6-022
Spatial and Temporal Lightning Analysis in Bali
I Putu Dedy Pratama, Ni Luh Desi Purnami, Pande Komang Gede Arta Negara and Putu Eka Tulistiawan

R6-023
Sumatera, Indonesia: Development vs Dark Sky from Nightlight Perspective
Alfiah Rizky Diana Putri, Robiatul Muztaba, Lesi Mareta, Mhd. Apri Arami, Muhammad Rizki Kurniawan, Adoni Theofilus, Jaka Pacitro, Fiqhy Alfath Faza Herzaditya and Hakim Luthfi Malasan

Room 7 (GATOTKACA)
Chairs: Aisya Nafiisyanti, Hubert Luce, Farid Lasmono

(Invited Speech)
Indonesian Radio Telescope and Its Application in Radio Astronomy
Peberlin Sitompul, Timbul Manik, Mario Batubara, Musthofa Lathif, and Farrahati Mumtahana

R7-001
A Software Improvement Method for Radiosonde Platinum Sensor
Rachmat Sunarya, Asif Awaludin and Wendi Harjupa

R7-002
Performance Analysis of Platinum Wire Temperature Sensor for Radiosonde
Soni Aulia Rahayu, Rachmat Sunarya, Edy Maryadi, Listi Restu Triani, Christine Cecylia Munthe

R7-003
A Low-Cost and Practical Method for Determining Raindrop Size from Spray Nozzle by Using a Mobile Phone Camera
Jesi Pebralia and Iful Amri

R7-004
Study on Adaptive Clutter Rejection System Using External Receiving Antennas for the MU Radar
Ryo Yabuki, Hiroyuki Hashiguchi, Issei Terada and Mamoru Yamamoto

R7-005
Revising the Models Used to Estimate TKE Dissipation Rates from UHF and VHF Radar Measurements
Hubert Luce, Hiroyuki Hashiguchi, Lakshmi Kantha, Abhiram Doddi, Dale Lawrence and Masanori Yabuki

R7-006
The Inversion Algorithm of Atmospheric Radar Signal Given by a 3-Dimentional Volume Scattering Semi-Physical Simulation
Ryosuke Tamura, Koji Nishimura and Hiroyuki Hashiguchi

R7-007
Satellite Rainfall Estimation from Himawari-8 Multi Channels Observation Using Random Forest Algorithm
Farid Lasmono, Risyanto, Fadli Nauval, Elfira Saufina, Teguh Harjana dan Trismidianto

R7-008
Estimation of TPW over Indonesian Maritime Continents Based on HimawAri-8 Data Using Machine Learning Techniques
Risyanto, Farid Lasmono, Ibnu Fathrio, Dita Fatria Andarini, Fadli Nauval, Aisya Nafiisyanti, Ina Juaeni and Teguh Harjana

R7-009
Machine Learning Models for Daily Maximum Water Level Prediction of Tidal-Riverine Water: A Case Study of Kapuas Kecil River in Borneo Island
Joko Sampurno, Valentin Vallaeys, Randy Ardianto and Emmanuel Hanert

R7-010
Classification of Precipitation Types from Micro Rain Radar Observation Using Artificial Neural Network
Bunga Aprilia, Marzuki, Imam Taufiq and Findy Renggono

R7-011
Rain Prediction Using Convolutional Neural Network (CNN) Method Based on Digital Image
Alya Syifa Ihsani, Anggunmeka Luhur Prasasti and Wendi Harjupa

R7-012
Artificial Neural Network Based Prediction of PM2.5 Mass Concentration in Bandung Metropolitan
Inggrid Wahyu Kinanti, Ade Romadhony, Indra Chandra and Azrina Abd Aziz

R7-013
Interpolation Methods Evaluation on Arbitrary Straight Line Flight Weather Data
Aisya Nafiisyanti

R7-014
Improvement in WRF Model Prediction for Heavy Rain Events over North Sumatra Region Using Satellite Data Assimilation
Immanuel Jhonson Arizona Saragih

R7-015
Improving Numerical Weather Prediction by Assimilating Clear-Sky Infrared Radiance from Himawari-8 Satellite: A Case Study of Heavy Rainfall over Southeast Sulawesi
Ibnu Fathrio, Risyanto, Farid Lasmono, Dita Fatria, Teguh Harjana, Ina Juaeni, Fadli Nauval, Aisya Nafiisyanti and Agung Febrian Putra

R7-016
Analysis of Spatial Comparation between Predicted Rainfall Based on Dynamic Model and Satellite

Haries Satyawardhana, Erma Yulihastin, Gammamerdianti, Candra Nur Ihsan and Eka Putri Wulandari

R7-017
Weather Prediction System Using Thomas-Fiering Model to Determine Initial Planting Recommendations in West Java Province

Candra Nur Ihsan and Nova Agustina

R7-018
Prediction of Extreme Rainfall in Padang City Based on Clouds Brightness Temperature Difference from Himawari-8 Satellite Data

Nining Jumianti, Marzuki, Wendi Harjupa, Risyanto and Muhammad Fadhlan Putranto

R7-019
Indo-Autralian Plate Velocity Measurement During Interseismic Phase in 2011-2012 Using Sumatran GPS Array (SuGAr) Data

Vira Friska, Deasy Arisa, Marzuki and Fadilla Monica

R7-020
Deformation Analysis During the Pre-, Co- and Post-Seismic Phase Associated with the 2019 Mw6.0 Mentawai Earthquake Using Satellite Geodetic Technology from Sumatran GPS Array (SuGAr) Data

Fadilla Monica, Deasy Arisa, Marzuki and Vira Friska

R7-021
Determining the Deformation Trend from Geodetic Measurement of the Indian Ocean Intraslab Earthquakes: As Obtained from the Sumatran GPS Array (SuGAr) Data

Sri Hamdiyessi, Fery Kurnia Sandi, Rihadatul Aisy Syofyani Nasution, Fadilla Monica, Deasy Arisa, Marzuki and Elistia Liza Namigo

R7-022
2D and 3D Subsurface Model of Baribis Fault Zone in West Java

Muhammad Hanif and Lina Handayani

R7-023
Palu Koro Fault Zone Subsurface Model from Microtremor Method and Its Relation to Potential Hazard

Muhammad Hanif, Adrin Tohari and Dadan Dani Wardhana

R7-024
Utilizing the Global Positioning System (GPS) Data from Sumatran GPS Array (SuGAr) to Measure Seismic Deformation Related to The Mw7.6 Padang Earthquake 2009

Galang P. Refindo, Nabilla F. Syafitri, Tsany N. A. Yenuar, Muhammad Hamidi, Deasy Arisa, Marzuki and Elistia L. Namigo

R7-025
Dynamics of West Coast of Sumatra and Island Arc Mentawai During the Coseismic Phase of the Mentawai Mw7.8 25 October 2010 Earthquake

Herizon Primadona, Ravidho Ramadhan, Reza Ananda Ramadhan, Vira Friska, Deasy Arisa, Marzuki and Elistia Liza Namigo

R7-026
Flood Analysis in East Sumba Regency through Synthetic Aperture Radar Data with Geo-Artificial Intelligence (Geo AI) Applications Based on Cloud Computing

Andini Dwi Khairunnisa, Sachi Emelin Carissa and Tia Sella Isnaini

09:30UTC(16:30WIB)- **Closing Remarks**

Closing Address

Didi Satiadi
Head of Research Centre for Atmospheric Science and Technology, Research Organization for Aeronautics and Space (LAPAN), National Research and Innovation Agency (BRIN)

Mamoru Yamamoto
Vice Director of Research Institute for Sustainable Humanosphere (RISH), Kyoto University

4. Symposium Abstracts

Keynote

Dynamical Influence of the Stratosphere on the Tropical Troposphere

Shigeo Yoden

Institute for Liberal Arts and Sciences, Kyoto University, Kyoto, Japan

The Equatorial Atmosphere Radar (EAR), which was built two decades ago under a collaboration between Kyoto University and Indonesia National Institute of Aeronautics and Space (LAPAN), has been a powerful tool to observe vertical coupling processes in the equatorial atmosphere. The dynamical influence of the stratosphere on the extratropical troposphere has been intensively studied in the last two decades or so, and consequent improvement of scientific understanding has already helped for exploiting in weather forecasting and climate prediction. The standard paradigm for interpreting and explaining such stratosphere-troposphere dynamical coupling in the extratropics is based on balanced dynamics; i.e., the non-local aspects of potential vorticity inversion in planetary wave propagation and wave-mean flow interaction in both troposphere and stratosphere. On the other hand, stratosphere-troposphere coupling in the tropics has no such comparable interpretive paradigm. Recent observational and numerical model studies point to an important stratospheric influence on tropical convection and convective systems, and the multi-scale dynamics of these systems is likely to play a vital role in determining the tropical response to spatio-temporal variations in the stratosphere.

In this talk, the international collaborative activity of Stratospheric And Tropospheric Influences On Tropical Convective Systems (SATIO-TCS) is reviewed; SATIO-TCS challenges such a research subject of the dynamical influence of the stratosphere on the tropical troposphere through multi-scale dynamics of tropical convective systems, under WCRP/SPARC project (http://www-mete.kugi.kyoto-u.ac.jp/SPARC_SATIOTCS/index.html). A study on the influence of the equatorial quasi-biennial oscillation (QBO) in the stratosphere on the global monsoon systems is introduced as a recent outcome of international SATIO-TCS collaborations. Composite difference analysis of the monsoon systems between opposite QBO phases shows several statistically significant differences in precipitation, its proxies (OLR and specific humidity), and circulation fields in the tropics and subtropics with dynamically consistent relationships for boreal summer and austral summer.

Keynote

The Past and Future Use of the Equatorial Atmosphere Radar in Atmospheric Research in Indonesia

Didi Satiadi

Research Centre for Atmospheric Science and Technology, LAPAN,
National Research and Innovation Agency (BRIN)

The equatorial continent-maritime region receives significant amount of solar energy, and therefore rich in heat and moisture, which drives active atmospheric convection coupled with convergence zone, producing precipitation hotspots that affect local and global weather and climate. Due to small Coriolis effect and large Rossby radius, the atmospheric dynamics in the region is governed mainly by hydrostropic balance between gravity and buoyancy forces, and hence dominated by complex interaction between atmospheric convection and waves. The region is mostly agrarian and vulnerable to various hydro-meteorological disasters related to extreme rainfall such as floods, landslides, and tornadoes, and also vulnerable to drought. Therefore, accurate information on weather, season and climate, as well as hydro-meteorological disaster early warning system, are important for the community and related authorities in the region. However, rainfall prediction in this region is a challenge due to complex and turbulent nature of atmospheric dynamics in the region.

Advancement of knowledge in atmospheric physics and dynamics in the equatorial continent-maritime region, including temporal and spatial multi-scale dynamic interaction, is the key to improve our understanding and prediction accuracy in the region. The Equatorial Atmosphere Radar (EAR) was developed at Kototabang Hill, Agam District, West Sumatra, Indonesia, by close and long term collaboration between Kyoto University of Japan and the National Institute of Aeronautics and Space (LAPAN) of Indonesia. The radar consists of around 560 Yagis antenna arranged in hexagonal array configuration with the overall aperture radius of around 110 m.

The radar can detect and measure vertical profile of atmospheric dynamics from around 2 km up to around 20 km height. The radar has been operating since 2001 up to now, and has produced many results and scientific findings which increase our understanding of the atmospheric dynamics in the equatorial region, including atmospheric convection, vertical coupling processes in the equatorial atmosphere, and troposphere-stratosphere interaction, ionospheric dynamics, etc. This presentation describe a brief summary of results from studies using the EAR and other supporting instruments conducted at the Research Center of Atmospheric Science and Technology, LAPAN-BRIN.

The use of the Radar has improved our understanding of atmospheric convection especially in the equatorial continent-maritime region and its interaction with atmospheric waves, vertical coupling processes, self organization of convection and precipitation, numerical modeling validation and improvement of convective parameterization, etc. The development of EAR and the plan for future development of EMU radar in the same location is inline with the Indonesia Space Master Plan, in which one of the medium and long term goals in space science is the development of an integrated space-atmosphere decision support system. This presentation also discusses potential use of EMU radar to support this goal by improving our understanding on the interaction between atmosphere and space as part of the sun-earth interaction.

Invited Speech

Observations of Turbulent Mixing in Tropical Tropopause Layer (TTL)

Hiroyuki Hashiguchi[1], Momoko Hashino[1], Richard Wilson[2],
Shinya Ogino[3] and Junko Suzuki[3]

1: Research Institute for Sustainable Humanosphere (RISH), Kyoto University, Japan
2: Université Pierre et Marie Curie (Paris06); CNRS/INSU, LATMOS-IPSL, Paris, France
3: Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan

The tropical tropopause layer (TTL) is a transition region between the troposphere and the stratosphere peculiar to the tropical zone. Physical and chemical processes in the TTL are important because they affect Stratosphere-Troposphere Exchange (STE). In this study, we analyzed small-scale turbulence near the TTL region and the associated transport using the data of observation campaign conducted in collaboration with STRATEOLE-2 (TTL / lower stratospheric observation project using super pressure long duration balloons). Observation campaign was conducted during November 21-December 6, 2019, and we continuously operated the Equatorial Atmosphere Radar (EAR) and launched some ozone and GPS sondes during the campaign. A turbulent layer that lasted for about 2 days was observed from the evening of December 1 by the EAR. The strong zonal wind shear and the west-tilted KH billow due to the distortion of the equatorial Kelvin wave were seen, and the deep convection system affected this, causing multiple fine KH instability and strong turbulence in the altitude range of 1 km. It was also shown that ozone fluctuations are mainly caused by fluctuations in the vertical distribution of temperature due to distortion or breaking of the equatorial Kelvin wave, and that turbulent mixing contributes secondarily. The altitude and intensity of the turbulent layer obtained by the EAR varies depending on the season, and affected by the activity of the equatorial Kelvin wave and convection, and the monsoon. These results suggest that the turbulent layer is caused by equatorial Kelvin wave distortion or breaking and that this wave distortion or breaking fluctuates the distribution of ozone. The turbulent layer observable by EAR with high vertical resolution may be an indicator of such large-scale disturbances.

Invited Speech

Small Satellite Research and Development and Its Applications in Indonesia

Wahyudi Hasbi

In 1976, Indonesia was the third country in the world, applying communication satellite technology for developing the country. Also, since 1971, Indonesia uses remote sensing satellite data for any application. The importance of the satellite application leads to LAPAN to develop satellite technology in Indonesia. As a developing country with many constraints and limitation, mastering the satellite technology is a challenge. However, Indonesia has launched three small satellites and having a roadmap for other small satellite development. Those small satellite used for several application as remote sensing, communication support during a disaster, maritime surveillance and also other technology demonstration in satellite technology. This talk will briefly describe the small satellite development and its application in Indonesia.

Invited Speech

Overview of the SPARC Reanalysis Intercomparison Project (S-RIP) during 2013-2021

Masatomo Fujiwara, Gloria Manney, Lesley Gray and Jonathon Wright

The Stratosphere-troposphere Processes And their Role in Climate (SPARC) project is one of the four core projects of the World Climate Research Programme (WCRP). Researchers interested in SPARC use global atmospheric reanalysis products to understand a wide range of processes and variability in the atmosphere, to validate chemistry climate models, and to investigate and identify climate change. The SPARC Reanalysis Intercomparison Project (S-RIP) was initiated in 2011 and officially started in 2013 to conduct a coordinated intercomparison of all major global atmospheric reanalysis data sets. The S-RIP has been aiming at writing up an assessment report in the SPARC report series (to be published by September 2021) (1) on overall quality of temperature, winds, ozone, and water vapor data, (2) on more process- and region-oriented evaluation of the Brewer–Dobson circulation, extratropical stratosphere-troposphere coupling, extratropical upper troposphere and lower stratosphere, the tropical tropopause layer, the quasi-biennial oscillation, polar processes, and the upper stratosphere and lower mesosphere, and (3) with a coordinated description of the reanalysis systems. We also have an inter-journal special issue on "The SPARC Reanalysis Intercomparison Project (S-RIP)" in Atmospheric Chemistry and Physics (ACP) and Earth System Science Data (ESSD). In the presentation, we will discuss key findings and recommendations as well as the evaluation of this first phase of the S-RIP activity.

Invited Speech

How Climate Change Drives Global Termite Distribution and Invasiveness

Sulaeman Yusuf

Research Center for Biomaterials, Indonesian Institute of Sciences (LIPI), Indonesia

Climate change and urbanization are the two most important issues in the recent global environment, that have severe direct and indirect consequences. From an urban entomologist perspective, those two phenomena are now being considered as the important driven factors that affecting the spread of exotic species, including termites. Termites are dominant insects in the terrestrial ecosystem that are distributed in tropical, subtropical, and warm temperate regions. They play an important role in ecosystems as well as significant economic impacts in urban areas where they attack buildings and structures. Twenty-eight termite species are considered global invasive species that have spread beyond their native ranges. Recent reports suggested that substantial economic and ecological damage caused by global invasive termites is likely to increase in the future, driven by dramatic climate change, rapid urbanization, and globalization.

Keywords: Climate change, termite, invasive species

Invited Speech (Room 1)

Atmospheric Environmental Research by Analyzing the Character of Indonesian Ozone Profile Using AQUA-AIRS Data

Ninong Komala

Atmospheric environmental research in LAPAN is carried out using analysis in the laboratory, various equipment, and in situ measurements. The limitation of in-situ observation network compared to the wide of Indonesia area made satellite data has been playing an important role in research on atmospheric chemistry and Green House Gases which is one of a national need and is also a major competency of LAPAN that needs to be developed. Based on monthly data of AQUA-AIRS from 2003 to 2020, we examined the characteristic of ozone profile in Indonesia. We analysed the time series, trend in troposphere and stratospheric layer also the dominant period affected the ozone variation. The results obtained that in the period of 2003-2020 the ozone profile from 1000 hPa to 1 hPa varies between 15 ppb to 10500 ppb. Ozone in the troposphere has a tendency to increase and in the stratosphere there is a slight decrease. The periods that dominate the variation of Indonesian ozone are 6 months, 12 months and 30 months.

R1-001

Decline of Surface Global Solar Radiation at Palembang City of Indonesia Correlated to Smoke Event in 2019

Saipul Hamdi, Sumaryati and Syahril Rizal

1: Center of Atmosheric Science and Technology, LAPAN, Indonesia
2: Bina Darma University of Palembang, Indonesia

It has been analyzed the decline of surface solar global radiation and reducing atmospheric visibility at Palembang, South Sumatra Province, Indonesia, during smoke event in September-December 2019. The aim of this study is to get values of the decline of global solar radiation and decrease in atmospheric visibility due to smoke event. The global solar radiation was measured at campus of Bina Darma University at Palembang City by using AWS integrated radiometer, and the visibility was observed in Talang Betutu, Palembang Airport. The smoke produced by forest fire surround Palembang caused declining of surface global solar intensity significantly. It also reduced atmospheric visibility in Palembang Airport down to 1.6 km, while in the atmospheric condition without smoke the visibility was around 8.2 km. This condition made the sun rise in the morning as if delayed for some ten minutes. Among 86 days of data of this period there are 46 days (53.3%) which has lower solar radiation intensity.

Keywords: visibility, smoke, forest fire, solar radiation

R1-002

Langley Plot and Lambert-Beer Law in Retrieving Solar Radiation at the Top of Atmosphere

Jamrud Aminuddin, Zaroh Irayani, Abdullah Nur Aziz,
Laras Toersilowati and Soni Aulia Rahayu

Atmospheric Aerosols play an important role in the Earth's radiation budget through the reflection of incoming solar radiation and formation of cloud droplets working as cloud condensation nuclei. Therefore, the precise measurement of aerosol parameters is important for increasing better understanding their real characteristics especially in the lower troposphere for precise evaluation of their impact to environmental condition. The aerosol optical thickness (AOT) is an important parameter for the atmospheric correction in satellite remote sensing as well as visibility degradation due to atmospheric pollution. In AOT calculation using sun-photometer data, the solar radiation at the top of atmosphere (ToA) is determined using Langley plot by linearization of Beer's Law equation. In the Langley plot analysis for the calibration, solar radiation at the top of atmosphere is retrieved using sun-photometer data in most clear sky condition. The correction factor employed in computing AOT are ozone gases (O_3) contribution derived from GOME-2 satellite and Carbon dioxide molecule (CO_2) derived from local station. From the overall procedure, we can estimate the AOT values with uncertainties of approximately 5%. Such a capability will be useful for studying aerosol properties.

Keywords: AOT, Langley, Lamber-Beer, sun-photometer, ToA.

R1-003

Development of Solar Radiation Observation System Using RTL-SDR

Didik Septian Pangestu[1], Rizal Suryana[2], and Sofyan Basuki[1]

1: Universitas Jenderal Achmad Yani, Jurusan Teknik Elektro, Indonesia
2: Pusat Sains Antariksa (Space Science Center), LAPAN, Indonesia

The sun which is the largest source of energy on earth which is very beneficial for life, it turns out that the sun can also have a negative impact on the earth. Each activity that occurs on the sun can cause different impacts depending on the type and magnitude of the activity. The impact that is often felt is the presence of a solar radio burst that occurs due to solar flare activity. Solar radio burst that occur can disrupt communication systems on earth so that solar radio burst must always be observed. Solar radio burst observations at the space science center (PUSSAINSA) were observed using a radio spectrograph (SN-4000) and Callisto. Both of these equipment have a simple system but the price is relatively expensive. RTL-SDR is a radio frequency receiver that can be developed using GNU Radio software, has a frequency range of 500 kHz-1766 MHz and the price is relatively cheap. This paper describes the development of a radio spectrograph using RTL-SDR to observe solar radio in the frequency range of 57MHz-180MHz. RTL-SDR will record the amplitude of radio waves in the frequency range of 57-180 MHz starting from 07:00-17:00, then processing is carried out so that the power and frequency values are obtained into a plot result in the form of a spectrograph to make it easier to observe.

Keywords: Solar radio burst, GNU Radio, RTL-SDR, Spectrograph

R1-004

Diurnal Variation of Fine Particulate Matter in Indonesia Based on Reanalysis Data

Nani Cholianawati

LAPAN, Indonesia

Fine Particulate Matter (PM2.5) has great effects to human health. Globally, PM2.5 cycles have a morning peak, an early night time peak, and an afternoon minimum (bimodal pattern). Knowing diurnal variations will improve our understanding of PM2.5 exposure. This research used hourly PM2.5 surface concentrations during 2019 – 2020 from Ground Observation in Central Jakarta and Reanalysis Data MASINGAR JMA with spatial resolution 0.375^{O} x (0.37147^{O} to 0.37461^{O}). We validated reanalysis data by binning it with ground observation in Central Jakarta Averaging hourly data for January (rainy season) and July (dry season). Those data were normalized to get diurnal variability. Descriptive analysis for diurnal variations of PM2.5 were done both measured from ground observations and reanalysis. The result was hourly reanalysis PM2.5 fitted enough to ground observation data (r=0.67). PM2.5 reanalysis was underestimated comparing to ground observation data. Both reanalysis and in situ PM2.5 showed unimodal pattern in dry season with a maximum peak occurred at midnight and an afternoon minimum. PM2.5 cycles in rainy season showed bimodal pattern with a night peak, a morning peak, and an afternoon minimum. PM2.5 in July 2020 at morning to afternoon had lower concentrations compared to 2019 may be due to lockdown policy (COVID19 pandemic).

Keywords: PM2.5, Reanalysis Data, Diurnal Variation

R1-005

Simulation and Evaluation of PM2.5 in the City of Palangkaraya Using the Model WRF-CHEM

Waluyo Eko Cahyono, Prawira Yudha Kombara, Emmanuel Adetya and Wilin Julian Sari

Center for Atmospheric Sciences and Technology, LAPAN, Indonesia

For the study and analysis of the state of air pollution of Palangkaraya, we implemented the regional weather prediction model with an online chemical coupling (WRF-Chem). The WRF-Chem modeling system simulates atmospheric physics and dynamical processes, atmospheric chemistry and biochemical processes. We compared and validated the results with the experimental measurements taken at ten monitoring stations that belong to the Indonesian Agency of Meteorology, Climatology and Geophysics (BMKG). This research investigated the behaviour of particulate matter (PM2.5) during 21 days of dry season and 21 days of wet season in 2019. The results show that there is an increase of PM2.5 concentration during the dry period. We further analysed meteorological variables of significant impact on that pollutant.

Keywords: WRF-Chem, air quality, PM2.5, atmospheric pollutant, forecasting

R1-006

Air Quality in the Bandung Basin of Indonesia as Measured by Passive Sampler

Wiwiek Setyawati, Dyah Aries Tanti and Asri Indrawati

A speedy increase in the number of motorized vehicles and industry in line with the fast population growth rate decreases air quality, affecting human health and the environment. Bandung, the capital city of West Java Province, is a basin-shaped region surrounded by mountains and has more than 2.4 million population. Therefore, air quality degradation will significantly impact the regions' sustainability. Monitoring of air pollutants is required to get information regarding air quality and its seasonal variability. We carried out a monthly sampling of ambient air using the Ferm-type passive gas sampler method at eleven monitoring points from 2014 to 2018. Seven sites represent urban, while the remaining four rural areas. The air quality parameters measured were NO_2, SO_2, and O_3. Lembang (rural site) had the lowest mean NO_2 (19.03 ± 15.05 μg/Nm^3), and SO_2 (10.52 ± 4.07 μg/Nm^3) concentrations. Surprisingly, the mean O_3 concentration was relatively more elevated in rural than urban sites. The seasonal mean NO_2 and O_3 concentrations were the highest during the dry to wet transitional season (September, October, and November). The annual mean of NO_2 concentrations in Kebon Kalapa and Martadinata, both urban areas, were greater than 50 μg/Nm^3 or had exceeded the National Ambient Air Quality Standard in Indonesia.

R1-007

Estimating the Impact of Spatio-Temporal Land Cover Changes on Air Quality Using Satellite Data in Beas Valley, Himachal Pradesh, India

Sayanta Ghosh[1], Renu Lata[1]*, Isha Thakur[1] and J.C. Kuniyal[2]

1: G.B. Pant National Institute of Himalayan Environment, Himachal Regional Centre, Mohal-Kullu, Himachal Pradesh, India
2: G.B. Pant National Institute of Himalayan Environment, Kosi-Katarmat, Almora, Uttrakhand, India

Alteration in land use is one of the primary causes of global environmental change. Changes in the land use also occurred rapidly in already vulnerable Indian Himalayan Region (IHR) for the last few decades. These activities are highly influenced by anthropogenic activities and have more serious consequences on the air quality of the high altitude area of IHR. In this study, the relationship between Land Use Land Cover (LULC) changes on air quality (SO_2, NO_2, PM10 and PM2.5) for Beas valley of Kullu district, IHR have been assessed. Using LANDSAT imagery from the past 12 years to analyze the land cover changes along with the multi-temporal MODIS data (2009-2020) as well as the ground observations of air quality parameters (SO_2, NO_2, PM10 and PM2.5) mass concentrations in the Beas Valley, Kullu, we explore the links between the mass concentrations of various air quality parameters and LULC trends. We found a moderate and, in some cases, moderately strong correlation between SO_2, NO_2, PM10 and PM2.5 observations and the land cover changes in the study area during 2009 and 2020. The ground observation data revealed that the average concentration of particulate matters such as PM10, PM2.5 showed a huge increase of 96 % and 66 % respectively in 2020 than that of 2009. Also we have discussed factors such as local climate, rapid tourist influx during tourist season and topography that can confound these comparisons. Further, we have quantified the cause and effect between LULC and air quality. The main outcome of the paper, we believe, will be helpful to get the quantified information about the land use alteration and possible impact on the air quality which is very essential for sustainable environmental planning in the Beas Valley.

Keywords: Land Use Land Cover Changes (LULC), Air Quality, LANDSAT imagery, MODIS data, Correlation

R1-008

Effect of Meteorology Parameters on Air Pollutant Standard Index in Urban Area (Case Study in Jakarta)

Dessy Gusnita

Atmospheric Environment Research Group, LAPAN

This paper aims to analyze the significant relationship between air quality and meteorological variables (temperature, wind direction, RH, radiation) in the DKI Jakarta areas for the period 2017-2020. Data analysis used secondary data on air pollutant concentrations from KLHK DKI Jakarta consisting of PM10, NO_2, SO_2, CO and O_3 parameters. Meteorological data uses data from BMKG which consists of meteorological parameters, namely: wind direction, solar radiation duration, temperature and relative humidity. Air temperature, humidity, wind direction and radiation are part of the meteorological parameters that can affect the concentration of pollutants in the air. The results show that the effect of pollutants is negatively correlated with the duration of the sun's rays, especially in the dry season. While the effect of pollutants on temperature shows a positive relationship, where when the pollutant increases the temperature tends to increase. Relative humidity is positively correlated with the concentration of air pollutants.

Keywords: air pollution, parameter meteorology, PM10, NO_2, SO_2, O_3

R1-009

Ozone Variability at 10 hPa in Indonesia Based on MERRA-2 Data

Prawira Yudha Kombara and Ninong Komala

Indonesia Nasional Institute of Aeronautics and Space (LAPAN), Indonesia

The variability of ozone at altitude of 10 hPa for the Indonesian region has been studied in this study. This study used MERRA2 data from 2003-2020 for areas with coordinates 95^0-145^0E and 12^0S–12^0N. MERRA2 is a reanalysis of data generated from global models and NASA assimilation systems. MERRA2 has the advantage of higher spatial resolution compared to satellite data. The method used in this research is Fast Fourier Transform (FFT) and Wavelet analysis. Based on the results of FFT and Wavelet analysis, we achieved the results that during the period 2003-2020 ozone in the territory of Indonesia at altitude of 10 hPa has a seasonal pattern. This is also supported by averaging the area of the entire territory of Indonesia for the same height and then did monthly composite which results in two peaks in the one-year graph with a distance of six months. However, we achieved different results when using the AIRS satellite data which is a product of NASA as well. The processing of AIRS data shows that ozone with the same year period and altitude for the territory of Indonesia has an annual pattern. The reason for this difference in results is still not clearly understood. From the monthly composite results, ozone from the AIRS data has one peak and one valley. In addition, the ozone magnitude from the AIRS data tends to be smaller than the MERRA2 data.

Keywords: Ozone, MERRA2, variability, seasonal

R1-010

Characteristics of Acid Deposition in Urban and Sub-Urban Area

Asri Indrawati, Dyah Aries Tanti, Wiwiek Setyawati, Sumaryati Sumaryati,
Indra Chandra and Atep Radiana

Acid deposition is an environmental problem both regionally and globally. Acid deposition characteristics are influenced by local emission sources, topography, meteorology, and also the contribution of Transboundary Air Pollution (TAP). This study was conducted to examine the characteristics of acid deposition in Cipedes and Telkom University as an urban area and Tanjung Sari as a suburban area. The data used are wet deposition and dry deposition data from 2019-2020. Data processing is carried out using time series analysis. Calculation of the Neutralization Factor (NF), and Ammonium Availability Index (AAI), and the PMF 5 model were carried out to trace pollutant sources in urban and sub-urban areas. The results showed that the concentration of anions and cations for the Cipedes area was higher than at Telkom University and Tanjung Sari. The pH range below 5.6, where acid rain occurs for Telkom University 34%, Tanjung Sari 17%, and Cipedes 7%. The monthly pattern shows differences in rainwater neutralizing compounds in the three study sites. The PMF 5 model gives the results that anthropogenic factors, sea salt, soil dust, and industrial characteristics influence the acid characteristics at the study site. The results of dry deposition using the passive sampling method showed that the concentrations of NO_2 and O_3 were the dominant gas concentrations in Cipedes and Tanjung Sari while at Telkom University were NO_2 and SO_2. The results of the study indicate that the differences in topography and pollutant sources that affect the characteristics of acids in urban and suburban areas.

R1-011

Analysis and Verification of Fire Danger Rating System (FDRS) Parameters in Land and Forest Fire in West Kalimantan in 2019 and Its Relationship with Hotspots and Rainfall

Jihan Putri Amelia, Zadrach Ledoufij Dupe and Indah Prasasti

Land and forest fires in 2019 have an adverse impact on Indonesia, one of them is West Kalimantan. The government is trying to develop an early warning system called the FDRS. However, the utilization of FDRS still requires verification on the actual events of fires and a study of its relationship with hotspot distribution and rainfall. This study aims to analyze and verify FDRS parameters in the 2019 land and forest fires in West Kalimantan as well as their relationship to hotspots and rainfall. The data used in this study is FDRS's data in 2019 (from LAPAN). Meteorological observation data, hotspot (from MODIS Terra-Aqua), and burnt area data (from KLHK) for verification. The analysis in this study was conducted using correlation method (r) and coefficient of determination (R2). The results showed that the value of the FFMC, DC, ISI, and FWI parameters over the burnt area in West Kalimantan in 2019 ranged from 48 to 89, 6 to 733, 0 to 5, 0 to 23. The FDRS parameter was strongly affected by the rainfall conditions 21 days before the fire incident (r mean = -0.54 to -0.66) and the number of days with light rainfall before the fire incident (r mean = 0.54 to 0.61). In the upper class of each FDRS parameter, the number of hotspots will increase (r mean = 0.62 to 0.68) and the burnt area as well (r mean = 0.64 to 0.74). Furthermore, about 27.85% of fire events were affected by rainfall conditions 21 days before the fire event and about 28.51% of fire events were also affected by the number of days with light rainfall (<20 mm/day) before the fire event. The findings also showed that about 70.48% of fire events could be identified based on the number of hotspots. Point out that the FDRS has a good ability to perceive land and forest fires that occurred in West Kalimantan in 2019.

R1-012

Direct Effect of Aerosol Respect to Radiation Budget on Forest Fire Event in Sumatera Region

Prawira Kombara, Waluyo Eko Cahyono, Wilin Julian Sari,
Emmanuel Adetya and Rosida Rosida

The calculation of direct effect of aerosol respect to radiation budget has been conducted by using the CERES and MERRA2 data. The calculation was caried out when fire forest events in Sumatera region on 2002, 2006, and 2015. CERES is based on satellite observation data that measure radiation budget of earth meanwhile MERRA2 is a reanalysis data product that provide many meteorological variables and both of data were created by NASA. MERRA2 data provide the aerosol variable and the aerosol variable that be used is Aerosol Optical Depth (AOD). This study aims to see the direct effect of aerosol that be generated from fire forest respect to radiation budget using CERES and MERRA2 data. Therefore, the calculation of direct effect of aerosol was caried out on before, event, and after forest fire event to see the alteration. In this study, we achieved the result that AOD variable from MERRA2 data can describe the condition well while forest fire occur. While fire forest occurs, there is a spike of AOD value, especially in 2015. This result was confirmed by the calculation of direct effect of aerosol that show negative value. That thing confirms the enhancement of aerosol concentration in air induce the solar radiation that reach earth surface was decrease significantly.

