Recent development of energetic particle gyro-Landau fluid models

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Gyro-Landau fluid models offer a convenient reduced dimensionality approach for modeling energetic particle destabilized Alfvén modes. Gyrofluid closures incorporate the necessary kinetic physics to excite these instabilities within a set of fluid equations and can be solved within either initial value (linear/nonlinear) or eigenvalue (linear) formulations. Such models consistently take into account the influence of the energetic particle component on the mode structure without the necessity of a perturbative approximation and can include a range of damping mechanisms. The TAEFL code utilizes the initial value approach and has recently been applied to a number of topics, including ITPA-EP group benchmarks, up-down asymmetric mode structures observed in DIII-D, damping measurements in JET and acoustic/Alfvén mode coupling effects. These applications will be described, along with recent upgrades that are underway to this model, such as more general fast ion distribution functions and extension to 3D equilibria.

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