

SMALL-SCALE AURORAL STRUCTURES OBSERVED SIMULTANEOUSLY AT THE TOP AND BOTTOM OF THE IONOSPHERE

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The Auroral Current and Electrodynamics Structure (ACES) sounding rocket mission was launched from the Poker Flat Research Range on January 29, 2009 into a stable auroral arc just north of Fort Yukon, Alaska. Its objective is to help refine current models of auroral structures. The mission consists of two nearly identical payloads mounted on Black Brant V and IX rockets, respectively. The two payloads, a high flyer and a low flyer reaching about 365 km and 130 km altitude, respectively, were launched one minute apart in order to be magnetically conjugate at apogee (i.e., sample the same magnetic field line). The payloads were instrumented to measure DC and AC electric and magnetic fields, HF radio waves, suprathermal and energetic ion and electron fluxes, plasma density, and optical auroral emissions. The Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E) contributed to the mission with two magnetic field sensors (Rogovsky coils) designed to measure directly the current density integrated over the (circular) cross section of the coils. No further assumptions about the current structure are necessary except that they are uniform across the plane of the coils which measures slightly less than 100 cm². The coils' principal frequency range covers the 1-400 Hz band which makes them ideal to sample accurately small-scale field-aligned currents in the ionosphere. In our presentation we will show first results from an analysis of our measurements of small-scale auroral electric currents. We will further put the results in context to present knowledge of small-scale structures in the aurora and their role in coupling the high-latitude ionosphere to the magnetosphere.

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