生存圏アジアリサーチノード活動報告

Humanosphere Asia Research Node Activity Report

ARN 2023

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

Table of Contents

Preface

Director of RISH
Mamoru Yamamoto

The environment surrounding humans is rapidly changing with complicated interlinkages, threatening sustainable development and healthy living. There has been an increasing demand for reliable future projections based on an accurate understanding of current conditions of Humanosphere, and for the presentation of measures for solving the problems. To establish the Sustainable Humanosphere, international collaboration and expansion of Humanosphere Science on a global scale is important.

In 2016, Research Institute for Sustainable Humanosphere (RISH) launched a 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. ARN integrates our various facilities and human networks in ASEAN region and Japan for consolidating the international collaborative research on “Sustainable Humanosphere”. We have held 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), the 5th one as ONLINE event due to the unfolding coronavirus (COVID-19) outbreak and travel restrictions, and the 6th one as a joint online program of “LAPAN-Kyoto University International Symposium for Equatorial Atmosphere“. Last year, the 7th symposium was held online with the Indonesian Research and Innovation Agency (BRIN) with the aim of understanding the current status of both countries in scientific activities to achieve sustainable society.

ARN serves as a hub connecting the ASEAN-Japan research network through its joint laboratory in BRIN, Indonesia, as well as an opportunity for various research institutes of Japan to access ARN’s overseas research facilities. This year, Kyoto University ASEAN Center, in collaboration with HAKU (the alumni association of former international students from Southeast Asia), will co-host the 18th Southeast Asia Network Forum (18th SEA) with the 2nd International Conference on Environment and Sustainable Development (2nd ICESD) to be held at Hasanuddin University in Makassar,

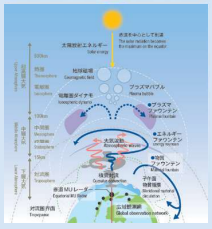
Indonesia, on October 28 and 29. The 8th ARN Symposium, also jointly organized with the 2nd ICESD, will be held on October 29 at Hasanuddin University, coinciding with the 18th SEA, to further strengthen and expand the international collaborative research network in the Southeast Asia region. This ARN Symposium will provide an opportunity for face-to-face as well as online exchanges to promote academic exchange in the post-coronal era. The symposium will be divided into Session 1 (Atmosphere and Energy) and Session 2 (Materials and Environment) to discuss the latest science and technology in related scientific fields that contribute to the creation of a “Sustainable Humanosphere” will be discussed.

October 2023

Director of RISH, Kyoto University
Mamoru Yamamoto

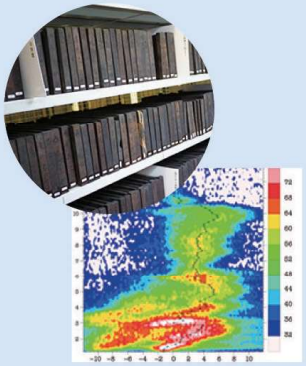
2. Humanosphere Asia Research Node

Cooperative Study of the "Equatorial Fountain"



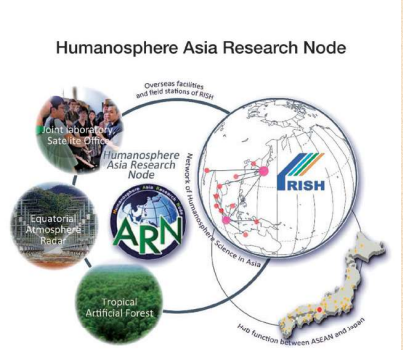
Cooperative Research on the Sustainable Production and Utilization of Tropical Biomass in Relation to Environmental Conservation

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

The 523rd Symposium on Sustainable Humanosphere

The 8th Asia Research Node Symposium on Humanosphere Science — jointly with — The 2nd International Conference on Environment and Sustainable Development

Hybrid Symposium October 29, 2023

➢ Opening Speech

MT/JST: 08:30-09:10/09:30-10:10

Dr. Akbar Hanif Dawam Abdullah (BRIN, Indonesia)

Prof. Mamoru Yamamoto (Director of RISH, Kyoto Univ., Japan)

