

Center for Environmental & Applied Fluid Mechanics



“Mixing, Morphology, and Melting in Homogeneous Isotropic Turbulence”

Blair A. Johnson
The University of Texas
at Austin



High levels of turbulence can increase instantaneous localized shear and in turn transport across interfaces. For example, the uprush in the nearshore can be characterized as bore-advected offshore wave-generated turbulence; resulting sediment suspension in the swash is observed to be greater than would be predicted by traditional mean shear models. To isolate the role of turbulence in transport processes, we conduct laboratory experiments in facilities with mean shear free homogeneous isotropic turbulence generated via randomly actuated synthetic jet arrays. We use particle image velocimetry and laser induced fluorescence to characterize turbulence and mass transport. We explore the boundary layer that develops when homogeneous isotropic turbulence interacts with a sediment bed, a sharp density stratification, and ice. For sediment experiments, we explore requisite turbulence levels for suspension and development of morphological features, including within-bed sediment dynamics. At a density interface, we explore conditions of flow and density that encourage mixing and generation of internal waves. For ice experiments, we evaluate how turbulence can increase melt rates at low temperatures through rapid stirring of meltwater plumes. These various boundaries each highlight the ability of turbulence to drive evolution of critical environmental systems.

Fall 2022 CEA FM Seminar Series

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<https://wse.zoom.us/j/93762992307>

