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Survey of Damped Eigenmode Effects in Fluid Models of Plasma Turbulence P.W. TERRY, D.R. HATCH, J.-H. KIM, University of Wisconsin-Madison — Eight distinct instability-driven plasma turbulence systems of relevance to fusion are surveyed for damped eigenmode effects in saturation using an analytic criterion based on general saturation balances.[1] All are found to have regimes in which damped eigenmodes provide a finite-amplitude-induced energy sink that plays a significant role in saturation. Analysis of these models gives constraints on the linear and nonlinear coupling between fields conducive to damped eigenmodes affecting saturation. The most critical condition is that the damping rate of the damped eigenmode not greatly exceed the growth rate. This tends to hold in regimes of stronger instability, not right at threshold. However, nonlinearities also matter. Certain linear couplings that hinder damped eignemode effects in electrostatic turbulence are overcome by magnetic nonlinearities. This study indicates that damped eigenmodes are a robust and ubiquitous mechanism for the saturation of plasma instability in local fluid descriptions. Supported by USDOE.

[1]P.W. Terry, et al., Phys. Plasmas **13**, 022307 (2006).

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