

INDEX Mission: Simultaneous Observations Between Optical Aurora And Auroral Particles With High-time and High-spatial Resolutions

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To investigate the fine-scale auroral structures, high-time and high-spatial resolution observations of optical auroras and auroral particles will be performed by the INDEX satellite which will be launched in August 2005 as a piggyback satellite into a polar orbit at an altitude of ~600 km. Taking advantages of the three-axis stabilized attitude control and the sun-synchronous (noon-midnight) orbit of INDEX, unique auroral measurements will be made by a multi-spectral auroral camera (MAC), electron and ion energy-spectral analyzers (ESA/ISA) and a plasma current monitor (CRM) onboard INDEX. MAC will observe monochromatic auroral images at emissions of N_2^+ first negative band (427.8 nm), OI (557.7 nm), and N₂ first positive band (670 nm) with the field-of-view (FOV) of 7.6°. ESA and ISA are the top-hat type electrostatic analyzers of which energy ranges are 10 eV/q to 12 keV/q with a time resolutions of 20 ms. CRM is a 3-axis impedance probe. These instruments will operate in the nightside auroral region mainly by two operation modes in the following. (1) Simultaneous measurement of optical auroral and auroral particles. In this mode, MAC observes an imaging area of ~130x130 km (at a 100 km altitude) around a magnetic footprint with spatial and time resolutions of ~2 km and 120 msec, respectively. (2) Auroral height distribution measurement. In this mode, only MAC and CRM are operated and the attitude of INDEX satellite is changed to direct the FOV of MAC on the limb of the Earth. In this mode, MAC observes an imaging area of ~270x270 km (at a 2000 km distance from the satellite) with spatial and time resolutions of ~4 km and 1 sec, respectively. In this paper, the science mission, instrumentations and its developments, operation modes, and current status of satellite integration will be presented.