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Filter-width and Atwood number effects in filtered homogeneous variable density turbulence DENIS ASLANGIL, JUAN SAENZ, DANIEL LIVESCU, Los Alamos National Laboratory — We investigate Atwood number (A) and filter width (w) dependence in filtered DNS of buoyancy driven homogeneous variable density turbulence, where density differences affect mixing and turbulence, and we discuss implications for modeling. We show that statistics and budgets of filtered fields transition smoothly between DNS and RANS fields and budgets, and we discuss these transitions in the context of flow length scales. At small w, filtered fields tend to DNS fields and the large-scale flow kinetic energy (k_l) budget tends to the total kinetic energy (k_t) budget; at large w, filtered fields approach RANS fields and k_l approaches the mean kinetic energy (k_m) budget. At intermediate w, the k_l budget has dissipation and pressure-dilatation work terms from the k_t budget, a mean pressure gradient term from the k_m budget, a production term from both the k_t and k_m budgets, and work by residual stresses against the filtered shear e_s, which tends to zero at both limits. Work by mean pressure gradients and by e_s exhibit density dependent back-scatter: at high A, e_s back-scatter occurs mainly in light fluid. Statistics of filtered fields, normalized by their RANS counterparts, smoothly and monotonically vary between 0 and 1 as w varies from dx to domain size, and the dependence on w is different for different quantities.

Juan Saenz
Los Alamos National Laboratory

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