

Global Search of Triggered Tectonic Tremor

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Deep tectonic tremor has been observed at major plate-boundary faults around the Pacific Rim. While regular or ambient tremor occurs spontaneously or accompanies slow-slip events, tremor could be also triggered by large distant earthquakes and solid earth tides. Because triggered tremor occurs on the same fault patches as ambient tremor and is relatively easy to identify, a systematic global search of triggered tremor could help to identify the physical mechanisms and necessary conditions for tremor generation. Here we conduct a global search of tremor triggered by large teleseismic earthquakes. We mainly focus on major faults with significant strain accumulations where no tremor has been reported before. These includes subduction zones in Central and South America, strike-slip faults around the Caribbean plate, the Queen Charlotte-Fairweather fault system and the Denali fault in the western Canada and Alaska, the Sumatra-Java subduction zone, the Himalaya frontal thrust faults, as well as major strike-slip faults around Tibet. In each region, we first compute the predicted dynamic stresses σ_d from global earthquakes with magnitude ≥ 5.0 in the past 20 years, and select events with $\sigma_d > 1$ kPa. Next, we download seismic data recorded by stations from local or global seismic networks, and identify triggered tremor as a high-frequency non-impulsive signal that is in phase with the large-amplitude teleseismic waves. In cases where station distributions are dense enough, we also locate tremor based on the standard envelope cross-correlation techniques. Finally, we calculate the triggering potential for the Love and Rayleigh waves with the local fault orientation and surface-wave incident angles. So far we have found several new places that are capable of generating triggered tremor. We will summarize these observations and discuss their implications on physical mechanisms of tremor and remote triggering.

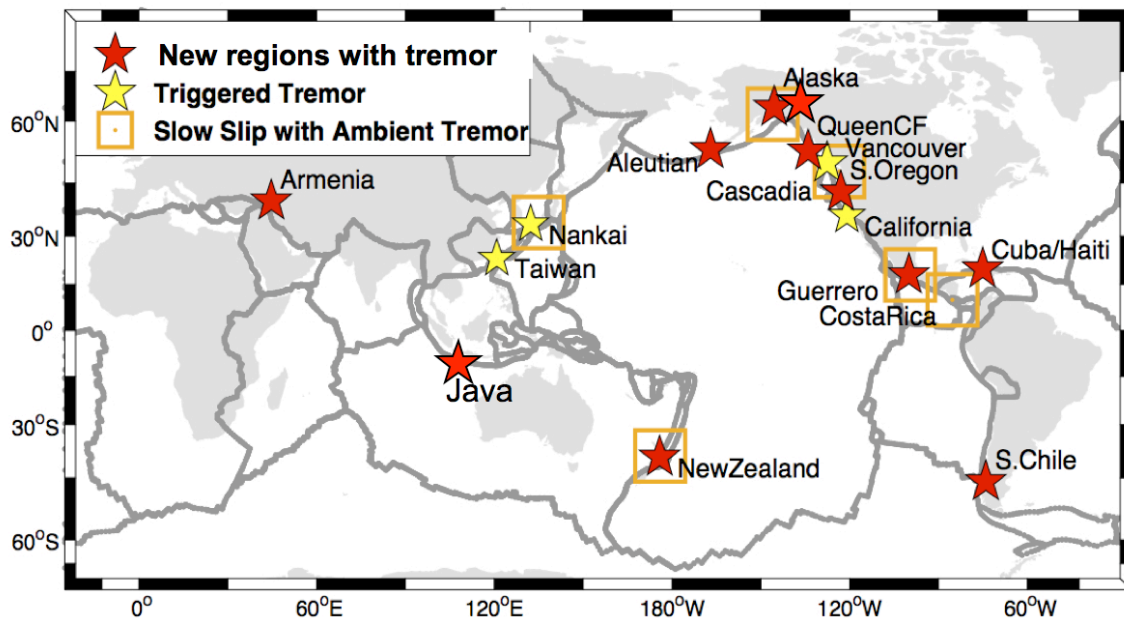


Figure 1. A summary map of triggered and ambient tremor locations around the world. Updated from Chao et al. (BSSA, 2013).