➢ Session 1 (Atmosphere and Energy)

MT/JST: 09:15-10:00/10:15-11:00

Dr. Masayuki Ito (RISH, Kyoto Univ., Japan)

Dr. Didi Satiadi (BRIN, Indonesia)

Prof. Marzuki (Universitas Andalas, Indonesia)

➢ Session 2 (Materials and Environment)

MT/JST: 10:10-10:55/11:10-11:55

Prof. Wakako Ohmura (RISH, Kyoto Univ., Japan)

Prof. Musrizal Muin (Hasanuddin University, Indonesia)

Dr. Sukma Surya Kusumah (BRIN, Indonesia)

➢ Closing Remark

Prof. Suharman Hamzah (Hasanuddin University, Indonesia)

The 523rd symposium on Sustainable Humanosphere

The 8th Asia Research Node Symposium on Humanosphere Science in conjunction with 2nd ICESD

Program

October 29, 2023

MT(Makassar Time)/JST

MT: Makassar Time; JST: Japan Standard Time

08:00-11:00/09:00-12:00	**Total time**

08:00-08:30/09:00-09:30	Registration and Internet connection		

08:30-09:10/09:30-10:10	**Greetings & Openning Speech**		<Chair> Dr. Noersomadi (Research Center for Climate and Atmosphere, BRIN)
Time		**Title**	**Speaker**
08:30-08:50/09:30-09:50	Greeting & Openning Speech 1	Research Collaboration of Biomass and Bioproducts in Indonesia	Dr. Akbar Hanif Dawam Abdullah (Director of Research Center for Biomass and Bioproducts, BRIN)
08:50-09:10/09:50-10:10	Openning Speech 2	Collaborative research on the equatorial atmosphere over Indonesia --- Achievements and future project ---	Prof. Mamoru Yamamoto (Director of RISH, Kyoto University)
09:10-09:15/10:10-10:15	Photo Sesssion		

09:15-10:00/10:15-11:00	**Session 1 (Atmosphere, Energy)**		<Chair> Dr. Noersomadi (Research Center for Climate and Atmosphere, BRIN)
Time		**Title**	**Speaker**
09:15-09:30/10:15-10:30	Invited	Seasonal variations and its controlling factors of dissolved methane concentrations in lakes and ponds from tropical to temperate region	Dr. Masayuki Itoh (RISH, Kyoto University)
09:30-09:45/10:30-10:45	Invited	Understanding Orography-MJO Interaction and Its Impact on Rainfall Variability in West Sumatra	Dr. Didi Satiadi (Research Center for Climate and Atmosphere, BRIN)
09:45-10:00/10:45-11:00	Invited	Land - sea contrast of diurnal cycle characteristics and rain event propagations over Sumatra and the need for Equatorial Atmosphere Radar (EAR) observations	Prof. Marzuki (Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Andalas)

10:00-10:10/11:00-11:10	Break

10:10-10:55/11:10-11:55	**Session 2 (Materials, Environment)**		<Chair> Dr. Khoirul Himmi Setiawan (Research Center for Applied Zoology, BRIN)
Time		**Title**	**Speaker**
10:10-10:25/11:10-11:25	Invited	Termite test methods for soil-treatment by termiticides and related materials	Prof. Wakako Ohmura (RISH, Kyoto University)
10:25-10:40/11:25-11:40	Invited	Current Challenges and Future Perspectives on Emerging Wood Preservation Technology in Indonesia	Prof. Musrizal Muin (Forest Products Utilization and Processing Laboratory, Universitas Hasanuddin)
10:40-10:55/11:40-11:55	Invited	Exploring the Viability of Citric Acid-Molasses as a Sustainable Adhesive	Dr. Sukma Surya Kusumah (Research Center for Biomass and Bioproducts, Research Organization for Life Sciences and Environment, BRIN)

10:55-11:00/11:55-12:00	**Closing Remark**	Prof. Suharman Hamzah (Hasanuddin University)

Research Collaboration of Biomass and Bioproducts in Indonesia

Akbar Hanif Dawam Abdullah
Research Center for Biomass and Bioproducts, National Research and Innovation Agency, Indonesia

Research Center for Biomass and Bioproducts was designed to answer the challenges of various national and global issues, including: less optimal utilization of abundant natural resources, dependence on imported products, and the high level of biomass waste from the agriculture and forestry sectors. Our mission is mastery of biomass conversion technology into bioproducts, both in the form of conventional products such as paper, pulp and furniture; or in new (advanced) products such as bioplastics, bio-adhesives, biofuels, cellulose based, starch based, and high quality functional bioproducts.

