

Abstract Submitted
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Turbulence production in low-Pr number convection flows¹ JOERG SCHUMACHER, Technische Universitaet Ilmenau, JANET SCHEEL, Occidental College Los Angeles — Convection at very low Prandtl numbers can be considered in some sense as Terra Incognita given the detailed investigations for $Pr \sim 1$ or $Pr > 1$ and the challenges in studying these turbulent flows in simulation and experiment. Laboratory experiments for $Pr < 10^{-1}$ have to be conducted in liquid metals such as gallium at $Pr = 0.021$ and sodium at $Pr = 0.005$ both of which are opaque. High-resolution direct numerical simulations are therefore the only tool to unravel the detailed three-dimensional mechanisms of turbulence generation in low-Prandtl number flows and to compare to convection flows at $Pr \sim 1$. We therefore analyze flows for which Rayleigh and Prandtl numbers are chosen such that the same Grashof number results. Analysis on enstrophy production due to vortex stretching and temperature gradient are discussed together with statistics of local strain.

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