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Viscous effects on the Rayleigh-Taylor instability with background temperature gradient DANIEL LIVESCU, SERGIY GERASHCHENKO, Los Alamos National Laboratory — The growth rate of the compressible Rayleigh-Taylor instability is studied in the presence of a background temperature gradient, Θ , using a normal mode analysis. The effect of Θ variation is examined for three interface types corresponding to combinations of the viscous properties of the fluids (inviscid-inviscid, viscous-viscous and viscous-inviscid) at different Atwood numbers, At, and, when at least one of the fluids' viscosity is non-zero, as a function of the Grashof number. Compared to the $\Theta = 0$ case, the role of $\Theta < 0$ (hotter light fluid) is destabilizing and becomes stabilizing when $\Theta > 0$ (colder light fluid). The most pronounced effect of $\Theta \neq 0$ is found at low At and/or at large perturbation wavelengths relative to the domain size for all interface types. The results are applied to two practical examples, using sets of parameters relevant to Inertial Confinement Fusion coasting stage and solar corona plumes. The role of viscosity on the growth rate reduction is discussed together with highlighting the range of wavenumbers most affected by viscosity. The viscous effects further increase in the presence of a background temperature gradient, when the viscosity is temperature dependent.

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