Abstract Submitted
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Towards Simulation of Stratified Turbulent Wakes at Very High Reynolds number[1] NIDIA CRISTINA REYES GIL, School of Civil and Environmental Engineering, Cornell University, KRISTOPHER ROWE, Leadership Computing Facility, Argonne National Laboratory, GREG THOMSEN, Wandering Wakhs Research, PETER DIAMESSIS, School of Civil and Environmental Engineering, Cornell University — We present the components of an upgraded Fourier/spectral-element (SEM) flow solver designed for the simulation of stratified wakes with non-zero net momentum. Use of a modal SEM in the vertical direction retains the flexibility of localized flow resolution of the wake core and offers improved numerical stability properties, as compared to its predecessor spectral multidomain penalty method scheme. The selection of the polynomial basis functions in combination with static condensation results in a large number of small tridiagonal systems, which enables code performance speed-up. Following a brief discussion of code performance, we will discuss results from implicit Large Eddy Simulations of stratified sphere wakes at internal Froude number, $Fr = 4$, which extend to body-based Reynolds number $Re \sim O(10^6)$. Our preliminary analysis will focus on characterizing the persistence of turbulent fine-structure deep into the intermediate stage of wake evolution. The numerical dissipation caused by spectral filtering will be quantified as a fraction of physical dissipation resolved by the grid. The potential of a distinct and sufficiently long window in time at $Re \sim O(10^6)$ which supports strongly layered turbulence in the strongly stratified regime will be discussed.

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