Keywords: Aerosol, direct effect, radiation budget, CERES, MERRA2

R1-013

Smoke Propagation during Fire Season in Kalimantan and Sumatra in 2015 and 2019

Sumaryati, Dita Fatria Andarini, Nani Cholianawati and Asri Indrawati

LAPAN

It has been studied the propagation of smoke produced during peak forest fires in Kalimantan dan Sumatra from September to October in 2015 and 2019 related to strong and moderate El Nino phenomena. The study aims to get an understanding of the propagation patterns of smoke from Kalimantan and Sumatra during the fire season. Forest fire is represented by hotspots observed by Terra, Aqua, and SNPP satellites, and they are selected for a confidence level more than of 80 %. The other data are aerosol optical thickness (AOT) observed by SNPP-VIIRS satellite and visibility obtained in Ogimet stations. Propagation of smoke is shown by its matrix trajectory which resulted by running of Hysplit model. The propagation of smoke is compared to the AOT and visibility changes spatially as an impact of smoke produced by fires. The result shows that the propagation of smoke is consistent with AOT pattern. However, the visibility pattern does not show a consistency with the propagation clearly. The transboundary smoke potency over Malaysia and Singapore occurs in September.

R1-014

Influence of Local Wind Respect to the PM2.5 Dispersion in Bandung Basin

Prawira Yudha Kombara, and Nani Cholianawati

Indonesia Nasional Institute of Aeronautics and Space (LAPAN), Indonesia

The PM2.5 dispersion simulation using WRF-Chem has been conducted. WRF-Chem is a numerical model that consist of weather model coupled with atmospheric chemistry. The simulations were conducted during a few days on the dry season and rainy season at the Bandung Basin, which is one of the areas with complex topography in Indonesia. The meteorological factors affect the dispersion of PM2.5 in the air, one of which is wind. Based on the numerical model simulation, we achieved the result that the Bandung Basin area has local wind called anabatic wind and katabatic wind. The anabatic wind occurs during the daytime while the katabatic wind occurs at night time. This study aims to describe the influence of local wind pattern respect to the dispersion pattern of air pollutant at Bandung Basin. The result of this study shows that there is difference of dispersion pattern of PM2.5 between the dry season and the rainy season. In the dry season, PM2.5 is more concentrated around the city of Bandung, especially in the morning and evening, while in the noon and afternoon the enhancement of PM2.5 concentration occurs in urban areas. Then in the rainy season, PM2.5 tends to accumulate in the centre of Bandung, precisely in the morning and evening, while in the noon and afternoon there is no accumulation of concentration in urban areas such as in the dry season. This is due to the difference of local wind patterns between the dry season and the rainy season. In addition, other meteorological factors such as surface temperature, humidity, and atmospheric stability were also explored to more describe the mechanism of the local wind influence respect to PM2.5 dispersion.

Keywords: PM2.5, WRF-Chem, Local wind, Bandung basin

R1-015

Correlation Investigation between Aerosols Variability, Forest Fire and Meteorological Variables during Summer Monsoon in Riau Province, Indonesia

Wilin Julian Sari, Waluyo Eko Cahyono, Rahaden Bagas Hatmaja,
Prawira Yudha Kombara and Emmanuel Adetya

Indonesia National Institute of Aeronautics and Space (LAPAN), Indonesia

Due to its size and its ability to absorb and scatter the sunlight, aerosols have adverse impacts in our air quality, energy budget, and hence our climate change. Aerosols can be generated naturally from desert, volcanic eruptions and forest fires and anthropogenically from transportation and industrial activities. Moreover, aerosols are affected by land use, land cover and meteorological phenomenon. Riau is one of the provinces in Indonesia that often experiences forest and land fires, which then generates aerosols to the atmosphere, especially during dry season. Therefore, to better understand the aerosol variability in Riau Province, Indonesia, expressed as AOD (aerosol optical depth), caused by the aforementioned factors, this study investigated the relationship between the AOD, enhanced vegetation index (EVI), wind speed (WS), Angstrom exponent (AE) and relative humidity (RH) during 2011 to 2020. The data used in this study are monthly data of Modis-Terra Deep Blue (DB) land only AOD at 550 nm (MOD08_M3 v6.1), Modis-Terra EVI product (MOD13C2 v006), WS MERRA 2 reanalysis data (M2IMNXLFO v5.12.4), DB AE for land (MOD08_M3 v6.1) and RH AIRS3STM v006, which were all retrieved from NASA's Giovanni website. High AOD (0.230-3.022) and high AE (1.50-1.78) have been observed during summer monsoon, indicating the presence of fine mode aerosols from biomass burning, which mainly resulted from the forest fires that happened in Riau. Further, AOD showed a denoting semi-annual variation with the lowest value in May (0.277) and the highest in September (0.984). On seasonal timescale, EVI was coincided with AOD but with no significant correlation. Meanwhile, a negative R is observed between AOD and RH, with RH lowest mean (67.6%) occurred in August.

Keywords: Aerosols, aerosol optical depth (AOD), enhanced vegetation index (EVI), relative humidity (RH)

R1-016

The Projections of Urban Climate Change Using Conformal Cubic Atmospheric Model (CCAM) in Bali, Indonesia

Laras Toersilowati, Bambang Siswanto, Edy Maryadi, Indah Susanti, Mamat Suhermat, Adi Witono, Hidayatul Latifah, Sinta Berliana Sipayung, Amalia Nurlatifah, Jamrud Aminuddin and Fildzah Adany

LAPAN

Urban climate change has short- and long-term effects on urban development decision-makers. The problem with this significant urban, regional and economic value is that there is very little usable information about climate change. Research on urban climate change was conducted in Bali, Indonesia, using the Conformal Cubic Atmospheric Model (CCAM) which works with the Representative Concentration Pathway (RCP) 4.5. The history data means average data from 1975 to 2005, climate projections with RCP4.5 scenario means average data from 2006 to 2099, and anomaly (urban climate change) is RCP4.5 minus history. The results represent the history of temperature between 22.5-27.5 ^{O}C and RCP 4.5 between 25.5-29.5 ^{O}C. Temperature anomalies can be observed in much of northern Bali, which has increased from about 1.6 to 2.9 ^{O}C. There is a trend towards reduced (drier) humidity in most parts of Bali, particularly in the northern part of Bali, while a small part in the south increases the (wetter) humidity. The comfort index of the Bali region in history is still relatively comfortable (20-26 ^{O}C), but on the condition RCP 4.5, there is no comfortable area with an index of more than 26 ^{O}C (hot and dry). This research is expected to be useful in assisting the government in planning properly.

Keywords: CCAM, comfort index, IPCC AR5, temperature, urban climate change

R1-017

Climate Change and Drought: A Perspective on Rainfall and Water Deficits in Java and Bali

Indah Susanti, Sinta Berliana Sipayung, Edy Maryadi, Amalia Nurlatifah, Hidayatul Latifah, Bambang Siswanto, Adi Witono, Lilik Slamet S. and Martono Martono

LAPAN

Climate change in tropical areas, such as Indonesia as a maritime continent, has had an impact on hydrological conditions. Using Terraclimate data from 1960 to 2019, changes in rainfall and temperature in Java and Bali had been analyzed by comparing two 30-year periods (1960-1989 and 1990-2019). The accumulated monthly rainfall from the two periods did not show any significant changes. The difference in rainfall between the two periods is more indicated by the anomaly. The second period shows rainfall anomalies that are greater than the first period, both for dry and wet extremes. Dry conditions in the first period showed the largest anomaly around -500 mm, while in the second period it showed anomaly around -800 mm. Meanwhile, in the wet season, the extreme conditions in the first period are around 800 mm and more than 1100 mm in the second period. On the contrary, the temperature in Java and Bali has shown a very significant increase. The increase in temperature has implications for changes in the rate of evapotranspiration in Java and Bali. To conclude, this increase in evapotranspiration leads to an increase in the water deficit rate (CWD). On Java Island in the dry month, the CWD value for the first period is around 60, while the second period reaches more than 70. This signifies that in the dry months, the islands of Java and Bali experience more severe water shortages in the 30 years of the second period.

Keywords: climate change, drought, water defisit, CWD

R1-018

The Impact of Climate Change to Meteorological Drought in Yogyakarta

Sinta Berliana Sipayung, Indah Susanti, Edy Maryadi, Amalia Nurlatifah, Hidayatul Latifah, Bambang Siswanto, Adi Witono, Laras Tursilowati, Mahmud Mahmud and Mamat Suhermat

LAPAN

Drought is a regional phenomenon that is naturally affected by climate conditions. Climate change which changes the pattern of rainfall and temperature, is very influential on the drought conditions in an area. Yogyakarta Province is one of the regions in the south of Indonesia with a distinctive regional character. By using rainfall data and the Palmer Drought Severity Index (PDSI) from 1950-2018, it can be shown that there is a change in the potential for 2 drought periods of 30 years for 5 districts in Yogyakarta Province. Changes are distinguished for the December-January-February period (DJF) which represents the wet season, and the June-July August period (JJA) which represents the dry season. The results of data analysis have shown an increase in rainfall for the wet season and a decrease in rainfall in the dry period. However, an increase in rainfall during the wet season does not mean that there has been a decrease in the level of drought. PDSI data for the first period showed an opportunity for an index of more than 4 by 21.55% for Bantul, 38.87% for Gunung Kidul, 39.85% for Yogyakarta City, 39.63% for Kulon Progo, and 39.49% for Sleman. This figure has increased for Bantul in the second period, but for other districts it has increased. This indicates that the increase in rainfall that occurred, accompanied by an increase in temperature and evapotranspiration, which causes the level of drought continues to increase. If this trend persists, there will be indications that rainfall in DIY will increase during the DJF season but the potential for drought will continue.

R1-019

Outstanding Issues in the Future Climate Projection over Indonesia

Yudha Djamil, Tri Hadi, Wirid Birastri and Xianfeng Wang

Earth climate towards the end of 21st century has been projected by various general circulation models (GCMs) which are organized by the Climate Model Intercomparison Project Phase-5 (CMIP5). Uncertainties of the future climate projection over Indonesia, as part of the Maritime Continent, appear to be large. Several efforts and initiatives to reduce uncertainties, such as model selection, multi-model ensemble, and dynamical downscalings, were engaged recently. However, despite all the significant improvements, considerable issues remain, such as suppression of the land-sea contrast in rainfall trend (e.g. Java) by the ensemble projections of the well-performed models. Moreover, the suppression is suspected to propagate into their downscaled product, and thus, further obscure future climate over the region. Several other issues and suggestions are also inventoried in this paper. Engaging a high resolution GCM verified by the paleoclimate data extracted from Indonesia is one of the suggestion to improve confidence of the future climate projection over the region.

R1-020

The Effect of Land Change on Urban Heat Island: Case Study of Bekasi Regency

Feri Nugroho, Ayub Sugara and Ayi Priana

The need for land increases every year due to population growth. The impact of increase in land demand has resulted in a higher rate of land change, as well as urbanization which has added the dense urban area. One of the impacts that often occurs in urban areas is the existence of an urban heat island (UHI). UHI is a condition where the air temperature in densely populated areas is higher than in the surrounding areas. UHI is one of the triggering factors for global warming, based on this periodic monitoring is needed regarding changes every year. The utilization of remote sensing and GIS can be an alternative for collecting data for continue monitoring. The aim of this study was to determine land changes that have an impact on changes in surface temperature in Bekasi regency in 2017 and 2020 by using remote sensing and GIS. This study uses Landsat 8 OLI satellite imagery data using band 10 for LST analysis, bands 5 and 4 to determine distribution of NDVI in Bekasi regency. To determine land use change, supervised classification method is used with the maximum likelihood algorithm and kappa validation as an accuracy test. Based on the results of kappa accuracy test, it was obtained 0.90% for 2017 and 0.99% for 2020. The final result of the research is to know changes in land use, which are divided into classes of built-up, waterbody, vegetation, and bare land as well as the results of UHI analysis. The results of UHI analysis, it was found that there was an increase in surface temperature from 2017 to 2020 in Bekasi regency. In 2017 the lowest temperature was 30 °C and the highest was 51 °C, while in 2020 the lowest temperature was 34 °C and the highest was 52 °C.

Keywords: Urban Heat Island (UHI), Land Change, Remote Sensing, GIS

R1-021

Characteristic of Precipitable Water Vapour in 2017-2019 over Bandung Estimated by GPS Data

Atep Radiana[1], Saipul Hamdi[1], Arif Aditiya[2], Fahmi Rahmatia[3], and Sjafrijon[3]

1: Pusat Sains dan Teknologi Atmosfer LAPAN
2: Pusat Jaring Kontrol Geodesi dan Geodinamika BIG
3: BPAA Agam, LAPAN

In this paper, the average amount of precipitable water vapor in the atmosphere (PWV) from 2017 to 2019 has been calculated which is derived from the GNSS data constellation using goGPS free software. The average PWV values for 2017, 2018, and 2019 were 38.9 mm, 34.7 mm, and 36.1 mm respectively and generally ranged between 11.4 and 56.3 mm. There is also a negative correlation between PWV and global solar energy of r = -0.37 and a gradient of descent is -2.86 Ly/mm. The PWV daily profile in this paper shows the PWV value occured at midnight and the greatest value occured during the day time. The PWV value used in this paper is the average value calculated over the time range from 11 to 13 o'clock.

Keywords: precipitable water vapor, Global Navigation Satellite System, global irradiance, goGPS

R1-022

Chemical Characteristics of Rainwater in Bandung and Kototabang

Fandy Balbo[1], Rusmawan Suwarman[2], and Arika Indri Dyah Utami[3]

1: Meteorology Department, Bandung Institute of Technology
2: Atmospheric Science Group, Bandung Institute of Technology
3: Meteorology Climatology and Geophysics Agency for Indonesia

We conducted air quality research by reviewing rainwater's chemical composition in Bandung and Koto Tabang, with a sampling period from December 2013 to November 2014. The principal ions in the chemical composition of rainwater consist of Ca2+, Mg2+, Na+, K+, NH4-, Cl-, SO42-, and NO3-. We analyze the data using statistical methods, Acid-Base Equilibrium, Enrichment Factor, Factor Analysis, and Back Trajectory. The statistical methods are used to interpret the development of major ions in seasonal time patterns and the effect of precipitation on the ion's concentration. Acid-base equilibrium analysis is used to interpret the process of neutralizing the acidity of rainwater. Meanwhile, the enrichment factor, analysis factor, and backward trajectories are used to interpret the distribution of rainwater element sources. This study shows that the low concentrations are associated with high rainfall events (Dilution Effect). In September-November, high concentrations of SO42- and NO3- were identified due to anthropogenic activity under low rainfall conditions. The pH of rainwater in low conditions at both locations is identified as acidic rainwater (pH 4.51 and 4.97). The neutralization process with alkali is not yet completed and is ineffective. The Investigation of source apportionment with Enrichment Factor, Analysis Factor, and Backward Trajectories result, show Bandung's pollutants come from local anthropogenic sources, while in Koto Tabang, it is indicated to long-distance transport pollutants.

Keywords: Rainwater Chemistry, Bandung, Koto Tabang, Acidity, Neutralization, Backward Trajectory, HYSPLIT, Enrichment Factor, Air Quality

R1-023

Comparison of PM10 Parameters Pre and Post Social Restrictions during the COVID-19 Pandemic in Serpong

Hendri Satria[2] and Dewi Tamara Qothrunada[1]

1: South Konawe Climatology Station, Indonesia
2: Network and Communication Center, BMKG Jakarta, Indonesua

The condition of the corona virus (Covid-19) outbreak that entered Indonesia made several regions in Indonesia implement large-scale social restrictions (PSBB). This application limits the public from social activities or crowds, so that workers and students carry out work from home and school from home. This condition certainly affects the reduced activity of motorized vehicles, which of course will affect the levels of air quality, especially PM10. The purpose of this study was to determine the effect of the application of PSBB on PM10 parameters in the Serpong area. The method used in this study is to compare PM10 data and meteorological parameters in February 2020, namely before the PSBB was applied and in March 2020, namely after the PSBB was applied. The data were then analyzed temporally and spatially using the openair package on the R-studio software. Based on the results of the analysis, it was found that PM10 conditions were relatively higher in March 2020 compared to February 2020. It can be concluded that PSBB conditions did not affect PM10 parameters in the Serpong area and meteorological conditions more affected the distribution of PM10.

Keywords: PM10, Covid-19, Air Quality, Meteorological Factor

R1-024

Investigation of Air Pollution during the COVID-19 Pandemic in Padang City: Correlation of Specific Pollutants with Daily Case and the Effect of Social Restrictions

Putri Nilam Sari[1]*, Nofriya[2], and Alberth Christian Nahas[3]

1: Department of Occupational and Environmental Health, Faculty of Public Health, Andalas University
2: Environmental Engineering Study Program, Sekolah Tinggi Teknologi Industri Padang (STTIND Padang)
3: Bukit Kototabang Global Atmosphere Watch Station, Meteorological, Climatological, and Geophysical Agency (BMKG)

The COVID-19 pandemic in the Padang city is still increasing, although several policies have been implemented to prevent the spread of cases. From the concept of the epidemiological triangle, air pollution is a risk factor that becomes a carrier of disease agents and affects the vulnerability of the human body. This study aims to see the correlation between CO, NO_2, O_3, PM10, and SO_2 with daily cases of COVID-19 in Padang City. This study uses an ecological study design by analyzing the correlation between specific pollutants and daily cases of COVID-19 in Padang City for one year (26 March 2020 - 25 March 2021). Data for specific pollutants were collected from the data analysis of the European Center for Medium-Range Weather Forecast (ECMWF) model. Meanwhile, data on the COVID-19 pandemic was obtained from the daily report of the Padang City Health Office. Pearson and Spearman correlation tests were used to see the correlation of specific pollutants with daily COVID-19 cases. The results showed that social distancing had a significant relationship with the concentrations of O_3 and PM10. The correlation of CO, NO_2, O_3, and SO_2, has a negative correlation with daily cases of COVID-19 at lag 0, lag0–7, lag0–14, lag0–21. In contrast, PM10 has a positive correlation at lag 0 and lag 0-7. Understanding the contribution of air pollutants to the increase in daily cases of COVID-19 is an essential factor for preventing more serious health impacts and requiring policy to control the emissions.

Keywords: specific pollutant, social restriction, COVID-19

R1-025

Impact of Tourism and Anthropogenic Activities on Air Quality: A Brief Study during Lockdown in 2nd Wave of COVID-19 Pandemic in Kullu Valley of North Western Himalayas

Isha Thakur[1], Renu Lata[1]*, Sayanta Ghosh[1] and J.C.kuniyal[2]

1: G.B. Pant National Institute of Himalayan Environment, Himachal Regional Centre, Mohal-Kullu, Himachal Pradesh, India
2: G.B. Pant National Institute of Himalayan Environment, Kosi-Katarmat, Almora, Uttrakhand, India

Here, the criteria pollutants such as CO, SO_2, PM10, PM2.5, and NO_2 have been monitored in Kullu valley which is a famous tourist destination in Himachal Pradesh during lockdown period of 2nd wave of COVID-19 pandemic. The Pre-Lockdown Period (PLD) from 1st January to 6th May 2021 is taken here as a reference period while the time period from 7th May to 31st June 2021 is the Lockdown Period (LD). The present study carried out to assess the anthropogenic impact on gaseous pollutants. SO_2 (1 hr average) and CO (8 hour average) were monitored using online gas analyzers which utilizes pulse fluorescence technology and gas filter technology respectively while PM10 (24 h average) and PM2.5 (24 h average) were monitored using gravimetric method and NO_2 (24 h average) by Jacob and Hochessier method. The concentration of pollutants were further analyzed incorporating Mean ± Standard Error. HYSPLIT model was used to determine back trajectory of long range transport of pollutants. The results revealed average concentration of CO 0.59±0.03 ppm in PLD period while it decreased to 0.35±0.01ppm in LD period indicating how CO is greatly influenced by vehicular emission in the valley, also particulate matters such as PM10, PM2.5 showed a decrease of 65.31% and 52.5% respectively in lockdown period. The overall air quality improved in the Kullu valley during lockdown period of second wave of COVID 19 pandemic as tourist related activity and anthropogenic activities had been restricted. MODIS data of PLD and LD period were also analyzed in ArcGIS 10.8 which indicates the similar results.

Keyword: COVID-19, Lockdown, Anthropogenic Impact, Gravimetric Method, Pulse Fluorescence Technology, Jacob and Hochessier Method, HYSPLIT Model, MODIS data

R1-026

The Global Atmospheric Condition during the COVID-19 Pandemic

Yuliana

Udayana University

The COVID-19 pandemic has been going on for more than a year. COVID-19 causes asymptomatic infection, severe infection, until death. Besides the negative impacts of the COVID-19 pandemic for the health and environment, there are positive impacts of the COVID-19 pandemic on the global atmospheric condition. This paper aims to describe the global atmospheric condition during the COVID-19 pandemic, especially in the lockdown period. This is a literature review. The literature was searched from the PubMed and Science Direct databases. Results revealed that lockdown causes the lowering concentration of atmospheric pollutants such as sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM10), and nitrogen dioxide (NO_2) in some countries. The level of ozone concentration was preserved. The studies in Saudi Arabia, China, Spain, New York, Pakistan, India, Egypt, South East of the UK, Western Europe, and Italy showed a similar result. However, the ozone concentration was different among the countries. It might be due to the temperature differences. Therefore, it is recommended to have a lockdown for 2-3 days every 3 months to improve the air quality. Conclusion: there is less pollutant concentration in the global atmospheric condition during the lockdown due to the COVID-19 pandemic. The different concentrations of ozone in some countries might be due to the difference in temperature.

Keywords: atmospheric, COVID-19, pollutant

R1-027

Correlation of Forest and Land Fires in Sumatra to Natural and Anthropogenic Forcing Using CMIP5 Data

Lesi Mareta[1,2], Alfiah Rizky Diana Putri[1,3], and Ridlo W. Wibowo[1,3],

1: Atmospheric and Planetary Sciences, Sumatera Institute of Technology (ITERA)
2: ITERA Meteorology and Climatology and Geophysics Unit
3: ITERA Astronomical Observatory

Forest and land fires are an annual local and national disaster that occurs in Indonesia. Two factors influence forest and land fires: natural forcing and /or anthropogenic forcing (human activity). Human activity releases large amounts of carbon dioxide (CO_2), carbon monoxide (CO), methane (CH_4), oxidant rates, nitrogen dioxide (NOx) and particulates which act as sources of greenhouse warming that have been monitored by satellites in recent years. This study will see correlation of forestvand land fires in Sumatra to natural and anthropogenic forcing ucing CMIP5 data. Models CSIRO-MK3.6.0 and ACCESS1.3 can represent the area of forest and land fires in Sumatra that are influenced by anthropogenic forcing. Anthropogenic forcing in question are all human activities that produce greenhouse gases. In 1997 and 2002, the area of forest and land fires caused by anthropogenic forcing was very high, this is because in that year greenhouse gases were very high due to forest and land fires.

Keyword: Anthropogenic, CMIP5, Correlation, Forest and Land Fire

Invited Speech (Room 2)

Mechanisms of Diurnal Precipitation over Sumatra: Measurement and Climate Model Perspectives

Marzuki, Helmi Yusnaini, Fredolin Tangang, Robi Muharsyah and Mutya Vonnisa

This study examines the mechanism of diurnal variation in precipitation over Sumatra based on observational data and several atmospheric models. We have re-investigated the characteristics of diurnal variation of precipitation in terms of amount (PA), frequency (PF), and intensity (PI) using rain-gauge network data. It is found that the diurnal cycle of precipitation is significantly affected by the terrain elevation, stations' distance to the west coastline of Sumatra, and rain event duration. A slightly larger PA and PF appear over the middle and western sections of the Barisan mountains, in which the mean PI is smaller in these regions. Most stations with large rainfall amount also have large rainfall frequencies, indicated by a strong correlation between PA and PF. The prevailing afternoon and early-evening peaks, i.e., 1500-2000 LST, appear mostly over mountain ranges where the amplitude of PA and PF tended to increase with elevation. Generally, rain events with a long duration tended to have a peak occurring at a later time compared with those events of shorter duration. The diurnal cycle of precipitation from rain gauge data was compared with that obtained from Integrated Multi-Satellite Retrievals of GPM (IMERG). There are some differences in PA, PF, and PI's peak time from these two instruments. We also found a seasonal and intra-seasonal change of peak time of PA, PF, and PI over Sumatra. The physical and thermodynamic diurnal oscillation mechanisms are then studied using several climate models.

R2-001

GSMAP Seasonal Rainfall Verification over Western Java

Arifatus Hikmah Rusmanansari[1], Rusmawan Suwarman[2],
Yudha Setiawan Djamil[3], and Yan Firdaus[4]

1: Meteorology Department, Bandung Institute of Technology
2: Atmospheric Science Research, Bandung Institute of Technology
3: Indonesian Institute of Science (LIPI)
4: Meteorological, Climatology, and Geophysical Agency (BMKG)

West Java, the most developed region in Indonesia, faced a great challenge in handling hydrological issues such as water supply (crops production, municipal water system, etc.) and hydro-meteorological hazards (flood, landslide, etc.). Continuous large-scale rainfall estimation is crucial to handle hydrological issues, which is provided by a high-resolution rainfall satellite product such as GSMAP. However, the quality of GSMAP remains unclear since it lacks ground-based verification. Widely distributed rain gauge network in West Java with almost 18 years (2000-2017) records is used to verify the quality of GSMAP. Based on ground observation, in the southern of West Java, the first peak of rainfall pattern occurs in November while in the northern coastal area of West Java, the first peak occurs in January-February. Spatially from GSMAP data also shows the same thing where in November there is a fairly high intensity of rain in the southern region of West Java. Both conditions are detected in ground observation and GSMAP. Therefore, GSMAP can detect the pattern of rainfall in tropical regions, especially West Java. In addition, rainfall seasonal variability of West Java can be captured too. However, GMAPs magnitude overestimates rainfall mainly in the southern region of West Java. Thus, GSMAP is still good enough for us to learn the pattern and variability of rainfall over the West Java.

Keywords: Rainfall, GSMAP, Seasonal

R2-002

Evaluation of GPM IMERG Products for Extreme Precipitation over Indonesia

Ravidho Ramadhan, Robi Muharsyah, Marzuki, Helmi Yusnaini,
Mutya Vonnisa and Hiroyuki Hashiguchi

Accurate information on extreme rain is essential for vulnerability analysis and early warning systems of hydrometeorological disasters. One of the newly launched satellites that can provide information about extreme precipitation is the Global Precipitation Measurement (GPM), which produces half-hour grid data through the Integrated Multi-Satellite Retrieval for GPM (IMERG) system. This work evaluates the performance of IMERG data to measure extreme precipitation over Indonesia. Three types of GPM IMERG data: IMERG-Early, IMERG-Late, and IMERG-Final were validated by rain gauge data in Indonesia for extreme rain indices from 2016 to 2020. In general, GPM IMERG and rain gauge observation show a good correlation ($r = 0.7$). The more accurate result is observed for the Number of Heavy to Extremely Heavy Precipitation (R10mm, R20mm, and R50mm) and extremely wet days (R99) indices. In addition, the accuracy of IMERG is smaller Simple Daily Intensity Index (SDII), Consecutive Dry Days (CDD), and Consecutive Wet Days (CWD) indices.

R2-003

Estimating Rainfall Data Using Tropical Rainfall Measuring Mission (TRMM) Data: Study Case in Pesawaran Meteorology and Geophysics Agency

Ali Rahmat and Fajar Setiawan

Research center for Limnoloy, Indonesian Institute of Sciences, Indonesia

Water is an essential element for humans, animals, and plants. Water in form of rainfall is the input for the ecosystem. The availability of water can be predicted from the occurrence of rainfall. However, because of the limitation of funds and the equipment the direct monitoring cannot be applied. One way to monitoring the occurrence of rainfall is using satellite data; one of them is using Tropical Rainfall Measuring Mission (TRMM) data. The purpose of this research is to estimating the rainfall data from TRMM data and evaluating the accuracy of data. The data was used in this research is daily rainfall data from Pesawaran Meteorology and Geophysics Agency (BMKG Pesawaran) and daily data from TRMM for 2000-2010. The results show R2 of the estimating data and observation data is 0.52. The R2 is not too high because TRMM data is spatial data and converted to point data, where the smallest area is 25km^2. However, this data still has the potential for primary estimation.

Keywords: Rainfall, TRMM, Monitoring

R2-004

Intraseasonal Change of the Diurnal Cycle of Precipitation over Sumatra from IMERG Observation

Helmi Yusnaini, Marzuki, Harmadi Harmadi and Mutya Vonnisa

Madden Julian oscillation (MJO) is an intraseasonal scale circulation in the form of the formation of super cloud clusters that move along the equator and impact the area it passes through. This study investigates the intraseasonal change in the diurnal cycle of rainfall over Sumatra. Diurnal characteristics in peak and average accumulation, frequency, and intensity of rain were obtained from Integrated Multi-Satellite Retrievals of GPM (IMERG) final run product version 06 data during 2016-2019. Data were classified into active (2,3,4 and 5 phases) and inactive (1,6,7 and 8 phases) phases of MJO. Overall, the highest number of rain events over Sumatra was rain with a short duration (< 3 hours). However, the most significant change in the number of rain events (> 50%) was found during the active phase of the MJO for rain with a long duration (> 6 hours), especially around the ocean. A significant shift in the peak time of rain was also observed for long-duration rain. Areas with the peak time of rainfall in the afternoon are wider in the active phase than in the inactive phase, especially for rain with a duration > 6 hours. Intra-seasonal changes in the peak time of rainfall are more clearly observed when seasonal factors are considered.

R2-005

Evaluation of GPM IMERG Rainfall Products over Indonesia at Multiple Spatiotemporal Scales

Ayu Putri Ningsih, Robi Muharsyah, Marzuki, Helmi Yusnaini,
Mutya Vonnisa and Ravidho Ramadhan

This study aims to evaluate rainfall products of Global Precipitation Measurement Integrated MultisatellitE (GPM IMERG) over Indonesia. The GPM IMERG products provide quasi-global (60◦N–60◦S) precipitation estimates, beginning March 2014, from the combined use of passive microwave (PMW) and infrared (IR) satellites comprising the GPM constellation. The IMERG products are available in the form of near-real-time data, IMERG Early and Late, and post-real-time research data, IMERG Final, after monthly rain gauge analysis is received and taken into account. Rain gauge networks over this region provide an exceptional resource for ground validation of satellite rainfall estimates. We validated the data during 2016-2020. In general, all IMERG products measures higher annual and monthly rainfall than the rain gauge. The average correlation coefficient for IMERG-F, IMERG-E, and IMERG-L is 0.66, 0.614, and 0.63. Thus, IMERG-F rainfall estimates are in the best overall agreement with data observation, followed by IMERG-L and IMERG-E estimates. However, this accuracy is not uniform; it differs at each station location and is influenced by topography and rainfall intensity.

R2-006

Correcting Bias GPM IMERG Precipitation over Brantas Watershed, Indonesia

Rana Karinta Hapsari[1], Arno Adi Kuntoro[2], Widyaningtias[2], Edi Riawan[3], Mohammad Farid[4], and Mohammad Bagus Adityawan[4]

1: Study Program of Magister Water Resources Management
2: Center for Water Resources Development, Institute Technology Bandung
3: Atmospheric Science Research Group, Institute Technology Bandung
4: Center for Coastal and Marine Development, Institute Technology Bandung

Accurate estimation of precipitation is important for water resources management. The Global Precipitation Measurement (GPM) mission provides next-generation global observations of rain and snow. The Integrated Multi-Satelite Retrievals for GPM (IMERG) algorithm combines information from the GPM satellite constellation to estimate precipitation over most of the Earth's surface. However, it is necessary to validated GPM IMERG products to determine the compatibility with the value of the rain gauge. In this study presents a correction factor for GPM IMERG over Brantas Watershed. The bias correction of the GPM IMERG (final pracipitation) product from January 2015 to December 2019 rainfall data which was conducted temporally and spatially by combining Quantile Mapping (QM) method and the Multiple Linear Regression (MLR) method. The combination of QM and MLR methods aims to obtain a correction factor for 132 grids in the Brantas Watershed. It shows a significant decrease in the bias value of the monthly rainfall GPM IMERG product. The rBias decreased 74% in lowland, 86% in mediumland and 88% in highland. The MLR method aims to obtain the equations used for the correction factor. Equations in MLR include longitude (X), latitude (Y), and elevation (Z). The collaboration of these three parameters produces a different correction factor for each grid. The higher probability result shows the more varied correction factor in Brantas Watershed. This condition occurs between 41 – 60%, 61 – 80%, and 81 – 100% of rain probability.

Keywords: GPM, IMERG, Brantas Watershed, Correction Factor

R2-007

Impacts of the QBO on MJO-Related Rainfall over Maritime Continent

Aldiatama Jumanissaba, Sandro W. Lubis and Sonni Setiawan

QBO and MJO have strong connections over the tropics during boreal winter. Recent studies have identified that the frequency and number of days of MJO are relatively higher during easterly QBO (QBOE) than during westerly QBO (QBOW). Using Tropical Rainfall Measuring Mission version 7 (TRMMv7) from the period of 1998-2014, we investigate the impacts of the QBO phases on MJO-driven rainfall over Maritime Continent during the rainy season (December to February). The results show that during QBOE (QBOW) daily rainfall anomaly in the wet phases of MJO is increased (decreased) by up to 3.3 mm/day (1.8 mm/day) and has more (less) obvious eastward propagation. Furthermore, during QBOE (QBOW) changes in extreme rainfall probability in the wet phases of MJO is increased (decreased) by up to 100% (70%) and has wider (narrower) distribution. The increased (decreased) MJO-related rainfall with respect to the different phase of MJO is associated with changes in cloud-radiative feedbacks due to the colder (warmer) tropopause temperature and upward (downward) vertical advection during QBOE (QBOW). These results suggest that QBO-MJO connection can alter large scale convection and rainfall intensity and extremes over the Maritime Continent.