Our research scopes of biomass resources including wood, non-wood, natural fiber, sugar starch, corps, herbaceous, agriculture residue, aquatic plant, and oily-plant residue; follows up the trends and challenges in innovation of material, chemical, energy from oil-refinery to bio-refinery industry.

Based on BRIN Regulation No. 9/2022 which was stipulated on February 25, 2022 RC Biomass and Bioproducts performs the following tasks: a. implementation of technical tasks of research, development, assessment, and application, as well as inventions and innovations in the field of biomass and bioproducts; b. preparation of scientific recommendations or scientific responses for goverment in the field of biomass and bioproducts; c. providing technical guidance and supervision in the field of biomass and bioproducts; d. implementation of cooperation in the field of biomass and bioproducts; and e. monitoring, evaluation, and reporting in the field of biomass and bioproducts.

Currently there are 18 research groups in RC. Biomass and Bioproduct, which are: Advanced Bio-composites, Bio-based and Synthetic Adhesives, Biocarbon, Bioproduct of pyrolysis, Eco Harvesting, Forensic of Lignocellulose, Functional Wood, Structural Composite, Primary Processing of Biomass, Polyphenol Bioproducts, Nutraceutical Bioproducts, Herbaceous Bioproducts, Bioproduct of Essential Oils, Polysaccharide Engineering, Biocompatible materials, Functional Cellulose, Nanocellulose, and Biopolymer. All these groups represent research topics in the center.

We have collaborated with 26 universities and 33 companies to enhance the strong and utilization of our research. We also have Research Collaboration Centers (RCC) which involving several campusses in one cluster. The RCC is a collaboration platform funded by BRIN containing prominent researchers to mastery selected topics in each cluster. There are 6 RCCs which we are actively involved, namely : RCC Biomass and Biorefinery, Bio-NanoCosmetic, Nanocellulose, Biomedical Scaffold, Bamboo Bioproduct, and Marine Biomaterials. All these research activities become more dynamic with the involvement postdoctoral and visiting scholar by BRIN research mobility scheme.

Keywords : biomass, bioproduct, collaboration

Collaborative research on the equatorial atmosphere over Indonesia --- Achievements and future project ---

Mamoru Yamamoto[1]
[1]Research Institute for Sustainable Humanosphere, Kyoto University, JAPAN

Research Institute for Sustainable Humanosphere, Kyoto University (RISH) has a long history of collaboration with researchers in Indonesia. In April 2004, Kyoto University established RISH by merging Wood Research Institute (WRI) and Radio Science Center for Space & Atmosphere (RASC), both of which collaborated with Indonesia, i.e., WRI with LIPI on wood and biomaterial sciences, RISH with BPPT and LAPAN on atmospheric and space sciences. In this presentation, I would like to focus on research on the equatorial atmosphere and show our achievements and future plans. Our interest in studying the equatorial atmosphere was initiated as the following research target after the MU (Middle and Upper atmosphere). Our first research activity in Indonesia was the feasibility study 1987 for the Equatorial Radar. BPPT and LAPAN were the institutions that helped our activities. Since then, we started observing the equatorial atmosphere by radiosondes, small radars, etc. In 2001, we installed the Equatorial Atmosphere Radar (EAR) at Kototabang, West Sumatra under close collaboration with LAPAN. The EAR has conducted for more than 20 years the long-term continuous observations of the atmosphere and ionosphere. Unfortunately, the EAR suffers from the lightning hit in 2019. Because of the COVID-19 problem, it took time to recover from the failure. The replacement radar controller is now ready in Japan, we will install it soon after the BRIN-RISH agreement on the EAR operation is concluded.

