Statistical estimate of the magnetopause reconnection rate as a function of the interplanetary magnetic field clock angle

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Abstract

The magnetic reconnection rate at the magnetopause critically determines how the magnetosphere as a whole couples to the solar wind. Its direct measurement, however, is extremely challenging. Estimates based on single event analysis often yield results with uncertainties of the order of the estimate itself, so are those from statistical analysis, so far limited to a small number of events. In this study, we propose four independent estimates of the reconnection rate from a large statistical approach based on machine learning detection, on about one million in situ measurements in the vicinity of the subsolar magnetopause. Results clearly show how the component of the magnetic field and bulk velocity normal to the magnetopause increase with the IMF clock angle as expected on-going from reconnection. Their ratio to tangential component is shown to be constant and about 0.1 for all IMF clock angles larger than 60∘.

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