

The Latest Results on Fine-Scale Auroral Phenomena by the Reimei Satellite and the Coordinated Ground-Based Observations

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Our Japanese team organized by experimental researchers of ISAS/JAXA, Rikkyo University, Tohoku University, and NIPR has been developing a scientific instrument package for a microsatellite called the INDEX mission with a selected scientific subject, namely, the intensive exploration of the fine-scale and highly time-varying auroral phenomena. The INDEX satellite was successfully launched from Baikonur Cosmodrome in Kazakhstan on August 23, 2005, as a piggyback satellite by a Dnepr rocket. The INDEX satellite on orbit has been given a Japanese name, Reimei (dawn in Japanese). The satellite attitude is three-axially stabilized and sun-oriented, and its orbit is sun-synchronous in a meridian of 0050-1250 LT at a 630-km altitude. While the number of these scientific instruments on Reimei is limited (just three types of observations), the design and performance of all instruments are optimized for achieving the scientific purpose, and the size and weight are reduced for the installation to the micro-satellite. Three-channel monochromatic auroral imaging CCD camera (MAC) takes two-dimensional images of visible auroral emissions of 428, 558, and 670-nm wavelengths with a field-of-view of 7.6 deg x 7.6 deg with spatial and time resolutions of 2 km and 120 msec, respectively. Tophat-type auroral electron and ion energy spectrum analyzers (ESA/ISA) measure wide pitch angle-energy distributions of electron and ions by covering an energy range of 10 eV - 12 keV in 40 msec of 32 steps with a field-of-view of 4 deg x 300 deg divided by 30 sectors. The local parameters of the topside ionosphere will be derived from the data obtained by three sets of Langmuir-type anodes as plasma current monitors (CRM). The geomagnetic field can also be monitored by three-axial fluxgate magnetometer in the satellite. By controlling the satellite attitude, we can simultaneously observe spatial distribution and time variation of fine aurora



emissions associated with auroral electron precipitation and ionospheric ion outflows with a full pitch-angle coverage and a high-time resolution. Our Reimei mission team and several ground-based observation teams have been collaborating for achieving the coordinated observations of auroral emissions and ion upflows both at nightside and dayside meridians. In particular, we have been realizing the Reimei-EISCAT coordinated observations using the plasma instruments on Reimei, the incoherent scatter radars (three radars at northern Scandinavia and one at Longyearbyen of Svalbard), optical imagers of Reimei and two EISCAT sites (Tromso and Longyearbyen), at every new-moon period in the last winter season. We are going to carry out closer cooperation with manysided observations including higher-altitude satellites and Canadian/Antarctic ground stations at more opportunities at least for the coming two years. In this talk, we present the latest results of the Reimei observations and the satellite-ground coordinated observations.