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Field-aligned currents associated with multiple arc systems

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The field-aligned current (FAC) system associated with auroral arcs provides important information regarding the generator responsible for multiple arc systems, and presumably for individual arcs themselves. We have identified two types of FAC configurations in multiple parallel arc systems using ground-based optical data from the Themis all-sky imagers (ASIs), and magnetometers onboard the Swarm satellites during the period from December 2013 to March 2015. The first type represents a collection of multiple up/down current pairs and the other is an arc system within a broad unipolar upward current sheet. We find that (1) events corresponding to the first FAC type are mainly located in the 23-0 MLT sector, and the second type between 20-22 MLT. (2) The average current intensities for upward and downward currents in the first type are similar (˜0.16 A/m). However, for the second type, the upward average current intensity (˜0.32 A/m) is greater than the downward current (˜0.21 A/m). (3) the average current density is larger in the first type for both upward and downward currents, with the latter, however, having a larger average density than the former in both types. (4) upward currents with more arcs embedded have a larger intensity, although the intensity of upward currents and the number of arcs do not show a linear relationship.

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