Keywords: easterly QBO, Indonesia, MJO, rainfall, westerly QBO

R2-008

Impact of MJO on the Distribution of Extreme Rainfall over Indonesia during IOD and ENSO Condition

W Harjupa[1], Trismidianto[1], Risyanto[1], E Saufina[1], F Nauval[1],
D F Andarini[1], T Harjana[1], Marzuki[1], and E Hermawan[1]

1: Center for Atmospheric Sciences and Technology,
National Institute of Aeronautics and Space (LAPAN). Bandung, Indonesia
2: Andalas University, Padang, Indonesia

MJO is the atmosphere phenomenon that caused extreme rainfall over Indonesia. Another phenomenon that also significantly affects Indonesian rainfall lower (positive) and higher (negative) than normal conditions are ENSO and IOD. This study was conducted to determine the influence of MJO to extreme rainfall during ENSO and IOD condition. The data used are monthly data of observation rainfall, rainfall estimated from aphrodite data, Nino3.4, IOD index and MJO Index with period of 2001-2010. The study focused on MJO phase 3, 4, and 5 during La Nina, El-Nino and IOD (+) and (-) with the distribution of Indonesia region. Based on the observation and estimated data using spatial and time series method with extreme rainfall threshold with 95 percentiles, the results showed the distribution of extreme rainfall more significantly during MJO phase 3 were higher over Sumatra, and MJO Phase 4 also affects Sumatra but extends more to Java, while Phase 5 affects central and Eastern Indonesia when the events of negative IOD and La Nina. The intensity of the distribution of extreme rainfall decreases when one of the phenomenon is inactive, for example when the IOD is Positive or an El Nino condition.

Keywords: MJO, IOD, ENSO, Distribution, Extreme rainfall

R2-009

The Influence of Boreal Summer Madden-Julian Oscillation on Precipitation Extremes in Indonesia

Fadhlil Rizki Muhammad, Sandro Wellyanto Lubis and Sonni Setiawan

The MJO is one of the dominant intra-seasonal variabilities that influence the extreme rainfall in the tropics, especially in Indonesia. This study examined the influence of Madden-Julian Oscillation (MJO) on Indonesian precipitation during the extended boreal summer (May – September). Here, episodes of intense precipitation (95th percentiles) during active MJO phases from 1998-2015 is evaluated, using the daily precipitation datasets from the gridded Asian Precipitation–Highly Resolved Observational Data Integration Towards Evaluation of Water Resources (APHRODITE) and several rain-gauges. The boreal summer MJO influences the likelihood of extreme precipitation, especially in the west and north parts of Indonesia. The west part experiences an increase in the probability of extreme precipitation by up to 50% and 80% during phases 2 and 3, respectively. Moreover, the extreme precipitation probability in the north part increases by up to 90% and 80% during phases 2 and 3, respectively. On the other hand, the influence of MJO is relatively small in the south and east parts of Indonesia. This stark contrast of the precipitation response between the north and south parts of Indonesia is consistent with the northward movement of boreal summer MJO.

R2-010

Convectively Coupled Equatorial Waves Triggering Torrential Rainfall Events over Sumatra, Indonesia

Muhamad Reyhan Respati, Sandro W. Lubis and Sonni Setiawan

This study examines the influence of convectively coupled equatorial waves (CCEWs) and their characteristics on torrential rainfall events over Sumatra, Indonesia on a sub-monthly timescale. The analysis of the ERA-Interim reanalysis data and the gridded Asian Precipitation-Highly Resolved Observational Data Integration Toward Evaluation of Water Resources (APHRODITE) product from 1980 to 2007 showed that Kelvin waves have a major role in the formation of the extreme rainfall event, compared to other waves such as equatorial Rossby (ER), mixed Rossby-gravity (MRG), and eastward inertio gravity (EIG) waves. In particular, it is found that the Kelvin waves contribute up to +100% (-70%) change of extreme rainfall probability during their wet (dry) phase, followed by ER waves that contribute up to +80% (-50%) probability change during their wet (dry) phase. The MRG and EIG waves have much less impact compared to the other waves. An examination of the characteristics of CCEWs reveals that the extreme rainfall modulation is found to be consistent with the distribution of the center of active (suppressed) convection and convergence (divergence) induced by the waves over Sumatra, Indonesia.

R2-011

The Madden-Julian Oscillation Forcing on the Diurnal Variation of Turbulence Kinetic Energy in the Tropical Tropopause Layer Observed with Equatorial Atmosphere Radar

Noersomadi

Center of Atmospheric Science and Technology, LAPAN, Indonesia

The Maddeh-Julian Oscillation (MJO) is characterized by the propagation of anomalous zonal wind and organized deep convection in the tropics where understanding of its forcing on the variation of tropical tropopause layer (TTL) at 14–18.5 km remains some challenges. This work aims to investigate the turbulence kinetic energy (TKE) which can be represented by the square of spectral width (s^2) observed with Equatorial Atmosphere Radar (EAR) near the TTL. The composite median of diurnal variation of s^2 in the MJO active phase (defined from the amplitude of Real-time Multivariate MJO index) shows larger maximum of TKE around 15–17 km compare to during MJO inactive, particularly in the early morning and afternoon. The magnitude of s^2 reached 1.4 to 1.8 ($m^2.s^{-2}$) in the afternoon through evening near the TTL associated with the propagation of MJO. The result describes the role of MJO on the diurnal variation of TKE around the TTL.

Keywords: MJO, spectral width, EAR

R2-012

Kelvin Wave Activity in the UTLS over the Maritime Continent from GPS RO Measurements

Diah A. Tiyas, Sandro W. Lubis and Sonni Setiawan

Kelvin waves are one of the most dominant atmospheric waves in the tropical upper-troposphere and lower-stratosphere (UTLS). However, research related to the characteristics of Kelvin waves in the UTLS over the maritime continent is very limited. Here, we utilize GPS RO measurements from January 2002 to December 2014 to study the characteristics of Kelvin waves over the maritime continent in the UTLS. The results show that the periodicity of observed Kelvin wave ranging from ~4-17 days and with the eastward zonal wavenumbers of 1 to 4. The vertical wavelengths of the Kelvin wave ranging from 2.8 to 4.9 km in the lower-troposphere, 2.8-7 km in the tropopause, and 4.9 – 12.1 km in the lower-stratosphere. It is also shown that the vertically propagating Kelvin wave has phase lines that tilt eastward with height and has a downward phase propagation in time. Furthermore, analysis of the Kelvin wave activity in the upper-troposphere reveals that propagation and phase speed of Kelvin wave are much slower than those in the lower-stratosphere due to the convection. Seasonal analysis also indicates that Kelvin waves are stronger in the JJA and SON period.

Keywords: GPS RO, kelvin wave, lower-stratosphere, upper-troposphere

R2-013

Changes in Diurnal Cycle of Rainfall over the Western Maritime Continent Associated with Cold Surge and the Madden-Julian Oscillation

Aldi Krismon[1], Muhammad Rais Abdillah[1,2]* and Nurjanna Joko Trilaksono[1,2]

1: Meteorology Study Program, Faculty of Earth Sciences and Technology, ITB, Bandung
2: Atmospheric Science Research Group, Faculty of Earth Sciences and Technology, ITB, Bandung

The Maritime Continent exhibits strong diurnal cycle of rainfall (DCR) that largely contributes to total precipitation in the tropics and to global atmospheric teleconnection. The DCR was shown to be modulated under various background conditions such as those induced by cold surge (CS) in the South China and the active phase of Madden-Julian Oscillation (MJO). However, collaborative impacts of these phenomena on the DCR are not well understood. Here we analyze the relative contributions of CS and MJO (phase 3-5) in changing DCR characteristics over the western Maritime Continent during the recent climate (2009-2019). By using harmonic analysis, we find that in general CS and/or MJO do not affect the timing of diurnal peaks of rainfall but do cause significant anomalies in diurnal amplitude, clarifying that diurnal peak modulation greatly contributed to daily-mean anomalies shown in previous studies. Different DCR changes are observed in Java, Borneo, and Sumatra Islands and their adjacent seas. The most prominent pattern is found in southwestern Sumatra when CS and MJO occur simultaneously.

R2-014

On the Mechanism of Anomalously Wet and Cold Weather over Java in the Month of June

Suaydhi

Java is known to have a very distinct rainy and dry seasons. The month of June is normally already in the period or the beginning of the dry season. The monthly rainfall average in June is usually below the annual average. The June surface temperature in Java is also cooler than that in the rainy season. However, some anomalies are observed during this month in some years with the occurrence of a relatively large amount of rainfall and colder weather than the June climatological average. Using the fifth generation of ECMWF Atmospheric Reanalysis of the global climate (ERA5) data, the June wet and cold episodes over Java is investigated. Daily data of June rainfall, surface temperature, horizontal wind and other atmospheric parameters between 2010 and 2021 are used in this research. It is found that the occurrence of rainfall and the variation of surface temperature over Java in June is influenced by the state of the Indian Ocean Dipole Mode (IODM) and the strength and position of the South Pacific Convergence Zone (SPCZ).

R2-015

Impact of La Niña to the River Discharge Variability in the Upper Citarum Watershed

Edi Rikardo Sinaga[1], Rusmawan Suwarman[2], Edi Riawan[2],
Yogi S.M. Simanjuntak[3], and Yudha S. Djamil[4]

1: Department of Meteorology, Faculty of Earth Science and Technology,
Institut Teknologi Bandung, Bandung, Indonesia
2: Atmospheric Science Research Group, Faculty of Earth Science and Technology,
Institut Teknologi Bandung, Bandung, Indonesia
3: Department of Earth Science, Faculty of Earth Science and Technology,
Institut Teknologi Bandung, Bandung, Indonesia
4: Indonesian Institute of Sciences

In the period of 1952–2020, there were 21 periods of La Niña events and 7 of them were in the strong category. One of the strongest of La Niña events occurred in 2010-2011, the large flood event was reported in this year at the Upper Citarum. The purpose of this study is to understand the relationship between the discharge variations in the Upper Citarum with La Niña. This study reveals that river discharge in the watershed experienced a significant increasing in October and January as a response to the La Nina, while the other months, the discharge of Upper Citarum watershed tend to decrease from its climatological average. However, La Nina increases rainfall climatology over the Upper Citarum watershed in September with a decreasing trend in the following months. Thus, it is suggested that the baseflow in the Upper Citarum watershed has a significant role to maintain the river discharge.

Keywords: discharge, La-Nina, regional rainfall

R2-016

Atmospheric Methane Variability during Upwelling Events in the Southern Coast of Java, Indonesia

Rahaden Bagas Hatmaja, Wilin Julian Sari, Fildzah 'Adany, and Prawira Yudha Kombara

Indonesia National Institute of Aeronautics and Space (LAPAN), Indonesia

As a greenhouse gas with a radiative forcing of 0.48 ± 0.05 Wm^{-2}, methane has better capability in trapping heat in the atmosphere compared to carbon dioxide. Besides being generated anthropogenically, methane is also produced naturally from the ocean, especially during coastal upwelling events due to the effect of biogeochemical process. This study aims to investigate the contribution of the seasonal coastal upwelling events towards atmospheric methane variability in southern coast of Java, Indonesia in 2011 to 2020. The upwelling identification were conducted by using monthly sea surface temperature (SST) reanalysis data from GLORYS12V1 model and monthly phytoplankton data, expressed as carbon in sea water, from PISCES biogeochemical model, which are retrieved from E.U. Copernicus Marine Service Information. Further, monthly AIRS data of atmospheric methane concentration at 1000 hPa, retrieved from NASA's Giovanni website, was used to analyse the methane concentration variability. Backward air movement trajectories using NOAA's HYSPLIT model were also estimated to look at the effect of the neighbouring areas to the atmospheric methane concentration. The results of this study show that the atmospheric methane seasonal variability, with a mole fraction of 1777.1 to 1830.3 ppbv, occurred in the same period of upwelling events during June to September, which marked by the higher abundance of phytoplankton with a concentration range of 1.1 to 8.1 $mmol/m^3$. Moreover, the mean of the highest methane concentrations of 1811 ppbv was found during the annual peak of upwelling events in September with a phytoplankton concentration reached up to 4.2 $mmol/m^3$. In addition, interannual variability of atmospheric methane concentration is related to Indian Ocean Dipole that coincide with an increase of upwelling intensity and phytoplankton abundance.

Keywords: Atmospheric methane, upwelling, phytoplankton, air-sea dynamics.

R2-017

Mindanao Current, Its Variations and Reaction to the El Niño-Southern Oscillation (ENSO) Event

Yusuf Jati Wijaya[1,2], Ulung Jantama Wisha[1,3] and Yukiharu Hisaki[1]

1: Department of Physics and Earth Sciences, University of the Ryukyus, Japan
2: Department of Oceanography, Faculty of Fisheries and Marine Science, Diponegoro University, Indonesia
3: Research Institute for Coastal Resources and Vulnerability, Ministry of Marine Affairs and Fisheries, Indonesia

The Mindanao Current (MC) is a southward meridional current in the western Pacific Ocean that establishes the low-latitude western boundary current. This study examined the variation of MC during 26 years (1994-2019) using data from the Copernicus Marine Environment Monitoring Service (CMEMS) global ocean reanalysis products. The first leading empirical orthogonal function (EOF) analysis of surface current, for summer and winter, revealed interannual variations of the MC. From the related time series, first principal component (PC1) showed a strong relationship to the El Niño-Southern Oscillation (ENSO), indicating a strengthening (weakening) in each El Niño (La Nina) event. Westward movement of Rossby wave played an important role in the variations of MC. When a negative (positive) sea surface height anomaly (SSHA) from eastern central Pacific Ocean arrived in the east of Mindanao Island, this would be causing a strengthening (weakening) of the MC. Moreover, positive (negative) Ekman pumping anomaly due to local wind forcing identified in the east of Mindanao Island which corresponded as well to the stronger (weaker) MC.

Keywords: Mindanao Current, El Niño, La Niña, Ekman pumping

R2-018

Comparative Analysis of Upwelling Characteristics in Northeast and Southwest of Indonesian Seas Area

Wicaksana SKJ* and I Sofiati

Center for Atmospheric Science and Technology, LAPAN, Indonesia

Information of the characteristics of upwelling in Indonesian sea has a very important role to estimate the potential fishing areas. The purpose of this study is to identify upwelling based on the Ekman pumping value that occurs in the northeastern and southwestern of Indonesia. The data used in this study are surface wind, sea surface temperature, chlorophyll-a and geostrophic current. Where the last three data are used as supporting analysis data for the calculation results of Ekman pumping. The method used in this study is to calculate Ekman pumping based on surface wind data for a period of 25 years (1995-2019). From the results, it can be seen that the SST at the time of the DJF in the southern sea of Java is warmer than its surroundings around 30 °C, and vice versa during the JJA about 27 °C. Chlorophyll-a (0.9 mg/m^3), geostrophic currents (1.1 m/s), and Ekman pumping ($4.8x10^{-5}$ m/s) have a fairly high intensity in the northern region of Java during DJF, while during JJA it occurs in southern Java. From the temporal analysis, it can be seen that the minimum intensity of chlorophyll a, geostrophic currents and Ekman pumping occurs during DJF and maximum occurs during JJA and vice versa for SST. This study supports previous studies, where the maximum Ekman pumping was followed by the minimum SST that occurred in both observation areas. However, chlorophylla and geostrophic currents in the southwest of Indonesia it follows seasonal characteristics but not for the northeastern region.

Keywords: Upwelling, Ekman pumping, chlorophyll-a, geostrophic current

R2-019

Atmospheric Response to the Southern Java Upwelling Variability Associated with Indian Ocean Dipole Event

Rahaden Bagas Hatmaja, Christine Cecylia Munthe,
Erma Yulihastin and Kadiman Erfitra Pramudia

LAPAN

On interannual timescales, Southern Java upwelling is closely related to the Indian Ocean Dipole (IOD) and El-Niño Southern Oscillation (ENSO). Recent studies stated that IOD tends to have a stronger correlation than ENSO in influencing the ocean-atmosphere dynamics within. This research investigated the atmospheric response to sea surface temperature (SST) changes during stronger upwelling off the Southern Java coast based on the composite of oceanic and atmospheric processes on the upwelling system associated with the IOD events from 1990 to 2020 by using a reanalysis dataset from the European Centre for Medium-Range Weather Forecasts (ECMWF) with a spatial resolution of 25 km during southeastern monsoon season (May to September). During positive IOD events, easterly wind anomaly generates upwelling Kelvin waves propagation along the equator to the coast off Sumatra-Java, thus strengthens the upwelling and transport cold deep water to the surface. The stronger upwelling contributes to reduce SST anomaly up to 1.82 standard deviations and increase chlorophyll-a concentration up to 3.19 standard deviations off the Java coast. As the response of the strengthened upwelling, the wind stress reduced as well as the near-surface air temperature by around 0.5 to 1 °C. Moreover, the wind stress anomalies can induce Ekman pumping and altered the SST magnitude as well, resulting in positive feedback that plays important role in driving the mesoscale air-sea coupling in the upwelling system. Furthermore, the rising of chlorophyll-a concentration as the phytoplankton abundance indicator is suggested to warm the SST due to absorption of solar radiation, then followed by surface air temperature warming and modify the tropical convection as well.

Keywords: ocean-atmosphere dynamics, Southern Java upwelling, Indian Ocean Dipole

R2-020

Vulnerability of the Bengkalis Coastal Areas to Exposure to Rob Flood and Its Impact Based on Spatial Modeling

Giant Amor, Muhammad Hanif, Rizki Atthoriq Hidayat Thoriq,
Arie Yulfa and Poppy Indrayani

Bengkalis Island is one of the small islands in the Riau Province which is located on the east coast of Sumatra which is strategically located in the middle of the Malacca Strait which is a traffic lane for international trade, however, it is vulnerable to tidal flooding as a consequence of the area located on the coast. Based on the phenomenon that occurred in early 2021, the Hydrometeorology Disaster dominated the disasters that hit the territory of Indonesia, especially the Bengkalis Region as an area affected by global climate change which caused a tidal wave on the coast of Bengkalis Island which became a concentration area for settlements, offices, shops, worship, and facilities. This research method uses geospatial modeling, using tidal height data from tidal stations of the geospatial information agency (BIG), land cover use image classification, land surface roughness index, and flood inundation scenarios. The results of this study we found that many coastal areas are prone to tidal flooding. In various scenarios of maximum height there are variations in the distribution of tidal flooding, for the final decision we use the worst scenario using the highest tidal discharge, which is 3.4 meters. This inundation simulation model inundated more than 74% of settlements in the coastal area, not only that, many agricultural areas were also affected by this tidal flood. We developed this simulation for analysis of losses due to tidal disasters, we found a loss index that reached 62% of the total loss of residential areas, this includes losses of infrastructure and residential building.

Keywords: tides, flood, spatial modeling, disaster

R2-021

Modeling the Generation of Tidal Bore at the Estuary of Rokan River, Indonesia

Ulung Jantama Wisha[1,3], Yusuf Jati Wijaya[1,2], and Yukiharu Hisaki[1]

1: Department of Physics and Earth Sciences, University of the Ryukyus, Japan
2: Department of Oceanography, Faculty of Fisheries and Marine Science,
Diponegoro University, Indonesia
3: Research Institute for Coastal Resources and Vulnerability,
Ministry of Marine Affairs and Fisheries, Indonesia

The Mindanao Current (MC) is a southward meridional current in the western Pacific Ocean that establishes the low-latitude western boundary current. This study examined the variation of MC during 26 years (1994-2019) using data from the Copernicus Marine Environment Monitoring Service (CMEMS) global ocean reanalysis products. The first leading empirical orthogonal function (EOF) analysis of surface current, for summer and winter, revealed interannual variations of the MC. From the related time series, first principal component (PC1) showed a strong relationship to the El Niño-Southern Oscillation (ENSO), indicating a strengthening (weakening) in each El Niño (La Nina) event. Westward movement of Rossby wave played an important role in the variations of MC. When a negative (positive) sea surface height anomaly (SSHA) from eastern central Pacific Ocean arrived in the east of Mindanao Island, this would be causing a strengthening (weakening) of the MC. Moreover, positive (negative) Ekman pumping anomaly due to local wind forcing identified in the east of Mindanao Island which corresponded as well to the stronger (weaker) MC.

Keywords: Mindanao Current, El Niño, La Niña, Ekman pumping

R2-022

Analysis Vulnerability Disaster of Landslide in Lantan Village North Batukliang District Central Lombok Regency Using Geoelectric Data and Sentinel Image Data

Syarifatul Ulfah[1], Marzuki[1], and Adi Susilo[2]

1: Department of Physics, Andalas University, Indonesia
2: Department of Physics, Brawijaya University, Indonesia

This research analyze the vulnerability disaster of landslides in Lantan Village, Batukliang Utara District, Central Lombok Regency from geoelectric data, rainfall, land movement, and topographic slope. Geoelectric data visualized using RockWorks15. The rainfall data is presented in a time series graph. The land movement is estimated by the Sentinel-1A satellite data, processed by using DInSAR (Differential Interferometry Synthetic Aperture Radar) method which is then mapped using ArcMap10.4. And the slope data in the study area is obtained based on the slope map data of the Central Lombok District. From the geoelectric data, it is obtained that the slip field is indicated in silt clay with sand and the direction of landslides in the study area, namely to the northwest with the type of landslide that may occur is translation landslides zone type A. Average monthly rainfall is in the low until high category (<100 to 300 mm) with rainfall pattern monsoon. Land movement that occur is land subsidence from -0,27 to - 0,30 cm/year are from 2018 to 2020 with an average land subsidence is about -0,285 cm/year. And the topographic slope of area is about 40o that is very steep category.

Keywords: Geoelectric resistivity, Slip field, Land subsidence, Sentinel imagery

R2-023

Tsunami Impact Assessment for Coastal City in Cilacap, Indonesia: A Geospatial Approach

Ranie Dwi Anugrah and Stevani Anggina

Cilacap is located in Southern Java Indonesia that notably prone to tsunami hazards. Since Cilacap is densely populated area hence it is necessary to analyze the risk of tsunami in its coastal area. This study aims to evaluate the risk of tsunami in Cilacap coastal area by integrating the function of hazard which is based on tsunami probability occurrence and tsunami inundation, with the vulnerability index based on human and economic aspects. The data used in this research consists of statistical data, maps, images that are collected through literature studies, secondary data, and field survey. The result shows the greater depth of the inundation, the greater the area at risk of tsunami. Furthermore, with scenario of 7 m height of tsunami, there are six villages at the high and very high risk of loss throughout tsunami events with 72.8 ha area. The estimated loss from its area affects the population of 20,850 people and the economic damage by $ 645,893. Furthermore, this paper provides plan for tsunami countermeasures that could be utilized as consideration by stakeholders for tsunami disaster prevention and mitigation.

R2-024

Quantifying Rainfall Uncertainties from TRMM Satellite Estimation over Ciliwung Basin

M. Ridho Syahputra[1]*, Faiz R. Fajary[1], M. Rais Abdillah[1], Edi Riawan[1], Rusmawan Suwarman[1], and Hengki Eko Putra[2]

1: Atmospheric Sciences Research Group, Institut Teknologi Bandung, Indonesia
2: PT. Reasuransi MAIPARK Indonesia, Indonesia

A rainfall dataset with good spatial and temporal resolutions is required for various applications, such as hydrological disaster and future planning. However, ground-based observations of rainfall are often incomplete and unevenly distributed. Another alternative source of rainfall comes from satellite estimation (remote sensing). However, the estimation has errors and uncertainties, which in turn affects subsequent applications. Therefore, it is important to quantify the uncertainty of rainfall estimation to provide additional information for users regarding reliability of the data. In this study a Monte Carlo simulation has been carried out to produce an ensemble rainfall dataset that is able to quantify the uncertainty of the TRMM (Tropical Rainfall Measuring Mission) 3B43v7 rainfall estimation product. This ensemble rainfall dataset can be used to provide information on probabilistic rainfall and error distribution from estimation of extreme rainfall (in the form of intensity-duration-frequency (IDF) and Probable Maximum Precipitation (PMP)).

Keywords: satellite estimates, uncertainty, extreme rainfall

R2-025

Atmospheric El Niño Precursors over the Maritime Continent

Wildan Novrizal[1]*, Faiz R. Fajary[2], and Nurjanna Joko Trilaksono[2]

1: Undergraduate Program in Meteorology, Institut Teknologi Bandung, Indonesia
2: Atmospheric Science Research Group, Institut Teknologi Bandung, Indonesia

El Niño tends to cause less rainfall (even drought) on Maritime Continent. Sea Surface Temperature (SST) monitoring is one way to find out El Niño's condition. However, these data are in the Pacific region, so El Niño observed when it already formed. Therefore, it is necessary to determine the precursor of El Niño over the Maritime Continent. This study aims to determine El Niño precursor from an ENSO signal propagation over Maritime Continent. The data used in this study are zonal wind and relative humidity (RH), from the reanalysis dataset (ECMWF ERA-Interim) and radiosonde observations (at three stations: Singapore, Kuching, and Koror), as a proxy of Walker circulation and water vapor. In addition, the Nino 3.4 index is used to monitor ENSO events. The methods used in this study are simple linear regression and a zero-phase Butterworth bandpass filter. By regression analysis, the contribution of El Niño in the data fields is analyzed. The filtered signals on the interannual timescale agree with El Niño's signatures as in the regression analysis. This study proposed that the convergence and maximum westerly wind at 850-hPa and maximum RH and changes from positive to negative RH at 500-hPa, over Maritime Continent, can be used as a precursor of El Niño. The appearances of the precursors at the three stations would be a promising indicator of the El Nino occurrence.

Keywords: Butterworth Bandpass Filter, El Niño, Precursor, Radiosonde

R2-026

Identification of Shoreline Changes in Padang City from 2000-2020 Using Modified Normalized Difference Water Index Method and Use of Digital Shoreline Analysis System

Beben Graha Putra, Arie Yulfa and Siti Khofifah

This study aims to: 1) Knowing the use of MNDWI on Landsat 7 and 8 images to see shoreline changes, 2) Knowing the magnitude of the rate of coastal change using the Digital Shoreline Analysis System. This type of research is quantitative research that uses remote sensing analysis methods and geographic information systems. The results of this study indicate that the use of the MNDWI transformation is very helpful in seeing the air boundaries so that in analyzing shoreline changes it can be used. Furthermore, after processing using DSAS, the results of the phenomenon that changes in the coastline in the city of Padang are dynamic are dynamic. The dominant abrasion phenomenon occurred in Padang City in the range of 2000-2005 and 2015-2020, it was found that the average abrasion rate was -3.40 m/yr in the 2000-2005 range and -3.58 m/yr in the 2015 range. -2020. The dominant phenomenon of accretion occurred in the years 2005-2010 and 2010-2015, with the average accretion rate in the 2005-2010 range of 3.51 m/yr and 2.39 m/yr in the 2010-2015 range.

Invited Speech (Room 3)

Precision Heat Monitoring in Agriculture Using Fuzzy Logic Model

Nnamdi Uzoukwu[1], and Acep Purqon[2,3]

1: Computational Science Department, Bandung Institute of Technology
2: Physics of the Earth and Complex Systems Laboratory, Bandung Institute of Technology
3: Data Science Department, Institute of Technology Sumatera

We investigate predictive modeling in agriculture using a Machine Learning based on fuzzy logic. Fuzzy logic is a methodology that employs imprecise in the mapping of input to output. It is effective in using linguistic expressions to encode control rules for simulating multivariate non-linear systems. In this study, the heat index for a growth room is modeled with the temperature and relative humidity using fuzzy rules extracted from sensor data collected over a 20-day period using Arduino IoT infrastructure. Exploratory data analysis is also performed to uncover the prevailing weather conditions in the growth room for the interval of study. When evaluated on a test set, the developed model obtained R2 of 0.974 and RMSE of 0.084, and the results are statistically significant ($F_{1,5915} = 222900.858$, $p < .001$). Given the combination of linguistic rules and significant prediction accuracy, the fuzzy logic model is an efficient learning technique for heat control problems.

Keywords: predictive modeling, heat index, fuzzy logic, machine learning, agriculture

R3-001

The Intersection of Environmental Science and Social Science in the Sustainability Innovation

Budi Harsanto

Universitas Padjadjaran, Indonesia

Sustainability innovation is a type of innovation that is focused not only on profit but also on minimizing negative environmental and social impact. Previous research has indicated that sustainability innovation requires a connection between environmental science and social science. The intersection, however, is not yet clear. The purpose of this paper is to identify the intersection of the two disciplines on the topic of sustainability innovation. The bibliometric method was used, which involved analyzing meta data in the Scopus academic database. According to the findings of the analysis, the two fields have made the highest contribution to the study of the sustainability innovation. When the analysis is narrowed down to the two subject areas, the contribution is fairly evenly distributed, with environmental science accounting for 26.7 percent and social science accounting for 27.5 percent. Other closely related areas discovered include energy (17.0 percent) and business, management, and accounting (10.2%). The findings of a co-occurrence analysis of keywords with at least 10 occurrences yielded 247 items that were divided into six clusters.

Keywords: environmental science, social science, sustainability innovation

R3-002

Implementation of Environmental Policy on Oil Palm Plantations Related to ISPO in Eastern Part of South Sumatra Province

Nurul Amri Komarudin[1], Hariyadi[2] and Tania June[3]

1: Natural Resources and Environmental Management Science, Graduate School, IPB University, Indonesia
2: Department of Agronomy and Horticulture, Faculty of Agriculture, IPB University, Indonesia
3: Department of Geophysics and Meteorology, Faculty of Mathematics and Natural Sciences, IPB University, Indonesia

This research was conducted to analyze the company's performance in managing and monitoring the environment; and to study the gap analysis of environmental policies in oil palm plantations and their implementation in the field based on ISPO criteria. The study site is particularly located in the eastern part of Sumatra Province, with a focus on six private companies in the palm oil plantation sector. Despite having such regulations and policies on environmental management, especially in the management of oil palm plantations, but there are still many environmental problems that are prominent due to the gap between the policies made and their implementation in the field. With this, regulatory gap analysis--a technique used for evaluating public policies by referring to ISPO criteria relating to the environment—was carried out. In terms of the company's performance analysis in managing and monitoring the environment in general, the results showed that 105 indicators out of 126 indicators on ISPO criteria related to the environment have been fulfilled. For its implementation, PT B obtained the highest score with a percentage of implementation of 100%, which means that the policies have been implemented well. While overall the value of the gap of environmental policies in oil palm plantations in the eastern region of South Sumatra Province has a value of 0.15 or below 0.50, which means the overall implementation of environmental policy has been successfully implemented in accordance with the plan while it has also the ability to overcome environmental problems.

Keywords: environmental policies, implementation, gap analysis, oil palm plantations

R3-003

Microclimate and Its Impact on Hotel Building Energy Saving Performance in the Tropical Coastal City

Bangun I.R. Harsritanto[1], Dany Perwita Sari[2], and Jeanny Laurens Pinassang[3]

1: Architecture Department, Universitas Diponegoro, Indonesia
2: Research Center for Biomaterials, Indonesian Institute of Sciences (LIPI), Indonesia
3: Architecture Department, Universitas Internasional Batam, Indonesia

The microclimate is influencing urban buildings, energy use, and sustainability progressively. Coastal tropical regions were also affected by this phenomenon. A hotel building model is presented for a study of urban heat islands (UHIs) and urban thermal environments. There should be measures taken to reduce the energy demands of hotel buildings, which tend to consume more energy than other types of buildings. In this paper, weather data analysis and building simulation are used to predict energy consumption based on microclimates. Using the example of an existing three-star hotel in Makassar, Indonesia, energy simulations were conducted using the eQuest software. The surface properties of building façades affect the thermal performance of buildings that also impacted the consumption of electricity. Results indicate that schedules of internal loads impact the accuracy of a hotel building's model most, followed by occupancy rate and coefficient of performance (COP) of chillers. According to our findings, Makassar microclimate variations should be taken into account when developing urban energy planning and building energy codes and standards.

Keywords: Urban Microclimate, Urban Heat Island, Hotel Building, Tropical Coastal City, Energy Efficiency

R3-004

Determination of Stunting Priority Locations and Regional-Based Stunting Management Strategies in Serang City

Erti Nurfindarti[1] and Nugrahana Fitria Ruhyana[2]

1: Badan Perencanaan Pembangunan Daerah Kota Serang
2: Badan Perencanaan Pembangunan Penelitian dan Pengembangan Kabupaten Sumedang

One of the main problems of development in Serang City is that the quality of human resources is not yet optimal, which is marked by the low quality of public health, including 2794 stunting cases in 2021. The stunting problem needs to be handled with a climate change approach because the issue of climate change is experienced by all regions in Indonesia, even the world, and the incidence of stunting is related to various impacts of climate change, such as food insecurity, availability of clean water, and sanitation. This study aims to determine the priority locus of stunting management based on the concept of adaptation to climate change and regional-based stunting management strategies. The research method is a mixed sequential explanatory method by combining the results of quantitative and qualitative analysis in determining the priority locus of stunting handling and regional-based stunting management strategies. The results showed that there were 4 (four) urban villages (kelurahan) that had a high risk of stunting, and based on the conditions of the four urban villages (kelurahan), the stunting management strategy was to accelerate the delivery of information related to stunting cases, carry out campaigns/counseling/education on stunting, prioritize government activity programs in priority locations, prepare areas for stunting priority is to have data resilience so that they can qualify for the aid, improve community culture which is still low in clean and healthy living behavior, increase stunting prevention programs, provide local government budget support, provide knowledge about stunting handling with climate change adaptation approaches to support sustainable development.

Keywords: stunting, risk, strategy

R3-005

Electrodeposition of Cu Layer with Mangrove Bark Extract Additive as an Inhibitor for the Application of Anti-Corrosion Coating

Dahyunir Dahlan, Muhammad Frassetia Lubis and Dwi Puryanti

Synthesis of Cu layer has been carried out by adding mangrove stem bark extract as an inhibitor to the CuSO4 solution during electrodeposition. The inhibitor concentration used was 0; 0.5; 1; 1.5; 2; 2.5 and 3% wt. The layers are characterized using a digital optical microscope to see the surface of the electrodeposition layer, x-ray diffaction is used to determine the phase changes that occur, while electron microscopy (SEM) is used to view the surface of the layer in more detail. The coating corrosion characteristics were calculated using a change in mass weight. From the characterization that has been carried out, it was found that the optimal inhibition of the corrosion rate was obtained when using 1% wt of mangrove stem bark extract inhibitor. At this concentration the lowest corrosion rate was obtained, while at this concentration the smoothest surface morphology was obtained compared to all types of samples that had been made. Machine learning models for predicting the daily maximum water level in a tidal river: the Kapuas Kecil River case study

R3-006

Reducing Sugars Production from Oil Palm Empty Fruit Bunches (OPEFB) by Combined Dilute Acids-Hydrothermal Pretreatment

Fahriya Puspita Sari, Fitria Fitria, Sita Heris Anita, Maulida Oktaviani and Widya Fatriasari

Indonesia is the biggest oil palm producer in the world, followed by its country, Malaysia. Together they supply nearly 90% of the global market with predicted combined production of about 60 million tonnes this year, Indonesia with 37.8 million tonnes. One of the residues of this industry is OPEFB which can be utilized as bioethanol feedstock due to its high holocellulose content of about 60%. As with other lignocellulosic biomass, OPEFB has to be pretreated before subsequent enzymatic hydrolysis to break or loosen the linkage of cellulose, hemicellulose, and lignin creating a large industry in food and agricultural products and chemicals. Therefore, this study investigated the influence of the three different acids (oxalic, maleic, and sulfuric acids), 3 concentrations (1%, 3%, 5%), and 3 heating durations (15, 30, 45 min) in an autoclave (121.1 °C) on the pretreatment of OPEFB and to evaluate sugar production after enzymatic hydrolysis of pretreated OPEFB. The results show that maleic acid gave the highest reducing sugar yield of 20.94 % at 5 % concentration for 15 min heating duration while 17.58 % and 15.40 % of reducing sugar yield were obtained from oxalic acid (3%, 45 min) and sulfuric acid (1%, 15 min) pretreated OPEFB, respectively. This study shows the promising result of using maleic acid for lignocellulosic pretreatment compared to oxalic and sulfuric acids.

