How the Thermosphere Shapes the Quiet-Time Plasmasphere

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The Naval Research Laboratory SAMI3 (Sami3 is Also a Model of the Ionosphere) code[1] is used to model observed plasmasphere dynamics for 2001 February 1--5, a period of quiet time refilling[2]. The SAMI3 model is driven at high latitudes by the magnetospheric potential calculated by the Weimer05 empirical model, using the observed solar wind. At mid-to-low latitudes, the self-consistent dynamo potential is included, driven by specified winds. During this quiet period we find that the shape of the plasmasphere, at any given time, varies significantly with the wind model even as a similar degree of model-data agreement is recovered for each of the three wind models used. Diurnal oscillations in the model electron density, a result of a non-round plasmasphere measured at a fixed local time, are consistent with the degree of variation seen in the measured densities. In all three cases, SAMI3 compares favorably to electron density measured in situ by the IMAGE spacecraft. Results with no winds or with specific wind effects excluded show that wind-driven ExB drifts shape the plasmasphere, relative to a round plasmasphere with no winds, and reduce the refilling rate, relative to the higher refilling rate found without winds.

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[1] Huba, J. and J. Krall, "Modeling the plasmasphere with SAMI3", *Geophys. Res. Lett.,* 40, 6-10, doi:10.1029/2012GL054300, 2013.

[2] Krall, J., J. D. Huba, R. E. Denton, G. Crowley, and T.-W. Wu, "The effect of the thermosphere on quiet-time plasmasphere morphology", *J. Geophys. Res. Space Physics,* 119, 5032-5048, doi:10.1002/2014JA019850, 2014.