The Search for Tectonic Tremor in Alaska

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Tectonic tremor has been observed in numerous places along the 2500 km of the Alaska subduction zone. Though not as evidently ubiquitous as in other subduction zones, some tremor activity coincided with a large slow slip event on the mainland that occurred between 1998 and 2001 [*Peterson and Christensen*, 2009], and there are reports of several instances of tremor along the Aleutian arc [*Peterson et al.*, 2011; *Brown et al.*, 2013]. However, because these studies have focused on the characterization of manually detected tremors, the full extent of where, when and how much tremor activity occurs along the margin remains unknown, along with its role in subduction. Here I set out to perform a systematic search for tectonic tremor activity along the margin. Starting in the central Aleutian Islands, a "sweet spot" known for persistent tectonic tremor (ambient and triggered), I apply an automated method to detect and locate tremor and find a nearly daily occurrence of short-duration (<20 min) ambient tremor. In 6 months of data, the tremors concentrate in 3 distinct zones of activity, occurring above where the plate is 50-70 km deep. Constraints on tremor depths and along-dip locations are inhibited by the linear Aleutian-controlled station geometry, but epicenters lie trenchward of the islands and are resolved well enough to be distinguished from volcanic activity. These preliminary results demonstrate the ability of automated methods to catalog tremor in the Alaska, motivating a larger-scale effort to catalog tremor along the entire margin. Such a catalog can be used as a starting point to examine time dependent relationships with earthquakes and geodetic transients, perform more detailed triggering studies, investigate low-frequency earthquakes to constrain plate geometry, and compare tremor distribution with physical properties of the subduction zone across its length.

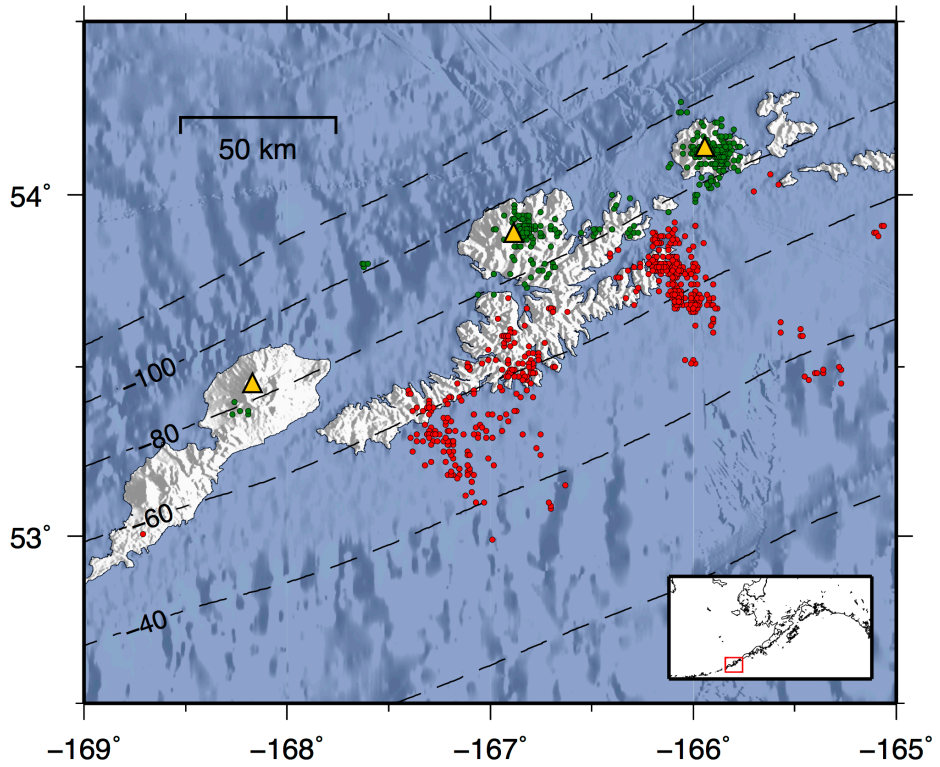

Figure: Results of automatic detection in study area. Yellow triangles show volcanoes and general location of seismic arrays used in this study. Green dots show volcanic earthquakes or the result of network problems at each seismic array. Red dots represent observed tectonic tremor. Dashed lines show plate depth contours.