Our future plan is the installation of the new radar in Kototabang. Current radar, the EAR, is powerful, but its sensitivity is limited compared to the MU radar. We now plan to install “Equatorial MU (EMU) Radar (EMU)”. The EMU will have an active phased array antenna with the 163 m diameter and 1055 cross-element Yagis. Total output power of the EMU will be more than 500 kW. The EMU can observe turbulent echoes from the mesosphere (60-80 km) which will the world first experiment over the geographic equator. In the ionosphere incoherent-scatter observations of plasma density, drift, and temperature will be possible. Multi-channel receivers will realize radar-imaging observations. We are proposing the project to the Roadmap 2023 by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). We hope that the EMU is soon funded, and it will be a world-class radar facility to advance studies of the equatorial atmosphere from Indonesia.

Seasonal variations and its controlling factors of dissolved methane concentrations in lakes and ponds from tropical to temperate region

Masayuki Itoh[1]
[1] RISH, Kyoto University, Japan

Introduction

Lakes are considered one of the important sources of methane emissions to the atmosphere, and estimates of global lake emissions (159 Tg CH_4 yr^{-1}) are highly uncertain due to their large spatio-temporal variability (Saunois et al., 2020). Most of the data used for estimation are from temperate and boreal lakes and observations from the tropical lakes, where methane production is expected to be more active

under high temperature conditions, are not sufficient. We present the detailed results of methane and environmental factors observed in a tropical volcanic lake (Philippines; Mendoza et al., 2020, JGR), a subtropical dammed lake (Taiwan; Itoh et al., 2015) in the Southeast Asian region comparing to the results in temperate lake and ponds (Lake Biwa and an agricultural pond in low rainfall area in Japan).

2. Materials and methods

Three volcanic lakes in the Philippines, Yambo (38 m in depth), Pandin (62 m), and Calibato (135 m (14.1° N, 121.4 °E; April 2018-February 2019); a dam lake in Taiwan (Fei-Tsui Reservour: FTR; 114 m in depth; 24.5° N, 121.3° E; October 2012-March 2014) in Taiwan. Mean annual temperature and annual precipitation were 27.7°C, 1639 mm (2015-18) and 21.5°C, 4052 mm (2004-13), respectively. Lake water samples by depth were collected using a Go-Flo bottle (General Oceanics, USA). Water samples were collected in glass vials (20-30 ml: dissolved methane concentration) and polyethylene bottles (for water quality analysis, etc.). Vials were sealed with rubber stoppers and aluminum seals, and methane concentrations were measured using GC with an FID detector (headspace method). Major dissolved ion concentrations were analyzed using ion chromatography, and vertical distribution of water temperature and dissolved oxygen concentration (DO) were observed at each site.

3. Results

The mean dissolved methane concentrations in volcanic lakes in the Philippines were Yambo (0.27 ± 0.07, 421 ±189 μmol L^{-1}), Pandin (0.48 ± 0.37, 1121 ± 125 μmol L^{-1}), and Calibato (0.34 ± 0.23, 943 ± 119 μmol L^{-1}) in surface and deep bottom layers with no clear seasonal variation was observed. On the other hand, dissolved methane concentrations in Taiwan FTR were 0.036 ± 0.026 in the surface layer and 135.6 ± 120 μmol L^{-1} in the deep bottom layer, both more than one order of magnitude lower than those in similar depth lakes in the Philippines were significantly different from those in 2012 (0.11 ± 0.23 in the deep bottom layer) and 2013(84.0 ± 25.4 μmol L^{-1}).

4. Discussion

In the Philippines, the water temperature in the deep bottom layer was 25°C even at 135 m depth in Calibato, which is a favorable environment for methanogens, and high methane accumulation was observed due to constant stratification in the deeper layers. Surface methane concentrations (0-5 m) were generally below 1 μmol L^{-1}. Dissolved methane concentrations showed a gradual increase below the surface in shallowest lake, Yambo. Methane concentrations increased sharply at depths below 20-30 m depth, suggesting the presence of an accumulation layer of highly concentrated methane. In the surface layers of the shallow and deep lakes, a relationship between meteorological (precipitation, atmospheric pressure, and temperature) variations and methane concentrations was observed, suggesting the influence of partial vertical lake mixing in the surface layers. In the Taiwan FTR, the water temperature in the deep bottom layer (100 m) is lower than that in the tropics (about 16°C year-round), and the vertical mixing that occurs during the low-temperature season supplies DO from the surface layer to the deeper layer. This is thought to suppress methane production in the bottom layer, which result in lower bottom methane concentrations than in the tropics. The intensity of vertical mixing in the previous year was also shown to determine the redox condition of the bottom layer in the following year, which in turn affected methane production and accumulation. These results indicate that the weakening of vertical mixing due to a warmer winter (global warming) may increase methane production and accumulation in the deep bottom of subtropical lakes and increase the opportunity to accumulate high concentrations of methane, as in tropical lakes.

