Multiple magnetic reconnection at the dayside magnetopause for southward IMF

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Two competing effects determine where magnetic reconnection occurs at the dayside magnetopause. The first effect is the dynamic pressure of the solar wind, which drives magnetosheath plasma against the magnetosphere. This effect maximizes at the subsolar magnetopause. The second effect is the tendency to reconnect where the magnetic shear is maximum; that is, where the magnetosheath and magnetospheric magnetic fields are anti-parallel. A recent statistical study of the location of reconnection indicated that, for certain southward IMF conditions, the dynamic pressure effect is more important but does not fully determine where reconnection occurs on the dayside. Specifically, reconnection does not occur at high-latitude, anti-parallel sites on the dayside. Rather it occurs in a continuous line that follows a ridge of high magnetic shear near, but not through, the subsolar magnetopause. This reconnection line connects to anti-parallel reconnection sites on both flanks of the magnetopause. In this study, Cluster observations at the dayside magnetopause are used to test this empirical prediction of the location of reconnection and investigate the competition between dynamic pressure and anti-parallel effects. Fifteen events were identified where anti-parallel and dynamic pressure driven effects result in different predictions for the ion and electron flow directions in the reconnection layers. All events show some evidence that dynamic pressure plays a more important role in the reconnection location, in agreement with the recent statistical study. However, some events show evidence for additional reconnection possibly associated with anti-parallel reconnection sites, producing multiple reconnection along individual magnetosheath and magnetospheric field lines.