R3-007

The Relationship between Climate Variables and Rice Productivity from the Aquacrop Simulation in the Clustering Area from the Results of the K-Means Method in Java Island, Indonesia

Kharisma Aprilina, Ardhasena Sopaheluwakan, Armi Susandi, Hastuadi Harsa, Utoyo Ajie Linarka and Rian Anggraeni

The result of the previous study using the k-means clustering methods on three climate variables, namely total annual rainfall, average annual maximum and minimum temperatures, resulted in two areas with different climatic characteristics in Java Island, Indonesia, with the first area tending to be in the lowlands and second area is predominantly in the highlands. This study aims to determine the relationship between those three climate variables and the irrigated and rainfed rice productivity from the results of the Aquacrop simulation in the clustered area. The results show that the total annual rainfall tends to have higher positive correlations with the average annual rice productivity of the Aquacrop simulation, both for irrigated and rainfed rice yield in areas where the lowlands are dominant than those in the highlands. Meanwhile, the average annual maximum and minimum temperature variables have an inconsistent relationship with the average annual rice productivity of Aquacrop simulation results in both the lowland and highland areas.

Keywords: aquacrop, k-means, temperature, rice

R3-008

The Impact of Climate Change on Effectivity of Biocontrol in the Arabica Coffee Landscape

Siska Rasiska, Pampang Parikesit and Iwan Setiawan

Climate change impacts coffee plant productivity through loss of biodiversity and disrupts the hydrological cycle in the mountain and the watershed agriculture, disrupted nutrient cycling, soil degradation, increased fire regimes, water scarcity, increased unsuitable habitat for coffee plants, increasing the vulnerability of arabica coffee plants, and the increased susceptibility of Arabica coffee to pests and diseases. Various technology can be applied and the main thing is monitoring, followed by cultural, physical, resistant host, biologic and RNAi botanic and insecticide. Biological control can be the effective pest management to control the coffee pest with spatiotemporal in widely area (landscape) and the process can take place over a long period of time sustainable. But, in the context of climate change, biodiversity can be threatened. This paper aims: 1) to study of the impact climate change on the pest in the arabica coffee landscape; and 2) to analyze the effectiveness of the biological control process. The literature review was used by using journal researches as with use Google scholar and Sciencedirect. The data obtained will be analyzed descriptively. The result shows that there are 20 studies the impact of climate change on biological, morphology, and behavior of pests and natural enemies of coffee pest and biological control must be change and must be supported by another technology of pest management, design suitable habitat management, preservation and conservation biodiversity.

R3-009

Zone of Biodiversity Extinction in Tropical Marine Ecosystems in Sumatra Island Using Climate Change Scenarios

Muhammad Hanif[1], Rizki Atthoriq Hidayat[1], Giant Amor[1], Luhur Moekti Prayogo[2]

1: Department of Geography, State University of Padang
2: Department of Geodesy Engineering, Gadjah Mada University

Global climate change is a real problem faced by the whole world, this climate change has a huge impact on the environment, especially on tropical ecosystems. Climate change causes disruption of the normal cycle of ecosystem arrangements and even changes in the conditions of life for biodiversity. Although the law of shelford's tolerance states that there is a power to recover or can be interpreted as the adaptability of living things to environmental changes, it is believed that not all are able to pass through this process. Some of the biodiversity is very sensitive due to changes in environmental variables that are a condition of life. This research is still very limited because it is still a generalization of ecosystems and the fact of their tolerance ability to survive. The method used in this research is the scenario of changes in global water temperature and sea level rise on the island of Sumatra. The data used in this study are based geospatial data, which obtained from remote sensing satellite such as: Aqua Modis, Spot and digital elevation, spatial data, statistical predictions, and literature studies. We grouped ecosystems into various eco-regions, bio-regons and land cover landscapes, to sharpen the analysis. The results of this study found that the greatest threat of biodiversity extinction occurred to the biodiversity of polyps up to 60% and sea grass which became a unit of shallow marine ecosystems, this is because the growth of polyps takes a very long time and is very sensitive to changes in water temperature which will cause coral reef bleaching. Not only that, we found a biodiversity extinction threat zone for more than 140 small islands and this island is the outermost part of the island of Sumatra due to shifts in water temperature and depth that cause a shift in the living conditions of biodiversity. This scenario provides an overview of priority locations for the conservation of aquatic ecosystems that need to be mitigated from the impacts of climate change.

Keywords: marine ecosystem, extinction, landscape ecosystem, geospatial

R3-010

Biomonitoring of Polycyclic Aromatic Hydrocarbons in the Ambient Air Using Plants: A Review

Desy Sulistiyorini

Sekolah Tinggi Ilmu Kesehatan Indonesia Maju, Indonesia

One of the groups of pollutants in the atmosphere is Polycyclic Aromatic Hydrocarbon (PAHs). PAHs compounds currently are extensively studied due to their harm to human and ecosystem health. Biomonitoring by using plants was currently introduced as an alternative to the monitoring of pollutants by the means of active air sampling to minimize the bias effect of the short-term active air sampling. Biomonitoring is also considered an effective technique to be applied in developing countries for the reason that it can avoid the high cost of instrumental monitoring. Previous studies from the last decade were analyzed to gain insight into current practices, progress, and challenges. Content analysis was employed to systematically characterize and classify the existing biomonitoring application. The emphasis in this review will, therefore, be placed on the use of bioaccumulation and biomarker responses in the plants, as monitoring tools for PAH concentrations for the ecosystem, as well as on its limitations.

Keywords: Biomonitoring, air pollutants, atmospheric pollutants, Polycyclic Aromatic Hydrocarbons (PAHs), plants

R3-011

Description of Macroscopic and Microscopic Alternaria Porri on Shallots (Alium Ascolonicum L) in Enrekang Regency

Himahwati[1], Muhammad Rifqy Aulia[1], Hali A. Karim[1],
Nur Ilmi[2] and Agus Riandi[2]

1: Departemen of Agrotechnology, University of Al Asyariah Mandar, Indonesia
2: Departemen of Agrotechnology, University of Muhammadiyah Pare-pare, Indonesia

Enrekang regency is one of the largest shallot producing centres in South Sulawesi. The area of shallot planting in Enrekang Regency is 6,610 ha. One of the obstacles in the efforts to increase the production is trotol disease attack caused by Alternaria porri. This study aims to find out the description of macroscopic and microscopic fungus A. porri which is the cause of trotol disease in Enrekang Regency. The method used is morphological identification after growing in PDA refer to the key of determination of fungi by Burnet and Hunter (1972). The results obtained showed in the macroscopic description obtained mycelium white to orange and gray and based on the description microscopic obtained conidia shape like a mace, with a blunt tip and has a bulkhead 3-5.

Keywords: Fungi, Trotol desaese, Shallot

R3-012

Increasing Rice Yield by Soil Tillage System and Water Management

Nourma Al Viandari[1]*, Anicetus Wihardjaka[2], Heru Bagus Pulunggono[1], and Suwardi[1]

1: Department of Soil Science and Land Resources, Faculty of Agriculture,
IPB University, Indonesia
2: Indonesian Agricultural Environment Research Institute, Indonesia

The dry season rice yield production is generally lower than the wet season crop on rainfed field. The low production is due to drought stress during the reproductive growth phase. This study aimed to determine the effect of water management and tillage system on rice yields at rainfed field. The experiment was conducted at the Jaken Experimental Station of the Indonesian Agricultural Environment Research Institute, Pati Indonesia from February to June 2019 with a split plot design, repeated four times. The treatment consisted of water management as the main plot and soil tillage as a sub-plot. The treatment of water management was continuous flooding and depend on rainfall flooding. The treatment of tillage system was shallow tillage (0-10 cm) and deep tillage (25-30cm). The tillage system and water management did not significantly affect the yield of IR64 rice grain with an average grain yield of 4.1 tons ha^{-1}. Shallow tillage significantly reduced the bulk density during the maximum tiller growth phase.

R3-013

Water Quality Assessment for Detecting Submarine Groundwater Discharge (SGD) Pollution in the Coastal Area of Krakas Beach, Lombok Utara Indonesia

W A Gemilang[1], U J Wisha[1] and H Bakti[2]

1: Research Institute for Coastal Resource and Vulnerability,
Ministry of Marine Affairs and Fisheries, Indonesia
2: Geotechnology Research center, Indonesian Institute of Science, Indonesia

One of the water resources in the coastal area is a submarine groundwater discharge (SGD) found in Krakas Beach, Lombok Utara, Indonesia. This spring discharge has a role in espousing nutrient intake and balancing the nitrogen and other dissolved organic compounds within a coastal ecosystem. On the other hand, the SGD could be beneficial as a freshwater resource for the local community and supporting marine tourism. The continued groundwater intake in the coastal area could induce coastal pollutions by triggering eutrophication, temperature degradation and salinity shock to coral reefs. Thus, assessing water quality in the surrounding SGD area is crucial to determine the pollution level caused by freshwater contamination. A survey using a water quality checker has been conducted. The groundwater samples from the source of SGD and the wells in the surrounding coastal area were collected and analyzed geochemically in the laboratory. Alpha radioactivity analysis was also done to detect the emergence of groundwater pollution. The 222Rn of groundwater ranged from 339.3843.44 Bq/m^3, SGD 242.6-1626.15 Bq/m^3, and non-SGD area 39.93-89.42 Bq/m^3, respectively. We found that the nitrate concentration predominated the nutrient content of groundwater in the study area (approximately 23.93 mg/L). The high concentration of nitrate contained in the groundwater was in line with the increasing nutrient evoked by SGD (ranging from 1-3.3 mg/L) whereby the nitrate concentration exceeded the quality standard for marine biota. The N:P ratio was >16 in the study area showing the imbalanced condition due to SGD. On the other hand, the emergence of SGD tremendously declined the salinity, resulting in the low coral cover in surrounding SGD area.

Keywords: Water, Quality, Submarine Ground Water Discharge, Pollution, Coastal, Lombok

R3-014

Spatial Distribution of Nutrient Export from the Catchment Area of Lake Rawapening

Nunung Nugroho

Balai Penelitian dan Pengembangan Teknologi Pengelolaan Daerah Aliran Sungai (BPPTPDAS), Indonesia

Eutrophication is a serious environmental problem faced by lake ecosystem in Indonesia, including Lake Rawapening. It is a natural process in which the enrichment of aquatic systems by nutrients, especially by nitrogen (N) and phosphorus (P) compounds, causes uncontrolled growth of plants and algae, resulting in an imbalance between production and consumption of algae. Eutrophication has adverse impacts on lake ecosystem, such as degrading water quality and decreasing biodiversity. Thus, reducing lake eutrophication was set as one of the super priority programs of the Lake Rescue Movement. Information on the spatial distribution of nutrient export becomes important to effectively implement the program. This study aims to estimate the magnitude and the spatial distribution of nutrient export from the catchment area of Lake Rawapening. The analysis was based on the Nutrient Delivery Ratio sub-model of the InVEST (Integrated Valuation of Environmental Services and Tradeoffs). The results indicated that the total nutrient loads of N and P in the catchment area of Lake Rawapening were 2,263,276 kg/year and 428,697 kg/year, respectively. Total exports of N and P nutrients that entered Lake Rawapening were 847,899.59 kg/year and 153,145.44 kg/year, respectively, which were 37.5% and 35.7% of the total nutrient load of N and P. Panjang Sub-sub watershed is the largest source of nutrient exports. Therefore, Panjang Sub-sub watershed should be selected as the focus area for implementing the reducing eutrophication program control of Lake Rawapening.

Keywords: Eutrophication, nutrient export, priority lakes, Lake Rawapening

R3-015

Prototype of Flood Monitoring System Based on River Turbidity Using Optical Fiber Sensor and Raspberry Pi 3 B+

Muhamad Iqbal[1], Aldo Novaznursyah Costrada[1], and Harmadi[2]*

1: Laboratorium of Instrumentation Physics, Department of Physics,
Faculty of Mathematics and Natural Science, Andalas University, Indonesia
2: Department of Physics, Faculty of Mathematics and Natural Science,
Andalas University, Indonesia

A prototype of flood monitoring system based on river turbidity has been developed using optical fiber sensor and the Raspberry PI 3 B+. The prototype of this flood monitoring system consists of 3 units, such as a unit of electrical energy source, a transmitter unit and a receiver unit. The electrical energy source unit has a function to produce energy from sunlight and to activate the transmitter unit. The transmitter unit has a function to measure the water turbidity and transmits the measurement result to the receiver unit. The receiver unit has a function to receive the river water turbidity data from the transmitter unit, manages and displays data in the form of a graph, saves the data, and gives an early warning using a buzzer when the flood was occured. The optical fiber sensor is used to measure the value of water turbidity by utilizing the change in the voltage output of the OPT101 photodetector. The result of the test and data analysist that have been done on the data of water turbidity will be sent from transmitter unit to receiver unit by using the nRF24L01+ transceiver. The maximum distance from data transmission of the nRF24L01+ was 739 m without obstacle and 318 m with obstacle. The threshold of turbidity value used to determine the potential for flooding in this prototype was 467 NTU. This prototype has a sensitivity of -1.3074 mV / NTU and the average relative error percentage of this prototype is 21.56% compared to the turbiditymeter Lutron TU-2016.

Keywords: flood, monitoring, optical fiber sensor, turbidity

R3-016

Public Urban Park Quality Assessment Using Fuzzy C Means Classification of Land Surface Temperature and Social Indicators

Arif Wicaksono

Land surface temperature (LST) derived from remote sensing data has been widely used as an indicator for analysis tool related with urban park and green space such as cooling effect. The aerial scope of using LST to identify which public urban park (PUP) locations have high temperature can be time saver for municipal authorities better than performing detail surveys. This LST in form of raster data can be converted into fuzzy linguistic membership values range from 0 to 1. One of the fuzzy classification method is fuzzy c means (FCM) where fuzzy membership of each data point is determined based on its initial center points and then iteratively adjusted to its final center. Therefore, this paper used LST generated from band 10 Landsat 8 image and classify it using FCM algorithm to locate the PUPs which have fuzzy high LST. However, the indicators of public urban park includes not only cooling effect but also social perspective such as standard service and public awareness. Bogor Municipality in Indonesia has 43 PUP locations, and each PUP has both standard service and public awareness score resulted from previous study. Hence, the selected PUP locations resulted from fuzzy high LST class will be assessed its quality based on two indicators namely standard service and public awareness. The result of this study will be useful for decision makers in Bogor Municipality to plan further actions to increase the quality of selected PUP locations.

R3-017

ETA Concept Program for Reducing Green House Effect in Indonesia Industrial Scale with IoT Integrated

Riki Purnama Putra, Roprop Latiefatul Millah and Shidiq Andhika

State Islamic University of Sunan Gunung Djati, Indonesia

Carbon emissions are one of the big polemics in Indonesia, around 200 tons of carbon per hectare comes from 94.1 million hectares of forest land and around 1000 tons of carbon per hectare comes from 22.5 million hectares of peat soil. Indonesia is the largest emitter in the world with an emission value of 1.68% of the total 40.9 billion carbon dioxide that has an impact on climate change and global warming. In the Kyoto agreement, there is a solution in the form of an Emission Trading scheme which was announced at a macro level. This study aims to design an application called Emission Trading Application (ETA) to control the high demand and low demand of a factory/manufacturer that requires emission slots in the Emission Trading scheme that limits emissions from a factory/manufacturer to overcome domestic trade problems in Indonesia. In addition, the Emission Trading Application (ETA) is also expected to help in increasing the country's foreign exchange with sustainable development. The method used in the development of this application, namely the qualitative descriptive method with the deepening of the material through the study of literature. The ETA program will offer emission quotas available to companies that should reduce their emissions. The ETA program will facilitate demands that have excess carbon emission quotas to become suppliers for companies with production levels of emissions that exceed the specified emission quota.

Keywords: Carbon Emission, Emission Trading, Emission Trading Application

R3-018

Utilization of Agroindustrial by Product for Bioinsecticide Production

Kirana Sasmitaloka, Mulyorini Rahayuningsih and Titi Sunarti

Microbial bioinsecticides is a products produced by microorganisms that can kill insect pests and disease-carrying vectors. Bacillus thuringiensis is one of well-known bioinsectiside resources, and utilized in organic farming for the replacement of chemical insecticides. Substrat composition affects the characteristics of bioinsekticides products, especially in growth, toxicity, and potential products. This research aimed to produce bioinsectides from Bacillus thuringiensis using agroindustrial by product as a substrate and its characteristics. The study was designed using a completely randomized design, consisted of two factor, namely the type Bacillus thuringiensis (Bacillus thuringiensis subsp. berliner and Bacillus thuringiensis subsp. aizawai) and kinds of substrate (onggok, pulp of coffee, starch fractions of iles-iles, and sago's waste), with four replication. The results showed that Bacillus thuringiensis has the ability to produce cellulase and amylase enzymes so it can be used agroindustrial by products as a carbon sources in solid media cultivation. Cultivation of Bacillus thuringiensis subsp. berliner using pulp of coffee as a substrate can produce the highest toxicity with VSC of 9.2 log CFU/g, LC50 value of 0.07 µg/ml and potency of 11429 IU/mg, while cultivation of Bacillus thuringiensis subsp. aizawai using onggok as a substrate can produce the highest toxicity with VSC of 10.8 log CFU/g, LC50 value value 0.09 µg/ml and potency 8889 IU/mg.

R3-019

Characterization of Novel Multi-Pulpose Oil Extracted from Asiatic Softshell Turtle and Its Palm Oil Alduteration Analysis Employing Fourier Transform Infrared (FTIR) Spectroscopy

Andi Tenri Nurwahidah[1], Septiana Indratmoko[1], Nida Churin Aini[1], and Akhmad Berryl Widyartha[2]

1: Department of Pharmacy, STIKES Al Irsyad Al Islamiyyah, Cilacap, Indonesia
2: Department of Material and Metallurgical Engineering, Faculty of Industrial Technology, Sepuluh Nopember Institute of Technology, Indonesia

Oil adulteration tends to become emerging and everlasting issue in Indonesia, especially the conventional adulteration by mixing cheap oil with valuable oil to obtain maximum profits. One of the popular falsified oils is Asiatic Softshell Turtle Oil (ASTO) since it is hard to extract, expensive, and beneficial for several purposes. The study aims to determine the properties and characteristics of ASTO and to develop a method to accurately detect the alduterator in ASTO. Characterization results showed that acid and saponification number of oil were 1.22 mg KOH/g and 188 mg KOH/g, respectively, which met the criteria of International Fishmeal and Oil Manufacturing Associations (IFOMA) and International Fish Oil Standards (IFOS). Furthermore, gas chromatography analysis of softshell ASTO pointed out that among 49 fatty acids peaks detected, 36 peaks are indicating fatty acids of methyl ester, confirming the precious quality of the oil. FTIR authentication indicated that infrared absorption spectrum profile of pure ASTO showed higher intensity at wave number 3007 cm^{-1} compared to falsified ASTO. The different spectrum also occurred due to shifting of wave numbers at fingerprint region (1112 cm^{-1}) as a result of the variety of saturated fatty acids and unsaturated fatty acids content in alduterated ASTO. In light of evidence, FTIR spectroscopy proposed a potential technique to detect palm oil alduteration in ASTO for originality verification purpose.

Keywords: Asiatic softshell turtle oil, FTIR, Authentication, Alduteration

R3-020

Moringa Oleifera as a Feed Ingredient in Broiler Diets

Jezzel Rabe, Katherine Caga-Anan, Fretchie Nebre,
Rhona May Gerondio and Karyn Chrislene Vitor

An experimental study was conducted to evaluate the efficacy of different feed formulations with Moringa oliefera leaf powder on the growth of Gallus gallus domesticus. The experimental design was completely randomized design with four (4) treatments that was replicated seven (7) times supplemented with 0.5%, 0.75%, 1.0% and control group of feed formulation with Moringa oliefera leaf powder. Growth parameters were evaluated such as height and weight. Data collected were analyzed using Two-way ANOVA at p<0.05. The result of the study revealed that the live body weight gains and height were higher in T 2 (0.75%) than the T 1 (0.5%), T 3 (1.0%) and T0 (controlled treatment). This implies that the feed formulation with Moringa oliefera leaf powder is significantly effective in increasing the growth of Gallus gallus domesticus. Formulated feeds supplemented with malunggay (Moringa oleifera) leaves powder were also determined to be less expensive than commercial feed excluding the cost of labor.

R3-021

PCR Column Contamination Gave False Positive Result for Cherax Quadricarinatus Densovirus (CqDV) In Sf 9 Cell Cultures

Dewi Syahidah, Jennifer Elliman and Leigh Owens

In vitro propagation C. quadricarinatus densovirus was conducted in Spodoptera frugiperda cell cultures (Sf9). The infection of CqDV was detected by H&E and by PCR. Sf9 was sub-cultured in 6 75TC flasks in Sf-900 II SFM media and Streptomycin (5ml/l). PCR was performed using primers CqDV 5nF/2AR (-CGC TGT GGA GAG TGC ACT AGA GGC- / -TCT GAA TCA ATC TCC TCA CGA TCG C-). Infected cells received CqDV inocula (200µl), whereas 1xPBS (200µl) was added into uninfected cells. Both cell groups were passaged every 5 days. Fifty percent of cells' suspension from each flask were collected for 12 passage times and subjected to HE and PCR analyses. The results showed that HE stains failed to show the effect of virus infections. However, the amplification of both Sf9 cell groups showed positive for CqDV (280bp). Therefore, non-template control samples (NTC)s were examined to detect any possible contamination of our PCR columns. Interestingly, PCR amplification of all NTCs were positive (280bp). These false positive results suggested contamination in our PCR columns because the DNA binding columns used in many extract kits have been shown in previous studies to be responsible for introducing foreign DNA into test samples. A non-column PCR method might give more accurate results for CqDV.

R3-022

Fighting COVID-19 Using Herbal Medicine according to Local Plant Diversity

Enung Nurhotimah

Human life must always be maintained for its sustainability with various efforts, the Covid 19 pandemic which began to endemic at the end of 2019 and became a pandemic until now the number of sufferers is increasing. The COVID-19 pandemic has resulted in human illness and death worldwide, a threat to human survival. The pandemic causes losses in various fields and threatens human life. Various efforts have been made to treat and prevent deaths from Covid 19, both with modern medicine and using traditional medicine. Traditional medicine can be used as a primary treatment or as an alternative treatment in cases of Covid 19. Traditional medicine develops according to culture, tradition and the biodiversity of medicinal plants that exist in an area, inherited by ancestors, for example in Indonesia traditional medicine is heavily influenced by the culture of drinking herbal medicine Traditional medicine in India is influenced by Ayurvedic medicine, in China it is influenced by Chinese herbal medicine traditions.

R3-023

Resistance Induction of Sweet Corn to Helminthosporium Turcicum Using Biochar Aplication

Desty Aulia Putrantri[1], Suskandini Ratih Dirmawati[2], Agus Karyanto[3], Darwin Pangaribuan[3] and Ainin Niswati[4]

1: Agronomy Master Study Program, Faculty of Agriculture, University of Lampung, Indonesia
2: Department of Plant Protection, Faculty of Agriculture, University of Lampung, Indonesia
3: Department of Agronomy and Horticulre, Faculty of Agriculture, University of Lampung, Indonesia
4: Department of Soil Science, Faculty of Agriculture, University of Lampung, Indonesia

Sweet corn is one of the horticultural commodities that people like because it has a sweet taste, but the national sweet corn production is not sufficient to meet market demand. The causes of low sweet corn production include lack of soil fertility and corn leaf blight. This study aims to determine the effect of type and dose and determine the best type and dose on maize resistance in the form of decreasing the intensity of blight. This research was conducted from September to November 2020 in Gunung Langgar Hamlet, Tanjung Bintang District, South Lampung. This study was arranged in a randomized block design (RBD) with control treatment (without biochar), 10 Mg rice husk biochar ha^{-1}, 20 Mg rice husk biochar ha^{-1}, 10 Mg coconut shell biochar ha^{-1}, 20 Mg shell coconut biochar ha^{-1}, 10 Mg cassava stem biochar ha^{-1}, 20 Mg cassava stem biochar ha^{-1} and three replications. The results showed that all biochar treatments could reduce the occurrence and severity of leaf blight, increase peroxidase enzyme activity and photosynthetic rate, and biochar treatment made from cassava stems with a dose of 20 Mg ha^{-1} was the most effective treatment to suppress the intensity of corn leaf blight and can increase the activity of the peroxidase enzyme and the rate of photosynthesis.

Keywords: biochar, leaf blight, sweet corn

R3-024

The Sustainable Digital-Farming Framework Using an Interdisciplinary Approach

Agusriandi and Hikmahwati

Universitas Muhammadiyah Enrekang, Indonesia
University of Al Asyariah Mandar, Indonesia

Agriculture and related activities have a very important role in advancing the economy of a country's. The usual ways of farming practice are becoming more lagging with technological advances. As one way to meet these demands, digital technology introduce to increase knowledge in agriculture. Nowadays, digital devices are increasingly being used by all groups, including farmers. The management of the framework for using digital tools has become an important focus for the sustainability of agriculture in the future. An important part of this research is designing a prototype model that is built with an interdisciplinary approach. The framework was built to adapt to the minimal conditions of information technology infrastructure. We involve various stakeholder parties such as extension workers, relevant government, academics, and researchers in designed a framework that has suitable for farmers' conditions to gain new experiences by combining knowledge in the fields of agriculture, environment, fisheries, community culture, and health.

Keywords: Digital-Farming, interdisciplinary approach, prototyping model

Invited Speech (Room 4)

EAR Construction Motivation Revisited: Indonesian Coastline Representing Earth

Manabu D. Yamanaka

It was 32 years ago when Prof. Kato and Prof. Fukao of Kyoto University, Pak Alex of LAPAN, Pak Chandra and Bu Tien of BPPT, and others including myself climbed Bukit Kototabang for the first time. After Prof. Habibie's very quick permission, followed by BMKG's GAW station, we needed a time before constructing the EAR in 2001. During these two decades, in addition to the EAR's initial targets concerning middle and atmospheric sciences, the significant role of the Indonesian maritime continent (IMC) for the global lower-atmospheric climate has been recognized. Many "mini-EARs" (wind profilers and weather radars mostly at BMKG stations) have revealed that the diurnal cycle (sea-land breeze circulation) along the world's longest coastline surrounding Sumatera and other major islands of IMC is the most robust mode of tropical cloud-rainfall generation. This process causes floods in stronger land-sea temperature gradients during remarkable monsoon (cold surge) and/or La Niña periods, and produces latent heat (amount of roughly 10–20 % of the green-house effect) compensating the global radiational-dynamical energy imbalance. Therefore, any modification of the land surface-hydrologic conditions such as urbanization and plantationization may change the diurnal cycle, local weather and also the global climate. It should be also noted that the diurnal-cycle circulation consists of equi-amplitude bidirectional (sea- and land-ward) internal gravity waves likely to cause the quasi-biennial oscillation (QBO) as the most robust mode in the stratosphere, or one of the most important initial targets of EAR. Indeed the coastline of IMC is the triple boundary maintained among land, sea and atmosphere of the earth, and the EAR and many mini-EARs listen sounds of the whole earth system.

R4-001

Effects of El-Nino and La-Nina on the Velocity Potential at 200 hPa over Maritime Continent

Eddy Hermawan[1], Tyo Maulana[2], and Rahmat Gernowo[2]

1: Center of Atmospheric Science and Technology, LAPAN, Indonesia
2: Physics Department of Diponegoro University (UNDIP), Indonesia

Rainfall is one of the climatological parameters that most plays a role in the variability of Indonesia's climate. The complexity of climate dynamics in Indonesia requires a comprehensive analysis to determine the factors causing extreme climatic conditions in Indonesia. Velocity potential of 200 hPa is able to describe the convective level of clouds in the troposphere. In order to analyze the dynamics of Indonesia's atmosphere, a temporal, spatial, and spectral analysis was carried out at a potential velocity of 200 hPa. The results show that the potential velocity of 200 hPa is not affected by the dynamics of the Indonesian atmosphere. Velocity potential of 200 hPa has an oscillation for 6 months with peak oscillation in MAM and SON. In the case of extreme climates in Indonesia, especially in El Niño in 2015 and La Niña in 2020, the velocity potential of 200 hPa is able to capture changes in climate conditions both in Indonesia and in the Pacific Ocean as seen from the results of spatial analysis and the Hovmöller diagram shown. The velocity potential of 200 hPa has a negatif correlation with rainfall, this explains that if the rainfall increases, the velocity potential of 200 hPa will decrease and vice versa. Based on the coefficient of determination test results, the potential velocity of 200 hPa affects about 10 to 20% of the rainfall intensity that occurs. Generally, the potential velocity of 200 hPa is able to explain the dynamics of the atmosphere that occurs in Indonesia, especially in the case of El Niño in 2015 and La Niña in 2020.

Keywords: Velocity Potential 200 hPa, El Niño, La Niña, Rainfall, and Atmospheric Dynamics

R4-002

Analysis of Prediction of the Occurrence of Rainfall Events Associated to ENSO Phenomenon Using Simple Logistic Model over Eastern Indonesia

Fadli Nauval[1], Elfira Saufina[1], Dita Fatria[1], Risyanto[1], Trismidianto[1], Wendi Harjupa[1], Marzuki[2], and Eddy Hermawan[1]

1: Center for Atmospheric Science and Technology,
National Institute of Aeronautics and Space
2: Physics Department, University of Andalas

Prediction of heavy rainfall events by fitting two simple logistic regression models between rainfall and El Niño-Southern Oscillation (ENSO) index has been conducted into the zone of eastern Indonesia from 2000 to 2019. The aim of this study is to look into the occurrence prediction pattern of several rainfall in the study area by applying the different and complementary logistic models which were Logit and Probit. The precipitation data was obtained from Global Satellite Mapping of Daily Precipitation (GSMaP) with the spatial resolution of 0.1 and the threshold at over 20 mm/day (moderate), 50 mm/day (heavy), 100mm/day (very heavy), and 150 mm/day (extreme). Meanwhile, El Niño-Southern Oscillation (ENSO) index utilized was the anomaly of NINO 3.4 (NINOA 3.4) acquired from National Oceanic and Atmospheric Administration (NOAA). The area of study was selected by displaying the linear regression of the delayed precipitation response towards NINOA 3.4. This work represents that the relationship between rainfall and NOAA 3.4 on Lag 4 gave the better correlation value than the others. The result shows that the number of rainfall occurrences for over moderate and heavy rainfall was dominantly observed during El Nino in the area while it occurred during La Nina for over very heavy and extreme rainfall. The accuracy of logistic regression derived was 94.9% (over moderate), 58.67% (over heavy), 95.20% (over very heavy), and 98.20% (over extreme). Concerning Logit and Probit distribution, as for Logit, it illustrates 0.0277 ± 0.0239 (above moderate), 0.2316 ± 0.0106 (above heavy), 0.1048 ± 0.0237 (above very heavy), and -0.0385 ± 0.0453 (above extreme). Meanwhile, in regards to Probit, 0.0135 ± 0.0113 (above moderate), 0.1440 ± 0.0066 (above heavy), 0.0476 ± 0.0109 (above very heavy), and -0.0150 ± 0.0175 (above extreme).

Keywords: logistic, models, threshold, lag, logit, probit, and accuracy (*state and mention preliminary results)

R4-003

The Response of Rainfall in Sumatera to Indian Ocean Dipole Phenomenon

Fahmi Rahmatia, Listi Restu Triani and Amalia Nurlatifah

LAPAN

Sumatera Island is one of the islands in Indonesia whose area that has various rainfall patterns and located directly adjacent to the eastern Indian Ocean. This causes rainfall in this island to be influenced by many things, one of that is the Indian Ocean Dipole (IOD). This study aims to see how the response of rainfall in Sumatera to the Indian Ocean Dipole phenomenon. The data used in this study is GSMaP data with 0.1° spatial resolution and monthly temporal resolution. Principal Component Analysis method is used to see how the spatial response of rainfall in Sumatera to the Indian Ocean Dipole phenomenon. While the Fast Fourier Transform (FFT) method is used to see what dominant phenomena affect rainfall conditions in the 10 capitals of the Province of Sumatera. The result of PC2 from PCA results on GSMaP rainfall in Sumatra states that the majority area of Sumatra has a negative response to the IOD phenomenon. This means when the IOD has a positive phase, most areas in Sumatera will experience a lack of rainfall. Vice versa, when the IOD has a negative phase, then rainfall in Sumatera tends to increase. The FFT results for all provincial capitals in Sumatera state that the majority of Sumatera is affected by seasonal phenomena such as monsoons and interannual phenomena such as IOD. These two results prove that rainfall in Sumatera is heavily influenced by the IOD phenomenon.

Keywords: Rainfall, Sumatera, IOD, PCA, FFT

R4-004

The Relation between ENSO and IOD with the Rainfall Events over Indonesian Maritime Continent Based on TRMM Precipitation Data

Teguh Harjana, Anis Purwaningsih, Trismidianto, Wendi Harjupa, Fadli Nauval, Dita Fatria Andarini, Elfira Saufina, Arief Suryantoro and Eddy Hermawan

ENSO and IOD are known factors that influence the number of rain events in the Indonesian Maritime continent. Warm ENSO events (El-Nino) and positive IOD are known to reduce rainfall, and conversely, cold ENSO events (La-Nina) and negative IOD events will increase the amount of rainfall in parts of the Indonesian Maritime Continent. El-Nino Index, Dipole Mode Index, and TRMM-3b42 rainfall data were used in this study to determine the relationship. The types of daily rainfall is obtained from the TRMM-3b42 data multiplied by 3-hours to obtain daily rainfall data. Rainfall events will be analyzed on the types of rain as commonly used by BMKG, namely light rain (r1, rainfall more than 5 and less than 20 mm / day), moderate rain (r2, rainfall between 20-50 mm / day), heavy rain (r3, rainfall between 50-100 mm / day), and very heavy rain (r4, rainfall 100 mm / day and above). Based on IOD, ENSO and TRMM-3b42 data from 1998-2015, as a preliminary result show that when there is no IOD occurred (neutral IOD), the La-Nina phenomenon can increase the rainfall event by almost 200%, but the effect of this La-Nina will disappear if a positive IOD occurs. The other results from this research also will be discussed.

