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Turbulent Buoyant Flows: A Structural Approach PHARES CARROLL, GUILLAUME BLANQUART, California Institute of Technology — In a wide variety of natural phenomena, buoyancy plays a significant role in the evolution of turbulent physics. However, there is no consensus in the literature in regards to the structural implications of the interplay between turbulence and buoyancy. In this study, two incompressible, miscible fluids with different densities are considered in the presence of gravity. In the implemented configuration, it is possible to vary independently the Reynolds and Richardson numbers, allowing for the methodical study of the interactions between buoyancy and turbulence. The simulation results are used to analyze the structural changes induced by buoyancy on the evolving turbulent field. Specifically, attention is paid to the spectral distribution of kinetic energy via calculation and analysis of spectra (energy production, dissipation, and transfer). This is done to determine where gravity (buoyancy) deposits its energy from a spectral perspective. Also, the evolution of each constituent term in the energy equation is examined and compared to results obtained from isotropic turbulent cases. Further, analysis is conducted on the alignment of the vorticity field with the direction of principle strains to identify how the turbulent structure is modified in the presence of such a body force.

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