UC **SANTA BARBARA**

Department of Earth Science

Earth Science Colloquium

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Ambient noise in Southern California: Using tidal modulation as a proxy for nearshore processes

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Ambient seismic noise is generated through a variety of interactions between the oceans, atmosphere and solid earth. These ever-present signals are generally used to invert for subsurface models of velocity structure which are used widely in the geosciences. Understanding the sources of ambient noise can be important to avoid potential inversion biases due to a non-diffuse wavefield or poorly distributed noise sources.

Tidal modulations of seismic energy have been observed in the infragravity band (0.005—0.05 Hz), and more recently in the microseism band (0.05—0.5 Hz) where their signature is thought to represent a nearshore noise generation process. Understanding the mechanisms behind nearshore and deep ocean generated seismic noise can help us to better understand the distribution of seismic noise in different frequency bands and potentially improve future models of subsurface structure.

A pilot experiment on infrasonic lahar detection at Mount Adams volcano, Cascades: Ambient infrasound and wind-noise characterization at a quiescent stratovolcano.

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Erosion, hydrothermal activity, and magmatism at volcanoes can cause large and unexpected mass wasting events. Large debris flows have occurred within the past 10,000 years at Mount Adams, Washington, and represent a significant hazard to communities downstream. In August 2017, we began a pilot experiment to investigate the potential of infrasound arrays for detecting and tracking debris flows at Mount Adams. We deployed a telemetered 4-element, 85 m aperture infrasound array (BEAR) ~11 km from a geologically unstable area where mass wasting has repeatedly originated. Here we present a preliminary analysis of data from this pilot experiment representing a survey of the ambient infrasound and noise environment at this relatively quiescent stratovolcano. Array processing reveals near-continuous and persistent infrasound signals arriving from the direction of Mount Adams, which we hypothesize are fluvial sounds from the steep drainages on the southwest side of Mount Adams. We interpret observed fluctuations in the detectability of these signals as resulting from a combination of (1) wind-noise levels variations at the array, (2) changes in local infrasound propagation conditions associated with atmospheric boundary layer variability, and (3) changing water flow speeds and volumes in the channels due to freezing/thawing and precipitation events. Ten events ≥ 0.2 Pa at BEAR have array processing parameters consistent with mass movement occurrence at Mount Adams. We locate one of the events using three additional temporary arrays operating for five days in August 2018. However, these events were not visually confirmed. Furthermore, several visually confirmed debris-flows that occurred during the study did not produce clearly identifiable infrasound signals. This study highlights the practical challenges involved in identifying relatively weak and emergent signals of interest in a noisy background environment. Debris flows are anticipated to propagate down existing drainages, but these drainages appear to be a persistent source of ambient fluvial infrasound, providing major challenges to automated signal detection.