Supercritical stability of the Large Helical Device plasmas due to the kinetic thermal ion effects

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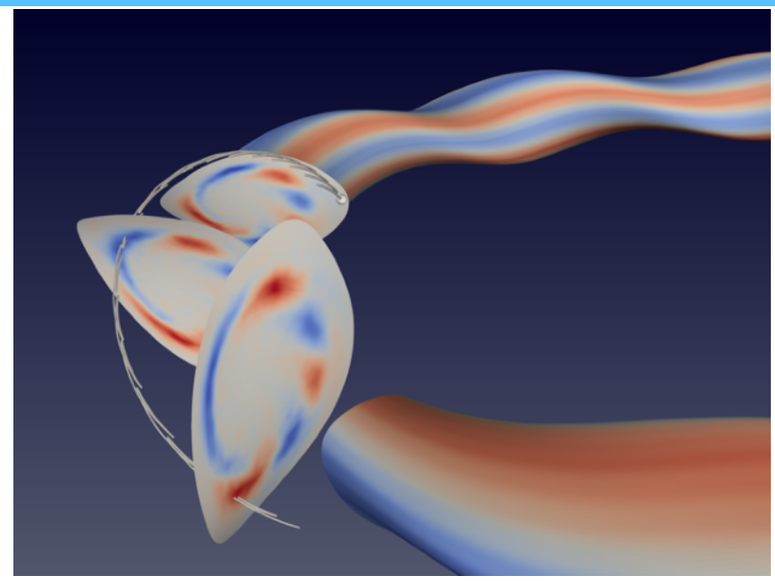
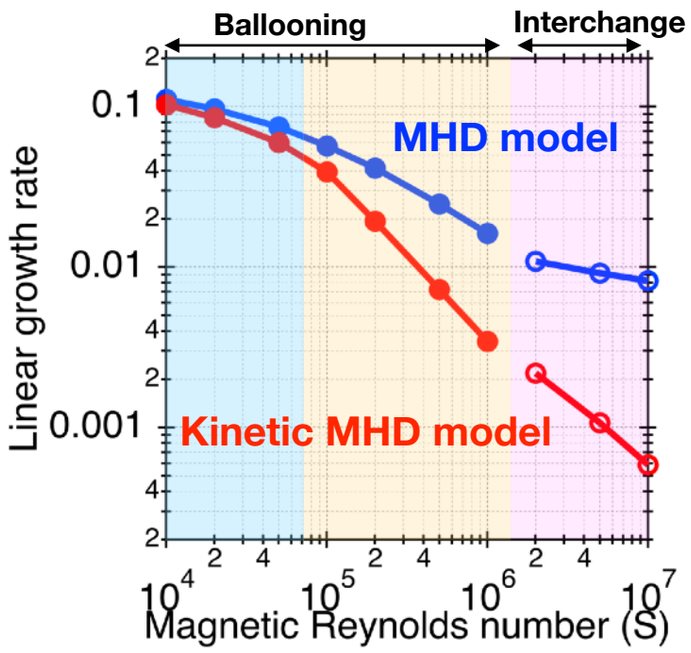
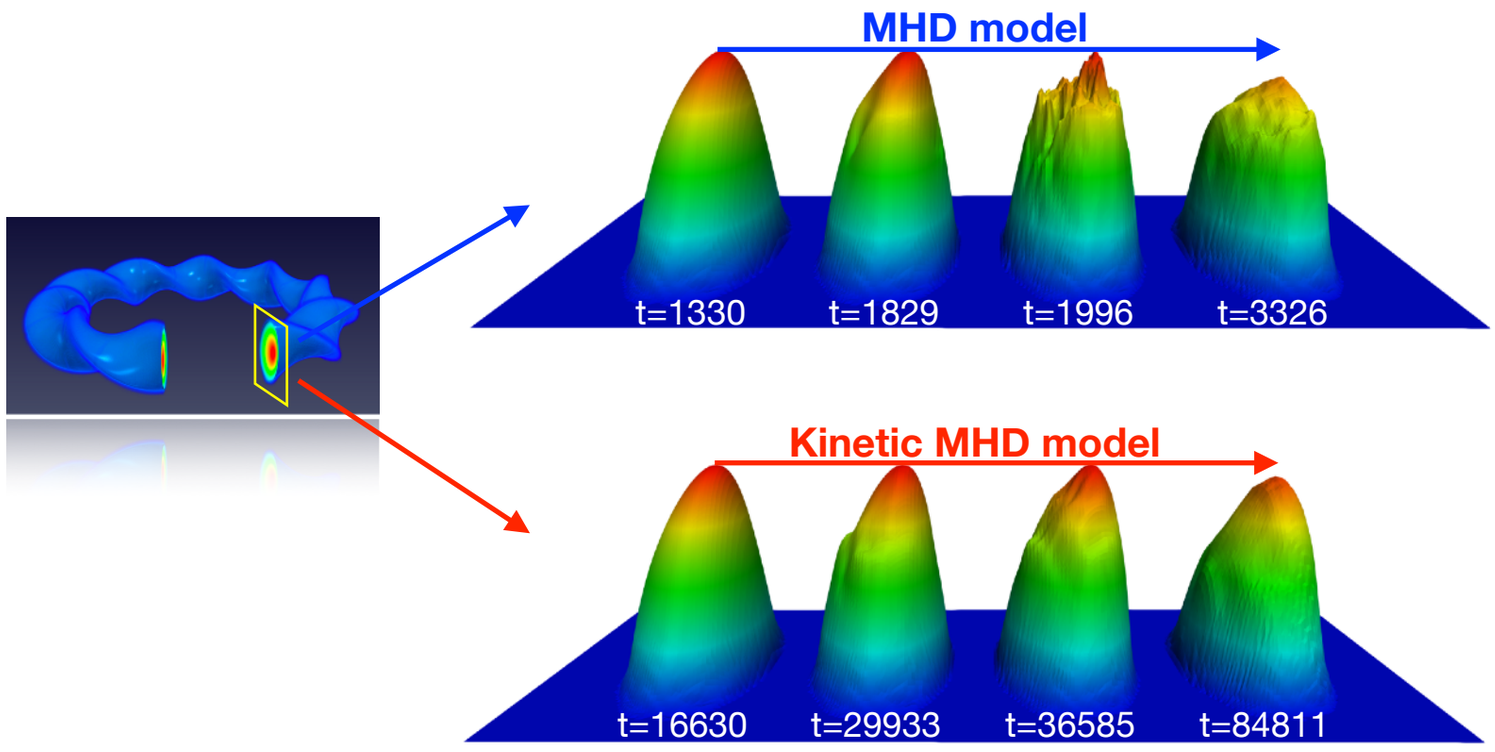
- Significant stabilizing effect of kinetic thermal ions is found for the LHD plasmas.
- The kinetic MHD simulations for the LHD plasmas at high magnetic Reynolds number show that the high beta plasmas can be maintained since the saturation level of the pressure driven MHD instabilities is significantly reduced by the kinetic thermal ions.
- This results from the fact that the response of the trapped ions to the instabilities is weakened by the precession drift motion in the three-dimensional magnetic field.
- The supercritical stability of the LHD plasmas well above the Mercier criterion can be attributed to the precession drift motion of the trapped ions in the three-dimensional magnetic field.



The orbit of a deeply trapped ion and the mode structure of the interchange mode.



Dependence of the linear growth rate on the S number. For the high S number, the linear growth rate significant decreases due to the stabilizing effects of the kinetic thermal ions.



Time evolution of the pressure profile on a poloidal cross section for $S=10^7$. For the kinetic MHD model, the high beta plasma is maintained at the saturated state.