

Micro-Satellite Mission `INDEX' for the Exploration of Small-Scale Auroral Properties: Current Status and Observation/Operation Plans

MASAFUMI HIRAHARA¹, TAKESHI SAKANOI², KAZUSHI ASAMURA³, YASUMASA KASABA³, MASAKI OKADA⁴, and HIROBUMI SAITO³

¹Department of Physics, College of Science, Rikkyo University, Toshima-ku, Tokyo, Japan ²Graduate School of Science, Tohoku University, Sendai, Miyagi, Japan ³Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Sagamihara, Kanagawa, Japan ⁴National Institute of Polar Research, Research Organization of Information and Systems,Itabashi-ku, Tokyo, Japan

We are now developing a Japanese micro-satellite, called INDEX (Innovative technology Demonstration Experiment). In addition to several kinds of technology experiments, the INDEX mission also has a scientific purpose for exploring smallscale auroral properties in the Earth's polar region. The INDEX satellite is a piggyback-type satellite launched in August in 2005 by a Dnepr-1 launch vehicle from Baikonur Cosmodrome in Kazakhstan. The attitude of INDEX is basically three-axis stabilized and sun-oriented, monitored with a star tracker, a magnetic aspect sensor, and three-axial optical fiber gyroscopes and controlled by three-axial magnetic torquers and a reaction wheel. This presentation reports the current status and observation/operation plans of the INDEX mission. The auroral phenomena are characterized by photon emissions over a wide wavelength range, associated with distinctive energy and pitch-angle distributions of electrons and ions, as reported on the basis of previous polar-orbiting satellite results. Three scientific instruments are installed on the INDEX satellite into a sun-synchronous orbit in the noonmidnight meridian of a 610-km altitude. One is the multi-spectral auroral imaging camera (MAC) with three channels of CCD and interference filter for obtaining twodimensional monochromatic 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. The second is the low-energy auroral particle instrument consisting of two top-hat type sensors: electron and ion energy spectrum analyzers (ESA/ISA) 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 other is the electric current monitor (CRM) consisting of three pairs of electrodes, using the measurement principle of the Langmuir probe. The most important scientific purpose based on these instruments on INDEX is the simultaneous observations performed by the high time- and spatial-resolutions of auroral emissions, charged particles, and plasma properties. This novel observation platform will provide us with crucial opportunities to investigate the physical properties of auroras and reveal the essence of the phenomenon.