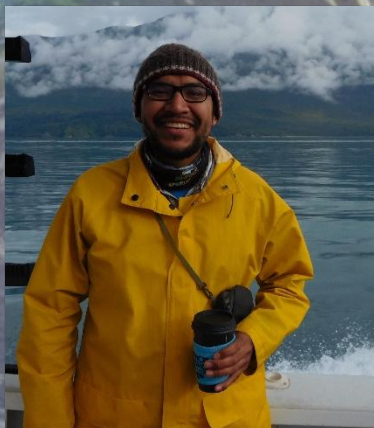
Seismic Signals from A Basin in Alaska, from A Landslide in Taiwan, And Strategies for Improving Hazard Products



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There are many different facets of natural hazards, including the unique seismic response of geologic materials and structures. Some geologic structures, such as sedimentary basins, modify waveforms as they propagate to the surface. Upon reaching the surface, they produce amplified displacements. I study the earthquake response of a sedimentary basin in central Alaska because many cities globally are affected by basins that amplify ground motion in complex ways. Additionally, I study landslides in Taiwan because there are many areas of mountainous terrain susceptible to landslides from heavy rain and high rates of seismicity. For this talk, I will focus on three research studies aimed at providing critical information for natural hazards on the effects of amplified earthquake waves on sedimentary basins, landslide seismic signal characterization for early warning, and the development of a new near-real-time earthquake product for the U.S. Geological Survey (USGS). In central Alaska, I deployed a set of seismographs on top of a 7 km deep basin for 5 years to understand shaking characteristics from local, regional and teleseismic earthquakes as well as seismic noise. I created a catalog of moment tensors from earthquakes with variable sizes and locations to help improve earthquake waveform simulations. Overall, I found that shaking within the basin can be several times stronger than on nearby-bedrock and having a wide variety of earthquakes in a catalog is critical for improving 3D earthquake waveform simulations. The second study focuses on characterizing when landslides will occur using the seismic signature of the Lantai landslide region in Taiwan. I used a machine-learning clustering method to identify characteristics in the combined seismic noise of several seismographs around a landslide region and identified a cluster related to landslide movement during a typhoon which underscores the potential of clustering methods in landslide early warning. USGS's ShakeMap currently estimates peak ground shaking, spectral acceleration, and perceived intensity after an earthquake in near-real-time. However, these metrics do not account for shaking duration and other significant ground motions that are important for accurately assessing landslides, liquefaction and infrastructure hazards. At USGS, I am developing the ingredients and models that can better represent the total energy of the ground shaking of globally significant earthquakes with the intensity metric cumulative absolute velocity (CAV). The work will hopefully significantly improve hazard characterization by accounting for these more nuanced but important factors.

19 August 2025

9:30 a.m.

Zoom Link: Here

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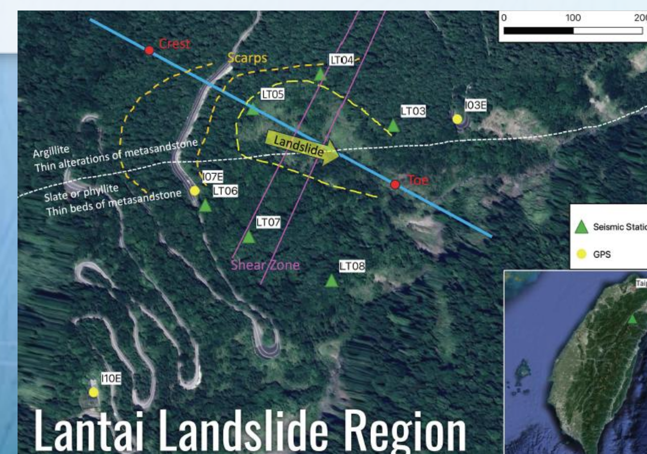

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