Plasmaspheric Plume Turbulence: Signature of an Electrostatic Corotation Convection Shear-Layer Instability

As demonstrated by IMAGE-EUV observations, plasmaspheric drainage plumes are a common feature emanating from the plasmasphere during periods of enhanced convection. Concurrent IMAGE-EUV and LANL-MPA observations reveal that plasmaspheric plumes are not a uniform density structure that extends out to geosynchronous orbit and beyond. Instead, in–situ observations reveal a large spatial-scale structure populated by small-scale density structures suggestive of the presence of a turbulent process. Here, we investigate the occurrence and nature of plasmaspheric drainage plumes as observed by concurrent EUV-MPA observations, as well as explore the possibility that the in–situ observed small-scale density structures are the signature of an instability produced by the sheared velocity found within the plasmaspheric layers separating the corotation of the main plasmasphere from the convection-driven flow generating the plume. Particle-in-cell simulations indicate that the generation of shear-flow driven instabilities is possible under plasmaspheric plasma conditions. The initial results of these simulations indicate that the plasmaspheric instabilities generated are electrostatic in nature, consist with in–situ plume observations.