Distribution of Characteristic Heat Frequency during Drift Mirror Instability and Kelvin-Helmholtz Instability at the Earth's Magnetopause

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Abstract

Various physical processes take place at the magnetopause across multiple scales as the shocked solar wind interacts with the Earth's magnetosphere. Those processes, including e.g., different plasma wave modes, magnetic reconnection, and Kelvin-Helmholtz instability, facilitate the transfer of magnetic and kinetic energy into thermal energy of plasma particles and involve non-adiabatic heating processes. However, often these cross-scale physical mechanisms are difficult to identify by a single spacecraft or even with a constellation of spacecraft within a single plasma scale-length. Since different physical mechanisms should have their own preferred and dominant heating mechanisms, these different mechanisms exhibit different statistical distributions in CHF. Here we present results of the statistical study using MMS data demonstrating that the CHF is distinctly different during Kelvin-Helmholtz instability (KHI) and drift-mirror instability (DMI). Furthermore, we investigate the application of the CHF, e.g., to reconnection in thin current sheets driven by KHI using burst mode data.

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