American Geophysical Union (AGU) Fall Meeting 2018 Oral Presentation: "The Influence of Flexural Rigidity on Wave-induced Hydrodynamics within Aquatic Vegetation Canopies"

Robert C. Houseago[1]
[1]*School of Environmental Sciences, University of Hull, r.houseago@hull.ac.uk*

Conference Overview

This research was presented at the AGU Fall meeting in 2018 thanks to the generous support provided by the British Society of Geomorphology's Postgraduate Conference Attendance Grant. This conference combines a vast array of earth science research areas including geomorphology, allowing dissemination of research to a large and diverse audience. Attending and presenting at AGU 2018 provided an excellent opportunity to meet fellow researchers, leading to many productive discussions.

Research Summary

Coastal aquatic vegetation such as seagrass is recognised as a valuable asset in coastal fringe environments, providing coastal protection, promoting biodiversity, and supporting blue carbon storage. There is a growing need to incorporate biota into the study of geomorphology. This research provides, for the first time, a systematic study into the effects of vegetation flexibility on wave-induced flow and turbulence structures within and above seagrass canopies. Blade flexibility is a fundamental vegetation characteristic, however, the hydrodynamics of coastal vegetation has largely been studied experimentally using rigid rods as surrogates. This research addresses the recognised need to improve knowledge regarding the role of vegetation flexural rigidity on hydrodynamics, the relationship with sediment mobility, and the coupled influence on coastal geomorphology.

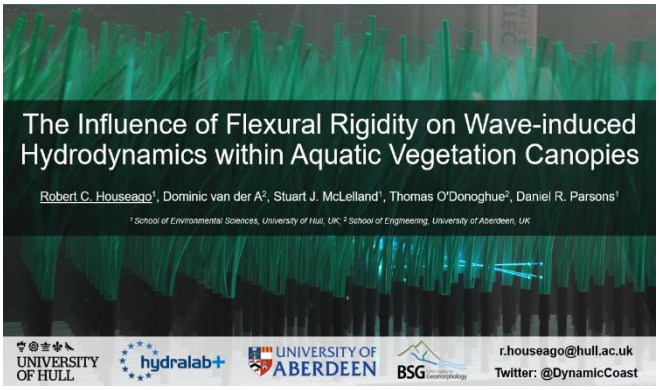

Figure 1: Presentation title slide

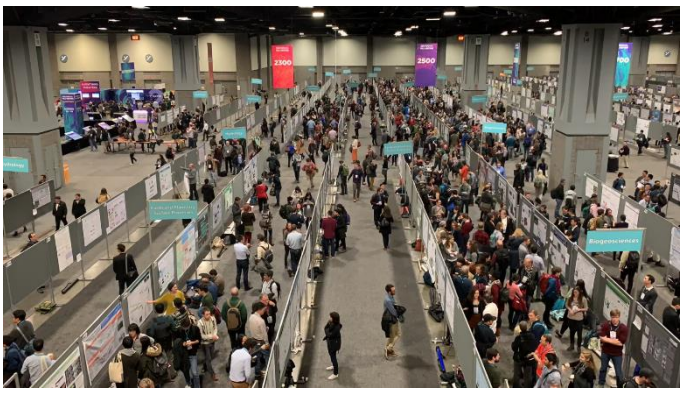

Figure 2: AGU Fall Meeting 2018 Poster Hall

A series of experiments were conducted within the Aberdeen University Random Wave Flume. Eight different artificial seagrass canopies were assessed, parameterised by field data, encompassing four different blade flexibilities at two canopy densities. Three regular wave conditions were tested, ranging from moderate to storm conditions at full-scale. High-resolution non-intrusive velocity measurements were made with a two-component Laser-Doppler Anemometer (LDA) (shown in image in Figure 1), measuring a vertical profile in the centre of each canopy, from the bed to above canopy.

Results show the spatial and temporal hydrodynamics are notably influenced by changes in vegetation blade flexibility, which is predicted to alter the sediment dynamics within the coastal system. The parameterisation of experimental variables from field data collection provides a direct comparison to nature, thus facilitating comparable data acquisition under controlled conditions, which are otherwise difficult to obtain in the field.

Social Media Summary

Research presented at AGU 2018 with the support of the British Society of Geomorphology highlights how vegetation blade flexibility notably influences in-canopy wave hydrodynamics.

Acknowledgements

This research was conducted in collaboration with co-authors: Dominic A. van der A[2], Stuart J. McLelland[1], Thomas O'Donoghue[2], and Daniel R. Parsons[1]
[2]*School of Engineering, Kings College, University of Aberdeen*