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Project Title: Magnetic Reconnection Associated with the Kelvin-Helmholtz Instability at Different Positions Along the Flank Magnetopause

Abstract:
As the solar wind flows past Earth, there is a flow shear across the flank magnetopause. In response to this shear, surface waves propagate along the boundary which roll up into vortices and grow in amplitude. These waves are referred to as the Kelvin-Helmholtz instability (KHI). One of the main processes for transporting matter and energy across the magnetopause is magnetic reconnection, and the KHI is thought to be a driver of magnetic reconnection along the flanks of this boundary. To determine how frequently reconnection occurs in the KHI, and its relation to the rolled-up state of waves, we examine KHI events at different positions along the flank magnetopause. We use data from NASA's Magnetospheric Multi-scale (MMS) mission, taking advantage of its tetrahedral formation and orbit which skims the magnetopause boundary. KHI events were verified using the dispersion relation, as well as investigating the rolled-up state of the vortices, and for the events with consistent burst data coverage, we looked for characteristic signatures of reconnection. These include sharp reversals of the magnetic field in the normal direction to the magnetopause, the presence of ion jets, and enhanced electromagnetic energy conversion. We have identified several new KHI events in different positions along the boundary and with differing levels of complexity and reconnection characteristics. Preliminary results suggest that we see less evidence of reconnection in events that are rolled up and further down the flank. This helps further our understanding of where the KHI can effectively cause reconnection.