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Residual Plasmaspheric Density Structure: In Situ Measurements and Complementary Plasmapause Test Particle Simulations

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The structure of the plasmasphere plays a critical role in the dynamics of other particle populations, by defining (and influencing) regions where strong loss terms may be present. Furthermore, the evolution of the plasmasphere is a generally useful diagnostic for the inner magnetospheric electric field that results from both solar-wind driving and significant cross-scale and cross-region coupling between the magnetosphere and ionosphere. We perform comparisons between in situ observations of the Los Alamos National Laboratory (LANL) Magnetospheric Plasma Analyzers (MPA) and the output of a plasmapause test particle (PTP) simulation for moderately disturbed intervals. We find that plasmaspheric plumes can become completely wrapped around the main torus and last for several tens of hours. During the main disturbance phase, pre-existing structure can become elongated into plumes, and can form filamentary density structure within plumes. Finally, during a recovery phase on 10 June 2001 a dayside bulge grew several earth radii as it rotated across the dayside. The formation of this bulge was unsuccessfully modeled using the McIlwain E5D electric potential and the Volland-Stern potential, providing evidence of a missing term in these models of the inner magnetospheric electric field.