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## Coastal Engineering Challenges of the 21<sup>st</sup> Century

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### Abstract

1.0-2.0+ meters of sea-level rise projected over the 21<sup>st</sup> century will challenge our sustained existence on the coast via increased flooding, beach erosion, cliff failure, saltwater intrusion in aquifers, and groundwater inundation. Understanding and predicting future coastal hazards depends on integrating data on natural and built systems with computer simulations. Although many computer modeling approaches are available to simulate coastal processes and hazards, few are capable of making the reliable long-term predictions needed for adaption or to enhance resilience. Recent advancements have allowed convincing simulations of waves, turbulence, coastal flooding, and sediment transport. However, the long-term evolution of coastal hazards, caused by the interaction of sea-level rise with many geologic and hydrodynamic processes, is notoriously difficult to understand let alone predict.

In this talk, I discuss several challenges in coastal ocean modeling and my research efforts overcome them. In particular, I focus on my dissertation work to develop a new type of ocean model: a nonhydrostatic, generalized vertical coordinate model, intended to provide high-resolution simulations of waves, turbulence, and mixing. Zooming out in scale, I discuss my recent modeling efforts to estimate global-scale increases in the frequency of extreme wave, tide, and surge-driven flooding events due to sea-level rise. We find that regions with limited water-level variability, located mainly in the Tropics, will experience the largest increases in flooding frequency. The 10 to 20+ cm of sea-level rise expected no later than 2050 will more than double the frequency of extreme water-level events in the Tropics, impairing the developing economies of equatorial coastal cities and the habitability of low-lying Pacific island nations.

**Date: Friday, February 23rd, 2018. 3:00 to 4:00PM**

**Location: University of Hawaii at Manoa, Holmes Hall Room 244**

Parking Available at the UH Lower Campus Structure (\$5.00 for the day).

### Speaker Bio

Sean Vitousek was born and raised in Hawaii. He attended high school at Hawaii Preparatory Academy. Next, he attended Princeton University and majored in Civil & Environmental Engineering. Outside of the class room, Sean played on the Princeton volleyball team and was the president of the Princeton surf club. Sean received his MS in Geology & Geophysics from University of Hawaii advised by Chip Fletcher. With a strong interest to pursue numerical modeling, he attended Stanford University and obtained his PhD in Civil & Environmental Engineering advised by Oliver Fringer and supported by the Department of Energy Computational Science Graduate Fellowship. Following his time at Stanford, he received a Mendenhall Postdoctoral Fellowship and worked at the US Geological Survey in Santa Cruz. Sean is now a research assistant professor in Civil & Materials Engineering at the University of Illinois at Chicago, where his research focuses on developing numerical models to predict coastal climate change impacts. In their spare time, Sean and his wife Sylvia enjoy playing with their 6 month old daughter, Merigold, who also likes to conduct fluid mechanics research during her bath time.

