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Space Technology 5 Multi-Point Measurements of Auroral Field-Aligned Currents

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During its three month long technology validation mission, Space Technology 5 (ST-5) returned high quality multi-point measurements of the near-Earth magnetic field. Its three micro-satellites were launched into a 300 x 4500 km, dawn – dusk, sun synchronous orbit (inclination 105.6 deg) orbit with a period of 138 min by a Pegasus launch vehicle on March 22, 2006. The spacecraft were maintained in a "pearls on a string" constellation with controlled spacings ranging from just over 5000 km down to under 50 km. Each spacecraft carried a miniature tri-axial fluxgate magnetometer and the data allow the separation of temporal and spatial variations in field-aligned current (FAC) perturbations measured on time scales of 10 sec to 10 min. The constellation measurements are used to: 1) Determine FAC current density using the "gradiometer method" which uses simultaneous magnetic field measurements at two points with known separation; 2) Measure FAC current density temporal variability over intervals up to 10 min; and 3) Determine the effect of geomagnetic activity on FAC current sheet motion and temporal variability.