

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Accuracy of the 2D+ t Approximation for Turbulent Wakes in Stratified Flows LAURA PAULEY, Pennsylvania State University — Wakes in the ocean can be produced by a stationary object in a current or by a moving object in stationary water. When viewed in a reference frame moving with the object, the wake can persist thousands of object diameters downstream. Due to the extensive domain, an unsteady two-dimensional (2D+ t) computation is often used to sweep downstream through the wake development. The 2D+ t computation approximates the development of the wake at a fixed location as an object moves past but applies cyclical boundary conditions in the streamwise direction. A Parabolized Navier-Stokes (PNS) method has the same numerical efficiency as the 2D+ t method but includes additional streamwise gradient terms found in the three-dimensional governing equations. The present paper investigates the accuracy of the 2D+ t approximation for stratified turbulent wake flows for a range of Froude numbers and Reynolds numbers. The 2D+ t results are compared with results from 3D Navier-Stokes computations and results from PNS computations to identify criteria at which the 2D+ t method will yield accurate results.

Laura Pauley
Pennsylvania State University

Date submitted: 29 Jul 2013

Electronic form version 1.4