Vertical motions in the polar lower thermosphere and ionosphere: Recent results from the incoherent-scatter radar

Shin-ichiro Oyama[1]; Sawako Maeda[2]; Hiroyuki Shinagawa[3]

[1] STEL; [2] Kyoto Women's Univ.; [3] NICT

http://www.stelab.nagoya-u.ac.jp/~soyama/

An important aspect of the coupled thermosphere-ionosphere system at high latitudes is to know various temporal and spatial relationships in the dynamic interaction between the thermosphere and ionosphere. While much is already known about the average characteristics of these systems, this subject has not yet been adequately investigated, in particular mesoscale phenomena. The most curious example is the vertical wind in the lower thermosphere at high latitudes. Ground-based observations with Fabry-Perot Interferometer (FPI) and more recent rocket measurements using Trimethyl aluminum (TMA) have demonstrated the existence of considerably larger vertical winds in the lower thermosphere at high latitudes than predicted with a global circulation thermospheric model. While many experimental evidences have been reported, the origin of these vertical winds, which are likely to be related to enhancements of geomagnetic activity, is still an open question of current research. Furthermore, our recent experiments using the incoherent-scatter radar (ISR) suggest that the lower thermosphere at high latitudes oscillates vertically with large amplitudes in excess of a few tens m/s even during geomagnetically quiet periods, and that altitudinal gradient can be significantly appeared within one scale height at the E-region height. These results suggest that it is important to derive thermospheric/ionospheric parameters with good height/time resolution. To do so the ISR is the best instrument, and the need for the altitude and time resolutions is the primary motivation to utilize the ISR. The presentation will introduce recent results of the lower thermospheric vertical wind estimated with the European Incoherent Scatter (EISCAT) radar located at the northern Scandinavia and the Sondrestrom ISR at Greenland.