The location of Component Reconnection at the Earth's Magnetopause During Dominant IMF By and Large Dipole Tilt Conditions

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The interplanetary magnetic field (IMF) convected with the solar wind drapes around the region of space dominated by Earth's geomagnetic field and undergoes a process called magnetic reconnection at the magnetopause; the boundary layer that separates these two distinct regimes. Magnetic reconnection changes the topology of magnetic field lines and is known to convert magnetic energy into kinetic energy and heat. This fundamental process occurs in many environments, spanning from laboratory plasmas to the heliosphere, the solar atmosphere, and to astrophysical phenomena. Magnetic reconnection at the Earth's magnetopause has been observed at various times and places as either anti-parallel and/or component reconnection. A model known as the Maximum Magnetic Shear Model combines these two scenarios, creating long reconnection lines crossing the dayside magnetopause along a ridge of maximum magnetic shear.

The connection points between the anti-parallel and the component reconnection segments of the reconnection line are known as 'Knee' regions. Using observations from the MMS satellites, it was shown that the location of the Knee region depends strongly on the local draping conditions of the IMF across the magnetopause, with certain draping conditions causing a deflection of the location along the anti-parallel reconnection region. This study discusses an event that shows that the entire component reconnection X-line crossing the dayside magnetopause can be affected by this deflection. This result emphasizes the importance of anti-parallel reconnection that seems to control where component reconnection is occurring.
