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Response of the cusp to an abrupt change in the IMF direction: comparison between Cluster observations and global simulations

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Recent analysis of Cluster measurements on 23 September 2004 has shown for the first time the immediate effect of the rotation of the Interplanetary Magnetic Field (IMF) on cusp particle precipitation observed by polar orbiting spacecraft [*Escoubet et al.*, 2007]. During the event the four satellites crossed the polar cusp within 2-16 minutes from each other while the IMF rotated from a southward to a northward direction. The first two spacecraft observed typical IMF-southward ion dispersions, while the last one observed both an IMF-southward dispersion in the boundary layer and an IMF-northward dispersion in the cusp. We present the results of three-dimensional magneto-hydrodynamic (MHD) and large-scale particle (LSK) simulations of the event. First, the global MHD simulation is used to determine the global topology of the magnetic field at different times during the event. In particular, we examine the effects of the IMF turning on the occurrence of multiple reconnection sites and determine their locations. We then investigate the topology predicted by the global MHD simulation by computing a large sample of ion trajectories in the time-dependent MHD electric and magnetic fields and comparing them with ion measurements. We conclude by using the results of the global MHD simulation and LSK computations to discuss how changes in the topology of the dayside magnetosphere affect the sources of the particles precipitating in the cusp.