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A Study of Dawn-Dusk Asymmetry of the Magnetopause Shape

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Shue et al. [1997] proposed a new function form $r = r_0[2/(1 + cos\theta)]^\alpha$ to determine the size and the shape of the magnetopause, where r_0 and α represent the standoff distance and the level of tail flaring, respectively. The variable r is the radial distance from the center of the Earth to a point on the magnetopause and the variable θ is the angle between the sun-earth line and the direction of r. Both the values of r_0 and α vary with the z component of the interplanetary magnetic field and the dynamic pressure of the upstream solar wind. In *Shue et al.* [1997], the magnetopause model is constructed in 2-D under an assumption of axis-symmetry on the sun-earth line. In our study, we will remove the assumption and extend the model to 3-D with an additional variable ϕ included, where ϕ is the clock angle, the angle between the z axis and the projection of r on the y-z plane in GSM coordinates. The *Shue et al.* [1997] model is valid in the equatorial plane because they used low-latitude magnetopause crossings obtained from ISEE1 and 2, AMPTE/IRM, and IMP-8. With an additional set of high-latitude Hawkeye magnetopause crossings, we are able to study relationships between α and ϕ. It is found that the magnetopause location has a dawn-dusk asymmetry. The magnetopause size on the duskside is larger than that on the dawnside. [Shue, J. H., J. K. Chao, H. C. Fu, C. T. Russell, P. Song, K. K. Khurana, and H. Singer, A new functional form to study the solar wind control of magnetopause size and location, J. Geophys. Res., 102, 9497-9511, 1997]