Tectonic Tremor Along the Alaska-aleutian Megathrust

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I characterize and locate tremor not associated with volcanoes along the Alaska-Aleutian subduction zone using continuous seismic data recorded by the Alaska Volcano Observatory and the Alaska Earthquake Information Center from 2005 to 2010. Visual inspection of waveform spectra and time series reveal dozens of 10 to 20-minute bursts of tremor along the length of the Alaska-Aleutian subduction zone. I use autocorrelation to demonstrate that these tremor signals are composed of hundreds of repeating low-frequency earthquakes (LFEs). The tremor activity characterized is localized in four segments, from east to west: Kodiak Island, Shumagin Gap, Unalaska, and Andreanof Islands. Although the geometry, age, thermal structure, frictional and other relevant properties of the Alaska-Aleutian subduction zone are poorly known, these characteristics are likely to differ systematically from east to west. Locations near Kodiak Island are the most reliable because station coverage is more complete. LFE hypocenters in this region are located on the plate interface near the down-dip limit of the 1964 M_w 9.2 Alaska earthquake rupture area. LFE hypocenters in the remaining areas along the arc are also located down-dip of the most recent M_w 8+ megathrust earthquakes. Although these locations are less well constrained, our results support the hypothesis that tremor activity marks the down-dip rupture limit for great megathrust earthquakes in this subduction zone. Lastly, there is no correlation between the presence of tremor and particular aspects of over-riding or subducting plate geology or coupling. It appears that LFEs are a fundamental characteristic of the Alaska-Aleutian subduction zone.