

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Measurement of High Reynolds Number Stratified Turbulent Wake of a Towed Sphere ALAN BRANDT, KENNETH KALUMUCK, Johns Hopkins APL — Although aircraft and ships operate at Reynolds numbers significantly greater than one million, there are virtually no extant data on the turbulence of wakes at $Re > 10^6$, above the drag crisis regime. The present study is designed to characterize the near-field of a stratified wake at large Reynolds numbers, $Re \sim 2 \times 10^5 - 10^6$, by towing a large diameter ($D \sim 0.5$ m) sphere through a thermally stratified fresh water lake and a thermally stratified large salt water towing tank. Stratification produced BV frequencies, N , up to 0.07 s^{-1} resulting in Froude numbers $F = U/ND \geq 15$. Three component turbulent velocities and temperature measurements were obtained using Acoustic Doppler Velocimeters (ADV) and an array of fast response thermistors at various downstream distances. Turbulence power spectra of both the velocity and temperature signals exhibited a clear $-5/3$ slope over an order-of-magnitude range in wavenumber, which is generally not clearly evident in lower Re laboratory experiments. This study is sponsored by the Office of Naval Research Turbulence and Stratified Wakes Program.

Alan Brandt
Johns Hopkins APL

Date submitted: 02 Aug 2017

Electronic form version 1.4