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Lower thermospheric wind dynamics during geomagnetic disturbance intervals using data from EISCAT and FPI

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European Incoherent Scatter (EISCAT) radars have conducted various kinds of simultaneous observations with other radars, ground-based optical instruments, rockets, and satellites for the last three decades. Research groups of Solar-Terrestrial Environment Laboratory (STEL) and National Institute of Polar Research (NIPR) have been contributing such research activities by operating radars and optical instruments in northern Norway. At the EISCAT Tromsoe site, STEL research group has operated an all-sky proton imager, a four-wavelength photometer, a Fabry-Perot Interferometer (FPI), a multi-wavelength all-sky camera, a digital camera, and a MF radar, and NIPR research group has operated an all-sky digital camera, a high-speed all-sky TV imager, a high-speed narrow-view TV imager, a meteor radar. Data taken with the radars and the optical instruments have been analyzed together with the EISCAT radar data in order to investigate the Magnetosphere-Ionosphere-Thermosphere coupling process such as three-dimensional current system and its effect on the lower thermosphere.
In the vicinity of the aurora arc, the three-dimensional current system can be evolved by the Pedersen current and up/downward field-aligned current (FAC). In the upward FAC region, aurora particles precipitate from the magnetosphere to the ionosphere increasing the ionospheric electron density and the conductivity. In the downward FAC region, the ionospheric electrons can be absorbed by the downward field-aligned electric field, which may induce proton precipitation from the magnetosphere. An experimental evidence consist with this hypothesis was found in the simultaneous observational data of the EISCAT radar and the proton imager at Tromsoe [Fujii et al., JGR, 114, A09304, doi:10.1029/2009JA014319, 2009]. This event study demonstrated that the electric-field magnitude and the proton emission intensity were enhanced in the downward FAC region.
In order to improve our quantitative understanding of the energy budget in the ionosphere and the lower thermosphere during evolution of the current system, we have analyzed simultaneous data obtained at the EISCAT Tromsoe site. This presentation particularly focuses on events found by simultaneous observations of the FPI and the EISCAT radar. We investigated data obtained from January to March 2009 and from October 2009 to January 2010 and have found eight events to be studied. In particular, we have found an event occurring on January 25-26, 2009, which was similar to the event analyzed by Fujii et al. [2009]. We will report results from the event studies and discuss the relationship between the 3D current, auroral arc and variations of the lower thermospheric wind.

Keywords: EISCAT, FPI, Lower thermosphere, 3D current, Auroral arc