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-P05_PG]Lidar observations for study of coupling processes over the equatorial region

3-min talk in an oral session

*Makoto ABO[1], Chikao NAGASAWA[1], Yasukuni SHIBATA[1] (1.Tokyo Metropolitan University)

Keywords:coupling process, equatorial region, lidar

Stratosphere-troposphere exchange is important for the budget of ozone in the lower stratosphere as well as in the troposphere. Upward transport occurs in the tropical region (Brewer-Dobson circulation), but the exact mechanism controlling the transport is not clear. We have constructed the lidar facility for survey of atmospheric structure over troposphere, stratosphere, mesosphere and low thermosphere over Kototabang (100.3E, 0.2S), Indonesia in the equatorial region [1]. The lidar system consists of the Mie and Raman lidars for tropospheric aerosol, water vapor and cirrus cloud measurements, the Rayleigh lidar for stratospheric and mesospheric temperature measurements and the Resonance lidar for metallic species such as Na, Fe, Ca ion measurements and temperature measurements in the mesopause region. The laser system included in this lidar facility consists of three pulsed Nd:YAG lasers, a pulsed Ti:Sapphire laser seeded by a ring Ti:Sapphire laser and a dye laser. The most parts of this lidar system are remotely controlled via the Internet from Japan. The full lidar observations started from 2004. The routine observations of clouds and aerosol in the troposphere and stratosphere are continued now. We found the top height of the stratospheric aerosol layer descend with time, synchronized with the QBO in the zonal wind. The QBO signals of the aerosol layer are noticed in the altitude range from 30 to 40 km. In addition, the tropospheric aerosol amount observed around the tropopause over Kototabang is much more than at mid-latitudes. They suspect that this is an evidence of active material exchange between the troposphere and the stratosphere over the equatorial region.We have installed DIAL (differential

absorption lidar) system for high-resolution measurements of vertical ozone profiles in the equatorial tropopause region over Kototabang, Indonesia. We will contribute to the elucidation of the climate change by getting observational information about high-resolution ozone density profiles, and the wave-propagation and material transportation using ozone as a tracer from the troposphere to the lower stratosphere over the equator.There were many ozone DIAL systems in the world, but almost systems are optimized for stratospheric ozone layer measurement [2] or tropospheric ozone measurement [3]. Because of deep ozone absorption in the UV region, the wavelength selection is important. Simulation results show that we can measure above 20km with height resolution of 500m within 5% random error.AcknowledgmentsThis work was financially supported by Grants-in-Aid for Scientific Research (No. 233401043).References1. Nagasawa C., M. Abo, Y. Shibata 23rd International Laser Radar Conference, No.2O-8, 43-46, 2006.2. Megie G. J., G. Ancellet,, J. Pelon, Lidar measurements of ozone vertical profiles, Applied Optics 24, 3454-3463, 1985.3. Nakazato M., T. Nagai, T. Sakai, Y. Hirose, Applied Optics, 46, 2269-2279, 2007.