R4-005

Investigation of Atmospheric Reanalysis Convective Parameters and Overshooting Cloud Top in Hail Events over Java Island

Bony Septian Pandjaitan

Hail is one type of severe weather events that can occur in Indonesia. Hail is usually followed by other types of severe weather types such as heavy rain, strong winds, or tornadoes. In this study, an investigation was conducted on the occurencee of the top overshooting pattern in cumulunimbous clouds using Himawari 8 Satellite data on hail events in Java Island. In addition, environmental conditions in the form of convective parameters were also investigated using atmospheric reanalysis ERA5 data. Algorithm using 10.8 micron IR channel is used to detect top overshooting and equipped with visible channel. Convective parameters are derived from temperature, relative humidity, and wind parameters from ERA5 Reanalysis data. Based on the results of this study, the overshooting top pattern appears during hail events and generally occurs at 12-17LT.In addition, there were variations in the value of atmospheric convective parameters following the pattern of season. DJF and MAM. DJF and MAM are seasons where almost all convective parameters show a higher intensity, where the highest average and median values occur at 14-17LT.

R4-006

The Impact of Vertical Velocity Parameter Conditions and Its Relationship with Another Weather Parameters in the Hail Event

Nadine Ayasha

Indonesian Agency of Meteorology Climatology and Geophysics, Indonesia

Hail happened in Sukabumi (August 23, 2020), Sekadau (August 22, 2020) and Bogor (September 23, 2020), where this extreme weather phenomen non occured in dry season. This study uses the ERA5 reanalysis model data and aims to examine the vertical velocity impact on the hail occurrence in dry season, as well as its relation to other weather parameters such as relative humidity, streamline and wind velocity. Moreover, HCAI product satellite data is used as supporting data for the convective cloud development analysis. Based on the results of graphs, contours and Hovmoller vertical cut from ERA5 modeling, the vertical velocity values in the 925 mb-300 mb layer in Sukabumi, Sekadau and Bogor before the hail event ranged between -1.2-(-0.2), -1.5-(-0.2), -1-0 Pa/s. A negative value indicates an upward motion of the air mass that trigger the convective cloud growth which produce hail. This is evidenced by the presence of Cumulonimbus cloud on HCAI product when hail falls, therefore the vertical velocity has a great effect on the hail event. In addition, the relative humidity in 850-700 mb layer is quite wet, which ranges from 80-90%. Meanwhile, the streamline and wind velocity in the three regions show the convergence with slowing wind velocity with the range from 2-4 knots. This results show that the upward motion of the vertical velocity is enough to form the wet atmospheric humidity and form a convergence for the convective clouds growth which produce hail in dry season.

Keywords: Hail, Extreme Weather, Vertical Velocity

R4-007

Characteristics of Hail-Producing Convection in Bandung, Indonesia as Derived from Himawari-8 High Resolution Data

H. Ikeda[1], S. Shige[1], K. Aonashi[1,2], H. Hirose[2], A. Hamada[3], N. J. Trilaksono[4], R. Yanti[5], D. S. Medyani[5], and P. Y. Kombara[6]

1: Graduate School of Science, Kyoto University
2: Earth Observation Research Center, Japan Aerospace Exploration Agency
3: Faculty of Sustainable Design, University of Toyama
4: Atmospheric Science Research Group, Faculty of Earth Sciences and Technology, Institut Teknologi Bandung
5: Undergraduate Program in Meteorology, Institut Teknologi Bandung
6: Indonesian National Institute of Aeronautics and Space

Hailstorms were observed by the LAPAN Transportable X-Band Weather Radar in Bandung basin on April 19, April 23, and May 3, 2017 (Trilaksono et al., 2020). During the hailstorms, the visible band (0.64 μm) reflectance and infrared band (10.4 μm) brightness temperature of Himawari-8 showed rapid cumulus development to the west of the observed radar echoes. This westward shift (about 10 km) is due to the parallax caused by the large satellite zenith angle of Himawari-8 (about 40°) at Bandung and high cloud top height. After parallax correction using the Himawari-8 cloud-top height data based on the method developed by Hamada and Nishi (2010), it was found that the position of the cumulonimbus clouds coincided with that of the radar echoes. In the above three hailstorms, the cloud top temperature minima observed in the 10.4 μm band were below −70℃ and the cloud top height was as high as 17 km. The split-window method (6.2 μm − 10.4 μm), which uses brightness temperature differences in different infrared bands, suggested that these cumulus clouds were overshooting. We will examine the correspondence between overshooting cloud and hail cases.

Keywords: Hailstorm, parallax correction, Himawari-8

R4-008

Rainfall Nowcasting with Rain Scanner Images in Bandung

Syukri Darmawan, Edy Maryadi, Annida Rahmawati, Asif Awaludin,
Tiin Sinatra and Fadli Nauval

Nowadays, weather observation by radar rises in the hydrometeorological application. The rain scanner is a small X-band radar that can monitor local rainfall within a 44 km radius. It operates in Bandung (6.89°S, 107.59°E) with 2 minutes time resolution. This study develops and tests local rainfall nowcasting based on machine learning using six months (November 2020 – April 2021) data from a rain scanner. The three last consequent radar reflectivity (dBZ) with the time range at 2 minutes served as input for machine learning to determine the following prediction of radar reflectivity. The results indicate that rainfall prediction within 10 minutes performs quite well. However, it has been observed that the longer the time, the less accurate the prediction generated.

R4-009

Examining the Characteristics and Dynamics of Quasi-Linear Convective System (QLCS) Using Weather Radar Data and Numerical Weather Model in North Sumatra Region

Immanuel Jhonson Arizona Saragih, Wiliam Wiliam and Imma Redha Nugraheni

Quasi-Linear Convective System (QLCS) is a mesoscale linear convective system that has the potential to cause heavy rain and strong winds. This study was conducted to identify the evolution of QLCS formed in the North Sumatra region using C-Band weather radar data in Medan and the Weather Research and Forecast (WRF) model. Identification of QLCS evolution was carried out to determine the characteristics of spatial and temporal distribution, types of formation and decay, system propagation profile, downslope wind profile using CMAX, CTR, HWIND, and VSHEAR radar products, and atmospheric dynamics during QLCS formation using WRF model output data. Four QLCS events were selected during 2020, namely April 06, May 07, June 13, and September 23. The analysis of the whole case study shows that QLCS dominantly occurs during the day with a duration of 60-90 minutes in the coastal ocean area. Broken areal is the dominant type of QLCS formation, while non-uniform 2 is the dominant type of decay. The dominant system propagation direction is east and south, with the dominant system propagation speed in the intermediate moving category. The value of vertical wind shear in the lower layer in each phase is classified as weak (<0.003 s^{-1}). The WRF model output data shows weather dynamics patterns that support the formation of a convective system in the QLCS formation region. The wind pattern shows a convergence area, the vertical velocity peaks at 0.8 Pa/s just before the QLCS begins to enter the mature phase, the air is relatively humid (RH > 95%), and the CAPE value reaches 1000-1500 J/kg.

R4-010

Study on Diurnal Variation of Rainfall Observed by X-Band Polarimetric Radar in Peatlands over Bengkalis Island, Eastern Sumatra, Indonesia

Mariko Ogawa*[1], Manabu Yamanaka[2], Awaluddin Awaluddin[3], Arief Darmawan[3], Albertus Sulaiman[4], Reni Sulistyowati[3], I Dewa Gede Arya Putra[5], and Osamu Kozan[1,2]

1: Center for Southeast Asian Studies (CSEAS), Kyoto University, Japan
2: Research Institute for Humanity and Nature (RIHN), Japan
3: Agency for the Assessment and Application of Technology (BPPT), Indonesia
4: Research Center for Physics, Indonesian Institutes of Sciences (LIPI), Indonesia
5: Center for Research and Development, Meteorological, Climatological, and Geophysical Agency (BMKG), Indonesia

Understanding the precipitation system in tropical peatlands is essential for peatland management for resilience from floods and forest fire. The diurnal variation of rainfall over the Indonesian maritime continent has been analyzed by satellite (Mori et al., 2004) and recently statistically analyzed using 229 rain gauge stations over Sumatra (Marzuki et al., 2021). However, since Bengkalis Island is located between Sumatra Island and Malay Peninsula and thus has complicated topography factor, and since the ground observation network is rough, the regional characteristics of diurnal variation of rainfall contains uncertainty. This study shows the preliminary results of the observation from February 2020 to May 2021 using 7 rain gauges and X-band polarimetric radar with high temporal and spatial resolution, which are located over Bengkalis Island.
In order to verify the radar-based estimated rainfall, the hourly accumulation data obtained from radar was compared with that of rain gauges. The average hourly rainfall obtained by radar was analyzed for time zone. Rain areas covered both land and sea areas at night from 8pm to 6am local time (LT), and heavy rain areas of about 50 mm or more crossed Bengkalis Island from west to east after midnight from 0am to 3am LT. On the other hand, rain areas were relatively distributed on land in the daytime from 10am to 4pm LT. This indicates that the land-sea breeze circulating type is dominant in this area.

Keywords: Indonesian maritime continent, diurnal variation of rainfall, peatlands, X-band polarimetric radar

R4-011

Variation of the Wind Profiles in the Tropical Tropopause Layer Associated with QBO-MJO Connection

Arlif Nabilatur Rosyidah[1], Nurjanna Joko Trilaksono[2] and Noersomadi[3]

1: Postgraduate Program in Earth Sciences, Faculty of Earth Science and Technology, Institut Teknologi Bandung, Indonesia
2: Atmospheric Science Research Group, Faculty of Earth Science and Technology, Institut Teknologi Bandung, Indonesia
3: Center for Atmospheric Science and Technology, Indonesian National Institute of Aeronautics and Space, Indonesia

The Quasi-Biennial Oscillation (QBO) is known as the alternating zonal wind in the stratosphere that is discovered to have connection with the tropospheric Madden-Julian Oscillation (MJO), particularly during the northern hemisphere winter. Discussion on the variation of wind profiles in the tropical tropopause layer (TTL), the transition layer at 14–18.5 km, related to QBO-MJO connection is still limited due to availability of high vertical and temporal resolution of observation data. We investigate 3-D wind profiles by Equatorial Atmosphere Radar (EAR) with 150 m vertical resolution during extended boreal winter (November to March) throughout 2003–2019 (16 years). We find five MJO active cases in the easterly QBO phase (QBOE), six during westerly QBO phase (QBOW), and 20 along the neutral QBO (QBON) which is defined as the change of easterly to westerly wind at 18.7 km. We observe radar tropopause (maximum echo power within TTL) to be lifted to 17 km during MJO active associated with QBOE compared to MJO active period during QBOW (16.7 km) and QBON (16.8 km). We also discover that the vertical wind is stronger representing more updraft activity in QBOE than QBOW and QBON.

Keywords: EAR, wind profile, TTL, QBO-MJO connection.

R4-012

Determining Quantitative Precipitation Estimation (QPE) through Comparison of the Z-R Relation Algorithms on Convective and Stratiform Rain in Parts of East Java

Bangsawan L.[1,2], Jatmiko R.H.[1] , and Nurjani E.[1]

1: Gadjah Mada University, Indonesia
2: Indonesia Agency for Meteorology Climatology and Geophysics, Indonesia

QPE can be calculated through empirical equations between weather radar reflectivity and rainfall called Z-R relation algorithm. The application of various Z-R relations has been widely carried out in Indonesia, but there is still little research on the most suitable ones to be applied, especially regarding the convective and stratiform rain types. This study aims to compare several Z-R relations, namely Rosenfeld Tropical, Fujiwara, and Arida et al., to determine the most effective algorithm in some areas of East Java. SRI product is accumulated into PAC and RIH to be validated at each rain gauge location during season periods and by considering the radius of the weather radar. The results show that the best Z-R relation algorithm is Arida et al., with the highest correlation value 0.76 and the lowest RMSE 0.82, followed by Fujiwara then Rosenfeld Tropical with the highest correlation values 0.71 and 0.67 and the lowest RMSE 1.2 and 2.09. The correlation tends to be higher during DJF as the peak period of the rainy season and RMSE tends to be lower in the stratiform rain. The strongest correlation and the smallest RMSE occur in the closest radius within 50 km from the weather radar location.

Keywords: QPE, Z-R Relation, Rain.

R4-013

The Diurnal Evolution of Tropospheric Winds and Its Variability in Response to Large-Scale Phenomena - An Analysis Based on Equatorial Atmospheric Radar Data

Wojciech Szkolka and Dariusz Baranowski

Sumatra - the westernmost island of the Maritime Continent (MC) - is strongly affected by propagating tropical phenomena. Previous research identified numerous interactions between weather modes - both local and large-scale – that affect local environment in the MC area. Here, the primary mode of variability in tropospheric winds – the diurnal cycle – is investigated based on Equatorial Atmospheric Radar (EAR), which provides powerful information about tropospheric dynamics over a wide range of altitudes, with high temporal frequency and over a long period. The study focuses on mean profiles for the three wind components, as well as their decomposition into diurnal and semi-diurnal cycles. The mean diurnal evolution of winds during boreal winter as well as variability associated with assorted weather phenomena has been investigated. Interannual modes such as Quasi-Biennial Oscillation (QBO), ENSO and Indian Ocean Dipole (IOD) were analyzed. On subseasonal time scale, the effects of Madden-Julian Oscillations (MJO) and convectively coupled Kelvin waves (CCKW) on diurnal wind evolution were studied. All of the above mentioned weather phenomena are known to affect precipitation patterns across the MC region. This analysis contributes to understanding of physical processes responsible for such interactions. Obtained results were compared against the ERA-5 reanalysis. The results show large differences in wind profiles between EAR and reanalysis, especially for vertical wind component. In addition, a substantial effect of ENSO phase as well as MJO and CCKW on the magnitude of diurnal and semi-diurnal cycle amplitudes was observed at all heights. For example, diurnal amplitudes of horizontal winds are the largest during MJO phases 4 and 5 at all levels. For CCKW, diurnal amplitude achieves maximum during peak activity at low levels and two days later near the tropopause. Meanwhile, it is found that the influence of IOD is imperceptible, while QBO effects are limited to levels above 200mb.

R4-014

Evaluation of the Surface Wind Speed, Shear of Wind Speed, Shear of Wind Direction and Richardson Number at Soekarno Hatta Airport Using Wyoming Radiosonde Data

Ina Juaeni, Ridho Pratama, Wendi Harjupa, Elfira Saufina,
Dita Fatria Andarini and Ibnu Fathrio

The data of surface wind speed, temperature and wind profiles from radiosonde were used in this study throughout January-June 2020 at Soekarno Hatta airport (Cengkareng) in Jakarta, to evaluate shear of wind direction, shear of wind speed and Richardson number as the atmospheric parameters that are very noticed in flight. In aviation, the Richardson number is used as a rough measure of air turbulence, which values below unity indicating significant turbulence. The surface wind speed can be evaluated directly from the observation data, while the shears of wind direction and wind speed were identified by calculating the differences of those parameters per meter at the vertical direction,(from the surface to 10 km). The result show that the minimum and maximum wind speeds are 0 and 20 ms^{-1}, respectively. During this period, there was an event where the surface wind speed exceeded the threshold value of safe surface wind speed for flight (15 ms^{-1}). Moreover, both the shears of wind speed and wind direction are far below the threshold value. Based on the analysis of turbulence using the Richardson number, the percentage of turbulence events is about 53%. This condition occured both in stable conditions (no-convective activity) characterized by the CAPE <1000 J kg^{-1} and unstable conditions (CAPE>1000 J kg^{-1}). Furthermore, there was no significant difference result between MJO active period (January-March 2020) and the weak MJO period (April-June 2020).

R4-015

The Average Cloud Base Height in Kototabang 2016-2018 (Comparison between Ceilometer, Radiosonde and Himawari-8)

Ridho Pratama[1], M Fadhlan P[1], Fahmi Rahmatia[1], Ina Juaeni[1], Risyanto[1], Wendi Harjupa[1], and Marzuki[2]

1: National Institute of Aeronautics and Space of Indonesia, LAPAN
2: Physics Department, Andalas University

Cloud data can be obtained through direct observation, and by using models on radiosonde or satellite data. Cloud observations in real time will be very helpful in predicting the potential for rain events in a place. Ceilometer CT25K can observe the cloud base height for three cloud layers up to 7.5 km. In this study, Ceilometer CT25K data was used to determine the average cloud base height in December January February (DJF), March April May (MAM), June July August (JJA), and September October November (SON) during 2016-2018. The average cloud base height in Kototabang compared to the Lifted Condensation Level (LCL) of the Radiosonde. Furthermore, Himawari-8 Geostationary Satellite data was used to confirm the presence of the clouds. The result shows that there is a difference in the cloud base height of the Radiosonde (LCL) with the cloud base height from the Ceilometer by 1-2%. The Brightness Temperature (TB) value of Band 13 of the Himawari-8 Geostationary Satellite observation in the same period shows that the average cloud top temperature is ranging from 240K to 270K.

Keywords: Ceilometer, Radiosonde, Himawari-8, Cloud base height, LCL

R4-016

Atmospheric Residual Layer Height Variations in Clear and Rainy Days Based on High-Resolution Radiosonde and Global Positioning System Radio Occultation Data

Pratikasari Resa[1], Trilaksono NJ[2], and Noersomadi[3]

1: Agency for Meteorology Climatology and Geophysics, Indonesia
2: Bandung Institute of Technology, Indonesia
3: National Institute of Aeronautics and Space of Indonesia, Indonesia

Local climate conditions, rainfall patterns, topography, and atmospheric circulation are some of the factors that influence the structure and variation of the residual layer. The residual layer is an atmospheric layer that appeared in the nighttime remaining from the mixed layer, which is formed in the daytime. In this study, we analyzed the variation of the residual layer on clear and rainy days. The estimated residual layer heights were obtained by extracting and calculating refractivity (N) from high vertical resolution radiosonde and Global Positioning System Radio Occultation (GPS-RO) data using vertical gradient methods. The results show that the residual layer is more varied during rainy days. In particular, the residual layer would be (not) formed if the rain occurs in the afternoon until before (after) sunset, which in turn is related to the presence (absence) of capping inversion. For the clear days case, the height of the residual layer at the beginning of the night would be the same as the heights of the mixed layer in the afternoon. Further analysis on the variation of the residual layer height, we find that the height of mixed layer in the next morning does not affected by the residual layer in the previous night. The variation of the mixed layer height in the next morning is more determined by the weather condition on that day.

Keywords: residual layer, radiosonde, GPS-RO, planetary boundary layer.

R4-017

The Influence of Borneo Vortex on Rainfall Variability over Western Indonesian Maritime Continent

Dita Fatria Andarini[1], Fadli Nauval[1], Elfira Saufina[1], Risyanto[1], Trismidianto[1], Wendi Harjupa[1], Marzuki[2], and Eddy Hermawan[1]

1: Center for Atmospheric Science and Technology,
National Institute of Aeronautics and Space, Indonesia
2: Pysics Department, University of Andalas, Indonesia

Borneo Vortex (BV) is a synoptic-scale disturbance that develops over the South China Sea during the Boreal Winter and is associated with the deep convection over the western Indonesian Maritime Continent (IMC). This study aims to analyze the roles of the Borneo Vortex on rainfall variability throughout November to March (2000–2020) using Global Satellite Mapping of Daily Precipitation (GSMaP) data. The wind components from ERA-5 reanalysis data were also used to identify the occurrences of Borneo Vortex. The results show that Borneo Vortex generally influences the rainfall intensity and the frequency of extreme rainfall events with the magnitude varying across the region. The Borneo Vortex Activities increase the anomaly of rainfall intensity over the Northern part of Borneo, Peninsular Malaysia, and the Northern and Southern part of Sumatra by up to 20 mm/day. Moreover, the analysis of extreme rainfall using the 95th percentile indicates that the frequency of extreme rainfall events increases around 50–90% during the Borneo Vortex events, especially in the Peninsular Malaysia, Western part of Borneo, and Southern part of Sumatera. On the other hand, the extreme rainfall frequency in central Borneo and the Southern part of Java Island decreases by up to 50% during the Borneo Vortex period.

Keywords: Borneo Vortex, extreme rainfall, synoptic-scale, 95th percentile

R4-018

Analysis of Multi-Scale Atmospheric Phenomena and Parameters Triggering Seroja Tropical Cyclone and Its Effect to Extreme Rainfall over Nusa Tenggara Timur

Luthfiyah Jannatunnisa and Trismidianto

From April 1 to 6, 2021, a tropical cyclone occurred which caused extreme rainfall resulting in flooding in several areas in East Nusa Tenggara. Convective activity and rainfall during tropical cyclones were analyzed using Himawari-8 IR1 data and GSMaP data, respectively. Analysis of atmospheric parameters used ECMWF ERA-5 data and several indices were used to see their interactions with global atmospheric phenomena. There are four stages of development of the Seroja tropical cyclone, namely disturbance, tropical low, mature, and decay phases with the peak of cyclone occurrence on April 5, 2021. High convective activity began to be seen in the south of NTT during the disturbance and tropical low phases and spread throughout NTT during the mature phase and begins to move further south during the decay phase. Tropical cyclones occur during strong MJO transitions between phases 4 and 5 which are one of the triggers for strong convective activity during cyclones, besides being influenced by strong low-level divergence, contributed by winds from the north and south. This tropical cyclone also causes the weak effect of the Borneo vortex around Kalimantan due to the strong attraction of the mass of water vapor by the cyclone. Tropical cyclones also cause changes in the movement of monsoon winds across the island of Sumatra. Compared to rainfall data, the intensity of rainfall over several area in NTT began to increase ever since the cyclone peak and continue to rise despite the cyclone was slowly decaying. With this result, we hope in the future we can anticipate the impact of any tropical cyclones that arise near Indonesia.

R4-019

Evolution of Mesoscale Convective Complex and Its Atmospheric Conditions during Heavy Rain in Bandung, 22 February 2018

Fauziah Fangia and Trismidianto

On February 22, 2018, there was a flood due to prolonged heavy rain in the Bandung Regency area (eastern part) which was identified as having a mesoscale convective complex. This paper describes the mesoscale convective complex that causes the flood and analyzes several weather parameters and conditions of global atmospheric phenomena when there are mesoscale convective clouds. The data used are rainfall data from GSMaP, cloud data from Himawari-8, weather parameter data from ECMWF ERA-Interim, and MJO and SOI index data are also used. This study indicates that the rainfall at the time of the flood is included in the category of very heavy rain caused by the presence of the mesoscale convective complex. The formation of mesoscale convective clouds is supported by atmospheric conditions in the form of divergence, vorticity, and vertical motion. The high specific humidity in the study area also allows the formation of convective clouds that produce heavy rain. Global parameters such as ENSO and MJO do not influence the formation of the mesoscale convective clouds.

R4-020

Trend Analysis of Precipitation and Temperature at Annual and Seasonal Time Scale over Semarang of Central Java

Ilham Fajar Putra Perdana and Niken Astrid Septyar

National Agency of Meteorology Climatology and Geophysics, Indonesia

Climate change is signalled by changes in temperature and precipitation pattern, so the research about characteristics of temperature and precipitation would help in detecting the existence of climate change over some region. This study was aimed to analyze the trend of temperature and precipitation over Semarang for the period of 1985 to 2020. The annual and seasonal characteristics of both parameters from three stations (Ahmad Yani Meteorological Station, Tanjung Mas Maritime Meteorological Station, and Semarang Climatological Station) were used to detect the existence of positive, negative, or no trend. The Mann-Kendall was used to identify the existence of a trend, while Theil-Sen was used to estimate the magnitude of the slope. Based on time series data of three stations, there was a significant increase of average, minimum, and maximum temperature for both annual and seasonal trend during the last 36 years. In general, the magnitude trend of temperature from all the stations was found at a rate of 0.02-0.04 C per year. Meanwhile, insignificant trends of annual precipitation happen/exist in three stations with Ahmad Yani Meteorological Station had the highest value in Mann-Kendall test. The magnitude of the decreasing trend from the three stations was found at a rate of 2.0 to 5.2 mm/year.

Keywords: trend analysis, temperature, precipitation, Mann-Kendall test, Theil-Sen test

R4-021

Comparison of Atmospheric Dynamics Conditions, Rainfall and Rainy Days with Historical Data during Flood Events in North Buton on 18 and 22 June 2021

Dewi Tamara Qothrunada[1] and Hendri Satria WD[2]

1: South Konawe Climatology Station, Indonesia
2: Network and Communication Center, BMKG, Indonesua

Based on data from the Regional Disaster Management Agency of North Buton Regency, there have been two flood disasters in June 2021 in North Buton Regency, namely on June 18 and June 22, 2021. The analysis was carried out to compare the dynamics of the atmosphere, rainfall, and rainy days with the climatological data when the flood occurred. This study aims to determine the physical conditions of the atmosphere and rain at the time of flooding from the climatological side. The data used are atmospheric dynamics data from the ITACs web-based application, as well as rainfall data and rainy days in June at the Wakangka, Sribarata, and Facejaya rain posts, Buton Regency. The results show that the anomaly of warm sea surface temperature, the anomaly of the westerly wind, and the presence of wet air masses moving up to the upper atmosphere caused convective clouds to appear in the area and caused heavy rainfall. Rainfall conditions and rainy days at the time of the flood were also above normal conditions and exceeded the extreme threshold. The amount of rainfall and rainy days that occurred, indicated that the flooding that hit North Buton Regency on June 18 and 22, 2021 was caused by high and intense rainfall.

Keywords: Flood, Rainfall, Rainy days, Atmosphere

R4-022

The Different Atmospheric Conditions Associated with Northerly Surge, Borneo Vortex and Madden-Julian Oscillation during the Extreme Rainfall Cases in Early 2021 over the Western Part of the Maritime Continent

Anis Purwaningsih

During early 2021 (January to February), several simultaneous extreme rainfalls resulted in floods over several locations on the western part of the Maritime Continent (East Aceh, South Borneo, Aceh Tamiang and Jakarta). The atmospheric conditions are different during the flooding event over these locations. Generally, the strong northeasterly wind over the South China Sea (SCS) appears during these flooding events. During the flooding event over East Aceh and South Borneo, the extreme rainfall is mainly associated with the vortex over the Borneo island, shown by higher vorticity over $25x10^{-6}s^{-1}$. The northeasterly wind from the SCS deflected over the equator along 105-110°E and changed to westerly and southwesterly wind toward Borneo Island. This deflection is strengthened by the eastward movement of the MJO wave in the active phase over the eastern part of the Indian Ocean (MJO phase 3) during both events. During the flooding event over Aceh Tamiang, the MJO was inactive over the western part of the Maritime Continent. The vortex over Borneo was not as strong as during the flooding case over East Aceh and South Borneo. The wind from Indian Ocean deflected southward along the west coast of Sumatra Island. This northwesterly wind over the Indian Ocean (west part of Sumatra island) is stronger than the other flood cases. Furthermore the vorticity magnitude over this area is also considerably higher than the other cases. During the Jakarta flooding event, the Borneo vortex does not appear, the northeasterly wind over SCS turned to southward wind, and the stronger wind speed elongated to the southern part of Java Island. The meridional SST gradient along the 105°E resulted in high wind speed over the western part of the Java island and played a role in low-level wind convergence at the beginning of the Jakarta flooding episode.

R4-023

Quasi-Linier Convective System (QLCS) Characteristics in Jakarta, West Java and Banten during 2018

Ilham Fajar Putra Perdana[1], Carrin Avisha Tambunan[1], Elang Sinaran Damai[1], M. Isa Al Anshory[1], Imma Redha Nugraheni[2], and Gumilang Deranadyan[1]

1: National Agency of Meteorology Climatology and Geophysics, Indonesia
2: Lecturer of School of Meteorology Climatology and Geophysics, Indonesia

Quasi-Linier Convective System (QLCS) term was firstly introduced by Lombardo and Colle on 2012. QLCS is an organized line-shaped convective system which has more than 50 km in length with reflectivity value more than 35 dBZ and 50 dBZ for its system and its embedded core, respectively. The ratio between its length and width has to meet 5:1. Since QLCS has an ability to produce some severe hazards such as, wind gusts, lightning, its important to know about the characteristic of QLCS. This research aimed to find out the QLCS characteristics in Jakarta, West Java, and Banten within 100 km range area from Radio Detection and Ranging (Radar) site of Jakarta. Radar data from Jakarta site during 2018 is used to quantify spatial and temporal characteristics of QLCS. The analysis showed that from 18 QLCSs that happen during 2018 mostly occur in DJF season which occur both in coastal and land. QLCS length tend to be longer in coastal which reach up to 132 km in length. However, most QLCSs have 50-70 km in length, 54-56 dBZ in maximum reflectivity, and No Stratiform Rain (NS) in shape. The temporal characteristics of QLCS depict that most cases occur during midnight and late afternoon which persist for 30-50 minutes in dominant. Based on wind rose diagram, most QLCSs move with 3-7 ms^{-1} in velocity or intermediate moving to northwest followed by south-west in direction.

Keywords: Quasi-Linier Convective System, Radar, dBZ

R4-024

The Evaluation of Rapidly Developing Cumulus Area Model in Detecting Rain in Bandung Basin

Aulia Azura[1], Wendi Harjupa[2], Muhammad Rais Abdillah[1,3], and Muhammad Fadhlan Putranto[4]

1: Meteorology Study Program, Faculty of Earth Science and Technology, Institut Teknologi Bandung, Indonesia
2: Center for Atmospheric Science and Technology, National Institute of Aeronautics and Space, Indonesia
3: Atmospheric Science Research Group, Faculty of Earth Sciences and Technology, Institut Teknologi Bandung, Indonesia
4: The National Institute of Aeronautics and Space, Indonesia

Bandung Basin is an area with high occurrence of convective activities that can even repeat itself through interactions with local circulation. The convective activities often produce heavy rainfall events that induce flooding, which results in both material and life losses. Radar observation is able to detect signals of potential heavy rainfall in near future. However, the detection from the radar has typically very short lead time and thus an early warning and the evacuation process become less effective. This current applies and assesses an alternative method to nowcast heavy rain, which is called Rapidly Developing Cumulus Area (RDCA) model. A recent study found that RDCA predicts the rain signal earlier than a typical rain radar. However, that study was carried out for rain events in Japan, which has distinct climate system with that in Indonesia. Therefore, this study aims to evaluate the RDCA model in detecting rain especially in Bandung Basin. RDCA uses 7 channels of Himawari-8 satellite data, which are processed in a logistic regression model to produce an index to detect the potential of rain. For the evaluation, we perform analyses of confusion matrix, brier score value, and Reliability Diagram. The results show that the RDCA model is quite accurate and reliable in nowcasting the heavy rain in Bandung Basin. More studies are needed to assess the RDCA model in other regions for a comprehensive evaluation of RDCA in Indonesia.

Keywords: RDCA, Logistic Regression, Himawari-8, Model Evaluations

R4-025

Intraseasonal and Interannual Variability of Cumulonimbus Cloud over the Maritime Continent

Suaydhi and Gammamerdianti

The distribution of cumulonimbus clouds over the Maritime Continent is analysed over different atmospheric conditions to investigate the influence of El Niño, La Niña, and MJO. The data used here are infrared brightness from the Himawari family satellites from 2000 to 2016, rainfall data from GSMaP, and ERA Interim reanalysis data. In this paper, the cloud types are identified using the 2-D threshold-based cloud type classification method with a threshold of cloud-top minimum value of 180 K. The results show that Cumulonimbus (Cb) and Mature Cumulonimbus (MCb) are more affected by El Niño, La Niña, and MJO phenomena, than other cloud types. When the MJO is active, Cb and MCb clouds are mostly concentrated in the vicinity of Sumatra, especially during El Niño. Clear sky is observed over the middle part of Indonesia during El Niño combined with active MJO. Cb and MCb clouds are more evenly distributed around Indonesia when there is MJO during normal or La Niña conditions. The distribution of the cloud changes during MJO event because it modifies and/or strengthens the low-level convergence in the atmosphere.

R4-026

Analysis of Changes in Convective Activities in the Event of Heavy Rain in Jakarta Using Himawari-8 Data and the RDCA Index (Case Study: Flood in Early January 2020)

Lutvi Andriani[1], Wendi Harjupa[2], M. Rais Abdillah[1,3], and M. Fadhlan Putranto[4]

1: Meteorology Study Program, Faculty of Earth Sciences and Technology, Institut Teknologi Bandung, Indonesia
2: Center for Atmospheric Science and Technology, National Institute of Aeronautics and Space, Indonesia
3: Atmospheric Science Research Group, Faculty of Earth Sciences and Technology, Institut Teknologi Bandung, Indonesia
4: National Institute of Aeronautics and Space, Indonesia

The floods that occurred in Jakarta in early January 2020 were caused by heavy rains on New Year's Eve. Daily rainfall reaches > 300 mm, which is the heaviest rainfall ever recorded. This incident caused flooding in most areas of Jakarta. Prediction of heavy rain is important for flood mitigation and other hydrometeorological disasters. Studies on the evolution of convective systems associated with heavy-rain events important for understanding the mechanisms behind these events. This study was conducted to determine the development and changes of convective clouds using Himawari-8 satellite data and the RDCA (Rapidly Developing Cumulus Area) index. RDCA is a logistic regression model for transmitting convective rain events based on 7 Himawari-8 band combinations. Predictions from the RDCA index were compared with 10-min-in-situ rainfall data and BMKG radar images. This study uses two heavy rain events that cause flooding events: afternoon and early morning rains. The early morning rainfall is well-predicted by the RDCA index. However, in the afternoon, the RDCA does not fully capture the rainfall structure observed by radar, especially the downstream near the coast. The rapid propagation of the convective system to the north from upstream may be one of the causes of the less accurate prediction of RDCA in the afternoon. In addition, the appearance of narrow but deep convective clouds as revealed by the high-resolution visible data may be under-estimated in the infrared channel, which could result in RDCA's current failure to detect a very potential rainfall event. In the morning, the convective system is much larger and stationary, so RDCA performance is better during this time. This study highlights the importance of RDCA in transmitting heavy rain events and finds some important problems that need further and detailed studies in the future.

