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Landau-fluid closure and drift-wave dispersion relations for arbitrary collisional plasmas[1] WONJAE LEE, UCSD, M.V. UMANSKY, LLNL, J.R. ANGUS, NRL, M.A. DORF, LLNL, R.H. COHEN, CompX, M.R. DORR, LLNL, S.I. KRASHENINNIKOV, UCSD — The Landau fluid model has been revisited to describe drift-wave instabilities in edge plasmas where the plasma parameters can vary by an order of magnitude or more. Usually, simple fluid models without Landau-fluid closure have been used to describe edge plasma dynamics. However, the collisionality conditions for the simple fluid descriptions are only marginally satisfied in present-day tokamaks and the validity conditions for such models will not be satisfied for future devices. As a result, the simple fluid models without Landau closure cannot properly describe the electron kinetic effects (e.g. the wave-electron resonances) in weakly collisional plasmas. We compare the analytical growth rates of drift-wave instabilities from the electromagnetic Landau-fluid model and the electromagnetic drift-kinetic model by conducting linear analysis on both models in various plasma parameters. Consequently, we demonstrate that both the electromagnetic Landau-fluid model and the electromagnetic drift-kinetic model, which yield similar linear growth rates, can be used to describe drift wave turbulence in a wide range of plasma parameters. We also present comparative simulations of drift wave instability using BOUT++ and COGENT(M. Dorf, invited talk, this meeting).

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