Velocity-space studies of fast-ion transport at a sawtooth crash in neutral-beam heated plasmas

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Abstract. In tokamaks the crash phase of the sawtooth instability causes fast-ion transport. The DIII-D tokamak is equipped with a suite of core fast-ion diagnostics that can probe different parts of phase space. Over a variety of operating conditions, energetic passing ions are observed to undergo larger redistribution than their trapped counterparts. Passing ions of all energies are redistributed, but only low energy ($\lesssim$40 keV) trapped ions suffer redistribution. The transport process is modeled using a numerical approach to the drift kinetic equation. The simulation reproduces the characteristic that circulating energetic ions experience the greatest levels of internal transport. An analytic treatment of particle drifts suggests that the difference in observed transport depends on the magnitude of toroidal drift.

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