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Richardson effects in turbulent buoyant flows RENAUD BIGGI, Ecole Normale Superieure, Cachan, France, GUILLAUME BLANQUART, Caltech, CA, USA — Rayleigh Taylor instabilities are found in a wide range of scientific fields from supernova explosions to underwater hot plumes. The turbulent flow is affected by the presence of buoyancy forces and may not follow the Kolmogorov theory anymore. The objective of the present work is to analyze the complex interactions between turbulence and buoyancy. Towards that goal, simulations have been performed with a high order, conservative, low Mach number code [Desjardins et. al. JCP 2010]. The configuration corresponds to a cubic box initially filled with homogeneous isotropic turbulence with heavy fluid on top and light gas at the bottom. The initial turbulent field was forced using linear forcing up to a Reynolds number of $Re_\lambda = 55$ [Meneveau & Rosales, POF 2005]. The Richardson number based on the rms velocity and the integral length scale was varied from 0.1 to 10 to investigate cases with weak and strong buoyancy. Cases with gravity as a stabilizer of turbulence (gravity pointing up) were also considered. The evolution of the turbulent kinetic energy and the total kinetic energy was analyzed and a simple phenomenological model was proposed. Finally, the energy spectra and the isotropy of the flow were also investigated.

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