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Tsunami Generation Mechanism of Historical Hawai'i Local Tsunamis

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Wednesday, October 27
3:30 pm - 4:30 pm Seminar

Zoom Meeting ID: 935 9608 7383
Passcode: OREseminar

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Abstract

The 4 May 2018 M_w 6.9 earthquake offshore of Kilauea Volcano at Hawaii Island has raised concern to emergency management agencies in Hawaii because of locally generated tsunami's short arrival time and unpredictable amplitude along the Hawaiian Islands. Fortunately, the tsunami impact of the 2018 M_w 6.9 earthquake was moderate over the entire Hawaii island chain. However, Hawaii experienced two larger earthquakes in recorded history, the 1975 M_w 7.7 Kalapana and 1868 M ~7.9 Ka`u earthquakes at the south flank of Hawaii Island. Even though the 1868 earthquake has a considerably larger magnitude, the resulting runup distribution around Hawaii Island is comparable to the 1975 event. Therefore, we reconstructed the 2018 Mw 6.9, the 1975 Mw 7.7, and the 1868 M ~7.9 earthquake tsunamis using the tsunami numerical model, NEOWAVE (Non-hydrostatic Evolution of Ocean WAVEs), with high resolution bathymetry and topography data to clarify consistency and distinct characteristics of each tsunami's generation mechanism and subsequent tsunami impact around Hawaiian Islands. The modeling results improve understanding of statewide tsunami hazards for development of emergency response plans and mitigation strategies for future Hawaii local tsunamis.