References

Volume 12, issue 3

Saunois et al., 2020, The Global Methane Budget 2000–2017, Earth System Science Data 12, 1561–1623

Itoh et al., 2015, Effect of inter-annual variation in winter vertical mixing on CH_4 dynamics in a subtropical reservoir, Journal of Geophysical Research- Biogeosciences 120, 1246-1261.

Study of Orography-MJO Interaction and Its Impact on Rainfall Variability in West Sumatra

Didi Satiadi, Anis Purwaningsih, Wendi Harjupa, Ibnu Fathrio, Elfira Saufina, Trismidianto Fahmi Rahmatia, Ridho Pratama

Research Center for Climate and Atmosphere, National Research and Innovation Agency (BRIN), Bandung, Indonesia

Orographic enhancement affects the formation and distribution of rainfall in mountainous regions. Moreover, large-scale phenomena, such as the Madden-Julian Oscillation (MJO), influence the rainfall variability in mountainous areas. In this study, we investigated the interaction between those multiscale prosecutors, orography, and MJO in modulating diurnal rainfall variability over the mountainous region of West Sumatra. We utilized MJO indices, the Convective Available Potential Energy (CAPE), and convective inhibition (CINH) from ERA5 reanalysis data spanning 21 years (2001–2022) at three locations surrounding the mountains to explore their role in rainfall variability. These three locations vary in elevation: the windward side (L1), the mountaintop (L2), and the leeward side (L3). Our findings indicate that elevation strongly influences rainfall, leading to varying rainfall intensities across the three locations. Rainfall was higher over L2 than over L1 and L2, except during the night when it was higher over L1 than L2, probably due to the effect of the sea climate on L1, which is located in the coastal area. Furthermore, we observed that enhanced rainfall over L2 coincided with lower CINH and CAPE values, while reduced rainfall over L3 occurred when CINH and CAPE values were higher. Moreover, the results also showed that the effect of the MJO on rainfall depended on the phase of the MJO. During MJO phase-3 (MJO-3), when the MJO convective center was still in the Indian Ocean, precipitation increased over all locations. Conversely, during MJO phase-4 (MJO-4), when the MJO convective center was in the Maritime Continent (MC), rain tended to decrease, particularly during the day. The results supported the previous finding by Peatman (2014) that precipitation increase occurred before the main MJO envelope arrived, called the “vanguard effects,” which signifies scale- interaction between the MJO and local circulation. Analyzing the correlation between the MJO and the CAPE, we discovered that MJO-3 reduced CAPE, and this reduction was more pronounced in MJO-4, except over L3. Similarly, investigating the correlation between the MJO and the CINH, we observed that MJO-3 reduced CINH while MJO-4 increased CINH. The reduction (increase) of CINH during MJO-3 (MJO-4) might explain the increase (decrease) of rainfall. Therefore, CINH might be essential in the interaction between MJO and topography, affecting rainfall variability. Overall, both topography and the MJO influenced the magnitude of all variables but tended to retain the shape of their diurnal cycles. The results could be significant in understanding the effects of MJO-topography interaction on rainfall variability over the region.

