

## Feature studies of the polar lower thermosphere by EISCAT\_3D

NOZAWA, Satonori<sup>1\*</sup>

<sup>1</sup>STEL, Nagoya University

The new EISCAT\_3D radar will give us with great opportunities. Its 3D volumetric observations of ion velocity will provide high quality neutral wind data in the lower thermosphere. Furthermore, its continuous observations will make it possible to study planetary waves in the lower thermosphere in more detail as well as day-to-day variabilities of tides. In this talk, we will describe our future study targets.

The lower thermospheric wind dynamics has been paid great attention for several decades to understand the Magnetosphere-Ionosphere-Thermosphere coupling, since the neutral atmosphere plays a key role. In particular, it has been an issue how the lower thermosphere will response to the solar wind energy input. IS radar measurements of the polar lower thermosphere begun about 40 years ago by a pioneer work of Brekke et al. [JGR, 78, 8235, 1973], and significant number of studies have been conducted since then. However, our understanding of the lower thermosphere is still limited. One of reasons is that the lower thermosphere is significantly influenced by atmospheric waves propagating from below. Thus, the day-to-day variability is very prominent. Owing to high running cost, long term datasets are hard to be obtained by IS radar a decade ago. In 2007-2008, EISCAT Svalbard radar was operated almost continuously for 1 year. However, only about 20% of the data sets can be used for deriving the ion velocity vector. If we have wind velocity datasets on daily basis like meteor and MF radars usually made for the mesospheric wind measurements (70-100 km), our understanding of the lower thermosphere wind dynamics will be much more progressed. EISCAT\_3D will make it possible.

Furthermore, the EISCAT\_3D radar will give us higher temporal resolution data sets of neutral winds in the lower thermosphere with multi volumes. The observations will allow us to distinguish the temporal and spatial variations of winds. One of scientific targets is to investigate wind variations nearby the auroral arc in the E-region. By combining sodium and Rayleigh LIDARs as well as meteor and MF radars, which provide neutral temperature and wind velocity, respectively, we expect we can investigate dissipation process of gravity waves in more details as well as effects of auroral precipitation on the middle atmosphere.

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