Ambient noise tomography across the southern Alaskan Cordillera

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Over the last decade, ambient noise tomography (ANT) has emerged as a powerful tool for imaging the lithosphere on orogenic scales often from "legacy" data sets. However, a notable deficiency in ANT coverage along the northern Pacific plate margin is observed in southern Alaska and westernmost Canada despite the availability of numerous temporary and regional seismic deployments in the area. This section of the North American Cordillera with active strike-slip faults, high levels of seismicity, and subduction-related volcanic activity make this a unique setting to study a variety of active orogenic processes warranting an ANT study. Here I present the results of an extensive data mining effort integrating 197 permanent and temporary seismic stations into an ANT study across southern Alaska and westernmost Canada. I measure the surface wave dispersion of Rayleigh waves extracted from the ambient seismic wavefield for 13 periods between 8 and 50 s. Principal observations of my tomography model are largely consistent with mapped geology features and previous geophysical studies while providing previously unavailable, laterally continuous details of the southern Alaskan Cordillera lithosphere. At intermediate periods, a geophysically uniform crust is observed north of the Denali Fault and is consistent with a sharp transition in crustal thickness. Under the Wrangell volcanic belt, a prominent low-phase-velocity anomaly correlates well with the lateral extent of a relative low-gravity anomaly and Neogene surface volcanics. At longer periods, a low-phase-velocity anomaly bounds the inferred eastern extent of the subducted Yakutat microplate beneath the Wrangell volcanic belt. (Figure 1). The orogenic scale of my ANT study allows for the imaged crustal and uppermost mantle structure to be interpreted in a regional context and represents the initial efforts required to produce a 3-D lithospheric scale velocity model across the Alaskan Cordillera.

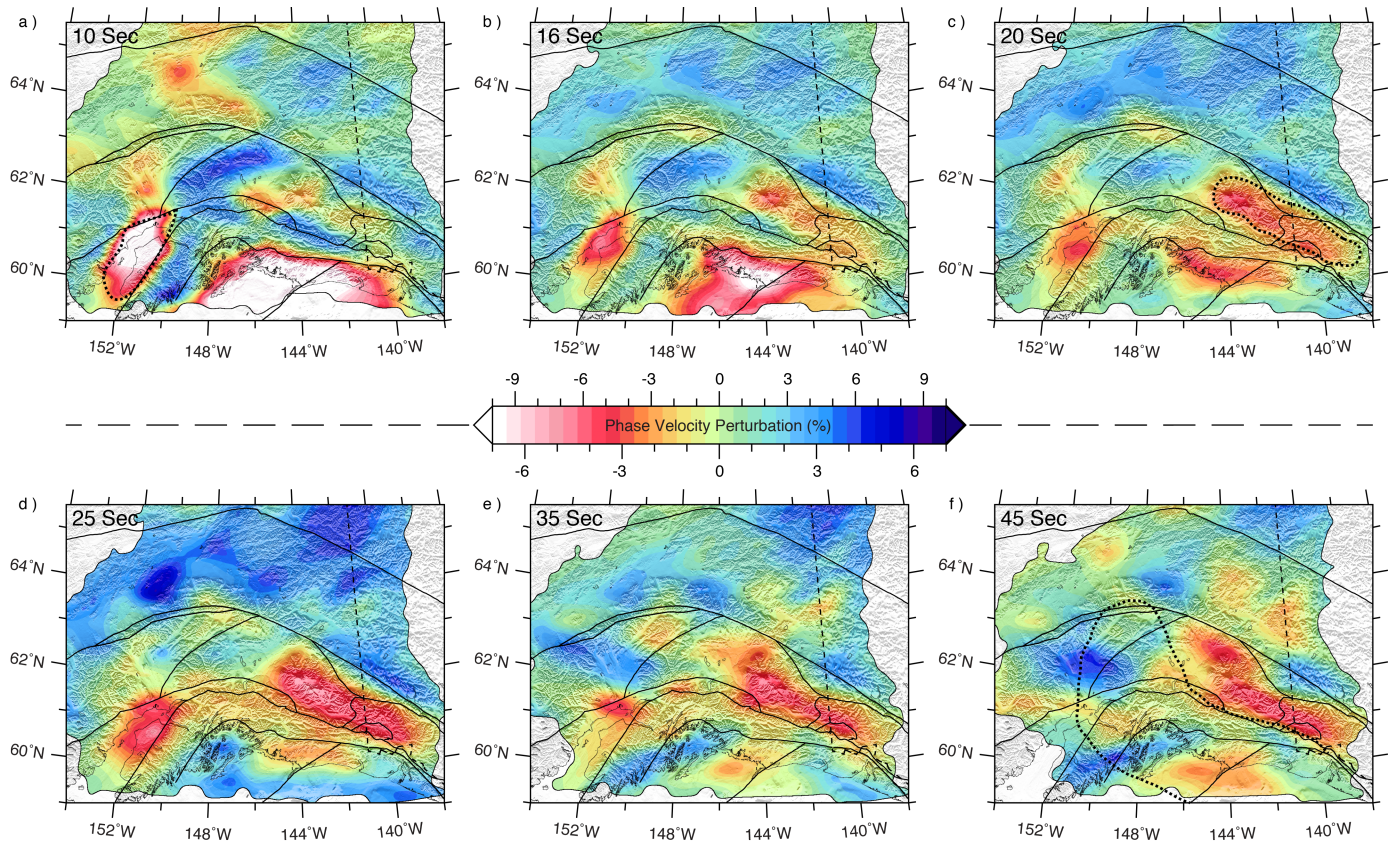

Figure 1 Two-dimensional Rayleigh wave period slices for six periods [(a) 10, (b) 16, (c) 20, (d) 25, (e) 35, and (f) 45 s] across the southern Alaskan Cordillera shown as perturbation from each period's mean phase velocity. Black lines show major faults and terrane boundaries. Dashed black lines show the lateral extent of the Mesozoic unconformity isopach map at 10 s (Figure 1a), general outline of the relative low complete spherical Bouguer gravity anomaly above the Wrangell volcanic belt at 20 s (Figure 1c), and projected track of the subducted Yakutat microplate at 45 s (Figure 1f).