Land - sea contrast of diurnal cycle characteristics and rain event propagations over Sumatra and the need for Equatorial Atmosphere Radar (EAR) observations

Marzuki Marzuki[1], Helmi Yusnaini[1], Fredolin Tangang[2], Robi Muharsyah[3], Mutya Vonnisa[1], Harmadi Harmadi[1]

[1]*Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Andalas, Padang, Indonesia*

[2]*Department of Earth Sciences and Environment, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Selangor, Malaysia*

[3]*Agency for Meteorology, Climatology and Geophysics of Republic Indonesia, Jakarta, Indonesia*

This study explores diurnal cycle variations over Sumatra, emphasizing land-sea differences and rain event propagation concerning changing rain duration and seasons. Using data from the Integrated Multi-satellitE Retrievals for the Global Precipitation Measurement (IMERG) final-run product version 6 (2015-2019) and 97 rain gauge stations, we analyze precipitation amount (PA), frequency (PF), and intensity (PI). Notable land-sea contrasts in PA, PF, and PI are evident, with PA and PF being primary contributors to the diurnal precipitation cycle. Coastal regions exhibit early morning peaks, contrasting with afternoon and evening peaks in the inland. Peak times of PA and PF also vary with rain duration, with short-duration rain events (< 3 hours) peaking much earlier than long-duration rains (> 6 hours). This temporal dependence affects westward and eastward rain propagation. Long-duration rainfall extends hundreds of kilometers from the coastline, while short-duration rain travels shorter distances. For mainland rain events, propagation often starts at high topographic points, highlighting the role of Sumatra's mountains. In the evening, the Equatorial Atmosphere Radar (EAR) detects upward motions, possibly due to anomalous westerlies, influencing upper tropospheric zonal wind anomalies. Rain event propagation also depends on Sumatra's width, more pronounced in equatorial and southern regions. In contrast, the northern region's narrower width leads to limited variation in PA and PF peak times. Spatial patterns of PA, PF, and rain event occurrence vary seasonally due to the Inter-tropical Convergence Zone (ITCZ) influence. However, rain event propagation characteristics, including peak times, exhibit minimal seasonal variation. Large-scale atmospheric patterns affect daily mean precipitation and diurnal variation amplitude but not phase. In summary, this study provides insights into diurnal cycle variations over Sumatra, shedding light on land-sea differences, rain duration impacts, and the role of topography and seasonality in precipitation patterns.

Termite test methods for soil-treatment by termiticides and related materials
- From past to future -

Wakako Ohmura[1], Shuji Itakura[2], Yoko Takematsu[3], Yuji Imamura[1,4]

[1]Research Institute for Sustainable Humanosphere, Kyoto University, JAPAN
[2] Faculty of Agriculture Department of Applied Biological Chemistry, Kindai University, JAPAN
[3] Graduate School of Sciences and Technology for Innovation, Yamaguchi University , JAPAN
[4] Architectural Research Association, JAPAN

All countries around the world are striving to reduce CO_2 emissions toward the goal of carbon neutrality in 2050. Amid these trends, wood is attracting attention as a carbon stock, renewable resource/material, and wooden or wood-hybrid structures of houses and nonresidential buildings are increasing not only in mid-latitude regions such as Japan and Western countries, but also in low-latitude, hot and humid regions of Southeast Asia. For these constructions to remain in use over the long term, termite control measures are absolutely essential.

The basic method of termite control for buildings is the prevention of hazardous subterranean termites, *Coptotermes sp.* from entering the building by physical and chemical techniques. The most common way to keep termites out of buildings is through chemical treatment of the soil under the floor of the building to create a chemical barrier.

Various chemicals have been used for soil treatment applications, but the types of chemicals have changed over time to low-toxic and slow-acting ones in consideration of their environmental impact, including human health. In addition, various types of termite prevention materials have been introduced, such as chemical-impregnated sheets and seals for covering soil or filling around pipes. Along with these changes in chemicals, methods for evaluating their effectiveness against termites have also been reviewed over the years.

In this presentation, methods for evaluating the termiticidal properties of soil-treatment chemicals and related materials, which have been revised in line with changes of chemical types and the introduction of new termiticidal materials, will be discussed.

