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First Reconnected Flux Tubes in the Near-Earth Tail: Comparison of Observations with Simulations

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Following the onset of reconnection, the first reconnecting flux tubes move away from the reconnection site creating an over-dense region in front of their leading edge, with a low density region lagging behind. The initial front observed at the magnetic equator has a fairly well distinguishable magnetic signature, which in space observation constitute a sub category of a broader group classified as magnetic pile-up events (or, alternatively, as dipolarization events). The first reconnecting flux tubes at the magnetic equator do not form a classic shock, but are associated with lower hybrid drift instabilities and whistler waves. As has been shown in work by others, the first reconnecting flux tubes are associated with strong dissipation, especially ion dissipation. In the high density region, the electrons and ions are decelerated and redirected perpendicular to the ejected exhaust. Near the first reconnecting flux tubes the ions gain energy and the electrons consist of two populations, one bi-streaming and the other more energetic (warmer) in the perpendicular direction. The latter population is most likely the source of the observed whistlers. Behind the first reconnecting flux tubes is a region that electrons have difficulty reaching, which observationally looks like an electron void. In this presentation comparisons between observations and simulations will be made.