Keywords: convective activities, hydrometeorological disaster, Himawari-8, logistic regression, prediction, RDCA

Invited Speech (Room 5)

Biomass Utilization in Tropical Area for Sustainable Development

Toshiaki Umezawa

Lignocellulose biomass such as trees and large-sized grasses is indispensable for establishing sustainable societies. Trees are essential for producing of wood-based materials and paper, which account for half of the total tree lignocellulose biomass consumption, while the other half is for burning. A significant part of the tree biomass used for fuel depends on natural forest logging, and the deforested area has been largely converted to deteriorated grasslands. Therefore, a reduction of natural deforestation by exploitation of high-productivity biomass are strongly required for sustainable development in harmony with environmental conservation. Large-sized grasses greatly surpass trees in terms of lignocellulose biomass productivity. In this context, the conversion of the deteriorated grasslands in tropical and subtropical regions into grass biomass crop farmland would be valuable for renewable resource production in the era of bioeconomy. In addition, the conversion of the deteriorated grasslands to biomass crop farmland and/or plantation forests may lead to restoration of biodiversity. In this context, we have been conducting “the Project for Producing Biomass Energy and Material through Revegetation of Alang-alang (Imperata cylindrica) fields” of SATREPS project as a collaboration with Indonesian Institute of Sciences. This project is in line with the aim of The Sustainable Development Goals (SDGs) and of great importance for a sustainable development path of the world.

Keywords: Tropical degraded grassland, Lignocellulose, Grass biomass, International collaboration, Sustainable society.

R5-001

Thermal Properties of Acetylated Starch-Chitosan Based Bioplastic Film

Yeyen Nurhamiyah, Firda Aulya Syamani, Wida Banar Kusumaningrum and Nanang Masruchin

Research Center for Biomaterials, Indonesia Institute of Sciences, Indonesia

The disadvantage of starch-based bioplastic films is that they are easily damaged when exposed to moisture, besides that they also exhibit less strong mechanical properties. To overcome the problem of the vulnerability of starch-based bioplastic films to water, research was carried out to utilize water-resistant materials such as acetylated starch and chitosan as raw materials for making bioplastic films. The addition of cellulose microfibrils from sorghum stalk fibers is expected to improve the mechanical properties of starch-based bioplastic films. In the manufacture of bioplastic films, chitosan was dissolved in glacial acetic acid (stirred at 250 rpm, 70°C, 2h), then starch was added (stirred at 250 rpm, 70°C, 1h), until a gel was formed. The addition of glycerol was 10% of the weight of starch and chitosan, while the addition of sorghum cellulose microfibrils was 1, 2, 3, 4, 5% of the weight of starch and chitosan. The resulting solution was poured onto a flexy glass, dried at room temperature for 3 days. The resulting bioplastic films were analyzed for their thermal properties with a thermogravimetry analyzer (TGA) and a dynamic mechanical analyzer (DMA). Based on TGA analysis, acetylated starch leaves 21.42% residue, slightly more than raw starch which is 18.35%, while chitosan leaves residue at 44.64% which indicates that chitosan is more stable to heat than starch and acetylated starch. Bioplastics made from acetylayed starch and chitosan with a ratio of 2:1 showed a residue of 30.72%, which means that the addition of chitosan can improve the thermal properties of starch-based bioplastics. Based on DMA analysis, acetylated starch-chitosan bioplastic (2:1) with 1% sorghum MFC was more elastic than other bioplastics in this study.

Keywords: acetylated starch, bioplastic film, dynamic mechanical analysis, thermal gravimetry analysis

R5-002

Correlation between Radiation Measurement on the Field Slopes Using Kurama (Kyoto University Radiation Mapping System) and Environmental Radioactivity in the Soil Depth Direction

Yoshikatsu Ueda, Naoto Nihei, Ratanaporn Norarat and Minoru Tanigaki

By using KURAMA (Kyoto University Radiation Measurement System), we can measure environmental radioactivity in real-time. We have good correlations between KURAMA measurement and direct sampling on the ground, but especially for measurement on the field slopes, the influence from the lateral direction of the slope may occur. We use the standard soil samples for calibration to check the results of the KURAMA measurements and confirmed the correlation of KURAMA measurement on the slope and of the soil sampled with each depth with the same place.

R5-003

Enhancing Visible Light Adsorption of TiO_2/Ti Photocatalyst by Co-Doping Cr and N Elements and Its Application in Tetracycline Photoelectrochemical Degradation

Akhmad Berryl Widyartha[1]*, Muhammad Nurdin[2], La Ode Ahmad Nur Ramadhan[2], Andi Tenri Nurwahidah[3], and Thamrin Azis[2]

1: Department of Material and Metallurgical Engineering, Faculty of Industrial Technology, Sepuluh Nopember Institute of Technology, Indonesia
2: Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halu Oleo, Indonesia
3: Department of Parmacy, STIKES Al Irsyad Al Islamiyyah Cilacap, Indonesia

Wide band gap limits TiO_2 application as photoelectrocatalyst only under ultraviolet (UV) region. Aiming to shift its optical absorption to visible light, this present study carried out preparation of Cr-TiO_2/Ti using anodizing method in mixing electrolytes glycerol, aquadest and $K_2Cr_2O_7$ as source of Chromium (Cr) and followed by doping nitrogen (N) using immersing method in gel containing N from NH_4Cl to obtain Cr-N-TiO_2/Ti photoelectrocatalyst for tetracycline degradation. Photoelectrocatalyst structure, morphology, composition and photocurrent response were examined using X-Ray Diffraction (XRD), Scanning Electrone Microscope (SEM), Emission Dispersive X-Ray (EDX) and Linear Sweep Voltammetry (LSV). Results demonstrated that TiO_2 at photoelectrode formed anatase phase and nanotube structure. In addition, EDX spectra confirmed that Cr and N successfully doped to TiO_2/Ti and photoelectrode obtained showed photocurrent activity under visible region. Photoelectrochemical degradation of tetracycline using Cr-N-TiO_2/Ti photoelectrode promoted 96,55% efficiency with 0.0344 minute-1 rate constant after 90 minutes irradiation under visible light. From the achieved results, it is crystal clear that co-doping Cr and N can reduce band gap of TiO_2 and retain electron/hole (e^-/h^+) pair recombination so that it can promise an efficient removal of tetracycline waste.

Keywords: Cr-N-TiO_2/Ti, doping, photoelectrocatalyst, tetracycline degradation, visible light

R5-004

A Systematic Review: Environmental Quality and Exposure to Ammonia Concentration from the Processing of Natural Rubber to Crumb Rubber

NA Komarudin[1]*, AB Velasco[2], EB Tarigan[3], and YS Hilmi[4]

1: Natural Resources and Environmental Management Sciences, Graduate School, IPB University, Kampus IPB Baranangsiang, Indonesia.
2: College of Agriculture, New Era University – Rizal Campus, Philippines
3: Indonesian Centre for Estate Crops Research and Development, Ministry of Agriculture Republic Indonesia, Indonesia
4: Department of Agricultural Socio-economics, Faculty of Agriculture, Universitas Gadjah Mada, Indonesia

Nowadays, processed natural rubber products such as crumb rubber have become the demands of global consumers who are oriented towards export markets. Therefore, the economic impact is felt more, but there are still other consequences. The consequences are not only economically beneficial but can also be detrimental to environmental conditions. The process of making natural rubber into crumb rubber causes a negative impact by means of air pollution in the form of odour, which is rarely noticed. The purposes of this study were to analyse the ammonia concentration resulting from the processing of natural rubber into crumb rubber, and to identify the impact of ammonia contamination on the environment, particularly human health. This research was conducted using a systematic review method with the help of Colandr machine learning. The results of the review show that the concentration of ammonia produced from the processing of natural rubber into crumb rubber in Indonesia has passed the specified quality standard threshold. It is found to have an impact on the environment such as damage to aquatic ecosystems and air quality, as well as effects on human health such as respiratory problems, chest pain, throat sore, and eye organ disorder.

Keywords: Ammonia, crumb rubber, Colandr, human health, natural rubber

R5-005

Effect of Precipitation Time on the Physicochemical Properties of Modified Sago Starch

Riska Surya Ningrum[1]*, Fadia Idzni Rodhibilah[2], Dewi Sondari[1],
Sudarmanto[1], and Dwi Ajias Pramasari[1]

1: Research Center for Biomaterial, Indonesian Institute of Science,
Cibinong Science Center, Indonesia
2: Student in Biology Department, Faculty of MIPA, Padjajaran University, Indonesia

Sago starch offered as alternative diet to rice and mainly consumed by people in eastern region of Indonesia. This starch content highly carbohydrate and fiber with low glycemic index. Sago starch broadly used in food industry, textile, paper, pharmaceuticals, biotechnology, and poultry industries as thickener, stabilizer, and gelling agent. But over sticky, high viscosity, not resistant to acid and unclear properties made unoptimal utilization of the starch. Therefore, this study investigated effect of ethanol precipitation time (E1=1 hour, E2=2 hours, E3=3 hours, E4=4 hours, and E5=5 hours) on the starch physicochemical properties (moisture, amylose content, solubility, chemical functional group, particle size, morphological, swelling power, thermal behavior, and crystalinity). The properties of modified sago starch were analyzed by gravimetri method, spectroscopy, Fourier Transform Infrared (FTIR), Particle Size Analyzer (PSA), Field Emission Scanning Electron Microscope (FE-SEM), Different Scanning Calorimetric (DSC), and X-Ray Diffractometer (XRD). This study showed precipitation time affect differently to each physicochemical properties. The 2 hour (E2) precipitation is the optimum time to improve the physiochemical properties of sago starch. This treatment increased thermal behavior and crystalinity followed by decreasing the amylose content, moisture content, water solubility, swelling power and hydroxyl-group which affect to up the hydrophobicity and reduce the particle size.

Keywords: ethanol, modification, precipitation, sago starch

R5-006

Evaluation of Land Suitability for Orange Plants (Citrus Sinensis L.) Post Eruption of Mount Sinabung, Karo District, North Sumatera

N I K Sani, Gusnidar, F I Ginting, A Yasir, A Fanani, and D Fiantis*

Departement of Soil Science, Faculty of Agriculture, Andalas University, Indonesia

The eruption of Mount Sinabung produced volcanic ash. These ashes cover agricultural land in its vicinity, causing a decrease i agricultural production. One of the agricultural products around Mount Sinabung is orange, previously they are one of the largest sources of income for the farmers. This study aimed to evaluate the land suitability for orange plants (Citrus sinensis L) after the eruption of Mount Sinabung. Soil samples were taken based on 4 cardinal directions (North, East, South, and West), each at a radius of 3-5 km, 5-7 km, annd 7-10 km. Soil samples were taken from the depth of 0-20 cm and 20-40 cm. Soil analyzed for soil texture, soil pH, CEC, organic C, total N, available P, and exchangeable bases (Ca, Mg, K, and Na). Evaluation of land suitability was done by 2 methods, the qualitative and quantitative methods by applying rating for each parameter. Results show that the Land evaluation range from S2 (Suitable), S3 (Marginally Suitable), and N (Not Suitable) with limiting factors such as slope, soil depth, soil texture, soil pH, and soil fertility. The results of the land suitability evaluation using these two methods have some differences because they have different land suitability criteria. Overall, the suitability area of the S2 class is 7,929.79 hectares located in Kuta Gugung, Kurbakti, and Kuta Mbaru, the area of the S3 conformity class is 13,038.29 hectares located in Namanteran, Sukandebi, Beganding, and Tiganderket and the area of the suitability class N is 7,207.49 hectares in Kuta Kepar, Kuta Tonggal, and Payung.

Keywords: Mount Sinabung, volcanic ash, citrus plants, land suitability

R5-007

Properties of Moulding Products from Sorghum Bagasse Combined with Alang-Alang Leaves, Sengon Wood or Bamboo Using Citric Acid-Sucrose

Subyakto, Eko Widodo, Triyati, Naomi Damaria Lidya Andini Hutauruk, Rabiyah Al Adawiyah and Kenji Umemura

Moulding products commonly made from wood and synthetic adhesives. Wood is becoming scarce and expensive, while synthetic adhesive is not renewable and toxic. Therefore utilization of substitute raw materials and natural adhesives was important. In this work, moulding properties made from sorghum (Sorghum bicolor) bagasse combined with alang-alang (Imperata cylindrica) leaves, sengon wood (Paraserianthes falcataria) or bamboo (Dendrocalamus asper) using citric acid-sucrose were investigated. Ratios of sorghum bagasse to alang-alang leaves or sengon wood or bamboo were 100:0, 75:25, 50:50, 25:75 and 0:100. Citric acid and sucrose (50/50 w/w) as adhesive was used at 20 weight percent of the total moulding weight. The dumbbell-shaped moulding was prepared using a hot press machine at temperature of 200^{o}C, pressure of 4 MPa for 10 minutes. The target board density was set at 1 g/cm^{3}. Bending strength and dimensional changes due to cyclic test were determined. Results showed that with increasing ratio of alang-alang leaves or sengon wood or bamboo decreased the bending properties and increased the dimensional changes.

R5-008

Strategies for Improving the Quality of Sorghum Bagasse-Acacia Wood-Based Particleboard

Yuliati Indrayani[1]*, Sasa Sofyan Munawar[2], and Jamaluddin[1]

1: Fuculty of Forestry, Tanjungpura University, Indonesia
2: Research Center for Biomaterials, Indonesian Institute of Sciences, Indonesia

The quality of sorghum (Sorghum bicolor L. Moench) bagasse-acacia (Acacia mangium W.) wood based particleboard under various Urea Formaldehyde adhesive concentrations were investigated. Particleboards were prepared with the composition of sorghum bagasse:acacia wood as 100:0, 75:25, 50:50, 25:75, 0:100. Sorghum bagasse and acacia woods have cut into smaller particles of 4-10 mesh size, and Urea Formaldehyde (UF) have used as the adhesive with a concentration of 8%, 10%, 12% based on the dry weight of the particles. The particleboards were pressed at a pressing temperature of 130ºC for 10 minutes with a target density of 0.8 gr/cm^3 and a specific pressure of 25 kg/cm^2. The results show that the physical properties as well as the mechanical properties of modulus of elasticity, modulus of rupture, internal bonding, and screw holding strength complied with JIS A 5908-2003. Testing against termites shows that the particleboard manufactured with a composition of 25% sorghum bagasse has classified as very resistant against termite attacks.

Keywords: sorghum bagasse, acacia wood, particleboard, physical-mechanical and biological properties

R5-009

Technological Properties of Formaldehyde Free Adhesives Based on Oxidized Starch Mixed with Different Cross-Linkers for Plywood

Apri Heri Iswanto and Muhammad Adly Rahandi Lubis

Formaldehyde free adhesive based on oxidized starch (OS) adhesives was formulated at different degrees of oxidation and combination of cross-linkers types and contents to replace urea-formaldehyde (UF) resins for plywood. Different mole ratios of hydrogen peroxide (H_2O_2)/starch (0.5, 1.0, 1.5, and 2.0), types of cross-linker, i.e., blocked-pMDI (B-pMDI) and citric acid (CA), and levels of the cross-linkers (5.0, 7.5, 10%) were employed to tailor the adhesion performance of OS adhesives. Technological properties of OS adhesives such as basic, chemical and thermal were characterized using several analytical methods. Adhesion performance of OS was evaluated in plywood panel according to Japanese Agricultural Standard (JAS) 233:2003. Peroxide oxidation reaction broken down the macromolecular structure of starch, resulting in lower molecular weight, solids content and viscosity of OS adhesives, but higher in gelation time. FTIR spectroscopy revealed that the amide linkages were formed by reacting the OS with B-pMDI, and ester linkages were built by reacting OS with CA. These two linkages governed the adhesion performance of OS in plywood. OS/BpMDI adhesive generally had higher curing temperature values than the OS/CA. Moreover, greater content of cross-linker accelerated the cross-linking reaction. Tensile shear strength of plywood increased with higher content of cross-linker, from 0.61 MPa to 1.18 MPa, showing that cross-linker had significant effect to enhance the adhesion performance of OS adhesive by increasing cross-linking density and forming bigger network than without addition of cross-linker. Plywood bonded with OS/CA adhesive exhibited better adhesion that that of OS/B-pMDI bonded panel and without formaldehyde emission. Adding 7.5% cross-linker was found to be the optimum level of addition in OS adhesive.

Keywords: adhesion, formaldehyde free, oxidized starch, plywood, wood adhesive

R5-010

Preliminary Study on the Utilization of Sugarcane Trash and Corncob for Xylo-Oligosaccharides and Xylose Production through Dilute Acid Hydrolysis

Thesalonica Yohana[1], M. Zuvan Maulana Fahrezi[1], Riska Surya Ningrum[2], Dwi Ajias Pramasari[2]*, Riksfardini A. Ermawar[2], Dewi Sondari[2], and Euis Hermiati[2]

1: Faculty of Agricultural Technology, Universitas Brawijaya, Indonesia
2: Research Center for Biomaterials, Indonesian Institute of Sciences (LIPI), Kawasan Cibinong Science Center, Indonesia

Sugarcane trash (ST) and corncob (CB) are abundant lignocellulosic biomass which are potential for producing xylo-oligosaccharides (XOS) and xylose in the biorefinery process. XOS are oligomers of sugars that consist of xylose units with DP ranging from 2-10 linked by β-(1,4)- bond and beneficial to use as prebiotics in food and pharmaceutical industries. Xylose is a xylan monomer that can be used for sweetener. Some organic acids have been reported as good catalysts for xylan extraction. In this study, the dilute organic acids, i.e. acetic acid and oxalic acid, were used for hydrolysing xylan-rich biomass (ST and CB) to produce XOS and xylose. Distilled water was used as a control treatment to be compared with dilute acid hydrolysis. The pretreatment was conducted by heating the biomass in an autoclave at 121oC for 30, 45, and 60 minutes with solid/liquid ratio (1:10). The result shows that the highest XOS concentration from ST and CB were 4.74 g/ L after hydrolysis using 2% oxalic acid for 45 min, and 1.31 g/L after hydrolysis using 2% acetic acid for 60 min, respectively. Meanwhile, the highest xylose concentration obtained from ST and CB was 10.04 g/L after hydrolysis using 2% oxalic acid for 45 min, and 13.94 g/L after hydrolysis using 2% oxalic acid for 60 min, respectively. The results of this preliminary study confirm that acid hydrolysis is potential to be used for the production of XOS and xylose from xylan-rich ST and CB.

Keywords: Xylo-oligosaccharides, xylose, sugarcane trash, corncob, acid hydrolysis

R5-011

The Geochemical Properties of Volcanic Materials: After a Year Mt. Sinabung Eruption

S L Rajmi, G Gusnidar, R L Lubis, F I Ginting, F R Hidayat, H Zulhakim,
A N Armer, N Yulanda, I F Syukri, and D Fiantis*

Department of Soil Science, Faculty of Agriculture, Andalas University, Indonesia

Indonesia has many active volcanoes, one of which is still active until now, namely Mt. Sinabung, located in Karo Regency, North Sumatra. Along with its pedogenesis, pyroclastic material has tremendous benefits as a provider of nutrients needed by plants. However, not all weathering products of volcanic material will produce the same amount of nutrient content. The study aims to identify the chemical properties of Mt. Sinabung volcanic ash after the 2019 eruption. There were 16 ash samples scattered in the east, southeast, and south sectors within a radius of 3-5 km from the peak of the eruption (the research area is 1,678.06 hectares). The samples were analyzed to determine the acidity status of the ash, available P, cation exchange capacity (CEC), and alkaline cations of Ca, Mg, K, and Na from volcanic ash. The results showed that Mt. Sinabung volcanic ash has an average pH value of H_2O acid (5.36) in the east sector, and a slightly acidic in the southeast (6.06) and south (6.27). The average available P in all sectors is very high, while the CEC is still low. In the southeast, east and south sectors, respectively, the available P values: 35.00 ppm, 59.37 ppm, and 165.96 ppm, and the CEC: 12.92 cmol kg^{-1}, 14.46 cmol kg^{-1}, and 15.46 cmol kg^{-1}. The sequence of base cation can be concluded: Ca < K < Na < Mg was classified as very low to very high. The discriminant analysis results showed that the chemical properties of volcanic ash in the southeast are different from the south sector, while in the east sector it has similarities with the southeast and south sectors.

Keywords: tephra, nutrient reserves, volcanic ash chemistry

R5-012

Feasibility Test of Using Disposable Baby Diaper Waste as Raw Material for Fiberboard

Sri Purwati, Djoko Sihono Gabriel and Kurnia Wiji Prasetiyo

The high number of births in Indonesia causes the waste of disposable baby diapers to be higher. The utilization of disposable baby diaper waste has indeed been carried out by several parties, but this is still not enough to unravel the problems caused by disposable baby diaper waste. This study aims to increase the value of disposable baby diaper waste by utilizing it as a raw material for fiberboard. Experiments were carried out to produce fiberboard made from disposable baby diaper waste combined with citric acid as an adhesive in various compositions and pressing times. The fiberboard is tested on several parameters based on the standard requirements of the Indonesian National Standardization Agency. From the results of the fiberboard testing, all treatments met the standard requirements of the Indonesian National Standardization Agency. The best treatment chosen was fiberboard with a compressed time of 15 minutes and the composition of raw materials and adhesives was 10:2.

R5-013

Influence of Different Pretreatment Methods and Yeast Strains on Xylitol Production from Sugarcane Trash Hemicellulose Hydrolysate

Maulida Oktaviani[1], Fahriya Puspita Sari[1], Benjarat Bunterngsook[2], Euis Hermiati[1], Verawat Champreda[2], and Takashi Watanabe[3]

1: Research Center for Biomaterials, Indonesian Institute of Sciences, Indonesia
2: National Center for Genetic Engineering and Biotechnology, Thailand Science Park, Thailand
3: Research Institute for Sustainable Humanosphere, Kyoto University, Japan

The two main factors that influence the success of xylitol production from lignocellulosic biomass are: (1) A pretreatment method that can increase cellulose digestibility, resulting in high sugar production and low concentration of by-products, (2) The use of microorganisms that can efficiently use sugar (especially xylose) and have a high tolerance to the inhibitors contained in hemicellulose hydrolysate. The present study aimed to investigate the influence of different pretreatment methods and yeast strains used in the xylitol production from sugarcane trash hemicellulose hydrolysate. The pretreatment was conducted in two methods: (1) microwave-maleic acid (1.8%) at 180 ˚C for 5 minutes and (2) liquid hot water-sulfuric acid (1%) at 170 ˚C for 30 minutes. The hemicellulose hydrolysate produced from each pretreatment is then used for fermentation using four different yeast strains to produce xylitol. Fermentation was carried out at 30 °C and 200 rpm for 72 h. Kluyveromyces marxianus TBRC 1524 gave the highest result at 24 h of fermentation, with 2.29 g/l xylitol production from 20.29 g/l xylose contained in sugarcane trash hemicellulose hydrolysate after microwave-maleic acid pretreatment. Unfortunately, no xylitol was produced by all the yeast strains after fermentation using liquid hot watersulfuric acid pretreated sugarcane trash hemicellulose hydrolysate. It was concluded that microwave-maleic acid and K. marxianus TBRC 1524 could be a potential pretreatment method and also a potential yeast strain, respectively, to increase xylitol production from sugarcane hemicellulose hydrolysate.

Keywords: Hemicellulose hydrolysate, Liquid hot water-sulfuric acid, Microwave-maleic acid, Pretreatment, Sugarcane trash, Xylitol, Yeast strain

R5-014

The Morphological Features of Sensilla on Non-Olfactory Organs in the Soldier Caste of Subterranean Termite Coptotermes spp.

Bramantyo Wikantyoso[1,2], S. Khoirul Himmi[2], Tomoya Imai[1],
Toshimitsu Hata[1], and Tsuyoshi Yoshimura[1]

1: Research Institute for Sustainable Humanosphere (RISH), Kyoto University, Japan
2: Research Center for Biomaterials, Indonesian Institute of Sciences (LIPI), Indonesia

Coptotermes spp. are known to live inside the substrate that they chose during colony foundation. Particularly, only the reproductive caste in the colony is decorated by a pair of eyes to assist their swarming role, while workers and particularly soldiers have lost both and are known to live away from light existence. The latter has been known to benefit from sensilla to sense vibroacoustic cues as to their communication inside the nest. However, apart from the antennae, there was little information about the sensilla characteristics and distribution in Coptotermes spp other body parts. In this study, we observed three species of Coptotermes spp. (C. curvignathus, C. formosanus, and C. gestroi) and described the distribution of sensilla on their body part namely labrum, head capsule, and pronotum. Each body part was separated from the other parts and was observed individually by Scanning Electron Microscope (SEM). Sensilla characterization was conducted by looking at the cuticular traits. Although the observation by SEM showed all three species possessed six types of sensilla, the abundances were different from each other. Bristle-like sensilla (Type I and II) numbers were greater in C. curvignathus compared to that of the other two species. While C. curvignathus and C. formosanus pronotum medial part were decorated with Sensilla type I in different abundances, it was less observed in C. gestroi. Two types of cuticular mechanosensilla type were observed namely hair-type (Type I, II, VI) and dome-type (Type IV). While most of the sensilla were mechanosensory by having projectory peg and obvious flexible socket characteristics, some of them may have tactical chemosensory by the existence of sensilla tip pore characteristics and thermo-/hygrosensitive by having sunken peg characteristics (Type V). We supposed that the less existence of bristle-like sensilla on soldiers may partially support their role in colony expansion and assist foraging in urban areas by neglecting particular vibroacoustic stressors from the environment.

Keywords: morphology, sensilla, mechanosensilla, mechanosensory, Coptotermes

R5-015

Land Snail Species from Rice Paddies in Tagum City (Philippines)

Jeaneth Molano and Karyn Chrislene Vitor

Several organisms are known to damage the seedlings in a rice field. However, only few literatures citing reviews of snails in agricultural areas. This paper is presented to assess species richness and relative abundance of terrestrial snails in the 1 ha rice paddies of Brgy. Pagsabangan, Tagum City, Philippines as well as the physical parameters in determining the microhabitat of land snails. Sampling was made using the strip transect sampling method through handpicking the live specimens and empty shells. A total of 1, 439 individuals were collected representing the Family Achatinidae, Thiariidae, Viviparidae, and Ampullaridae. Four species identified are agriculturally important snails such as the Achatina fulica, Melanoides turricula, Vivipara costata and Pomacea canaliculata. Findings showed a high species richness but a low species diversity. Mean soil temperature and air temperature are shown to be conducive for these species. Understanding the status of these species can be used as baseline in rice cultivation management and other agricultural management activities.

R5-016

Intertidal Arthropods of Pantukan, Davao De Oro, Philippines

Juliet Berdera, Jean Amor Jamero, Reyna Jane Gontinas, John Gary Tejano and Karyn Chrislene Vitor

Marine arthropods represented by crustacea are economically and ecologically important species but are faced with threats among coastal biodiversity. In this study, crustacea in the intertidal areas of Bongabong, Pantukan, Davao de Oro, Philippines were assessed using an opportunistic sampling method in 2019 to 2020. A transect-quadrat method was used in an approximately 20,000 m2 study area. Hand-picking, coring, and sieving was used as sampling techniques. A total of 321 individuals belonging to 33 species were identified in the area. These organisms represent Class Malacostraca under Decapoda and Stomatopoda. The most abundant species found are important species such as hairy crab (Pilumnus vespertilio), swimming crab (Thalamita admete), and God-spotted hermit crab (Clibanarius cruentatus). Species richness showed highest in station 1 (R=5.757) while station 2 showed low species diversity (H'=1.953) and evenness index (E=0684). The species diversity of the area is low compared to the reported studies in the country. Given these findings, an immediate action is needed to prevent future threats to coastal biodiversity.

R5-017

Effects of Air-Fine Bubbles Water on Cultivated Shiitake Mushroom in Thailand

Rattanaporn Norarat[1], Wichet Thipprasert[2], Vishnu Thonglek[2], and Nantinee Srijumpa[3]

1: Faculty of Science and Agricultural technology,
Rajamangala University of Technology Lanna
2: Faculty of Engineering, Rajamangala University of Technology Lanna
3: Chiang Rai Horticulture Research Center, Thailand

Shiitake (Lentinula edodes) is a prized mushroom with a delicious taste, aroma and rich of vitamin. It is used medicinally for diseases involving depressed immune function-including cancer, AIDS, environmental allergies. Therefore, the cultivation of shiitake mushroom is rapidly gaining popularity because of the high market demand and high-priced. However, the production of shiitake mushroom has not met the total demand yet. Therefore, Thai farmers still need and alternative effective technique to drastically increase the yield. Fine bubbles technology is rapidly emerging in agriculture field due to their remarkable property such as negatively charged surface (zeta potential), highly efficient gas solubility and larger specific surface area which may increase the growth rate of the plant. In this study, we examine the effect of Air-fine bubbles (Air-FB) water on cultivated shiitake mushroom in Thailand. Results show the total weight of mushroom were increased significantly different (81%) when compared with the group that applying by tap water (control). Furthermore, in the case of beating on the top of substrate (traditional method) and then applying air-FB water, it can enhance the total weight of mushroom by 23% compare with beating stimulation and applying tap water.

Keywords: Shiitake mushroom; Yield improvement; Fine bubbles; Beating stimulation

R5-018

Reduction of Copper and Lead Metal Content in Gonggong Snails Using Lime

Fitrah Amelia[1]*, Ramses[2], and Ismarti[1]

1: Program Studi pendidikan Matematika, FKIP, Universitras Riau Kepulauan, Indosesia
2: Program Studi pendidikan Biologi, FKIP, Universitras Riau Kepulauan, Indosesia

Pollution that often occurs in the sea is heavy metal pollution. Heavy metals that often pollute are lead (Pb) and copper (Cu). Heavy metal pollution that occurs often has an impact on plants and animals that live in the sea. Animals that are often contaminated with heavy metals are snails because of the nature of snails that can accumulate metal due to their sedentary nature, filter feeders, and their slow movement to keep away from metal contamination. The purpose of this study is to reduce metal pollution in seafood, one way that can be done by soaking seafood using organic acids such as lime, because organic acids contain citric compounds that can bind metals. Metal content analysis was carried out using Perkin Elmer Type AAS PinAAcle 900T brand. The results showed that lime can decrease the metal content of copper (Cu) in gonggong snail meat with optimum conditions at a concentration of 10%, immersion time of 90 minutes and the percentage reduction of 49%. While for Pb (lead) the optimum condition occurs at a concentration of 10% and an immersion time of 30 minutes with a 25% decrease in percentage. So that it can be said that lime is better in reducing levels of copper metal (Cu) compared to Pb (lead).

Keywords: Lime, Gonggong Snail; Lead Metal, Copper Metal

R5-019

Environmental Impact Analysis through Heavy Metals Contained Sago Starch

Ikhsan Nazar Arrahman

Currently, environmental damage has become a hotly discussed issue in various media, both print and electronic. This environmental problem cannot be separated from various unsustainable human activities. Many studies state that there has been severe environmental damage due to improper waste management, both in the form of liquid waste, gas and solid waste from human activities such as land clearing for settlements, waste management activities, agricultural and livestock activities, industrial activities, as well as mining and exploration of oil and gas drilling. The impact of this environmental damage can have an impact on various important sectors such as the agricultural sector itself, including Sago (Metroxylon sago) plantations. Sago is a flour-producing plant that generally lives in swampy areas and is often located not far from human activities, so that the ability of plants as heavy metals bio-sorbents needs to be considered to take into account the possibility of heavy metals absorption by plants in amounts that exceed the threshold and endanger health if flour containing heavy metals above the threshold is consumed by humans and livestock. In this study, the authors conducted an experimental study by testing the heavy metals content in Sago samples in the district of Hulu Sungai Utara, South Kalimantan to identify the possibility that the absorbed heavy metals content exceeded the safe limit for consumption. From the results of the study, it was found that some of the heavy metals content in sago flour exceeded the allowed safe threshold, this was very worrying considering the dangers of heavy metal absorption by the body in the long term and in excessive amounts.

R5-020

Assessment of the Geochemical Weathering Indices of Volcanic Soil after the Eruption from Mount Sinabung in 2020

R L Lubis, Juniarti, S L Rajmi, A N Armer, F R Hidayat, H Zulhakim,
N Yulanda, I F Syukri, F I Ginting, and D Fiantis*

Department of Soil Science, Faculty of Agriculture, Andalas University, Indonesia

The weathering process of volcanic material that erupts will release nutrients depending on the type of rock and the level of weathering and then fertilize the soil. The level of weathering of volcanic soils can be measured by calculating the weathering indices to evaluate the stage of soil development, nutrient mobility, and indicate the intensity of chemical weathering in the soil. In this paper, we analyze the total elemental oxides and the degree of weathering of the soil affected by the eruption of Mount Sinabung for 10 years (2010-2020). The samples were taken using the grid sampling method with an interval of 1 km and samples collected as many as 34 samples. In this study, the calculation of the chemical weathering indices includes the Ruxton Ratio and Product of Weathering Indices (PWI). The results of this study indicates that the average total soil oxides are TiO_2 (0.53-0.90%), MgO (0.74-2.48%), K_2O (1.37-1.88%), P_2O_5 (1.40-2.52%), CaO (2.40-3.59%), Fe_2O_3 (4.82-7.91%), Al_2O_3 (23.09-28.60%), and SiO_2 (53.60-59.28%). The average soil weathering indices calculated from the Ruxton ratio is between 1.90-2.61 classified as moderatly to optimal weathering. PWI have an average range of 58.93-64.58 which indicates a low level of weathering. The Southeast sector has a higher weathering rate than other sectors, so it can be concluded with Southeast > South > Southwest > Northeast.

Keywords: Soil Nutrient, Elemental Oxide, Weathering Degree

R5-021

Effect of Community-based Total Sanitation Program with Diarrhea Incidents in Children under Five

Fenita Purnama Sari Indah

STIKes Widya Dharma Husada Tangerang, Indonesia

The incidence of diarrhea in toddlers around the world in 2016 was quite high, amounting to 4 billion cases and 2.2 million of them died. In Indonesia, diarrhea was an endemic disease and a potential outbreak that was accompanied by death. The objective of this study was to determine the determinants between Community-Based Total Sanitation (STBM) and the incidence of diarrhea in children under five in Tangerang City. This study used a quantitative approach with cross sectional design. A sample of 76 mothers who had toddlers. The independent variable was Community-Based Total Sanitation (STBM) which includes the behavior of open defecation, drinking water and food management, household waste management, and household waste water management. The results showed that only open defecation was significant with the incidence of diarrhea in infants (p value 0,000) with OR = 6,720, while, drinking water and household food management (p value 0.237), household waste management (p value 1,000), household wastewater management (p value 0.237) was not related to the incidence of diarrhea in infants. Respondents who have open defecation behavior had a 6.7 timeshigher tendency for toddlers to have diarrhea.

