

Using LOFAR to explore the MLT region in multi-static radar configurations: Preliminary results using KAIRA

J. L. Chau⁽¹⁾, D. McKay^(2,3), G. Stober⁽¹⁾, J. Vierinen⁽²⁾, M. Lehtinen⁽³⁾, T. Ulich⁽³⁾, and R. Latteck⁽¹⁾

(1) Leibniz Institute of Atmospheric Physics at the University of Rostock, Kühlungsborn, Germany

(2) UiT, The Arctic University of Norway, Tromsø, Norway

(3) Sodankylä Geophysical Observatory, Sodankylä, Finland

The Low-frequency Array (LOFAR) is a large radio telescope located in Europe consisting of currently more than 48 stations (small arrays) in the VHF and UHF bands. Both bands are appropriate for Atmospheric and Ionospheric studies. In this work we use the low-band antenna (LBA) array (i.e., between 10 and 80 MHz). The signals of each of the receiving antennas (almost omnidirectional) are sampled and combined in a variety of ways. KAIRA (Kilpisjärvi Atmospheric Imaging Receiver Array) comprises of two LOFAR-derived telescope systems, that operates independently from the LOFAR network. Given such independence, in August 2016, we have performed multistatic experiments in northern Scandinavia, with two different radar frequencies and in a variety of receiving antenna and frequency bandwidth configurations. Namely we performed experiments to simultaneously obtain specular meteor echoes and polar mesospheric summer echoes (PMSE). For transmission we used: (a) MAARSY operating at 53.5 MHz transmitting coded pulses with 2 μ s baud widths, and (b) the Andenes meteor radar operating at 32.55 MHz transmitting coded pulses with 10 μ s baud widths, both systems are more than 170 km away from KAIRA. In this work we present the technical details on how the data was synchronized, processed and analysed, and the MLT winds and PMSE results of 48 hours observations around the Perseids meteor shower. We will also discuss the feasibility and advantages of using LOFAR-like systems as a complement for MST radars.