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Stochastic sawtooth reconnection in ASDEX Upgrade

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In this work we investigate non-complete Sawtooth reconnection in ASDEX Upgrade tokamak. Such reconnection phenomena are associated with internal m/n=1/1 kink mode which does not vanish after the crash phase (as would be the case for complete reconnection). It is shown that this sawtooth can not be fully described by pure m/n=1/1 mode and that higher harmonics play an important role during the Sawtooth crash phase. We employ the Hamiltonian formalism and reconstructed perturbations to model incomplete Sawtooth reconnection. It is demonstrated that stochastization appears due to excitation of low- order resonances which are present in the corresponding q-profiles inside the $q=1$ surface which reflects the key role of the q_0 value. Depending on this value two completely different situations are possible for one and the same mode perturbations: (i) the resonant surfaces are present in q-profile leading to stochasticity and sawtooth crash ($q_0 \approx 0.7 \pm 0.1$); (ii) the resonant surfaces are not present which means no stochasticity in the system and no crash event ($q_0 \approx 0.9 \pm 0.05$). Accordingly central safety factor value is always less than unity in case of non-complete sawtooth reconnection. Our investigations show that stochastic model agrees well with experimental observations and can be proposed as a promising candidate for explanation of the sawtooth reconnection.