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Tearing Mode Onset and Evolution Studies on DIII-D[1]

D.P. BRENNAN, ORISE, M.S. CHU, R.J. LA HAYE, T.C. LUCE, E.J. STRAIT, T.S. TAYLOR, A.D. TURNBULL, General Atomics, S. KRUGER, SAIC — A theoretical mechanism for the onset of tearing modes due to the approach of ideal stability boundaries is studied and compared to initial value code results and the experimental data. Linear tearing stability calculations on time series of kinetic equilibrium reconstructions in DIII-D shots are presented, which indicate that the tearing modes in these shots are classically unstable at the time of onset. The onset mechanism of these shots results from the approach of ideal stability boundaries and the occurrence of poles in Δ'. This is proposed as an alternative mechanism for the onset of neoclassical tearing modes (NTMs) in tokamaks. Several ideal modes can seed NTMs through forced reconnection. However, tearing modes often appear suddenly without an ideal mode causing a seed island through forced reconnection, which could be explained by this mechanism. Evolving these equilibria in time using the nonlinear 3D resistive code NIMROD, the saturated island widths will then be compared to the Δ' from the linear growth rate and the predictions from the island evolution equation.

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