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Space Technology 5 Multipoint Observations of Transpolar Arc Related Field-aligned Currents

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Transpolar arcs are often observed during northward interplanetary magnetic field and their formation and motion is dependent on IMF By. In the present study we use data from the Space Technology 5 (ST5) mission consisting of three microsatellites which provide the first multipoint measurements of field-aligned currents (FACs) in low Earth orbit (∼300-4500 km) [Slavin et al., 2008]. We use this unique data set to study the variability of transpolar arc associated field-aligned currents. The high-latitude arcs are identified by DMSP SSJ4 particle data with global details provided by TIMED GUVI images. We show examples of transpolar arc and auroral oval associated field-aligned currents where the currents are expected to change both temporally and spatially corresponding to changes in the interplanetary magnetic field. All of our ST5 examples occur during quiet times and thus have much weaker FACs than those measured during geomagnetic storms [Le et al., 2009]. We perform Minimum Variance Analysis on the magnetic field variations in the arc region in order to evaluate the infinite current sheet assumption for the large-scale currents and how closely the current sheet is Sun-aligned.