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A Comparative Study of Spatially Evolving Self-Propelled Wakes and a Patch of Turbulence in a Stratified Fluid ANIKESH PAL, MATTHEW DE STADLER, SUTANU SARKAR, University of California San Diego — Direct numerical simulation (DNS) is used to compare the evolution of a self-propelled wake and a patch of turbulence in a stratified fluid. The primary focus of this study is to determine the influence of the mean velocity profile on the evolution of the wake. The cases considered are: (a) self-propelled wake with a canonical mean velocity profile, (b) self-propelled wake with the mean removed, (c) a patch of turbulence with the same initial energy spectrum, and (d) a patch of turbulence with a different initial energy spectrum. The Reynolds number (Re), Froude number (Fr) and Prandtl number (Pr) used in the simulations are 10000, 3.194 and 1 respectively. Auxiliary temporally evolving simulations are used to generate the inlet boundary conditions for the spatially evolving cases. We obtain qualitatively and quantitatively similar results among (a), (b) and (c) for the evolution of kinetic energy, vortical structures and the wave field. However the wake dynamics in case (d) with a different initial energy spectrum show significant differences. The implication is that the fluctuating components of the velocities close to a body determine the subsequent flow. The mean velocity may exert an indirect influence through its influence on the near-wake turbulence spectrum.

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