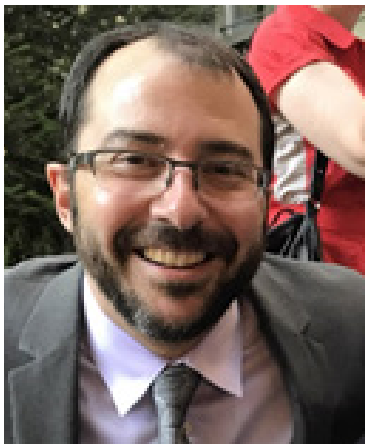
UNIVERSITY OF MARYLAND

THE BURGERS PROGRAM FOR FLUID DYNAMICS
FLUID DYNAMICS REVIEWS SEMINAR SERIES

MOMENTUM FLUXES IN THE AIRFLOW AND AT THE SURFACE OF WIND-DRIVEN WAVES WITH INTERMITTENT AIRFLOW SEPARATION



Friday, October 2, 2020 | 11am - 12pm
Zoom link: https://umd.zoom.us/j/4487374796
Meeting ID: 448 737 4796

Guest Speaker

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ABSTRACT

The small-scale physics within the first centimeters above the wavy air-sea interface is the gateway for transfers of momentum and scalars between the atmosphere and the ocean. We present a detailed laboratory investigation of the momentum and energy fluxes over between wind-generated waves and the turbulent airflow aloft. Experiments were performed in the large wind-wave facility at the Air-Sea Interaction Laboratory of the University of Delaware. Airflow velocity measurements were acquired above wind waves using a combination of particle image velocimetry (PIV) and laser-induced fluorescence (LIF) techniques. The data also allowed for direct measurements within the viscous sublayer in the turbulent airflow. We observe that airflow intermittently separates downwind of wave crests, starting at wind speeds as low as 2.19 m/s. Such events are accompanied by a dramatic drop in tangential viscous stress past the wave's crest, and a gradual regeneration of the viscous sublayer upon the following (downwind) crest. At the interface, the viscous stress and the form drag contribute to the total stress. We show that wave viscous stress contributes minimally to the wave growth. Using a triple decomposition technique, mean, wave-coherent, and turbulent velocity fields are obtained. In the airflow, and within the wave boundary layer, we show the momentum flux budget which includes the total air-water momentum flux and its viscous, wave, and turbulent components.

BIO

Fabrice Veron is a professor in Physical Ocean Science and Engineering in the School of Marine Science and Policy at the University of Delaware. He currently serves as the deputy dean for the College of Earth, Ocean, and Environment. Veron received a PhD from Scripps Institution of Oceanography in 2020 after obtaining degrees in Mechanical Engineering and Applied Mathematics from the University of Bordeaux, France. His research interests revolve around small scale air-sea interactions. Most of his work involves experiments on breaking waves and related phenomena such as the injection of turbulence and bubbles in the water columns and the resulting air-sea gas fluxes; or the ejection of sea spray in the airflow and the resulting air-sea mass, moisture, and heat fluxes.

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