Keywords: Incidence of diarrhea; Community-Based Total Sanitation; Children under Five

R5-022

Mass Wasting Affected Area Mapping Based on Relative Difference of Normalized Difference Vegetation Index Using Google Earth Engine in Nusa Tenggara Timur (Case Study: Tropical Cyclone Seroja, 3 April 2021)

Bayu Nugraha and Nadhilah Humairah Salwa Salsabil

Remote sensing from satellite vehicles has become increasingly important for preventing natural hazards, especially mass wasting. Mass wasting events cannot be fully prevented but can be managed to reduce disaster risk. Big data and cloud computing, as a rapidly growing industry, have also received a lot of attention. A combination of those two can perform massive-scale and complex computing. Google Earth Engine which provides access to large-scale data analysis through cloud computing technology has made it possible for the first time in history to rapidly and accurately process vast amounts of satellite imagery at high resolution. Mass wasting is a common phenomenon in Indonesia, especially during periods of the rainfall season. This phenomenon has the potential to cause catastrophic loss of life and physical destruction. Thus, this paper aims to map the affected areas of the mass wasting event. The methodology of this work consists of the following steps: (a) Dataset selection (Landsat 7, Landsat 8, Sentinel-2), (b) Event parameter set (Event Date, Pre-Window Length, Post-Window Length, Maximum Cloud Cover, Slope Threshold), (c) calculations on the highest NDVI-pixel composite, (d) Exploit changes for mapping of the affected areas (landslides and debris flow).
This paper was developed in Nusa Tenggara Timur in which mass wasting occurred due to the presence of severe tropical cyclone Seroja which formed on 3rd April 2021. All of the changes produced by TC Seroja were mapped showing that the affected locations can appropriately be simulated by the model.

Invited Speech (Room 6)

Impacts of the 2019 Antarctic Stratospheric Sudden Warming Event on the Equatorial Thermosphere and Ionosphere

Yasunobu Miyoshi and Yosuke Yamazaki

A sudden stratospheric warming (SSW) event occurred in September 2019 in the Antarctic region. By using an atmosphere-ionosphere coupled model (GAIA), impacts of the 2019 SSW on the equatorial thermosphere and ionosphere are studied. During the 2019 SSW, the neutral wind in the lower thermosphere, the equatorial electro jet (EEJ) and electron density fluctuate with a period of about 6 day. In this study, excitation mechanism of these 6-day oscillation in the equatorial thermosphere and ionosphere is shown. Our results are as follows. The 6-day wave is generated in the stratosphere during the 2019 SSW, and propagates upward into the lower thermosphere. The 6-day wave induces the modulation of the semidiurnal tide with a period of 6-day through the non-linear interaction between the 6-day wave and semidiurnal tide. Furthermore, the 6-day oscillations in the EEJ and electron density are caused by the 6-day fluctuation in the lower thermosphere through the E-region dynamo process.

R6-001

Ionospheric Observation Using Equatorial Atmosphere Radar (EAR) Kototabang for the 26 December 2019 Annular Solar Eclipse Research

Agri Faturahman, Varuliantor Dear, Jiyo Harjosuwito, Afrizal Bahar,
Asnawi Husin and Rezy Pradipta

Solar eclipse passage has the capacity to cause some change in the ionosphere, which makes it a valuable event to be studied using multi-instruments. On 26 December 2019, an annular solar eclipse passed in the vicinity of Equatorial Atmosphere Radar (EAR) at Kototabang station. We utilize the capability of EAR for detecting field aligned irregularities (FAI) to discover changes that occur in the ionosphere during the eclipse. The EAR observation was also supported by other instruments. The results of EAR observations show some appearance of FAI (strong echo power backscatter) at the altitude of ionospheric E layers (90-100 km) during the solar eclipse. Traces of strong sporadic E layers (with spread) were also observed on ionograms from the FMCW ionosonde at the same location, confirming the EAR observation. The appearance of FAI and these sporadic E layers were likely to be related to the solar eclipse event. The results of several other studies also supported this hypothesis. Furthermore, we found on the eclipse day that the normally occurring FAI at 150 km altitude disappeared, meanwhile on 25 and 27 December 2019 the 150 km altitude FAI was observed. We suspect that the absence of FAI at altitude 150 km was related to the solar eclipse phenomena. Another interesting finding is the presence of a spread echo backscatter around noon on 25 December 2019, one day before the eclipse.

R6-002

Study of the Characteristics of Ionospheric F Layer above Kototabang during Flare Event on August 9, 2011

Muly Prety Mahayu, Ednofri and Alfiah Rizky Diana Putri

The ionospheric layer has an important role such as a reflector of radio waves. The F2 layer is commonly used to reflect radio waves because it is a large layer and appears most often. When a flare occurs, the solar emits high-energy particles as well as x-ray and ultraviolet radiation. Flare events can increased absorption of HF radio waves as a result of ionization in the D layer by x-rays.
We used the critical frequency of ionospheric F2 layer (foF2) and also the height of F layer (h'F) from Ionosonde over Kototabang, West Sumatera, Indonesia (100.32 E, 0.23 S) from 8 to 10 August 2011 research data to determine its impact on the flare events on August 9, 2011 class X6.9 to study about its influence on the Ionospheric F layer.

Keywords: Flare; Ionospheric layer; Solar activity; Critical frequency; F2 layer; Radio Waves

R6-003

Long-Term Analysis of Electron Density Observed by the MU Radar and Auto-Scaled Ionosonde Data

Masuda Shuto, Yokoyama Tatsuhiro and Yamamoto Mamoru

The MU radar, located in Shigaraki-Cho, Koka City, Shiga Prefecture, is a large atmospheric radar designed to observe the middle and upper atmosphere, and has been observing the ionospheric F region as an Incoherent Scatter (IS) radar regularly since 1986. The IS radar emits radio waves into the upper atmosphere and is capable of estimating various physical quantities in the ionosphere that contribute to the intensity and spectrum of the scattered waves. Electron and ion temperatures, plasma drift velocities and echo power are regularly observed by the MU radar (http://www.rish.kyoto-u.ac.jp/mu/isdata/). First, we focus on the statistics of the echo power, which is proportional to the electron density. The peak echo power measured by the MU radar is calibrated as the electron density that corresponds to the foF2 measured by Kokubunji ionosonde. We compare the electron density observed by the MU radar with the International Reference Ionosphere (IRI) model. Second, we are planning to build a system that reads ionospheric parameters from ionograms obtained by Shigaraki ionosonde, most of which remains unanalyzed. After removing noise and interference signals, a machine learning model will be developed to process ionogram images automatically.

R6-004

Exploring an Extension of Space Situational Awareness in Southeast Asian Region Utilizing EAR Observation Data

Afrizal Bahar[1], Varuliantor Dear[2], Asnawi Husin[2], Agri Faturahman[2], Jiyo[2], Rezy Pradipta[3]

1: Agam Atmospheric and Space Observation Office,
National Institute of Aeronautics and Space (LAPAN), Indonesia
2: Space Science Center, National Institute of Aeronautics and Space (LAPAN), Indonesia
3: Boston College, Institute for Science Research, United States

The concept of Space Situational Awareness (SSA) refers to the ability to detect and track threats, enabling appropriate mitigation measures aimed at protecting space assets. In this paper, we explored a possible extension of this concept by considering not only asset protection but also connectivity to satellites in orbit by users under various circumstances. Turbulence in ionospheric layer at low latitude can degrade connectivity to satellites (GNSS and SATCOM). Field Aligned Irregularities (FAI) from such turbulence are often detected by Equatorial Atmosphere Radar (EAR) when the radar beam is pointed perpendicular to magnetic field lines. EAR has been operational in Kototabang (0.20 S, 100.32 E; 10.36 S dip latitude), with beam steering capability up to 30 degree from zenith direction. At ionospheric altitude, EAR's direct horizontal coverage is around ~200 km. However, considering the physical properties of Equatorial Plasma Bubbles (EPB), we can extend the effective "viewing area". The north-south elongation of EPB implies an additional ~4000 km coverage from EAR meridionally. Eastward drift of EPB implies a further ~2000 km extension of coverage zonally. In this scheme, EAR effectively "guesses" the location of FAI when they are not directly in the field of view. In our study, we reconstructed the EPB geometry in three dimensions (3-D) based on EAR FAI data and the above assumptions. The reconstructed 3-D EPB geometry may be useful to many types of users such as those in maritime, aviation or aerospace sector operating in the Southeast Asian region -- therefore extending the concept of SSA more widely.

Keyword: Space Situational Awareness (SSA), Equatorial Plasma Bubble, Scintillation, GNSS

R6-005

Scintillation Drift Velocity Observed by Closely-Spaced GPS Receivers in Indonesia

Yuichi Otsuka and Prayitno Abadi

To investigate zonal drift velocities of a few hundred meter-scale irregularities associated with equatorial plasma bubbles, we have operated three single-frequency GPS receivers at the Equatorial Atmosphere Radar (EAR) site at Kototabang, West Sumatra, Indonesia (0.20ºS, 100.32ºE; geomagnetic latitude 10.6ºS) since January 2003. The GPS receivers sampled GPS signal intensity at a rate of 20 Hz. Distances between the receivers were 116, 127, and 152 m. Drift velocities of irregularities were measured using cross-correlation analysis with the time series of the GPS signal intensity obtained from the three receivers. By analyzing the drift velocity data, equinoctial asymmetry of the zonal drift velocity is found. The eastward drift velocity is higher in March Equinox than in September equinox (Otsuka et al. 2006, Abadi et al., 2017). By analyzing the drift velocity data obtained during a period from 2003 to 2021, in this study, we investigate seasonal and solar activity and magnetic activity dependence of the drift velocity.

Keywords: velocity, plasma bubbles, EAR, GPS

R6-006

Estimation of Geomagnetic Storm of Solar Cycle 24 Based on Solar Wind and Magnetic Field Parameters

Anwar Santoso and Dyah Rahayu Martiningrum

Space Science Center LAPAN

Geomagnetic storms are important phenomena in space weather research and also one of the parameters provided in the LAPAN space weather service, SWIFtS (Space Weather Information and Forecast Service). Some of geomagnetic storm prediction models have been developed. In 2017, a geomagnetic storm model was developed based on the behavior of the solar wind parameters and the Bz (-) interplanetary magnetic field. Data during 1996-2006 are used to develop the model. In this paper, we estimate the geomagnetic storms event during 2007-2020 by using a model based on the input of a combination between interplanetary magnetic field behavior towards the south (Bz (-)), solar wind density (N_{SW}) namely $P_{Bz\text{-}Nsw}$ and a geomagnetic storm model. A geomagnetic storm model based on input the behavior of the interplanetary magnetic field towards the south (Bz (-)), the density (N_{SW}) and speed of the solar wind (V_{SW}), namely P_{Total}. The analysis results obtained that the Dst*(P_{Total}) model has a slight advantage in accuracy. This result can be seen from the average deviation value between Dst data and Dst geomagnetic storm model output ($P_{Bz\text{-}Nsw}$) that is 46.7% and the average deviation between Dst data and Dst geomagnetic storm model output (P_{Total}) is -29.4%. Likewise, the mean value of the data gap time and the gap time output of the geomagnetic storm model ($\triangle T(P_{Bz\text{-}Nsw})$) is 73.7% and the average value of the data gap time and the gap time output of the geomagnetic storm model ($\triangle T(P_{Total})$) is 2.4%. For shortly, in the total the intensity of the geomagnetic storm is more suitable/better using the Dst*(P_{Total}) model which is a superposition parameter of the speed and density of the solar wind, because it has a smaller deviation between the data and the model output.

Keywords: solar wind parameter, geomagnetic storm, space weather, interplanetary magnetic field

R6-007

The Equatorial Spread-F Occurrence as Functions of Solar Activity, Geomagnetic Activity, and Evening Upward Plasma Drift Analyzed by Logistic Regression

Prayitno Abadi, Gilland F. P. Achyar, Dyah R. Martiningrum, Reza R. Septiawan, Umar A. Ahmad and Septi Perwitasari

Equatorial spread-F (ESF) manifests the existence of the ionospheric irregularities (plasma density fluctuation) in the nighttime equatorial region. We notice three factors that strongly affect the generation of the ESF; that is, solar activity (F10.7), geomagnetic activity (Kp index), and evening upward plasma drift (v) associated with the pre-reversal enhancement (PRE) phenomenon. This study investigates the strengths of F10.7, and Kp index, and v that likely cause ESF occurrence. The maximum value of the Kp index from 0 to 12 UT is a measure of geomagnetic activity on a certain day. We calculate the probability (P) of the ESF occurrence with F10.7, Kp index, and v as classifiers by using logistic regression, $P(z) = 1/(1+\exp(-z))$ with z is a linear function consisting of the classifiers. Here, we need to find z, and we train 814-days observation of v and ESF occurrence data obtained from three ionosondes in the equatorial region over Southeast Asia to find z. Shortly, we obtain $z = -0.2342 - 0.0098 \cdot F10.7 - 0.0588 \cdot Kp + 0.1718 \cdot v$ that is used in calculating P(z), and we define that the ESF occurs and does not occur when $P(z) > 0.5$ and $P(z) \leq 0.5$, respectively. Furthermore, we test our logistic regression, P(z), to classify the occurrence/non-occurrence of ESF in the dataset that is used for training. As a result, we found our logistic regression has a true skill score (TSS) of 0.63 in classifying the occurrence/non-occurrence of ESF. TSS values range over [-1 1], and the value > 0 or even closes to 1 means the classifiers can correctly classify the event. In conclusion, with TSS = 0.63, we consider that our logistic regression can classify the occurrence/non-occurrence of ESF at a certain night.

R6-008

The Characteristic of Ionospheric Plasma around a Bias Spacecraft in Space

Nizam Ahmad

The interaction between spacecraft with the ionospheric plasma in space can lead to charging phenomena, depending on the accumulation of charge on the spacecraft surface. The charge flow to and from the spacecraft surface condones a current giving rise to amendment in the electric potential of the spacecraft. In this fashion, the ionospheric plasma tends to yield an adverse effect on the spacecraft. Conversely, the presence of a spacecraft in space can disrupt the property of plasma such as density leading to a non-quasineutral sheath region. In the present study, a bias spacecraft has been set up and numerically simulated in which the electic potential of spacecraft is about -5V and -10V in addition to the ion to electron temperature ratio is around 0.2 (Ti/Te ~ 20%). In order to satisfy the quasi-neutral condition, the plasma density of ion and electron is relatively the same which is on the order of 109 particles/m^3. We found that the more negative the spacecraft potential the more electrons repelled away from the body, whereas the ion trajectories conjoin together and more pronounced in the downstream side leading to ion focusing region. This region can be problematic for sensitive electronic components on the spacecraft.

R6-009

Morphological of E-F Region Field Aligned Irregularities in Low Latitude

Dyah Rahayu Martiningrum, Prayitno Abadi, Anwar Santoso and Mamoru Yamamoto

The irregular plasma density and velocity fluctuations often occur in the Earth's ionosphere regions. When radio signals propagate through that region, they cause a fade in received signal power known as scintillation. The generation of these plasma irregularities is one of the important manifestations of space weather. Recently, research of the mechanism and the morphology of plasma irregularities has progressed. In this study, we analyzed E and F region Field Aligned irregularities (FAI) observed by a VHF backscatter radar with operating frequency 47 MHz have been operated at Kototabang (0.20ºS, 100.32ºE; dip lat 10.36ºS), Indonesia. Seasonal variation of E and F region field aligned irregularities observation compare with sporadic E (Es) and equatorial spread F (ESF) occurrences observed by ionosonde. The ionosonde provide various E and F region parameters such as the critical frequency of F2 layer (foF2), the critical frequency of sporadic E layer (foEs), and the maximum height of F2 layer (hmF2) We analyzed for equinox (March, April, September, and October), June solstice (May-August), and December solstice (November-February) of data observations during 2011-2012. We also discussed correlation between sporadic E (Es) and equatorial spread F (ESF) occurrences to understand morphological of coupling between E and F region of the Earth's ionosphere.

R6-010

Impact of Plasma Depletion on the Occurrence of Scintillation in the Minimum Years Phase of Solar Cycle 23

Ednofri

In the equatorial region, ionospheric plasma disturbances, such as ionospheric density depletions called equatorial plasma bubbles (EPBs), frequently occur. EPB is an important component of the space weather because it can interfere with satellite communication systems, satellite-based navigation, and radio communications. Although the EPB has been studied over the last several decades, it still attracts attention because of its strong influence on radio waves of ionospheric trans-communication. Some aspects of observation, generally statistically, such as morphology, seasonal behavior, latitude-long variations, and some dynamic aspects of this irregularity have been the subject of much research in the past and have been studied reasonably well. However, prediction and day‐to‐day variability the impact of EPB on scintillation is still a challenging problem even today, especially in minimum years of solar activity. Therefore, this study was conducted to determine the impact of the occurrence of EPB on scintillation at any given time. In order to study the occurrence of EPB, an all-sky imager (ASI) observation will be used to detect large-scale airglow depletion as two-dimensional images. Three closely-spaced single-frequency (1.5754 GHz) GPS scintillation receivers (Astech G12) will be used to detect EPBs as scintillations of the GPS signals and measure their drift velocities at an altitude of 350 km and within the area approximately 500 km. The spatial correlation between the ionospheric scintillation and the large-scale EPBs structure seen in ASI images at post-sunset, midnight and post-midnight in some cases for the selected day will be studied, and efforts will be made to discuss the results under different atmospheric coupling processes associated with it. The supporting data from another instrument like ionosonde will also be used.

R6-011

Simulation of Solar Flare Mechanism Based on Ideal Magnetohydrodynamics State by Disrupting the Stability of Magnetic Field due to the Plasma Momentum Injection

Ni'Matus Sholikhah and Bambang Setiahadi

Flare is defined as one of the forms of Solar activity that has a direct influence on the Earth. Electromagnetic energy released by flare could induce the disturbance of the Earth's atmosphere. The flare mechanism is slightly difficult to perceive because of the complexity of the flare process, which has non-linear characteristics and also requires some parameters. The condition of magnetohydrodynamic could be used to describe the phenomenon of flare formation and other Solar activities. The observation result does not show a sufficient illustration of the flare mechanism formation. In order to obtain further understanding of the mechanisms of flare formation, the numerical approximation simulation could be applied by using some approximation such as statistical empirical, and theoretical. In this research, the numerical approach was applied by solving ideal magnetohydrodynamic equations with the finite difference method. The result of the numerical solution was used to simulate the process of flare formation. Many physical process of the Solar were suspected as the cause of flare formation. This paper outlines the process of flare formation as a result of the disturbance of the magnetic field which was produced by the injection momentum of plasma.

Keywords: Flare, magnetohydrodynamic, magnetic field

R6-012

The Characteristics of Solar Flare and CMEs that Caused SPE during Solar Cycle 24

Neflia Neflia

SPE is one of the most severe hazards in the space environment. Such events, tend to occur during periods of intense solar activity, and can lead to high radiation doses in short time intervals. The proton enhancements produced by these solar events may last several days and are very hard to predict in advance and they also can cause harm to both satellite and human in space. The most significant sources of proton in the interplanetary medium are both solar flares and interplanetary shocks driven by coronal mass ejections (CMEs). In this study, I try to find the characteristic of Flare and CME that can cause the proton events in interplanetary medium. For my preliminary study, I will search flare characteristic such as class and position as an SPE causes. I also did the research with CME characteristics such as Angular Width (AW) and linier velocity. During solar cycle 24, the solar activity remain very low with several large flare and Halo CME. This low activity also occur on solar proton events in interplanetary medium. From January 2009 to December 2019, there are 42 SPEs with flux range from 12-3895 pfu (10 MeV). The solar flare during these events varies from C to X-class flare. From 47 X-class flare that occur during 2009-2019, only 11 flares cause the SPE. Most of active region locations are at solar Western Hemisphere (26/42). only 28 from 320 halo CME (AW=360) cause SPE. Although the probability of SPE from all flare and CMEs during this range of time is small but they have 3 common characteristics, ie, most of the SPE have active region position at Solar Western Hemisphere, the CME have AW=360 and they have a high linier speed.

R6-013

Flare Potentiality Associated to Different Sunspot Groups during Solar Cycle 24 Observed by LAPAN Pasuruan

Amatul Firdausya N. Cahyaningtyas[1], Siska Filawati[2], and Silvi Oktavia Hanum[2]

1: Institut Teknologi Bandung
2: BPAA LAPAN Pasuruan

Sunspot evolution is explained in the context of the evolution of active areas undergoing morphological changes. The Zurich classification is a classification of sunspot groups based on their size, shape, and structure. While flare is an increase in the intensity of radiation emitted in a short time in the area around sunspots that can trigger Coronal Mass Ejection and cause radio signal disturbances in the Ionosphere. Therefore, it is very necessary to study sunspots and flares to minimize the negative impact of sunspots and flares. This study uses flare data from NOAA and sunspot data from BPAA LAPAN Pasuruan. The 24th solar cycle starting from 2008 to 2019, shows that the R-sunspot and flare values have the same trend, which is increasing at the beginning of the cycle. The peak occurred in 2013-2014, marked by an increase in R-sunspot and flare, then decreased until 2019. Because the pattern of the intensity of R-sunspot and flare is the same, flare activity is related to sunspot activity. The comparison of sunspot data grouped by Zurich classification and flares shows that flares that occur during the 24th cycle are sequentially produced by sunspot classes of D, E, F, A, B, C, G, H, J. Flares in the early phase of the cycle (2008-2010) was dominated by class B, while the peak phase was dominated by classes C, M, X which mostly came from sunspot class D. The objective of this study is an initial study in predicting flares.

Keywords: Flare, Sunspot, Zurich Classfication

R6-014

Optimization of Array System Configuration Using the Smoothed-Pad Algorithm

Mario Batubara, Timbul Manik, Musthofa Lathif and Peberlin Sitompul

The source of astronomical objects, in general, is very far distance from the observation instrument, so that the transmitted signal is received very small and is at risk of being disturbed by other sources around the receiving system. Therefore, currently, the concept of multiple receivers with array interferometer configuration arrays is used to improve the quality of the source signal detected by the receiving system. The position of each individual receiving system, known as the antenna pad, determines the quality performance of the received signal output. The antenna positions are arranged in a discrete grid system so that there is a vacancy between the positions or pads. In this paper, a basic computational technique will be presented to overcome the emptiness of the region between one antenna to their neighbor. As an initial result, the integration of each position with its neighboring positions with some of its smoothing functions is optimal in filling the void region, and maximizing the u-v coverage.

R6-015

Solar Wind Speed Time-Series Forecasting Based on Long Short-Term Memory (LSTM) Neural Network Model

Tiar Dani[1], Rhorom Priyatikanto[1], Anton Winarko[1], and Gerhana Puannandra Putri[2]

1: Space Science Center, LAPAN, Indonesia
2: Sumedang Space and Atmospheric Observatory, LAPAN, Indonesia

The solar wind speed is one of the disturbances precursors for the space environment around the Earth due to the solar flare, Coronal Mass Ejection (CME), or the coronal hole. The increase in solar wind speed can cause geomagnetic disturbances marked by the decrease in the Dst index observed on the Earth's surface. This study proposed the Long Short-Term Memory (LSTM) Neural Network model to forecast solar wind speed per hour for the next 24-hours during solar minimum. The model using input from solar wind speed observed by Advanced Composition Explorer (ACE) on Lagrangian-1 orbit as internal input and the area of the geoeffective coronal hole from Solar Dynamic Observatory (SDO)/Atmospheric Imaging Assembly (AIA) 193 Angstrom detected by DeLuna as an external input. The obtained solar wind speed forecasting model has an average RMSE (Root Mean Square Error) value of 41.15 km/s for a 24-hours ahead forecast. We also carried out the solar wind speed forecast results validation analysis from October 28, 2019, to May 9, 2021, and found the best-fit correlation of 0.85 with forecast results of 77% correct, 11% overestimate and 12% underestimate.

Keywords: Solar Wind, Long Short-Term Memory, Coronal Hole, Minimum Solar Cycle

R6-016

A Review of Observations of Equatorial Gravity Waves in the Mesosphere and Thermosphere Using an Airglow Imager at Kototabang, Indonesia

Kazuo Shiokawa and Yuichi Otsuka

This paper reviews characteristics of gravity waves in the mesosphere and thermosphere based on measurements by an airglow imager at Kototabang (100.3E, 0.2 S), Indonesia, where the Equatorial Atmosphere Radar is located. Due to high tropospheric convective activities in this region, we observe atmospheric gravity waves in both the mesopause region and in the thermosphere and ionosphere. The propagation of gravity waves in the mesopause region in the OH airglow images are controlled by wind filtering by QBO and by source distribution in the troposphere (Suzuki et al., 2009). The gravity waves in the thermosphere are observed as medium-scale traveling ionospheric disturbances (MSTIDs) in the 630-nm airglow images which show clear southward preference of propagation direction (Shiokawa et al., 2006; 2009; Fukushima et al., 2012). These southward-moving MSTIDs are different from the electrified MSTIDs in the middle latitudes which predominantly move westward and equatorward. Corresponding neutral density variations were also identified by the CHAMP satellite which crossed over the MSTIDs above Kototabang (Moral et al., 2019). Poleward-moving thermospheric gravity waves were also identified associated with the midnight temperature maximum (Fukushima et al., 2017).

R6-017

Continuum Study on Uranus at the Millimeter/Submillimeter Wavelength with ALMA Data

Farahhati Mumtahana[1,2], and Taufiq Hidayat[1]

1: Department of Astronomy, FMIPA, Institut Teknologi Bandung
2: Space Science Center, National Institute of Aeronautics and Space

Uranus is very unique solar system body with its extreme rotational axis, low luminosity, asymmetrical internal magnetic field and magnetosphere, questionable internal structure, a complex system of rings and satellites. Yet unlike the other Solar System planet mission, Uranus is the least understood and least visited planet that was only be attained once by Voyager 2 flyby mission in 1986. However, with the development of observation techniques and instruments both in space and ground, some advanced telescopes presently observe Uranus routinely. Moreover, most of the exoplanets detected so far have similarities with the ice giant type. Atacama Large Millimeter/submillimeter Array (ALMA) radio interferometer is one high-end Instrument that frequently observes Uranus since it is often chosen as a calibrator. With the abundance of ALMA data, this study is aimed to reconstruct the Uranus images and build the Uranus continuum model from the distribution of flux density over several frequencies on ALMA wide-range bands. To achieve these goals, Common Astronomy Software Application (CASA) data processing tool with a Python interface is used. The ALMA data used in this research was Uranus's observational data from 2012-2018 at bands 3, 4, 6, 7, 8, and 9. After careful data selection and calibration, we obtained 110 observational data points. Due to the high angular resolution that can be achieved by ALMA, some well-resolved radio continuum images of Uranus were also obtained. Furthermore, the deconvolution result of the combined 78-point continuum data is sufficiently representative to build the continuum model, showing the higher the frequency the higher the flux density.

Keywords: Uranus, continuum, millimeter/submillimeter, ALMA

R6-018

The Implementation of API Gateway Architecture on Space Weather Information System

Yoga Andrian, Ahmad Zulfiana Utama and Rizal Suryana

Microservices is an architecture that can separate applications become several small applications (service) independent. Each service can communicate to other services using the Application Programming Interface (API). Direct access to the service from the client is not the best approach, this method will increase data traffic if our microservice system grows up with a lot of services. This condition must be avoided because each service basically has a limit on the number of requests and system resources. To overcome this issue, we need an application/server that acts as a gateway between client and service and has a role as middle-ware which is responsible for authentication, rate limiting, caching, transforming, and load balancing. The usage of API Gateway can reduce the level of dependence of service on other services, latencies, and improve the microservices security system. Our proposed system will implement microservices architecture and API Gateway into web development in the Space Science Center environment.

Keywords: Microservices, API Gateway, Information System, Space Weather Data

R6-019

Risk Management of Spaceport in Indonesia: Vurnerability Level of Spaceport Biak

Intan Perwitasari, Stevani

Centre for Aerospace Policy Studies, LAPAN, Jakarta

Indonesia will build and operate a spaceport in Biak Papua. Safety factors become the standard that must be met in the construction and operation of the spaceport later. The operation of the spaceport will depend on several factors including both vehicle / technical technology, location (distance to settlement, population density), and environment. The purpose of this study was to analyze the level of vulnerability and the need for safety standards in the construction of a spaceport in Biak. Data used are primary and secondary data from previous literature. The method used is quantitative and qualitative by using spatial data, overlay, and the AHP method. The results of the study will describe the level of vulnerability and risk management required in the construction and operation of the spaceport.

Keyword: vurnerability, spaceport, GIS, AHP

R6-020

Automatic True Color Composites Generation Based on NOAA JPSS Satellites Data

Karunika Diwyacitta, Andy Indradjad and Budhi Gustiandi

True color composites is an image that shows real color combinations seen by human eyes. In satellite data context, it is generated by combining the visible red, green and blue bands to associated red, green and blue channels of a computer display. True colors products mostly are more preferable for many people since they can easily tell the information contained in it. Vegetations, waters, grounds and lands are widely used information which can be obtained from true colors images. This paper proposes an automation system to generate true colors products from NOAA JPSS series satellite data. The automation system uses an open source module named Community Satellite Processing Package (CSPP) Polar2Grid Version 2.3 as its main processing system. Inputs needed for this system are VIIRS SDR band-I, band-I terrain corrected geolocation and band-M in HDF5 format. The output generated from this system are reprojected true color images in GeoTIFF format. There are five types of modules inside the automated system. Those are a search module, a comparison module, a checking module, a processing module, and a storage allocation module. The system was installed in a server computer in the LAPAN Remote Sensing Data Center. Remote Sensing Ground Station Pekayon receives all SDR data of NOAA JPSS satellites from direct acquisitions done by Remote Sensing Ground Station Parepare. The automation system has been proven to operate successfully and has been included as part of operational activities in LAPAN remote sensing processing facilities. The products have been utilized as base maps in current web-based low-resolution products dissemination system.

R6-021

Utilization of VIIRS Imagery in Analyzing Light Pollution as the Threat towards Bird Performance in the Region of Medan, North Sumatra, Indonesia

Rizki Atthoriq Hidayat, Muhammad Hanif, Giant Amor, and Harizurrahman

Department of Geography, State University of Padang

The decline in biodiversity is strongly influenced by anthropogenic activities, especially land use changes and urbanization that cause ecosystem imbalances, even causing ecological disasters. Population growth causes more massive human activities, both during the day and at night. This study will focus on human activities at night in excessive use of artificial light which causes light pollution which results in the disruption to the birds sleep performance around densely populated areas of human activity. Excessive light causes disturbances in the balance of the surrounding ecosystem, especially the disturbance to the bird performance and beahviour change, so that this causes habitat stress. The focal area in this study is the the region of Medan, North Sumatra Province with the consideration that this province is one of the most populated in Sumatra Island and the region of Medan in the densest in population because situated around metropolitan area, which surely has massive human activities. This study aims to calculate the magnitude of the threat to the bird performance due to light pollution by utilizing the VIIRS Stray Light Corrected Nighttime Day/Night Band Composites Version 1 satellite image which was analyzed with GIS and Remote Sensing devices combined with infrastructure parameters to support the emergence of artificial light. This study found that 65% of the area in The Region of Medan has light pollution with the highest threat in residential areas and highly concentrated in Medan City. This threat has also begun to penetrate the vegetated area (the forest edge) which is the natural habitat of various wild animals. The area that is less disturbed by the threat of light pollution is found in the northwestern part.

Keywords: light pollution, bird performance, ecosystem, population

R6-022

Spatial and Temporal Lightning Analysis in Bali

I Putu Dedy Pratama, Ni Luh Desi Purnami, Pande Komang Gede Arta Negara and Putu Eka Tulistiawan

18 people have been killed by lightning strikes in Bali since 2014, with the most striking locations in rice fields and occurring in the afternoon. Lightning observations in the Bali area have been carried out in real time at the Denpasar Geophysics Station since 2009. This paper aims to determine the temporal and spatial characteristics of lightning events by analyzing the average daily occurrence of lightning per month and analyzing the density of lightning strikes in the Bali area. The data used is cloud to ground (CG) lightning recording data for the Bali region in 2009-2020. From the results of spatial mapping, it shows that the area with the highest density of lightning strikes occurs on the southwest coast of Bali, the Nusa Penida Island cluster, the mountainous area and the island of Bali. Then the average daily lightning occurrence shows that from 2009-2020 the temporal characteristics of lightning produce a semidiurnal graph with two peaks in the after midnight (01.00 LT) and afternoon (14.00 LT). These results indicate that the Bali region has two cloud convection patterns.

R6-023

Sumatera, Indonesia: Development vs Dark Sky from Nightlight Perspective

Alfiah Rizky Diana Putri[1,2], Robiatul Muztaba[1,2], Lesi Mareta[1,3], Mhd. Apri Arami[1,2], Muhammad Rizki Kurniawan[1,2], Adoni Theofilus[1,2], Jaka Pacitro[1,2], Fiqhy Alfath Faza Herzaditya[1,2], Hakim Luthfi Malasan[2,4]

1: Atmospheric and Planetary Sciences, Sumatera Institute of Technology (ITERA)
2: ITERA Astronomical Observatory
3: ITERA Meteorology and Climatology and Geophysics Unit
4: Astronomy Division, Institut Teknologi Bandung

Sumatera is the second largest island of Indonesia in terms of its population. With Java's overpopulation and overcapacity, more and more development is carried out targeting Sumatera. In this research we analyze nightlights from both cloud-free composite VIIRS-DNB data and deep convolutional neural network super resolution data on the period of 2012-2020 using Python and QGIS. Furthermore, we analyze this development and its consequences on the decrease of green areas, which simultaneously means shrinkage of dark sky viewing areas. This has to be controlled, because currently Sumatera has 97.6 percent of areas with low light pollution (defined as radiance of less than 3 nW/m^2*sr), even near to large cities, opening up possibilities of accessible dark sky parks. With controlled development (signed by NLDI, Nightlight Development Index), these dark sky parks and nearby areas can be maintained and remain protected. This is an ongoing work. From our current result, we have found that Sumatera's area of development has been growing at about 163% (based on increase of high light pollution area) with average increase of 0.04 nW/m^2*sr per year and a decrease of 0.2% of areas with low light pollution per year, with an upwards trajectory. We also have mapped dark sky park candidates on 10 provinces to provide supervision in autonomous province-level according to criteria such as radiance, radiance changes, closeness to tourism attraction, and closeness to capital or big cities.

Keywords: development, dark sky, nightlight, NLDI.

