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Investigation of the stochastic model for sawteeth[1] MARIE-CHRISTINE FIRPO, WAHB ETTOUMI, CNRS - Ecole Polytechnique, RICARDO FARENGO, HUGO FERRARI, PABLO LUIS GARCIA-MARTINEZ, Centro Atomico Bariloche, AGUSTIN LIFSCHITZ, CNRS ENSTA-Ecole Polytechnique — Tokamak sawteeth have often been considered as a manifestation of magnetic reconnection in a laboratory plasma. However, measurements have repeatedly shown that the very fast crash phase may be associated with little reconnection, as the central q-profile remains below one and almost unchanged before and after the sawtooth collapse. One is thus left with the need to search for an explanation of the fastness of the sawtooth crash outside of the pure frame of magnetic reconnection. To account for incomplete reconnection, Lichtenberg argued in a seminal paper that the fast disruptive relaxation could be caused by the intrinsic large-scale stochasticity caused by overlapping magnetic islands. Nevertheless, the well known nickel trace experiments in JET [Wesson et al. PRL 1997] appeared to contradict the simple notion of stochasticity and thermal redistribution. Using a full orbit following code for the nickel ions, we demonstrate that the profile flattening of nickel ions during the sawtooth crash phase may be well reproduced using a stochastic model for the magnetic field and the electric field deduced from an ideal MHD hypothesis, but not in the case of integrable magnetic field lines. A chaotic indicator for the nickel motion quantifies the discrepancy between the two scenarios.

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