Summary: TH/P5-67

Two-fluid and gyro-viscous effects on the pressure-driven modes in a heliotron device

by H. Miura et al.

Subejct: Full 3D simulations of ballooning mode in the LHD, for the R_{ax}=3.6m and β_0=5% equilibrium to study the two-fluid effects in the evolution of the modes.

Results and discussion:

- Introduction of the two-fluid term can modify the equilibrium component of the magnetic field instantaneously and change profiles of unstable modes (growth rates, radial profile of eigen-functions).
- The change of the equilibrium component deteriorates the stabilizing effect of the parallel heat conduction.
- Due to these effects, the introduction of the two-fluid effect can seriously deteriorate pressure profile after nonlinear saturation of the ballooning modes.
- Damping of high wave-number components (by the hyper-diffusivity here, but presumably by the gyro-viscosity when the FLR term is included) can extend the linear-growth period and cause larger fluctuations.
- In this sense, the introduction of the gyro-viscosity (or more complete form of the kinetic effect) does not necessarily explain the mild saturation of the modes in a heliotron device, and we need more complicated physics.