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Global simulations of the response of the cusp to a large rotation of the IMF

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Ion dispersions observed by the Cluster spacecraft as they cross the polar cusps offer a unique opportunity to investigate the large-scale topology and dynamics of magnetic reconnection at the dayside magnetosphere. In particular, consecutive crossings of the cusp resulting from the string of pearl configuration of the Cluster spacecraft in that region are well suited for investigating the temporal evolution as well as the spatial extent of ion dispersions as solar wind discontinuities interact with the dayside magnetopause. We have revisited our simulation study of the response of the cusp to a large rotation of the interplanetary magnetic field (IMF), which was observed by the Cluster spacecraft on 23 September 2004. During that event the four satellites crossed the polar cusp within 2-16 minutes of each other while the IMF rotated from a southward to a northward direction. When simulating such events, we first run a three-dimensional global magnetohydrodynamic (MHD) simulation to determine the global topology of the magnetic field at different times during the event and then use a large-scale particle (LSK) simulation to determine the regions where ions enter the magnetosphere and to predict their energy-latitude dispersion in the cusp. We present the results of new simulations of the event that used idealized rotation of the IMF for input instead of the actual IMF observations that were used in our previous study. Comparing the results of the two sets of simulations allows us to determine whether ion injections' transient features identified in our previous study result from the large-scale reconfiguration of the magnetic field topology of the dayside magnetosphere as the discontinuity interacts with the magnetopause or from smaller scale fluctuations in upstream conditions.