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Experimental investigation of the interaction between turbulent boundary layers and near-surface wave-induced forcing. OWEN WILLIAMS, University of Washington — Free-surface waves can have a significant impact on sub-surface turbulent boundary layers that are present on undersea vehicles or on the bottom of flowing bodies of water such as estuaries. This problem has a wide parameter space and resultant changes to boundary layer structure due to wave forcing still require investigation. Here, preliminary experimental measurements within the newly commissioned wave channel at the University of Washington are detailed. Particle image velocimetry (PIV) is used to examine velocity statistics across the water column. In an effort to more readily identify changes in underlying boundary layer structure, a range of flow decompositions, such as snapshot partial orthogonal decomposition (POD) are evaluated in an effort to separate turbulent motions from the forcing, which to first order is a traveling wave. The effect of the relative difference between water depth and boundary layer thickness will be examined, as well as the Froude number of the surface waves. Ongoing efforts to examine the full parameter space will be discussed, as dimensional analysis and linear wave theory suggest there are up to seven parameters relevant to either inner or outer layers.

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