Limited cold ion heating in the magnetopause boundary layers

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Abstract

For cold and heavy magnetospheric ion populations that reach the dayside magnetopause, how those populations evolve across magnetopause separatrices into the reconnection exhaust, and how the populations may affect or be affected by reconnection, are still not well understood. Here, we investigate a case of apparent minimal heating of cold, magnetospheric ion populations entrained in the magnetopause boundary layers. For several magnetopause crossings on 2019-01-25, while MMS was in a "string-of-pearls" configuration, a significant amount of cold (temperatures of _˜1's-10 eV) magnetospheric H+ is present in the outer magnetosphere. This cold H+ population is accelerated by the **E**xB drift near the magnetopause, but remains cold (temperatures of 10's eV) well into the boundary layers and reconnection exhaust. Inter-spacecraft comparisons of H+ distributions, the various wave modes observed in the boundary layers, and implications for ion heating versus acceleration mechanisms are discussed. The lack of heating for the magnetopause crossings on 2019-01-25 differs from that observed in previous work where MMS was farther away from the X-line, pointing to the highly spatially structured nature of reconnection sites along the separatrices and the influence of macroscale conditions on kinetic scale physics at the magnetopause.

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