

Coupling processes in the upper atmosphere revealed by imaging observation of the ISS-IMAP mission

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Imaging observation of the ISS-IMAP (Ionosphere, Mesosphere, upper Atmosphere, and Plasmasphere mapping) mission detected the airglow in the mesosphere and the lower thermosphere (MLT), and the ion resonant scattering in the ionosphere from 2012 and 2015. It was installed on the Exposure Facility of Japanese Experiment Module of the International Space Station, EF of ISS-JEM, and consisted of two sets of imagers. Visible-light and infrared spectrum imager (VISI) observed the airglow of 730nm (OH, Alt. 85km), 762nm (O₂, Alt. 95km), and 630nm (O, Alt. 250km) in the MLT region, and Extra ultraviolet imager (EUVI) observed the resonant scattering of 30.4nm (He⁺) and 83.4nm (O⁺) from ion in the Ionosphere. Horizontal two-dimensional imaging of VISI frequently detected concentric wave structures in the mesosphere. The wave features of the concentric wave structures imply the propagation direction and the center of the structure. Using them, some of them can be directly connected with the lower atmospheric phenomena, such as tornado and tropical cyclone. This observation revealed the coupling between the lower and the upper atmospheres with atmospheric gravity waves. On the topside of the ionosphere, EUVI detected the interhemispheric asymmetry of the He⁺ ion distribution. It shows clearly longitudinal variations, and implies that the interhemispheric neutral wind and the configuration of the geomagnetic field affect the transport of He⁺ as the result of the coupling process between the neutral atmosphere and the ionized atmosphere on the bottomside of the ionosphere. Results of the imaging observation of the MLT region and the ionosphere from ISS, and the coupling processes will be discussed in the presentation.

Keywords: Thermosphere, Ionosphere, Mesosphere, Atmospheric gravity wave, Airglow, International Space Station