IMAP/VISI ステレオ観測によるオーロラ発光高度決定

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Determination of auroral emission height using stereoscopic data obtained with IMAP/VISI

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The ISS-IMAP is a science mission which observes the thermosphere, ionosphere and plasmasphere from the international space station (ISS) at an altitude of 400 km. This mission is one of the Multi-mission Consolidated Equipment (MCE) installed on the exposed facility (EF) of the Japanese experiment module (JEM), which was be launched successfully on July 21, 2012 with HTV3 (Konotori). The ISS-IMAP consists of a visible imaging spectrometer (VISI) and extra-ultra violet imager (EUVI). 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) with the two field-of-views looking forward (+45 deg. to nadir) and backward (-45 deg. to nadir) to make a stereoscopic measurement of the airglows to subtract background contaminations from clouds and ground structures. 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 with a maximum spatial resolution of ~4 km . We will obtain a continuous line-scanning for all emissions line from + 51 deg to -51 deg. in geographic latitude with the successive exposure cycle with a time interval of ~1 - several sec.

After the successful launch and installation on JEM/EF, we carried out the initial function check of VISI on August 11 – 14, and confirmed that VISI works correctly. Further, test measurements were carried out on September 6-10 and 25-26. From these data, we clearly find auroral emissions at high-latitudes in the southern hemisphere as well as airglow emission in the whole latitude region. From the comparison between forward FOV data and backward FOV data obtained with VISI (i.e., the stereoscopic data), we expect to determine the auroral emission height. The time lags between forward FOV data and backward FOV data at the same location are ~80 sec and ~40 sec for auroral emissions at altitudes of 100 km and 250 km, respectively. We see some changes of auroral shape between forward FOV data and backward FOV data due to the time lag. Although the change of auroral shape might produce an error in height determination, we expect to be able to determine the auroral emission height with good accuracy in many cases except for disturbed period like substorm expansion phase. The huge and continuous stereoscopic data obtained with VISI provide us a quit unique opportunity to investigate statistical analysis of auroral emission height, such as pulsating aurora. We will start nominal operation from the middle of October. In this presentation, the initial results of auroral height determination with VISI data will be shown.