Hybrid D.N.S. model of the spatially-evolving turbulent wake
ALEXANDRA VANDINE, SUTANU SARKAR, Mechanical and Aerospace Engineering, UC San Diego — A hybrid spatially-evolving D.N.S. model is used to simulate the turbulent wake behind a sphere at Reynolds number, $Re = U_\infty D/\nu = 3700$ and Froude numbers, $Fr = U_\infty/ND = \infty, 3$, and 1. Without a sphere in the domain but inflow conditions generated from a body-inclusive simulation, this method is a hybrid of both body-inclusive and body-exclusive models. To investigate extraction sensitivity, inlet conditions are extracted from three locations in the streamwise direction, $x_1/D = 3, 6$, and 10. It is found that strategic choice in extraction location accounting for local flow physics is required for statistical accuracy. Grid resolution is examined for all Froude numbers. Vorticity contours illustrate good qualitative agreement between the hybrid model and body-inclusive simulations. The two-layered form is captured well while phase lines indicating internal wave propagation are clearly observed. Analysis of turbulent kinetic energy also indicates agreement between the hybrid model and body-inclusive simulations.

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