Abstract Submitted
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Stratified turbulence diagnostics for high-Reynolds-number momentum wakes[1] PETER DIAMESSIS[2], Cornell University, QI ZHOU, University of Calgary — We analyze a large-eddy simulation (LES) dataset of the turbulent wake behind a sphere of diameter D translating at speed U in a linearly stratified Boussinesq fluid with buoyancy frequency N. These simulations are performed at Reynolds numbers $Re \equiv UD/\nu \in \{5 \times 10^3,\ 10^5, 4 \times 10^5\}$ and various Froude numbers $Fr \equiv 2U/(ND)$. The recently obtained data at $Re = 4 \times 10^5$, the highest Re attained so far in either simulation or laboratory, and $Fr \in \{4, 16\}$ enable us to systematically investigate the effects of Reynolds number on this prototypical localized stratified turbulent shear flow. Our analysis focuses on the time evolution of various diagnostics of stratified turbulence, such as the horizontal and vertical integral length scales, turbulent kinetic energy and its dissipation rate ε, and the local rate of shear between the spontaneously formed layers of vorticity within the larger-scale quasi-horizontal flow structures. This leads to a discussion of the transitions between distinct stratified flow regimes (Brethouwer *et al.* 2007) in the appropriately defined phase diagram, and we highlight the dynamical role of the Gibson number $Gi = \varepsilon/(\nu N^2)$, and its dependence on the body-based Reynolds number Re.

[1]ONR grants N00014-13-1-0665 and N00014-15-1-2513
[2]I will be able to attend the meeting on Nov. 19 20, as I will have a 7-month old at home. If you could schedule the presentation for one of the first two days of the conference I'd hugely appreciate it !

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