

Space-borne imaging of the ionosphere, mesosphere, thermosphere and mesosphere in the mid- and low-latitude region

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Plans of space-borne imaging observation of the ionosphere, mesosphere, thermosphere and mesosphere in the mid- and low-latitude region will be introduced. The Earth's upper atmospheric region in this region is a part of the Earth's atmospheric system and co-rotates with the Earth. On the other hand, it is a boundary region between the space and the atmosphere, and influenced by the solar wind through the magnetosphere. The phenomena in this region have shorter time scale and larger spatial scale than those in the other atmospheric region because the electromagnetic process generates the phenomena in this region. As an example, plasma bubble occurring at low-latitudes uplifts in the velocity of 500m/s. They stretch along the geomagnetic field line to more than 3,000km. Imaging observation with large field-of-view is necessary to observe the whole structures of these phenomena that has rapid temporal change and large spatial scale. New ground-based observation techniques have been developed to observe the two-dimensional and three-dimensional structures. But the field-of-view of the ground-based measurement is limited especially over the ocean. As space-borne imaging observation, the IMAGE satellite made successful observation in FUV and EUV. ISS-Ionosphere-Mesosphere-upper Atmosphere, Plasmasphere mapping (ISS-IMAP) mission is a plan of the space-borne imaging observation of the upper atmosphere. It will be installed on the Exposed Facility of Japanese Experiment Module on the International Space Station (EF of ISS-JEM), and start observation in 2011. The orbit of ISS is suitable to observe phenomena in the mid- and low-latitude region. Following the low Earth orbit observation by ISS-IMAP, small satellite observation is planned to make global imaging of the Earth's upper atmosphere. These space-borne remote sensing missions are expected to play a role of the meteorological satellites in the low Earth orbit and the geosynchronous orbit for the meteorology. The importance of observations of the near geospace environment is increasing, as accuracy of space-borne techniques such as GPS and SAR get being required high. The space-borne imaging observation is necessary for the wide observation in the Earth's upper atmosphere.