Current Challenges and Future Perspectives on Emerging Wood Preservation Technology in Indonesia

Musrizal Muin
Forest Products Utilization and Processing Laboratory, Universitas Hasanuddin
Makassar, Indonesia

Increasing the service life of wood in use could reduce replacement costs and allow more efficient use of forest resources. One way to extend the service life of wood is through wood preservation. The development of wood preservation technology from various aspects is becoming increasingly important due to the less availability of natural resistance wood species and they are highly vulnerable against deteriorating organisms. In Indonesia, there are some aspects that should be considered in the implementation process of developed wood preservation technology, including technical factors such as raw materials, preservatives, and preservation methods as well as non-technical factors such as perceptions, human resources, and infrastructure. Basically, the developed wood preservation technology should be able to adapt to the condition of the raw material being preserved, the type of preservative used, and the acceptance from society. Various research and development steps had been performed to respond this needs. In this regard, some research topics are oriented towards the utilization of various types of naturally available preservative materials, the preservation of wood and bamboo products, as well as the development of new alternative approaches, including technical and non-technical perspectives. The non-technical perspectives such as community optimistic attitude, government policy support, global competition, public demand, and the availability of preserved wood on the market are believed to be the important factors in the society acceptance of any wood preservation technology.

References

Barly, B. and S. Subarudi. 2010. Kajian Industri dan Kebijakan Pengawetan Kayu: Sebagai Upaya Mengurangi Tekanan terhadap Hutan. Jurnal Analisis Kebijakan Kehutanan 7(1), 63-80. 10.20886/jakk.2010.7.1.63-80.

Meena, R. K. 2022. A Review: Hazardous effect of chemical wood preservatives on environmental conditions, ecological biodiversity and Human being and its alternatives through different botanicals. Environment and Ecology 40 (3), 1137-1143.

Muin, M. and K. Tsunoda. 2004. Biological performance of wood-based composites treated with a formulation of 3-iodo-2-propynyl butylcarbamate and silafluofen using supercritical carbon dioxide. Journal of Wood Science 50(6), 535-539.

Uslinawaty Z., M. Muin, and Suhasman. 2020. Distribution of permethrin on laminated bamboo after the preservative treatment using SC-CO2 as a carrier solvent. IOP Conf. Ser: Mater. Sci. Eng. 935 012003.

Exploring the Viability of Citric Acid-Molasses as a Sustainable Adhesive

Sukma Surya Kusumah[1], Jajang Sutiawan[1], Muhammad Adly Rahandi Lubis[1], Kenji Umemura[2]

[1]Research Center for Biomass and Bioproducts, Research Organization for Life Sciences and Environment, National Research and Innovation Agency (BRIN), KST Dr (HC) Ir. Soekarno, Jl. Raya Bogor Km. 46, Cibinong, Bogor, Jawa Barat, 16911, Indonesia, [2]Laboratory of Sustainable Materials, Research Institute for Sustainable Humanosphere, Kyoto University, Gokasho, Uji, Kyoto, 611-0011, Japan

The utilization of a novel adhesive formulation comprising citric acid (CA) and molasses represents a promising alternative bio-adhesive to conventional formaldehyde-based adhesives, which is imperative for the advancement of composite materials in the future. The adhesive has been specifically engineered to possess environmentally sustainable properties while also being economically efficient and adaptable in many applications. This research investigates the synthesis methodology, adhesive characteristics, and prospective uses of the CA-Molasses adhesive under examination. The CA-Molasses adhesive exhibited robust adhesive properties, commendable biodegradability, and promising applicability across diverse sectors such as construction, woodworking, and packaging. Moreover, the adhesive exhibits sustainable characteristics, including the utilization of renewable resources as its raw material and the potential to mitigate environmental consequences in comparison to conventional adhesives. The covalently bonded ester groups in the CA-Molasses adhesive give it a lot of potential as a viable and environmentally friendly way to make strong and long-lasting bonds in a wide range of industrial sectors.

Keywords: Bio-based adhesive, citric acid-molasses, environmentally friendly, hybrid adhesive

Edited by
Academic Exchange Committee and Asia Research Node,
Research Institute for Sustainable Humanosphere (RISH), Kyoto University

Wakako Ohmura (Chair)
Hubert Luce
Tatsuhiro Yokoyama
Suyako Tazuru
Rika Kusakabe
Takahito Watanabe

生存圏アジアリサーチノード活動報告

Humanosphere Asia Research Node Activity

Report ARN 2023

発行日	令和5年12月10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