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Simulation of ITG instabilities with fully kinetic ions and drift-kinetic electrons in tokamaks[1] YOUJUN HU, YANG CHEN, SCOTT PARKER, Univ of Colorado - Boulder — A turbulence simulation model with fully kinetic ions and drift-kinetic electrons is being developed in the toroidal electromagnetic turbulence code GEM. This is motivated by the observation that gyrokinetic ions are not well justified in simulating turbulence in tokamak edges with steep density profile, where ρ_i/L is not small enough to be used a small parameter needed by the gyrokinetic ordering (here ρ_i is the gyro-radius of ions and L is the scale length of density profile). In this case, the fully kinetic ion model may be useful. Our model uses an implicit scheme to suppress high-frequency compressional Alfven waves and waves associated with the gyro-motion of ions. The ion orbits are advanced by using the well-known Boris scheme, which reproduces correct drift-motion even with large time-step comparable to the ion gyro-period. The field equation in this model is Ampere's law with the magnetic field eliminated by using an implicit scheme of Faraday's law. The current contributed by ions are computed by using an implicit δf method. A flux tube approximation is adopted, which makes the field equation much easier to solve. Numerical results of electromagnetic ITG obtained from this model will be presented and compared with the gyrokinetic results.

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Youjun Hu
Univ of Colorado - Boulder

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