[EE] Evening Poster | P (Space and Planetary Sciences) | P-EM Solar-Terrestrial Sciences, Space Electromagnetism & Space Environment

[P-EM10]Coupling Processes in the Atmosphere-Ionosphere System

convener:Huixin Liu(Earth and Planetary Science Division, Kyushu University SERC, Kyushu University), Loren Chang(Institute of Space Science, National Central University), Yuichi Otsuka(名古屋大学宇宙地球環境研究所)

Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Vertical coupling mechanisms throughout the whole atmosphere are critical to understanding the near Earth space environment, as well as its sensitivity to the solar, geomagnetic, and atmospheric drivers. This international session focuses on physical/chemical processes occurring in the mesosphere, thermosphere, and ionosphere (MTI) from both the poles to the equatorial region. Both quiet and disturbed states in response to lower atmospheric forcing or solar forcing are important for understanding the MTI system and its coupling to other regions. We invite presentations of observations and observational concepts with ground-based and/or space-borne instruments, theoretical studies, numerical simulations, and development of data analysis systems for various kinds of temporal and spatial variations in MTI system.

[PEM10-P01]Atmospheric gravity waves generated by pulsed ionospheric convection: A link between the solar wind and the Earth’s atmosphere

*Paul Prikryl[1,2], Robert Bruntz[3], Bharat S. R. Kunduri[4] (1.Physics Department, University of New Brunswick, 2.Geomagnetic Laboratory, Natural Resources Canada, 3.Johns Hopkins University Applied Physics Laboratory, 4.Bradley Dept. of Electrical and Computer Engineering, Virginia Tech)

Keywords:Atmospheric gravity waves, Traveling ionospheric disturbances, Solar wind - magnetosphere - ionosphere - atmosphere coupling, High-speed solar wind streams, Extratropical and tropical cyclones

Atmospheric gravity waves (AGWs) [1] play an important role in transporting momentum and energy through the atmosphere. Solar wind coupling to the magnetosphere-ionosphere-atmosphere (MIA) system has been recognized as an important source of AGWs that are manifested in the ionosphere as traveling ionospheric disturbances (TIDs) and observed by HF radars [2] and ionosondes. Solar wind Alfvén waves modulating Joule heating and/or Lorentz forcing of the high-latitude lower thermosphere have been shown to generate medium-scale AGWs [3]. Using the dispersion relation between the gravity wave frequency and the wave vector [1], ray tracing [3] in a model atmosphere shows three distinct group paths (wave propagation modes) that reach the F region of the ionosphere: waves that travel directly upward, waves that are reflected in the mesosphere, and waves that are reflected in the troposphere or from the Earth’s surface. Another approach is the Transfer Function Model (TFM) [4] that describes gravity wave response in the atmosphere and shows that propagating waves originating in the thermosphere can excite a spectrum of AGWs in the lower atmosphere, albeit of much smaller amplitudes. These include “lower modes” that are of particular interest in the present paper: the wave reflected from the Earth’s surface and the ducted wave that propagates in the lower atmosphere to large distances away from the source and leaks up into the thermosphere. We will present observations of TIDs and discuss possible influence of the downward propagating gravity waves on tropospheric weather [5].

[1] Hines C.O., Can. J. Phys. 38, 1441–1481, 1960.

[2] Samson J. C., et al., Geophys. Res. Lett., 16, 875–878, 1989.
[3] Prikryl P., et al., Ann. Geophys., 23, 401-417, doi:10.5194/angeo-23-401-2005, 2005.
[4] Mayr H.G., et al., J. Geophys. Res., 89, 10929–10959, 1984.
[5] Prikryl P., et al., J. Atmos. Sol.-Terr. Phys., https://doi.org/10.1016/j.jastp.2017.07.023