Measurements of resonant transport of fast ions during a sawtooth crash

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Abstract. A sawtooth crash is well known to cause redistribution of both thermal and energetic ions. Conventionally, particle transport during the instability is explained by invoking flux-attachment, which applies to particles below a critical energy whose toroidal drift is not strong enough to decouple them from a flux surface over the duration of a crash. Thus, the interaction between highly-energetic ions, such as RF-heated populations, and sawteeth is typically expected to be minimal. However measurements in DIII-D show that energetic ions with energies exceeding neutral beam injection (NBI) energies are susceptible to transport by resonances. In a discharge with two phases of heating (NBI-only and NBI+RF), a drop of 50% in the fast-ion density is observed during the NBI+RF phase, while negligible transport is detected during the NBI-only phase. It is shown that the RF-accelerated ions populate a region of velocity-space where various bounce-precession resonances exist.

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