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Simulations and Theory of nonlinear interchange/tearing instabilities in the SOL edge of toroidal plasmas[1] WENDELL HORTON, LINJIN ZHENG, HIDEAKI MIURA, University of Texas at Austin — Numerical simulations of a reduced theoretical model for the interchange/tearing instabilities are presented for the turbulence generated by the steep gradients in scrape-off-layer (SOL) edge plasmas. Plasma near the Last Closed Flux Surface (LCFS) and into the scrape-off layer (SOL), are characterized by open magnetic field lines that terminate on the divertor plates. Theoretical and numerical modeling is presented - which includes the current diffusivity which gives the turbulent transport from the pedestal into SOL. The simulations give a low-level saturated current profile in the SOL region with a current density jump across the LCFS. The nonlinear numerical simulations show that the interchange modes evolve into complex structures with a tearing mode/reconnection component that releases both pressure and current gradient energy components. These complex energy releases are consistent with earlier simulations on the current-interchange tearing modes in Zheng and Furukawa [Phys. Plasmas 2010, 2013]. The applicability of the model to the tokamak edge stability and ELM studies is discussed.

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