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Variable Transport Property Effects on the Compressible Rayleigh-Taylor Instability[1] KEVIN CHERNG, SANJIVA LELE, Stanford University, DANIEL LIVESCU, Los Alamos National Laboratory — In the Rayleigh-Taylor instability, how the presence of large transport property differences, which for example may develop in response to heating, can affect the flow development remains an important open question. Using the PadeOps compressible flow solver, we explore an idealized problem of two compressible, RT unstable fluid layers beginning at different temperatures, specifically a hotter, lower density gas layer pushing against a colder, denser layer. Three transport property configurations are considered: simulations that use constant properties, ones that use variable temperature-dependent properties which obey a plasma-type power law and ones that begin with constant properties then transition to variable properties. Results are presented for simulations with temperature ratios up to 10 and Atwood numbers up to 0.7. Heat conduction due to the initial thermodynamic nonequilibrium and transport property variations caused by temperature increases delay instability development, influence the overall amount of molecular mixing and suppress turbulent behavior in the hotter fluid.

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