Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Drag reduction through wave-current interactions with a marine hydrofoil IGNAZIO MARIA VIOLA, SUSAN TULLY, DAVID INGRAM, Univ of Edinburgh — A hydrofoil exposed to oscillating flow experiences a reduction in drag due to the Knoller-Betz effect. This is experimentally identifiable by an increasingly inverted von Krmn wake and a corresponding thrust force on the foil. The rate of drag reduction, dependent on plunge amplitude and frequency, reduces with unsteady flow phenomena at higher reduced frequencies. For experimental ease, investigations of this effect have relied on actively plunging/pitching a foil within a steady current. However, one potential application is to drag reduction in high-speed ships adopting submerged foils. In this case the foil is travelling through wave-current induced oscillatory flow, resulting in an additional dynamic variation of hydrostatic pressure across the chord; a phenomena not fully addressed in previous experiments. Here we investigate the effects of this pressure gradient on drag reduction for a stationary foil in combined waves and current, through a combination of force measurements and particle image velocimetry.

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Date submitted: 16 Nov 2015 Electronic form version 1.4