Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Wave-Induced Momentum Flux over Wind-driven Surface Waves[1] KIANOOSH YOUSEFI, FABRICE VERON, University of Delaware, MARC BUCKLEY, Helmholtz-Zentrum Geesthacht, NYLA HUSAIN, TETSU HARA, University of Rhode Island — In recent years, the exchange of momentum between the atmosphere and the ocean has been the subject of several investigations. Although the role of surface waves on the air-sea momentum flux is now well established, detailed quantitative measurements of wave-induced momentum fluxes are lacking. In the current study, using a combined Particle Image Velocimetry (PIV) and Laser Induced Fluorescence (LIF) system, we obtained laboratory measurements of the airflow velocity above surface waves for wind speeds ranging from 0.86 to 16.63 m s-1. The mean, turbulent, and wave-coherent velocity fields are then extracted from instantaneous measurements. Wave-induced stress can, therefore, be estimated. In strongly forced cases in high wind speeds, the wave-induced stress near the surface is a significant fraction of the total stress. At lower wind speeds and larger wave ages, the wave-induced stress is positive very close to the surface, below the critical height and decreases to a negative value further above the critical height. This indicates a shift in the direction of the wave-coherent momentum flux across the critical layer.

[1]NSF OCE1458977 , NSF OCE1634051

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Date submitted: 01 Aug 2017 Electronic form version 1.4