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Predator-prey paradigm for Alfvn instability dynamics in realisitc RBQ simulations NIKOLAI GORELENKOV, VINICIUS DUARTE, Princeton Plasma Physics Laboratory, HERBERT BERK, U.Texas, ROSCOE WHITE, Princeton Plasma Physics Laboratory — To understand the dynamics of multiple Alfvn Eigenmode (AE) instabilities excited simultaneously by energetic beam ions we developed a heuristic Predator-Pray (PP) model where two PP systems each consisting of a predator (AE) and a prey (resonant ions) are coupled together. The first PP system works as a source of particles for the second system which in its turn plays a role of a sink of those particles. Our model helps to understand multiscale intermittencies observed in Resonance Broadened Quasi-linear (RBQ) simulations [Gorelenkov, NF'18, PoP'19]. An interplay between the growth, damping rates and the effective scattering frequency in RBQ simulations is found in the presence of a single and multiple RSAEs. RBQ model adapts the quasi-linear (QL) approach (Berk et al.,PLA 1996) and generalizes it for a realistic problem near marginal state of unstable AEs. The diffusion equation is solved simultaneously for all particles together with the evolution equation for mode amplitudes by going beyond the perturbative-pendulum-like approximation for the wave particle dynamics. We apply the RBQ code to DIII-D plasma with elevated q-profile where the fast beam ions show stiff transport properties [Collins, PRL'16].

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