Geophysical Research Abstracts
Vol. 18, EGU2016-14366, 2016
EGU General Assembly 2016

The evolution of high-latitude field-aligned currents and magnetospheric dynamics in response to solar wind drivers

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While the statistical behaviour of the solar wind-magnetosphere-ionosphere system is well defined by the Dungey cycle, questions remain on the behaviour of this coupled system during extreme conditions, for example during magnetic storms or periods with long lasting northward IMF, and on how, and how fast, the system reacts to abrupt changes in the solar wind driver. Field-aligned currents play a crucial role in the dynamics of this coupled system as they provide connectivity between different regions and act as channels for energy and momentum transfer. These currents have been investigated in the last decade thanks to observations from low-orbiting satellites, such as CHAMP, Ørsted, DMSP, and the Iridium constellation. However, many previous studies concentrated on the statistical behavior of the current systems or measurements from individual observatories. In this paper we will employ data from Swarm, AMPERE, DMSP, Cluster, SuperDARN and SuperMAG to perform a multi-point study of high-latitude field-aligned current systems evolution and properties and magnetospheric dynamics in response to the solar wind driver, concentrating on the intervals of changes in the IMF orientation and extreme IMF and solar wind conditions.