Dynamic Modeling of Step-wise Internal Transport Barrier Formation in DIII-D NCS Discharges

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Abstract

The GLF23 transport model is used to dynamically follow bifurcations in the energy and toroidal momentum confinement in DIII–D discharges with an internal transport barrier. The temperatures and toroidal velocity profiles are evolved while self-consistently computing the effects of $E \times B$ shear stabilization during the formation and expansion of internal transport barriers. The barrier is predicted to form in a step–wise fashion through a series of sudden jumps in the core electron and ion temperatures and toroidal rotation velocity. These results are consistent with experimental observations. In the simulations, the transitions are a direct result of local $E \times B$ driven transport bifurcations. A precursor at each transition is clearly evident with a dip appearing in the temperatures and toroidal velocity as the $E \times B$ shear rate passes through zero.

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