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Kinetic Energy Balance Perspective on the Structure and Dynamics of the Air Flow Over Surface Waves TIHOMIR HRISTOV, Dept. of Mechanical Engineering, Johns Hopkins University — The transition from current empirical to mechanistic understanding of the interaction between wind and the wavy water surface requires describing the spatio-temporal dynamics of the wave-induced fields in the wind. Studies have reported failure to detect dynamic or statistical signature of such fields in spectra, structure functions, kinetic energy balance, or in turbulent dissipation measurements. Here we analyze the wave-induced fields of velocity and pressure, their structure functions and higher order moments, e.g. energy and momentum fluxes. The existence of wave-induced fields is demonstrated. While velocity is predominantly turbulent, pressure is organized and coherent with the waves. The latter indicates that random force mechanism for wind-wave interaction proposed by C. Eckart (1953) and O.M. Phillips (1957) is inefficient and virtually inactive. The explicit form of the structure function obtained here and the partitioning of fluxes into turbulent and wave-induced, explain the failures to observationally detect a wave signature in the structure function and in the TKE budget.

Tihomir Hristov
Dept. of Mechanical Engineering, Johns Hopkins University

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