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On Anomalous Dissipation and Relaxation in ELMs

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We present a new dynamical model of pedestal ELM phenomena based upon the multi-scale interaction between low- n MHD ballooning mode and short scale ETG turbulence. ELM dynamics are determined by the few basic process results from multi scale interaction. These includes: generation of hyper resistivity (η) in coupled ballooning mode - ETG turbulence; excitation of hyper resistive BM near ideal MHD threshold; regulation of η via feedback loop between hyper resistive and ETG mode; formation of steep current and pressure gradients between primary resonances by process of gradient pinching. It is argued that gradient pinching, which occurs as primary modes grow, will destabilize dissipative convective cells throughout the pedestal. In particular, these cells will be driven in the region between the primary helicity. This ensemble of BMs and dissipative BMs will result in fast relaxation throughout the pedestal. Note that the multi-helicity interaction effectively spreads the relaxation throughout the region of the pedestal.

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