International Session (Oral) | Symbol P (Space and Planetary Sciences) | P-EM Solar-Terrestrial Sciences, Space Electromagnetism & Space Environment

[P-EM06_30PM2]Study of coupling processes in Sun-Earth system with large radars and large-area observations

Convener:*Mamoru Yamamoto(Research Institute for Sustainable Humanosphere, Kyoto University), Yasunobu Ogawa(National Institute of Polar Research), Satonori Nozawa(Solar-Terrestrial Environment Laboratory), Hiroyuki Hashiguchi(Research Institute for Sustainable Humanosphere, Kyoto University), Chair:Hiroyuki Hashiguchi(Research Institute for Sustainable Humanosphere, Kyoto University)
Wed. Apr 30, 2014 4:15 PM - 6:00 PM 312 (3F)

The Earth accepts huge input of energy and material from the Sun. The Earth's environment is maintained by the balance between their inputs and outputs. It is important to study energy and material transport of the Earth. This is an international session that discusses studies of the coupling processes in the Sun-Earth system based on the projects of large radars and large-area observation network. The facilities and networks included are the Equatorial MU Radar (EMU) in Indonesia to study the whole equatorial atmosphere, the EISCAT_3D radar system to study detailed structures and elementary processes of the magnetosphere-ionosphere in the polar region, and global observation networks of magnetometers and radio and optical instruments to study the coupling processes with the global scale. We will show outline of the project and discuss sciences by soliciting variety papers. This session is open to the world, and we strongly encourage submission of papers related to other facilities and projects, i.e., atmospheric or incoherent-scatter radars, observation networks, satellites, and simulation or theoretical studies, etc.

5:15 PM - 5:30 PM

[PEM06-P09_PG]Numerical simulation of Generalized Auroral Computed Tomography toward its application to the EISCAT_3D project

3-min talk in an oral session

*Yoshimasa TANAKA[1], Yasunobu OGAWA[1], Akira KADOKURA[1], Bjorn GUSTAVSSON[2], Takehiko ASO[3], Urban BRANDSTROM[4], Hiroshi MIYAOKA[1], Genta UENO[5], Satoko SAITA[6] (1.National Institute of Polar Research, 2.University of Tromso, 3.The Graduate University for Advanced Studies (Sokendai), 4.Swedish Institute of Space Physics, 5.The Institute of Statistical Mathematics, 6.Research Organization of Information and Systems)

Keywords:aurora computed tomography, EISCAT_3D, simulation, multi-point camera observation

The EISCAT_3D is a next-generation phased-array incoherent scatter radar, which is capable of measuring three-dimensional (3D) ionospheric plasma parameters at ten-times higher temporal and spatial resolution. Thus, it is expected that the EISCAT_3D will provide new insights into auroral physics. On the other hand, optical imaging observation will be still useful for studying the auroral dynamics, because high-sensitivity camera can generally measure horizontal 2D distribution of the aurora at higher temporal resolution than the radars. We demonstrate by numerical simulation how useful monochromatic auroral images taken at multi-point camera network are for the study of aurora dynamics in the EISCAT_3D project. We apply the generalized - aurora computed tomography (G-ACT) to simulated observational data from real instruments, that is, the Auroral Large Imaging System (ALIS) and the EISCAT_3D radar. The G-ACT is a method to reconstruct three dimensional (3D) distribution of auroral emission and ionospheric electron density (corresponding to horizontal 2D distribution of energy spectra of precipitating electrons) from multi-instrument data. It is assumed that a core site of the EISCAT_3D

radar is located at Skibotn (69.35N, 20.37E), Norway, and scans an area of 0.8 degrees in geographic latitude and 3 degrees in longitude at 130km altitude with 21x21 beams. Two neighboring discrete arcs are assumed to appear in the observation region of the EISCAT_3D radar. The reconstruction results from the G-ACT are compared with those from the normal ACT as well as those from only the electron density observed by the EISCAT_3D radar. It is found that the G-ACT can interpolate the ionospheric electron density at much higher spatial resolution than the original one observed by the EISCAT_3D radar. Furthermore, the multiple arcs reconstructed by the G-ACT are more precise than those by the normal ACT. Even for the case that the reconstruction by the ACT is difficult due to unsuitable location of the camera sites relative to the discrete arcs and/or a small number of available images, the G-ACT allows us to achieve the reconstruction.