

Abstract Submitted
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Dynamics of Coherent Structures in Stratified Wakes at High Reynolds Number¹ SHEEL NIDHAN, University of California, San Diego, KARU CHONGSIRIPINYO, Chulalongkorn University, OLIVER SCHMIDT, SUTANU SARKAR, University of California, San Diego — Stratified wakes at high Reynolds number (Re) are known to develop organized coherent structures at intermediate to late values of buoyancy time (Nt). In the present study, we analyze the dynamics of coherent structures in the wake of a disk at $Re = 50000$ and $Fr = 2, 10$ using large-eddy simulations (LES) and spectral POD (SPOD). SPOD eigenspectra of both wakes show a spectral peak at the vortex shedding frequency ($St \approx 0.13 - 0.14$) of the unstratified counterpart throughout the domain. With increasing Nt , eigenspectra of $Fr = 2$ exhibit increasingly significant low-rank behavior, particularly around the vortex shedding frequency. We also find that the arrival of the $Fr = 2$ wake, at $Nt \approx 20$, into a regime of strongly stratified turbulence (SST) is marked by the dominance of the region with turbulent internal gravity waves (IGWs) to the energy carried by the leading SPOD modes. The onset of turbulent IGW emission in the $Fr = 10$ wake occurs when it enters the intermediate stratified regime (IST). Reconstruction of various turbulent fluxes is also performed to uncover the contribution of different modes towards the statistical descriptors of the flow.

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