Identifying Seismogenic Deposits in Cascadia Inland Lake Sediments: A Natural Experiment Recorded in the Sedimentary Records at Squaw Lakes, Oregon, USA

Details

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Abstract

A natural experiment began after a landslide dammed Squaw Creek located ~100 km from the Oregon coast at the Oregon/California border (42.035804°N, 123.021973°W) separating the drainages at the confluence of Squaw and Slickear Creeks, resulting in the formation of Upper (Little) Squaw Lake and Lower (Big) Squaw Lake. Upper Squaw Lake is the smaller of the two lakes (7.2 ha) with a large drainage (40 sq km) and the sediments contain a 2000-y record of disturbance events. The thickest (~5 cm to ~35 cm) of the disturbance deposits correlate in timing and frequency as compared to the onshore/offshore record of seismogenic turbidites suggesting they were possibly triggered by strong shaking from great earthquakes. Both the drainage and the lake itself are situated within the Condrey Mountain Schist Terrane which consists of black graphitic quartz-mica schist (“blackschist”), with considerable amounts of chlorite-actinolite schist (“greenschist”), and is prone to failures. In contrast, Lower Squaw Lake is a larger, long lake (18.6 ha) with a small drainage (19 sq km). Lower Squaw Lake is also surrounded by the Condrey Mountain Schist, but approximately 95% of the drainage is located in the Western Hayfork Terrane, composed primarily of metavolcaniclastic andesitic agglomerate and tuff which is much more resistant to erosion and failure. These differences in geologic setting allow for the identification of deposits formed internally to the lake at Lower

Squaw Lake, which can then be compared to the record from Upper Squaw Lake where the frequency of disturbance event deposits is much higher than reasonably expected from earthquakes. Because disturbance event deposits in Pacific Northwest lakes have been typically attributed to post-fire erosion or extreme hydrologic events, we take advantage of these differences in setting to differentiate between seismogenic and aseismic deposits in Cascadia lake sediments.

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