LOCAL INFLUENCE OF MIRROR MODE FLUCTUATIONS ON MAGNETOPAUSE RECONNECTION

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We present observations from two subsolar Cluster magnetopause crossings with southward interplanetary magnetic field and strong mirror mode fluctuations in the magnetosheath. In both events the reconnection outflow jets show strong variations on the timescale of one minute. We show that at least some of the recorded variations are truly temporal, not spatial. On the same timescale, mirror mode fluctuations appear as strong magnetic fluctuations in the magnetosheath next to the magnetopause. This suggests that mirror modes can cause the variations either through modulation of continuous reconnection or through triggering of bursty reconnection. Using a theoretical scaling law for asymmetric reconnection we show that the first of our events is compatible with the modulation hypothesis. The second event also exhibits flow reversals, pointing to patchy and bursty reconnection, but mirror modes may play a role in triggering the variations. A hybrid simulation shows formation of magnetic islands at the magnetopause, which also would be compatible with patchy reconnection. These examples illustrate that to understand magnetopause reconnection in depth, it is necessary to know the local boundary conditions in the magnetosheath, not just the IMF direction. The rather small-scale mirror mode fluctuations can strongly influence the total energy conversion at a magnetic boundary, and should be common when the solar wind, or a stellar wind, hits a magnetised celestial object.

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