Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Vertical Flux of Mean Flow Kinetic Energy in the Near-Wake of a Marine Propeller in the Presence of External Turbulence[1] LUKSA LUZNIK, BENNITT HERMSEN, United States Naval Academy — This experimental study examines the spatial evolution of the three-bladed marine propeller model (D=13cm) near wake in the early stages from the immediate wake behind the propeller up to 7 propeller diameters downstream for two inflow conditions: one with imposed external turbulence with 7% intensity and integral scale compared to propeller blade geometry, and the second one with clean inflow conditions as a reference. Resulting Reynods number is $Re_{0.7R}$ =4.7x10^5. All components of the vertical fluxes of mean flow kinetic energy are calculated from available three-dimensional PIV data and compared for the two inflow conditions. Influence of external turbulence on the wake instability process of mutual induction is examined and it was found that external turbulence enhances tip-vortex roll up mechanism resulting in earlier breakdown of individual vortices into small scale turbulence. Conditional sampling is performed to analyze the mechanisms of mean flow kinetic energy transport and it was found that outward interactions and sweep events contribute the most to the vertical transfer of mean flow kinetic energy from the inner wake to the free stream.

[1]Funded by Office of Naval Research

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Date submitted: 31 Jul 2019 Electronic form version 1.4