

Paleotsunami deposit evidence of distant source tsunamis in the

Hawaiian Islands

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Large subduction zones earthquakes along portions of the Pacific "Ring of Fire" generate tsunamis that can impact the Hawaiian Islands. Over the past 200 years of written records, the Hawaiian Islands have experienced tens of small or intermediate sized tsunamis generated from ruptures along the Alaska-Aleutian, Kuril-Kamchatka, Chile, and Japan subduction zones. This study reports on efforts to estimate future tsunami hazard for the Hawaiian Islands through sedimentologic and stratigraphic analyses of potential tsunami deposits beneath present and former Hawaiian wetlands, coastal lagoons, and river floodplains. Mapping and dating anomalous beds of marine sand and silt along the coast is critical for assessing the hazard from distant as well as local tsunamis. Coastal sites on the islands of Hawai'i, Maui, O'ahu, and Kaua'i were selected based on historical tsunami runup, numerical inundation modeling, proximity to sandy source sediments, degree of wetland disturbance, and prior geologic and archaeological investigations (Figure 1). Marine-sourced sand beds within peaty and/or muddy wetland deposits on the north and northeastern shores of Kaua'i, O'ahu, and Hawai'i are interpreted as tsunami deposits.

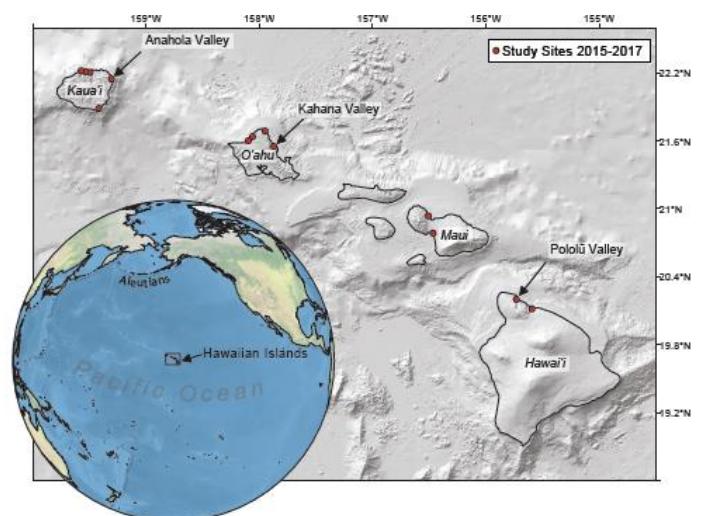


Figure 1. Location of coastal sites examined for evidence of tsunami deposits.

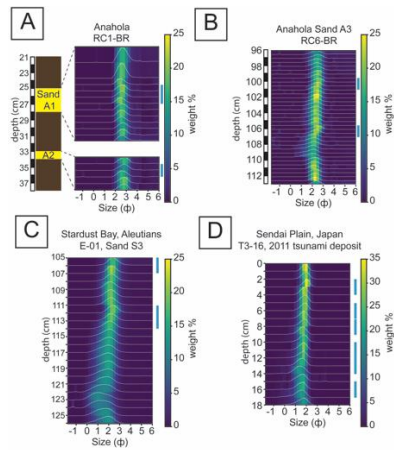


Figure 2. Grain-size distribution of modern (D) and paleo-tsunami deposits from the Aleutians (C) and Hawaii (A and B).

Deposit stratigraphy of paleo-tsunami deposits resembles characteristics of known modern tsunami deposits from 2011 Japan along the Sendai Plain (Figure 2). At a few of the Hawaiian sites, deposits thought to be associated with known 1946 and 1957 Aleutian-generated tsunamis are identified and are analogs for deeper and older probable tsunami deposits. Radiocarbon based age models date sand beds at ~120 cm depth to ~800-600 cal yr BP, suggesting they may correlate with local eastern Aleutians tsunami deposits of about the same age (Witter et al., 2016, Witter et al., 2018). Therefore, these results suggest that a large Aleutian Islands subduction earthquake generated a tsunami that inundated the Hawaiian Islands. These results help to extend the short historical record for the Islands and improve the assessment of tsunami hazard.