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Possible collaborative study between ISS-IMAP observation and whole atmosphere-ionosphere modeling

Hidekatsu Jin[1*], Yasunobu Miyoshi[2], Hitoshi Fujiwara[3], Hiroyuki Shinagawa[1]

[1]NICT, [2]Kyushu University, [3]Seikei University

There have been an increasing number of studies suggesting the effects of lower atmospheric activities on the upper atmospheric variations on various temporal and spatial scales. The recent discovery of longitudinal wave-4 dependence in the ionospheric density by optical instruments indicates its relation to the longitudinal dependence of tropospheric moist convection, and the subsequent studies suggest that the atmospheric wave propagation plays a key role in the vertical atmospheric coupling. It has been known for long that ionospheric local time variation and its amplitude is observed to differ day-to-day, and the effect of atmospheric waves has been suggested, but its specific origin has not been clarified yet. Recent studies also suggested the significant effects of lower atmosphere in the observed phenomena such as modulated tidal variations in the thermosphere-ionosphere during stratospheric warming periods, thermospheric midnight temperature maximum, and so on.

In order to investigate these vertical atmospheric coupling, we have developed a whole atmosphere-ionosphere coupled model by coupling three independent models self-consistently (GAIA: Ground-to-topside model of Atmosphere and Ionosphere for Aeronomy). In this talk, we will discuss the possibility of collaborative study between the ISS-IMAP observation and GAIA simulation. Models are generally developed over assumptions, simplification and parameterization, and thus it does not necessarily reproduce actual phenomena. On the other hand, observations are not sufficient in their temporal and spatial coverage, resolution, and variable information for analyses. The model-observation collaboration will enable more realistic modeling and reliable analysis with sufficient information by compensating the deficiencies of each other.

Keywords: satellite observation, modeling, simulation, upper atmosphere, middle atmosphere, lower atmosphere