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Time-resolved PIV measurements of the atmospheric boundary layer over wind-driven surface waves COREY MARKFORT, University of Iowa, MATT STEGMEIR, TSI Incorporated — Complex interactions at the air-water interface result in two-way coupling between wind-driven surface waves and the atmospheric boundary layer (ABL). Turbulence generated at the surface plays an important role in aquatic ecology and biogeochemistry, exchange of gases such as oxygen and carbon dioxide, and it is important for the transfer of energy and controlling evaporation. Energy transferred from the ABL promotes the generation and maintenance of waves. A fraction of the energy is transferred to the surface mixed layer through the generation of turbulence. Energy is also transferred back to the ABL by waves. There is a need to quantify the details of the coupled boundary layers of the air-water system to better understand how turbulence plays a role in the interactions. We employ time-resolved PIV to measure the detailed structure of the air and water boundary layers under varying wind and wave conditions in the newly developed IIHR Boundary-Layer Wind-Wave Tunnel. The facility combines a 30-m long recirculating water channel with an open-return boundary layer wind tunnel. A thick turbulent boundary layer is developed in the 1 m high air channel, over the water surface, allowing for the study of boundary layer turbulence interacting with a wind-driven wave field.

Corey Markfort
Univ of Iowa

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