

Space-borne imaging observations of the Earth's upper atmosphere

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The imaging observation of the Earth's upper atmosphere has been conducted for long years and improved with new wave length and new field-of-view. Space-borne imaging of the upper atmosphere provide opportunities for new wavelength that cannot be detected from the ground, and new field-of-view that is much wider than that of the ground-based observation. ISS-IMAP (Ionosphere, Mesosphere, upper Atmosphere, and Plasmasphere mapping) mission is another space-borne imaging missions to elucidate the Earth's upper atmosphere, the mesosphere, the ionosphere, the thermosphere and the plasmasphere. It is a scientific mission that installs two imaging instruments on the Exposed Facility of Japanese Experiment Module on the International Space Station (EF of ISS-JEM). The observation is planed to be started in 2011 fiscal year. It will make imaging observation of the Earth's upper atmosphere with visible-light and infrared spectrum imager (VISI) and extra ultraviolet imager (EUVI). The objective of this mission is to clarify the physical mechanism of the following three processes: (1) energy transport process by the atmospheric structures whose horizontal scale is 50-500km in the upper atmosphere (2) process of the plasma transport up to 20,000km altitude (3) effect of the upper atmosphere on the space-borne engineering system. ISS-IMAP will measure the following three parameters in the lower latitude region than 50 degrees: (1) distribution of the atmospheric gravity wave in the mesopause (87km), the ionospheric E-region (95km), and the ionospheric F-region (250km) (2) distribution of the ionized atmosphere in the ionospheric F-region (3) distribution of O⁺ and He⁺ ions in the ionosphere and plasmasphere. VISI will observe the airglow of 730nm (OH, Alt. 85km), 762nm (O₂, Alt 95km), 630nm(O, Alt.250km) in the Nadir direction. EUVI will measure the resonant scattering of 30.4nm [He⁺] and 83.4nm [O⁺]. Its field-of-view is 15 degrees, and points the limb of the Earth to observe the vertical distribution of the ions. ISS-IMAP will observe the EUV from the plasmaspheric ions, which cannot be detected from the ground, and will have wide field-of-view that cannot be obtained by the ground-based observation. The scientific objectives and current status of the ISS-IMAP mission will be review in the presentation.

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