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Multiple Reconnection Lines at the Dayside Magnetopause

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Recent 2.5D global hybrid simulations investigated the formation of flux transfer events (FTEs) and their convection and interaction with the cusp. Multiple FTEs have been reported with a size range from a few hundred to thousands of km. Based on these simulations, we have analyzed several Polar cusp crossings in the northern hemisphere to search for the signature of such FTEs in the energy distribution of downward precipitating ions: overlapping, parallel to the ambient magnetic field, streaming ion beams.

Overlapping ion distributions have been analyzed before and are usually attributed to a combination of variable ion acceleration on crossing the magnetopause with the time-of-flight effect from the entry point to the observing satellite. Most step-up cusp ion structures only overlap for pitch angle scattered ions and not for the parallel streaming distribution. This feature is the tell-tale sign for pulsed reconnection, where the reconnection rate at the magnetopause decreased to zero, physically separating convecting flux tubes and their parallel streaming ions. However, several Polar cusp events also show overlapping ion distributions in the parallel-streaming precipitating ions. This condition might be caused by re-opening an already reconnected field line, forming a magnetic island (flux rope) at the magnetopause. In this presentation we will discuss several events that show parallel, overlapping ion energy dispersions consistent with the formation of such magnetic flux tubes.