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The Effects of Surface Wind Waves on the Atmospheric Wave and Turbulent Kinetic Energy Budgets[1] KIANOOSH YOUSEFI, FABRICE VERON, School of Marine Science and Policy, University of Delaware — The energy exchanges between the atmosphere and ocean are strongly contingent on small- and large-scale dynamics at the air-sea interface. However, there are relatively few investigations on the airside wave and turbulent kinetic energy budgets. Here, we present laboratory measurements (PIV/LIF) of velocity fields in the turbulent airflow above surface waves for 10-m wind speeds of 2.25 to 16.59 m/s. The wave-induced and turbulent velocity components are then extracted from the instantaneous velocity to examine, in detail, the wave and turbulent kinetic energies (WKE and TKE). The TKE is enhanced downwind of wave crests away from the surface and reduced in a thin layer near the interface. These intense regions of TKE are attributed to the airflow separation events past wave crests. It was further observed that the streamwise turbulent velocity variance carries the bulk of the TKE. Like the TKE, a region of enhanced WKE was observed, but it was located on the upwind side of waves close to the surface. This is consistent with the patterns observed in streamwise wave-induced velocity variances. Finally, the measurements provide direct measurements of the generation of WKE by the mean shear in the airflow. We will discuss the results in the context of the total kinetic energy budget.

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