

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Ship wave resistance on non-linear vertically sheared currents

BENJAMIN SMELTZER, YAN LI, SIMEN ELLINGSEN, Norwegian University of Science and Technology — Wave resistance is responsible for approximately one-third of the fuel consumption for large-size ships. We present calculations of this wave resistance force for a vessel traveling on a realistic background current of arbitrary depth-dependence. Previous theoretical work has considered currents that vary linearly with depth (constant shear), with results showing a dependence of the wave resistance forces on the shear strength as well as the direction of ship motion relative to the current profile. We extend these results to realistic measured profiles using a piecewise linear approximation to the current in the vertical direction. The background current is divided into layers each with a linear velocity profile. The method is applied to various measured current profiles, and wave resistance calculations are presented as a function of a number of system parameters such as ship Froude number, direction of motion relative to the surface current, and hull shape aspect ratio. For the profiles considered here, the wave resistance may vary up to a factor of two with direction of motion for low Froude numbers.

Benjamin Smeltzer
Norwegian University of Science and Technology

Date submitted: 01 Aug 2016

Electronic form version 1.4