Currents and associated electron scattering and bouncing near the diffusion region at Earth's magnetopause

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Based on high-resolution measurements from NASA's Magnetospheric Multiscale mission, we present the dynamics of electrons associated with current systems observed near the diffusion region of magnetic reconnection at Earth's magnetopause. Using pitch angle distributions (PAD) and magnetic curvature analysis we demonstrate the occurrence of electron scattering in the curved magnetic field of the diffusion region down to energies of 20 eV. We show that scattering occurs closer to the current sheet as the electron energy decreases. The scattering of inflowing electrons, associated with field-aligned electrostatic potentials and Hall currents, produces a new population of scattered electrons with broader PAD which bounce back and forth in the exhaust. Except at the center of the diffusion region the two populations are collocated and behave adiabatically: the PAD of inflowing electrons focuses inward (towards lower magnetic field), while the bouncing population gradually peaks at 90° away from the center (where it mirrors owing to higher magnetic field and probable field-aligned potentials).

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