Tremor and slow slip implications for Alaska tectonics

*Aaron Wech[1]

1. USGS Alaska Volcano Observatory

The tectonics of the eastern end of the Alaska-Aleutian subduction zone are complicated by the inclusion of the Yakutat microplate, which is colliding into and subducting beneath continental North America at near Pacific Plate rates. The interaction among these plates at depth is not well understood, and further east even less is known about the plate boundary and the source of Wrangell volcanism. A distinct drop off in intra-plate seismicity there could signal the end of the plate boundary, the start of aseismic subduction, or a tear in the down-going plate. Further compounding the uncertainty is the possible presence of the Wrangell slab that is faintly outlined by an anemic, eastward-dipping Wadati-Benioff zone beneath the Wrangell Mountains. Here I show results from a systematic search for tectonic tremor to map slow, plate boundary slip in south-central Alaska. The ~11,000 tremor epicenters identified continue 85 km east of the inferred Pacific Plate edge marked by Wadati-Benioff zone seismicity. The tremor locations coincide with the edges of the down-going Yakutat terrane and transition from periodic to continuous behavior as they near the eastern edge of the Yakutat terrane, and more recent evidence suggests tremor may continue even further southeast near the Wrangell volcanic field. I interpret the tremors to mark slow, semi-continuous slip occurring at the interface between the Yakutat and North American plates. The slow slip region lengthens the megathrust interface beyond the edge of intraslab seismicity and may provide evidence for a connection between the Yakutat slab and the aseismic Wrangell slab.

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