Cold Plasma Seminar
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Title
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Coupling Between Intense Meso-Scale Auroral Streamer Structures, the Concurrent Generation of Giant Undulations and STEVE Emissions, and Intermixing of Cold and Hot Plasma Populations in the Dusk to Pre-Midnight Plasmapause Region

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Abstract
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Over the past few decades, the dynamics associated with the equatorward ejection of auroral streamer structures into the substorm bulge from its poleward edge during substorm expansion phases has been described in detail and has been solidly linked with the Earthward propagation of BBFs launched from reconnection sites in the tail. In particular, it has been shown that while the arrival of these structures near the equatorward regions of the auroral oval can sometimes be associated with new substorm-like auroral activations (pseudo-breakups or new onsets), by far the most dominant consequence of the arrival of these forms in the near-Earth regions is the generation of auroral torches and omega-band forms. These are very important consequences of meso-scale flows in the tail because omega bands are known to produce intense ground magnetic perturbations which can produce harmful GICs in long conducting technological systems like power transmissions lines, pipelines and rail-lines. In addition, recent studies have also shown for the first time that intense streamer events can also lead to the development of dynamic equatorward moving detaching SAR arcs.

Here, we present new observations showing additional consequences of the intense meso-scale streamer events. Specifically, we present high resolution, multi-wavelength auroral imagery (391.4nm, 557.7nm, 630.0nm) to demonstrate that both giant undulations (GUs) and sub-auroral longitudinally elongated STEVE-like auroral forms can be generated as a consequence of intense streamer events. The two types of forms appear concurrently and are related to one another. A very high-resolution time-lapse capture of such an event from the ground is also presented which clearly shows the relationship between STEVE and the GUs. In addition, Los Alamos National Laboratory (LANL) geosynchronous measurements show that the cold-to-warm ion populations in the plasmasphere close to the plasmapause typically become highly structured and often intermixed with the hotter fresh electron plasma sheet populations. These observations provide direct evidence in support of a previously proposed theoretical model whereby the meso-scale flows cause: 1) an Earthward penetration of the ion plasma sheet (especially on the pre-midnight/dusk side); 2) the generation of SAPs flows in that region; 3) the concurrent generation of GUs and STEVE; 4) the disruption and/or intermixing of meso-scale structuring on the plasmapause. Two main consequences are that this chain of processes can lead to: re-distribution of cold ions into the cloak region (which may episodically feed the so-called "long-lived" drainage plumes); and re-distribution of hotter plasmasheet electrons into the plasmasphere (which may contribute to some of the as yet unexplained dynamics associated with STEVE emissions).