Invited Speech (Room 7)

Indonesian Radio Telescope and its Application in Radio Astronomy

Peberlin Sitompul, Timbul Manik, Mario Batubara,
Musthofa Lathif, and Farrahati Mumtahana

BRIN - ORPA

Facilities for space research in Indonesia, particularly in the fields of astronomy and astrophysics is very important. Now, BRIN-LAPAN is developing a new National Observatory in Indonesia with many instruments such as Optic Telescope and Radio Telescope. The radio telescopes in Indonesia will provide many benefits such as capacity building in Technology, in Science of Astronomy, Geodesy, Atmospheric, skill to construct Radio Telescope, design of data processing and experiences in collaboration with international researchers. Currently, an optic telescope with a 3.8 m is being developed in Mount of Timau, Kupang, East Nusa Tenggara Indonesia since 2017, which is expected to be completed by the end of 2021. In addition to optical telescope, the studies and conceptual designs of radio telescope are being carried out on a frequency of around 1-50 GHz and 80-350 MHz. The steps of this project are divided to many years: in year 2021 of the study and design the radio telescope concept, in year 2022 for budget planning, and in the period of year 2023 of starting of the developing the radio telescope. The first steps in plan is to develop a 20m class parabolic radio telescope and in multi wavelength frequencies in the range of 1-50 GHz with preference in L, C, K, Q bands.

Keywords: Radio Telescope, National Observatory, Space Science, Astronomy, multi-wavelength

R7-001

A Software Improvement Method for Radiosonde Platinum Sensor

Rachmat Sunarya, Asif Awaludin, and Wendi Harjupa

Center for Atmospheric Science and Technologi, LAPAN

Platinum sensor is well known to have finest accuracy in measuring temperature. A Pt100 sensor is employed in a balloon-borne radiosonde to obtain vertical distribution of temperature. The main issue in Pt100 sensor measurement is the nonlinear relationship between resistance and temperature. In this paper, the sufficient piecewise sections and the order of polynomial calibration equations were investigated. Systematic errors emerged when the inverse Callendar-Van Dusen equation was applied to obtain the relationship between temperature and resistance for PT-100 data. To tackle this problem, two piecewise equations in two temperature ranges are adopted to notably improve the accuracy of these calibration equations. A dataset of the resistance of PT-100 sensors in the range from -70 °C to 30 °C were measured. The sensor was launched together with Radiosonde RS41 using a meteorological balloon to provide measured standard temperature data for calibration process. The dataset was used to develop sufficient calibration equations with regression analysis.

Keywords: Platinum sensor, radiosonde, piecewise calibration equation, regression analysis

R7-002

Performance Analysis of Platinum Wire Temperature Sensor for Radiosonde

Soni Aulia Rahayu, Rachmat Sunarya, Edy Maryadi, Listi Restu Triani and Christine Cecylia Munthe

Center for Atmospheric Science and Technology, LAPAN

In this era, the observation of atmospheric parameters is indispensable for a certain area both vertically and horizontally. Vertical observation of atmospheric parameters can be done using a radiosonde. Radiosonde has many functions such as help provide weather information inflight and studying vertical atmospheric conditions in the region of Indonesia. One of the sensors carried by the radiosonde is a temperature sensor. So far, radiosonde sensors depend on imports from abroad. This research will focus on the design of a platinum wire-based temperature sensor. In this research, platinum wire with a diameter of 0.025 mm, a resistance of 99.99% or ± 10 Ω was used. The platinum wire was wound to a zero Ohm resistor with the number of turns according to the required specifications. After going through laboratory testing, a platinum wire-based temperature sensor is subjected to field testing using a reference radiosonde per the provisions of the World Meteorological Organization (WMO). The results obtained show that the response time of the platinum sensor can follow the reference data. The correlation value obtained is 0.99 for temperature measurements from +27°C to -83.7 °C.

Keywords: vertical atmosphere, radiosonde, temperature sensor, platinum wire

R7-003

A Low-Cost and Practical Method for Determining Raindrop Size from Spray Nozzle by Using a Mobile Phone Camera

Jesi Pebralia[1] and Iful Amri[2]

1: Department of Physics, Faculty of Sciences and Technology, Jambi University, Indonesia
2: Department of Electronics Engineering, Politeknik Jambi, Indonesia

This study proposed a new method to determine raindrop size from the spray nozzle. The technique is a combination of flour method and digital image processing. This method consists of a mobile phone camera used to make a digital image, a ruler used to create a scale on the digital image, and graphic design software used to organize the digital image, as well as an image processing software to determine the raindrop size. If this method is compared to the previous process, this method is very practical because our mobile could be implemented here so that it will save the time. In addition, it will make the experiment cost to be relatively inexpensive. Also, the accuracy of measurement obtained is high. Moreover, this method will be an alternating method to solve the disadvantage of the previous method. By implementing this method, the droplet which has a diameter below 0.5 mm can be measured. Thus, this technique may be much useful for researchers to ascertain a quantitative relationship between the drop size distribution and other variable from the rain water or the spray nozzle.

Keywords: droplet, low-cost and practical method, mobile phone camera, raindrop size, spray nozzle

R7-004

Study on Adaptive Clutter Rejection System Using External Receiving Antennas for the MU Radar

Ryo Yabuki, Hiroyuki Hashiguchi, Issei Terada, and Mamoru Yamamoto

Research Institute for Sustainable Humanosphere (RISH), Kyoto University, Japan

Strong clutter echoes from a hard target such as a mountain or building sometimes cause problems of observations with atmospheric radars. In order to reject or suppress ground clutter echoes, it is effective to use NC-DCMP (Norm Constrained-Directionally Constrained Minimum Power) method, which makes null toward the direction of the clutter, if we can receive signals independently from plural antennas [Nishimura et al., JTech., 2012]. It has been demonstrated that the NC-DCMP method is effective to real observation data with the MU (Middle and Upper atmosphere) radar [Hashiguchi et al., Radio Sci., 2018]. Although NC-DCMP method suppresses clutter echoes with almost maintaining the shape of main lobe to add pseudo-noise compared with the conventional DCMP method, the signal-to-noise ratio (S/N) of atmospheric echoes is somewhat degraded. We studied the clutter suppression method with little S/N degradation by using external antennas. Four turnstile antennas are installed in the MU radar site. We compared the NC-DCMP method using the each received data of 25 channels, which is a conventional clutter suppression method, and the NC-DCMP method using the simple combination of 25 channels and 4 channels of external antennas. In the former case, the S/N of the atmospheric echoes is somewhat degraded, but in the latter case, so the S/N degradation is not observed. In the latter case, the clutter suppression is sometimes insufficient. This cause is considered to be that the range shift happens between external antennas and main antennas because of the clutter direction. We handled each external antenna as virtual antennas whose data are shifted with some patterns to match the range shift. As a result, we suppress clutter echoes sufficiently. We can apply the achievement of this study to the Equatorial Atmosphere Radar (EAR), which is a VHF-band active phase-array radar located at West Sumatera, Indonesia.

R7-005

Revising the Models used to Estimate TKE Dissipation Rates from UHF and VHF Radar Measurements

Hubert Luce, Hiroyuki Hashiguchi, Lakshmi Kantha, Abhiram Doddi,
Dale Lawrence and Masanori Yabuki

Accurate measurement of the turbulence kinetic energy dissipation rate (TKE) is important for characterizing atmospheric turbulence and for predicting pollutant dispersion and some larger-scale processes, for example. For a very long time, analytical models have been proposed to retrieve this parameter from the width of UHF and VHF Doppler radar spectra. These models were recently assessed from comparisons with Unmanned Aerial Vehicles (UAV) data collected during Shigaraki-UAV-Radar EXperiment (ShUREX) campaigns (2016-2017) at Shigaraki MU observatory. Unexpectedly, the commonly used models applied to the MU (VHF) radar and the LQ7 (UHF) radar were found to be flawed and a simple model based on dimensional analysis provided the best agreements with UAV-derived dissipation rates. However, this simple model reveals contradictions and its applicability must be understood. The problems seem to be solved, at least qualitatively, by new theoretical derivations inspired by Basu and Holtslag (BLM, 2021) and based on energy budget equations. In particular, even if other problems are raised by these derivations, they lead to a generalized expression permitting us to identify the domain of applicability of the model commonly used for turbulence in stratified conditions.

R7-006

The Inversion Algorithm of Atmospheric Radar Signal Given by a 3-Dimentional Volume Scattering Semi-Physical Simulation

Ryosuke Tamura, Koji Nishimura and Hiroyuki Hashiguchi

To estimate the accurate 3-dimensional wind velocity and its dispersion by an atmospheric radar, a brand new radar equation is proposed as it called Spectral Observation Theory (SOT). (Nishimura et al, 2020). In this equation, the correlation function (CF) of the received signal is equal to the multiplication of scattering CF, two-way beam pattern CF and window CF, and those CFs are determined by wind velocity, its dispersion, and sampling temporal lag in order. This implies we can estimate those parameters by the inversion i.e. radar inversion (RI) based on SOT. In this study, we verify the accuracy of RI by a 3-dimensional volume scattering semi-physical simulation. As a result, it is shown that RI can precisely estimate wind velocity, its dispersion.

R7-007

Satellite Rainfall Estimation from Himawari-8 Multi Channels Observation Using Random Forest Algorithm

Farid Lasmono, Risyanto, Fadli Nauval, Elfira Saufina, Teguh Harjana, and Trismidianto

Center for Atmospheric Science and Technology, LAPAN

Rainfall estimation from geostationary satellite has advantage on its relatively high temporal resolution, therefore the data can be utilized for supporting the early warning systems of hydrometeorological disasters. The estimation from infrared channels of geo-satellite, however, usually lack of accuracies due to their indirect relationship with rain and only detects the top properties of clouds. This study implemented one of the most popular machine learning algorithms i.e., random forest (RF) to estimate the rainfall using the multi channels data from Himawari-8 satellite at several locations in Indonesia. We differentiated daytime and nighttime algorithms based on whether the visible channels observations were included. The use of the brightness temperature (BT) of infrared channels and their difference (BTD) were also examined. To provide reference labels of data training, ground-based rainfall measurements from several stations were used including Agam, Bandung, Sumedang, Garut, Pontianak, and Pasuruan station. In general, RF algorithm could provide acceptable accuracy in estimating rainfall from Himawari-8 with the score of accuracy of 69.7% (POD = 0.73; FAR = 0.35). The "false alarm" appears when the actual rainfalls are generated from warm type clouds which have warmer brightness temperature of IR than the typical convective clouds. Daytime rainfall retrieval has a slightly better result compared to the nighttime retrieval, the difference was ~1.5%, since daytime has more numbers of independent variables from the albedo of the visible channels. Amongst all of the infrared channels and BTDs used, the most significant contribution was coming from BT(10.45) μm, followed by BTD(10.45-8.6) μm, and the water vapor channel, BT(6.25) μm. The ML-based satellite rainfall estimation, in which the data are trained by the collocated point rainfall observation, has limitation because of the large satellite spatial scale. The local-type precipitations occurred at the station are unable to be well detected by the satellite instruments.

Keywords: machine learning, rainfall estimation, Himawari-8, random forest

R7-009

Machine Learning Models for Daily Maximum Water Level Prediction of Tidal-Riverine Water: A Case Study of Kapuas Kecil River in Borneo Island

Joko Sampurno, Valentin Vallaeys, Randy Ardianto and Emmanuel Hanert

In a tidal river, the water level modeling is an essential part of compound inundation mitigation. The modeling could be applied to help coastal communities to understand their inundation risk and to take adequate measures. Machine learning models are a potential candidate for water level modeling because they can capture and represent complex input and output relationships of natural phenomena using only historical data. Therefore, this study aims to evaluate the machine-learning algorithms capable of predicting the daily maximum water level of the Kapuas Kecil River. Then we selected the most suitable model to mitigate the future flood risk in the city of Pontianak. Different machine learning models, namely: Multi-Linear Regression, Random Forest, Neural Network, and Support Vector Machine, have been evaluated. The result shows a ranking of the features with the most decisive influence. Then, it proposes the Support Vector Machine with the linear kernel function as the most suitable algorithm to predict the future daily flood risk in the city.

R7-010

Classification of Precipitation Types from Micro Rain Radar Observation Using Artificial Neural Network

Bunga Aprilia, Marzuki, Imam Taufiq and Findy Renggono

Classification of convective and stratiform rain is important in weather and climate studies because each type of rain has different physical characteristics. Therefore, a method for classifying rain continues to be developed by many investigators to obtain an accurate, effective, and simple approach. This study examined the performance of Artificial Neural Network (ANN)-backpropagation to classify rain types from observations of Micro Rain Radar (MRR) observations in Serpong (6.359ºSL; 106.673ºEL). The inputs of ANN are radar reflectivity, Doppler speed, and Liquid Water Content (LWC). Rain events on January 5, 2017, at 16.28 – 21.21 local time were used as training data. The ANN results were validated with rains classified by the Bright Band (BB) method. The most appropriate ANN-backpropagation architecture is the 3-6-1 architecture (input layer-hidden layer-output layer), with an activation-transfer function being competitive and a learning rate of 0.9. The Mean Square Error (MSE) of the training step was 0.0098735, and the average percentage of accuracy for the test step was 94%. A rain event with a single type throughout the rain can be classified accurately by ANN. Thus, the ANN can be a solution to the shortcomings of the BB method, which sometimes classification result of a single type rain event is inter-spersed with another type, which is physically impossible.

R7-011

Rain Prediction Using Convolutional Neural Network (CNN) Method Based on Digital Image

Alya Syifa Ihsani[1], Anggunmeka Luhur Prasasti[1], and Wendi Harjupa[2]

1: Computer Engineering, Electrical Engineering Faculty, Telkom University, Indonesia
2: Center for Atmospheric Science and Technology,
Indonesian National Institute of Aeronautics and Space, Indonesia

Hydrometeorological disasters such as floods and landslides are natural disasters caused by heavy rain. These natural disasters often occur in Indonesia, not only causing material losses, but natural disasters also often take lives. To reduce the impact of natural disasters, it is necessary to predict rain which is one of the factors in natural disasters and any other needs. Rain prediction was developed using numerical models cannot predict rain accurately. Because of this reason, the rain prediction system was developed using the Convolution Neural Network (CNN) method in this research. Thousands of cloud images from Bogor sky were used for the training process. It consists of two categories, cloudy images and rain images, to build predictive models. The simulation process is carried out by inputting a cloud image through several processes such as preprocessing, feature extraction, and learning process, so this system can predict the rain in the next hour. The accuracy of this system can reach up to 75% which better than previous research, a decision support system for predicting rainfall using the Adaptive Neuro-Fuzzy Inference System (ANFIS) method with parameters such as air temperature, relative humidity and air pressure. The model that has been built can strengthen the existing rain models and provide more accurate information about the occurrence of hydrometeorological disasters.

Keywords: Hydrometeorological disaster, Prediction, Cloud imagery, Image Processing, Convolutional Neural Network (CNN)

R7-012

Artificial Neural Network Based Prediction of PM2.5 Mass Concentration in Bandung Metropolitan

Inggrid Wahyu Kinanti[1], Ade Romadhony[2], and Indra Chandra[1]

1: Engineering Physics, School of Electrical Engineering, Telkom University, Indonesia
2: Informatics, School of Informatics, Telkom University, Indonesia

Increased levels of fine particulates (PM2.5) concentrations in the air are in line with economic growth and human activities. PM2.5 mass concentrations can be influenced by emission sources as well as meteorological parameters, such as temperature, relative humidity, pressure, rainfall, and wind speed/direction. We deployed the air quality monitoring system based on microsensors at the Tokong Nanas (GKU) and Deli Building, Telkom University, Bandung Metropolitan. Several methods were used to predict those concentrations. Not all of the meteorological parameters have shown significant results for PM2.5 forecasting, with an average root mean square error (RMSE) value is 27 $\mu g/m^3$. In this study, optimization of the PM2.5 mass concentration forecasting system has been built using the Artificial Neural Network Backpropagation method. Meteorological parameters used were only those that had significant properties on PM2.5 concentration, namely rainfall intensity, relative humidity, and wind speed. The best network model obtained for the forecasting system has an architecture of 4-9-12-9-1 with a learning rate value of 0.2 for the GKU network model and 4-50-9-9-1 for the Deli Building (0.3). The RMSE and mean absolute percentage error (MAPE) performances produced by the best GKU and DELI network models were 8 $\mu g/m^3$ and 37%, and 13 $\mu g/m^3$ and 15%. Further analysis is needed to examine polluted air behaviors and to address the air quality problem in Bandung Metropolitan in the future.

Keywords: Air quality, artificial neural network, forecasting, microsensors, PM2.5

R7-013

Interpolation Methods Evaluation on Arbitrary Straight Line Flight Weather Data

Aisya Nafiisyanti

Indonesian National Institutes of Space and Aeronautic

The JATAYU Decision Support System (DSS) for air transportation safety implements feature that displays data along the flight path (currently the flight path is a straight line from departure to arrival airport's coordinates). To obtain the data, interpolation method is used to provide more detailed information. There are two interpolation methods tested in this study, namely bilinear/cubic interpolation and nearest-neighbour interpolation. The current resolution used in the decision support system is 5 km, while the produced interpolation data should ideally have a higher resolution. Data with 2.5 km and 1 km resolution are generated to act as comparison data. The case study areas are the islands of Java, Bali, and Nusa Tenggara. Based on the test results using Mean Absolute Percentage Error and Root Mean Squared Error, both methods show good performance with error rate below 7%. However, bilinear/cubic interpolation gives better results than nearest-neighbour interpolation. The average error generated by the first method is 3.964% lower than the second method.

Keywords: Interpolation, Bilinear, Cubic, Nearest-neighbour, Error

R7-014

Improvement in WRF Model Prediction for Heavy Rain Events over North Sumatra Region Using Satellite Data Assimilation

Immanuel Jhonson Arizona Saragih

Located adjacent to the Indian Ocean and the Malacca Strait as a source of water vapour, and traversed by the Barisan Mountains which raise the air orographically causing high diurnal convective activity over the North Sumatra region. The convective system that was formed can cause heavy rainfall over a large area. Weather Research and Forecasting (WRF) was a numerical weather model used to make objective weather forecasts. To improve the weather forecasts accuracy, especially for predict heavy rain events, needed to improve the output of the WRF model by the assimilation technique to correct the initial data. This research was conducted to compare the output of the WRF model with- and without assimilation on 17 June 2020 and 14 September 2020. Assimilation was carried out using the 3D-Var technique and warm starts mode on three assimilation schemes, i.e. DA-AMSU which used AMSU-A satellite data, DA-MHS which used MHS satellite data, and DA-BOTH which used both AMSU-A and MHS satellite data. Model output verification was carried out using the observational data (AWS, AAWS, and ARG) and GPM-IMERG data. The results showed that the satellite data assimilation corrects the WRF model initial data, so as increasing the accuracy of rainfall predictions. The DA-BOTH scheme provided the best improvement with a final weighted performance score of 0.64.

Keywords: water vapour, diurnal convective activity, forecasts, rain

R7-016

Analysis of Spatial Comparation between Predicted Rainfall Based on Dynamic Model and Satellite

Haries Satyawardhana, Erma Yulihastin, Gammamerdianti Gammamerdianti, Candra Nur Ihsan and Eka Putri Wulandari

The Indonesia Maritime Continent (90-150E, 12S-12N), so-called IMC, consists complex of sea-land composition with the rainfall seasonal characteristics determined by the Asian-Australian monsoon system. As the result, the seasonal rainfall has high variability in both time and spatial scales. Importantly, despite it more difficult to predict, the seasonal prediction is needed to support the agriculture sector which has the main impact on the Indonesian economy. This study used a regional climate model of the Conformal Cubic Atmospheric Model (CCAM), with a spatial resolution of 32 km and a daily temporal resolution also records spanning from 2016 to 2017 for simulation of the dry and wet seasons period. The seasonal prediction examined in initial and boundary conditions from The Global Forecast System (GFS) data and 11 predictive sea surface temperature (SST) data from The Predictive Ocean Atmosphere Model for Australia (POAMA) with the IMC domain, then the rainfall reconstruction is carried out based on the maximum correlation of members (11 result of seasonal prediction) with satellite rainfall. The results show that the predicted rainfall for the next 8 months with the current updated predictive SST is well-quantitatively captured compare to the GSMaP satellite rainfall data. Additionally, the spatial correlation between model-simulated and satellite data exhibits high variability in spatial and appears clearly different between the northern and southern parts of IMC.

R7-017

Weather Prediction System Using Thomas-Fiering Model to Determine Initial Planting Recommendations in West Java Province

Candra Nur Ihsan[1] and Nova Agustina[2]

1: Center of Atmospheric Science and Technolgy, National Institute of Aeronautics and Space
2: Department of Informatics, Sekolah Tinggi Teknologi Bandung

West Java Province is one of the provinces in the center of agricultural production in Indonesia. The phenomenon that has occurred in recent years is that thousands of hectares in West Java Province have experienced crop failures, one of the factors is erratic climate change. The major impacts of climate change need to be minimized, one of which is to make weather predictions to recommend early planting. In this study, researchers made weather predictions consisting of Temperature, Humidity and Rainfall using the Thomas-Fiering model to determine the start of planting in 2022. The evaluation was carried out using the homogeneity test, namely the T test to compare two different population samples, namely the training data population and the prediction data. As a result, both data have the same variance (homogeneous). After the weather prediction data is obtained, the initial planting recommendations can be applied based on the criteria for Temperature, Humidity, Rainfall, and length of time for planting. The results of the initial planting recommendations were successfully visualized in the form of a Planting Calendar.

Keywords: Prediction, Climate, Weather, Thomas-Fiering, Planting Recommendations

R7-018

Prediction of Extreme Rainfall in Padang City Based on Clouds Brightness Temperature Difference from Himawari-8 Satellite Data

Nining Jumianti[1], Marzuki[1], Wendi Harjupa[2], Risyanto[2], and M. F. Putranto[2]

1: Department of Physics, Faculty of Mathematics and Natural Science, Universitas Andalas, Indonesia
2: The Center for Atmospheric Science and Technology, LAPAN, Indonesia

Padang city has an equatorial rain pattern with high convective cloud activity. This causes extreme rain, namely rain with very heavy intensity, which can impact human life in the form of material losses and loss of life. Himawari-8 Satellite observation allows detecting cloud growth causing extreme rain faster than using radar or surface rain observations. This study observed the extreme rain phenomenon in Padang on September 9, 2020, using the Himawari-8 satellite data. This rain was very heavy, with rainfall intensity above 100 mm/day, which caused floods and landslides in some areas in the city. Convective clouds that cause extreme rain are detected using brightness temperature data from the IR1 channel. The brightness temperature difference method is used to provide complete information about cloud particle types. Himawari-8 satellite data can show convective clouds with cloud top temperatures experiencing significant changes, with the lowest cloud top temperatures reaching 200K. In addition, clouds with strong updrafts were also obtained, as well as ice particles in these clouds. The use of the brightness temperature difference value can provide a clear picture of convective clouds so that observations of clouds that produce extreme rain on September 9, 2020, are well observed.

Keywords: Brightness temperature difference, Convective clouds, Extreme rain, Himawari-8, Padang

R7-019

Indo-Autralian Plate Velocity Measurement during Interseismic Phase in 2011-2012 Using Sumatran GPS Array (SuGAr) Data

Vira Friska, Deasy Arisa, Marzuki and Fadilla Monica

The movement of the Indo-Australian Oceanic Plate towards the Eurasian Continental Plate in the western part of Sumatra Island causes the formation of a subduction zone. As a consequence, this area has a high potential for earthquakes. The magnitude of earthquake depends on the energy accumulation in interseismic period. Global Positioning System (GPS) is one of satellite geodetic approach used to measure the speed of plate movement. This study aims to determine the plate velocity and direction of movement at the stable/interseismic phase during 2011-2012, using Sumatran GPS Array (SuGAr) data. RINEX data from GPS was processed using GAMIT/GLOBK software. Eight SuGAr observation stations spread across the west coast of Sumatra Island were used. The result shows that MLKN, NGNG, PTLO, and BTHL stations moved northeastward at the average horizontal speed of 41.83 mm/year. The direction of this movement is consistent with the direction of subduction of the Indo-Australian Plate.

R7-020

Deformation Analysis during the Pre-, Co- and Post-Seismic Phase Associated with the 2019 Mw6.0 Mentawai Earthquake Using Satellite Geodetic Technology from Sumatran GPS Array (SuGAr) Data

Fadilla Monica, Deasy Arisa, Marzuki and Vira Friska

Subduction activity near Sumatra Island has frequently generated earthquakes, making this region an active tectonic area in the world. As one of the disaster mitigation actions in earthquake zone societies, geodynamic analysis is needed to model an earthquake probability. The geodynamic study is easier to complete with a new Global Positioning System (GPS) technology. By using the continued GPS method, it can analyze a deformation at the earthquake phases, the silent/stable period with no earthquake occurrence (pre-seismic), the period after the earthquake (post-seismic), and the period during the earthquake rupture (co-seismic). This work conducted deformation analyzes of pre-seismic co-, and post-seismic associated with the Mw 6.0 Mentawai earthquake using Sumatran Global Positioning System Array (SuGAr) data. The earthquake occurred on February 2, 2019, through a thrust fault mechanism. SuGAr data were processed using GAMIT/GOLBK 10.71 software. Several stations around the earthquake's epicenter were used, i.e., SMGY, SLBU, TRTK, KTET, LNNG, MKMK, LAIS, and MLKN. During the pre-seismic phase, the deformation vector is about 0.48 to 0.90 cm northeastward, which is the same direction as that of subduction of the Indo-Australian plate towards Eurasia. The largest deformation vector in the co-seismic phase is 2.53 cm southwestward was observed at the SMGY station. The vector of deformation in the post-seismic phase was 1.6 cm – 1.8 cm to the southwest and indicating that there is still a release of earthquake energy in this phase so that this post-seismic phase still lasts for 30 days.

R7-021

Determining the Deformation Trend from Geodetic Measurement of the Indian Ocean Intraslab Earthquakes: As Obtained from the Sumatran GPS Array (SuGAr) Data

Sri Hamdiyessi, Fery Kurnia Sandi, Rihadatul Aisy Syofyani Nasution, Fadilla Monica, Deasy Arisa, Marzuki and Elistia Liza Namigo

Indonesia is located at the boundaries of 3 major tectonic plates, and Sumatra sits atop the subduction of the Indo-Australian plate beneath the Eurasian plate. Sumatra has been affected by numbers of small to large scale of Megathrust earthquakes, strike-slip fault earthquakes at the Sumatran faults, and later found to have been affected by the intraslab earthquake at the Indian Ocean. The Mw8.6 2012 Indian Ocean earthquake is one of the largest earthquakes that occurred close to the eastern edges of Indian Ocean. It indicated the complexity in the rupture pattern, at the area of the plate compression in the north and south of the central Indian basin, where the deformation is manifested as deformation around the basin. The dynamics of the west coast of Sumatra was observed before, during and after the earthquake using GPS data, known as the Sumatran GPS Array (SuGAr) which is widely distributed in Sumatra. Data was processed using GAMIT/GLOBK software to obtain the deformation in the pre-seismic, co-seismic and post-seismic phase. Eight SuGAr stations (SDKL, PTLO, PBLI, LEWK, HNKO, BTHL, BSIM, and BITI) showed similar southwestward trend of movement before the earthquake, which suddenly shifted toward the northeast direction with significant scale, and soon returned to its preseismic trend of southwestward movement after the earthquake (post-seismic phase). Four southernmost stations (BTET, NGNG, MSAI and MLKN) showed southeastward movement before the earthquake and significantly shifted toward the northwest direction during the rupture. These four stations also showed quick recovery to its initial (preseismic) trend during its earliest postseismic period.

R7-022

2D and 3D Subsurface Model of Baribis Fault Zone in West Java

Muhammad Hanif and Lina Handayani

The Baribis fault is one of active fault which has great hazard potential situated in highly populated region of West Java, Indonesia. However, the spatial manifestation and subsurface geometry remains unclear due to several factors. The gravity method is powerful in illuminating the subsurface structure on high to shallow depth from various sources such as active fault. Terrestrial gravity survey were conducted on hundreds points around the Bandung to Pamanukan region covering the probable Baribis active fault line in the Subang-Purwakarta segment to generate complete Bouguer anomaly (CBA) map and subsurface model. The results were examined by several subsurface model in the corresponding region using multiple geophysical approaches from published literature and satellite imagery. The resulting 2D and 3D model of Baribis active fault zone evaluated by several a priori published data revealed information such as subsurface rock density distribution and area prone to surface rupture and earthquake wave amplification. This study would suggest the environmental sustainability strategy especially in hazard mitigation.

R7-023

Palu Koro Fault Zone Subsurface Model from Microtremor Method and Its Relation to Potential Hazard

Muhammad Hanif, Adrin Tohari and Dadan Dani Wardhana

The Palu Koro fault is one of the most active geological structure in Indonesia. The 7.4 Mw earthquake that occurred on September 28, 2018 in Palu City, Donggala Regency and Sigi Regency, was followed by the effects of liquefaction phenomena in the form of flow failure, ground oscillation, lateral spreading and ground settlement resulting in fatalities and major building damage. Previous study revealed that the local subsurface structure on Palu basin play an important role on the liquefaction factor. Therefore, we ran 50 microtremor measurements around Palu to anticipate the upcoming hazard prone area. Multichannel analysis for surface wave (MASW) and single station microtremor survey were conducted to know the shear wave velocity (Vs) of the soil layer to bedrock. The resulting predominant period and seismic vulnerability map were cross validated with several subsurface model and collapsed building map by satellite imagery. The study suggested some areas that should be paid attention especially for construction planning.

R7-024

Utilizing the Global Positioning System (GPS) Data from Sumatran GPS Array (SuGAr) to Measure Seismic Deformation Related to the Mw7.6 Padang Earthquake 2009

Galang P. Refindo, Nabilla F. Syafitri, Tsany N. A. Yenuar, Muhammad Hamidi, Deasy Arisa, Marzuki and Elistia L. Namigo

The Sumatran GPS Array (SuGAr) which is widely distributed in Sumatra has provided the possibility to measure various mechanisms of plate deformations. This study aims to analyze deformation in the preseismic, co-seismic, and post-seismic phase related to the occurrence of the Mw7.6 Padang earthquake, 30 September 2009. GPS data is used to understand the deformation at several areas with various distances from the epicenter. Ten SuGAr data in RINEX format is processed using GAMIT/GLOBK software to obtain three-dimensional daily position data. The value of postfit nrms < 0.25, Wide Lane fixed > 90%, and Narrow Lane fixed > 85% confirmed the good processing procedures and the good ability to correct and eliminate errors due to ambiguity. This study confirmed stable rate of plate movement before the earthquake, followed by sudden change at the coseismic phase, where the GPS stations ABGS, KTET, LNNG, MSAI, PKRT, PPNJ, TIKU, and TLLU showed significant jumps. GPS stations in the Mentawai Backthrust zone (KTET, MSAI, PKR, PPNJ, TLLU) showed the 3 to 13 mm southwestward movement at the coseismic phase, and the GPS stations in the west coast of Sumatra (ABGS, LONG, TIKU) have been moved 9-15 mm to southeastward (ABGS), and northwestward (LNNG and TIKU). The results also show that the size of the deformation due to the earthquake has a negative correlation with the distance of the earthquake epicenter. The result also shows that the plate movement returns to its pre-seismic stable rate immediately after the earthquake.

R7-025

Dynamics of West Coast of Sumatra and Island Arc Mentawai during the Coseismic Phase of the Mentawai Mw7.8 25 October 2010 Earthquake

Herizon Primadona, Ravidho Ramadhan, Reza Ananda Ramadhan, Vira Friska, Deasy Arisa, Marzuki and Elistia Liza Namigo

Sumatra is located at the top of Sunda Megathrust, a large subduction zone where Eurasian continental plate subducts beneath the Indo-Australian ocean plate. This mechanism provide a high potential of small to large scale earthquake and numbers of following hazard. On October 25, 2010, a Mw7.8 earthquake near Mentawai occurred and followed by a tsunami. The dynamics of Mentawai Islands and West Coast of Sumatra was observed before, during and after the rupture using the Global Positioning System (GPS) technology, widely known as the Sumatran GPS Array (SuGAr) network. RINEX data from several SuGAr's stations in Mentawai (BSAT, SLBU, PRKB, SMGY, KTET, PPNJ) and West Coast of Sumatra (LNNG, MKMK, LAIS, MNNA) was processed using GAMIT/GLOBK software to obtain the coseismic deformation data. In the preseismic phase (30 days before the earthquake) no anomalies were found that could be used as precursors for the earthquake. The largest deformation was observed at the BSAT station in Bulasat, Mentawai as a 28.36 cm southwestward coseismic jump and the coseismic jump at the stations in the Sumatra (LNNG, MKMK, LAIS, MNNA) was below 3 cm toward the same direction. During the 30 days after the earthquake the plate relaxation at the postseismic phase was observed and seems to require some period of times to recover to its normal deformation trend. This shifted postseismic trend is indicated by change in the direction of plate movement compared to the preseismic trend.

R7-026

Flood Analysis in East Sumba Regency through Synthetic Aperture Radar Data with Geo-Artificial Intelligence (Geo AI) Applications Based on Cloud Computing

Andini Dwi Khairunnisa Daulay, Sachi Emelin Carissa, and Tia Sella Isnaini

Department of Geography, Faculty of Mathematics and Natural Sciences,
University of Indonesia

East Sumba Regency is between 9°16–10°20 South Latitude and 119°45 – 120°52 East Longitude. East Sumba Regency is also one of the flood-affected areas due to the Seroja Tropical Cyclone phenomenon in April 2021. Flood-affected areas can be analyzed by applying Geospatial Artificial Intelligence (GeoAI). GeoAI combines spatial and environmental science methods, such as AI, computing, data mining, and GIS for data extraction. The data used is Synthetic Aperture Radar (SAR) which is applied to create or reconstruct two-dimensional images or three-dimensional objects, such as landscapes. The analysis using SAR data in Sentinel-1 images and MODIS Land Cover Type Yearly Global with a resolution of 500 meters and JRC Global Surface Water Mapping Layers version 1.3. Sentinel-1 imagery is a medium for detecting and identifying flooded areas by calculating the difference in the value of the microwave backscatter from objects on the earth's surface. The results of the analysis of the inundated area will be overlaid with additional data to produce information related to the estimated flood area, the number of populations exposed to flooding, and agricultural land affected by flooding. Thus, the use of Geo AI for the analysis of flood-affected areas expected to be a solution to environmental problems in East Sumba Regency, Indonesia.

Keywords: East Sumba Regency, Floods, GeoAI, Environmental Science, Synthetic Aperture Radar

生存圏アジアリサーチノード活動報告

Humanosphere Asia Research Node Activity Report

ARN 2021

発　行　日　　令和４年２月吉日

編集兼発行者　　京都大学　生存圏研究所
京都府宇治市五ヶ庄

印　刷　所　　株式会社　田中プリント
京都市下京区松原通麩屋町東入


RISH