Electron Scattering and Acceleration by Whistler Waves at Collisionless Shocks

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Electrons are accelerated to non-thermal energies at shocks in space and astrophysical environments. While Shock Drift Acceleration (SDA) has been considered a key process of electron acceleration at collision-less shocks, it has also been recognized that SDA needs to be combined with an additional stochastic process to explain the observed power-law energy spectra. Here, we report observations of Earth’ s bow shock by the Magnetospheric Multiscale (MMS) mission and present in-situ evidence of pitch-angle scattering of non-thermal electrons by whistler waves. As the solar activity picks up in the coming years, we anticipate conjunctive, simultaneous observations of interplanetary shocks by, for example, MMS and Geotail, enabling us to further advance our understanding of electron acceleration at shocks.

Keywords: shock, particle acceleration

