DFD20-2020-001014
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Abstract for an Invited Paper
for the DFD20 Meeting of
the American Physical Society

Vegetation Hydrodynamics for Climate Mitigation and Adaptation[1]

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Coastal ecosystems, such as seagrass and salt marsh, diminish the impact of storm surges and waves. In addition, these ecosystems sequester carbon, called blue carbon, more rapidly than terrestrial forests. Because of these attributes, coastal vegetation is considered an integral part of climate mitigation and adaptation. Predicting the value of these ecosystems with regard to coastal protection and/or blue carbon credit requires models for the interaction of fluid motion with flexible vegetation. This talk describes the development of scaling laws to predict the drag on individual plants, and the extension of these laws to predicted wave decay over a meadow of plants, considering both reconfiguration (the bending of plant elements in response to fluid drag) and sheltering between plant elements. Plant reconfiguration and drag are functions of a Cauchy number (ratio of hydrodynamic drag and the restoring force due to plant rigidity) and the ratio of wave excursion to plant height. Experiments with live and dynamically-similar model plants validate the drag on individual plants and the prediction of wave energy dissipation. Models of seagrass and marsh grass are considered.

[1]National Science Foundation, MIT MITEI Seed Fund