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Stationarity of the Reconnection X-Line at the Dayside Magnetopause

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When the interplanetary magnetic field is southward and has a substantial Y component, reconnection at the magnetopause occurs at low latitudes. Under these conditions, the maximum magnetic shear model for the reconnection X-line at the magnetopause predicts a continuous X-line stretching from the dawn to dusk terminators. Further, the model predicts a stationary X-line that moves on the magnetopause on the timescale of minutes only in response to IMF clock angle changes on the same timescale. Some recent global MHD simulations of the magnetopause suggest that, due to the production of flux transfer events, the X-line need not be stationary, even for steady solar wind and IMF conditions. The stationarity of the reconnection X-line is testable observationally under certain, restrictive conditions. This stationarity is tested using observations from the Magnetospheric Multiscale mission. For two events, the X-line distance from the MMS spacecraft is constant over several minutes (within relatively large error bars) and also appears to be near the location predicted by the maximum magnetic shear model. Thus, the reconnection X-line at the magnetopause appears to be stationary for constant IMF clock angle.