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Visible airglow observation by VISI on ISS-IMAP: Current status of development and simulation of airglow measurement (3)

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The ISS-IMAP mission is one of the constituents of the Japanese Experiment Module (JEM) 2nd stage plan which will be launched in 2011 or 2012 onto the International Space Station (ISS). The main scientific subject of this mission is to clarify the energy and physical transfer processes in the boundary region between earth's atmosphere and space with the visible spectrometer and extra ultraviolet imagers.

We have been developing the visible imaging spectrometer instrument (VISI) on ISS-IMAP. VISI will measure three nightglow emissions; O (630 nm, altitude 250 km), OH Meinel band (730 nm, altitude 87km), and O₂ (0-0) atmospheric band (762 nm, altitude 95 km). We designed a bright (F/0.9), wide-angle (field-of-view 90 degrees) objective lens. To subtract background contaminations from clouds and ground structures, VISI will perform a stereoscopic measurement by taking two line-scans of the airglow spectra in 45 deg. forward and 45 deg. backward directions. Each field-of-view is faced perpendicular to the orbital plane, and its width is about 550 km mapping to an altitude of 100 km. The phase velocity of airglow wave structure is also estimated from the difference between forward and backward data. We will obtain a continuous line-scanning image for all emissions line from + 51 deg to -51 deg. in geographic latitude by the successive exposure cycle with a time interval of 1 - several sec. From the simulation of airglow observation with a simple sine-curve airglow pattern including noises, we found that the wave structure in airglow can be identified for the three emissions. In this presentation, the current status of instrumental development, system design, operation plan, and simulation of airglow observations will be reported.

Keywords: ISS, JEM, thermosphere, ionosphere, development, optics