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Mix mitigation with external magnetic fields and hot-spot ion viscosity in Rayleigh-Taylor unstable inertial confinement fusion plasmas

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— Rayleigh-Taylor instabilities (RTI), an interchage instability commonly observed in inertial confinement fusion capsules, causes mixing of hot and cold fuels leading to energy loss from the hot-spot. Large externally applied magnetic fields can slow the growth of the RT while damping short-wavelength RT modes. Further mix mitigation is possible through hot-spot ion viscosity if ignition quality temperatures are achieved since viscosity has a strong dependence on ion temperature, $\sim T^{5/2}$. During deceleration when the gas-ice interface is RT unstable, the Reynold's number, *Re*, is laminar in the hot-spot due to high viscosity and it is turbulent in the ice. Even with a disparate *Re* profile across the gas-ice interface, the ion viscosity can be strong enough to damp short-wavelength RTI and short-wavelenth Kelvin-Helmholtz modes. In the absence of physical dissipation, the peak vorticity and the peak magnetic field suffer from ultraviolet divergence. Viscosity saturates the peak vorticity and resistivity saturates the peak magnetic field. A study of vorticity and magnetic field saturation will be presented using a visco-resistive Hall-MHD model in addition to results showing mix mitigation using magnetic fields and ion viscosity.

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