# Seismic body-wave velocity and attenuation tomography of the upper mantle and crust beneath Alaska

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**Abstract:**

Seismic attenuation and seismic velocity provide valuable and complementary information about Earth structure. They can be affected by variations in rock properties such as temperature, melt content, composition, grain size, and wave properties such as frequency. Laboratory-derived empirical relationships among these rock properties and seismic parameters have been previously established, but substantial gaps exist in our understanding of these relationships in an observational seismological context. In particular, the relation between attenuation and melt is unclear, with some studies suggesting a weak dependence, while others suggest a larger effect. The joint interpretation of three-dimensional velocity and attenuation tomographic models provides critical insight into the mantle thermal structure, due to the distinct sensitivity of these two parameters to various mantle properties. Since 2013, the Transportable Array (TA) deployed in Alaska and some regions of western Canada (AKTA), together with several flexible arrays, has greatly increased broadband coverage of the Alaskan arc, back-arc, and continental interior. This dense coverage of stations provides a unique opportunity to improve our knowledge about Earth's structure beneath this region. This study uses P, S, and SKS waves of teleseismic events to create velocity and attenuation models for Alaska and Western Canada. We are testing two different approaches to calculate differential attenuation: 1) the comb of filters and 2) spectral ratios. We expect that our attenuation models will improve our understanding of the mantle structure in areas where it remains unclear such as the convergence of the Yakutat terrane in South-central Alaska. Ongoing work involves interrogation of these models to reconcile the relationship between melt and attenuation. Moreover, the models contain low-velocity zones beneath the subducting slab, with intriguing implications for subduction dynamics and megathrust coupling.

**Keywords:**

Attenuation, velocity, tomography, Alaska

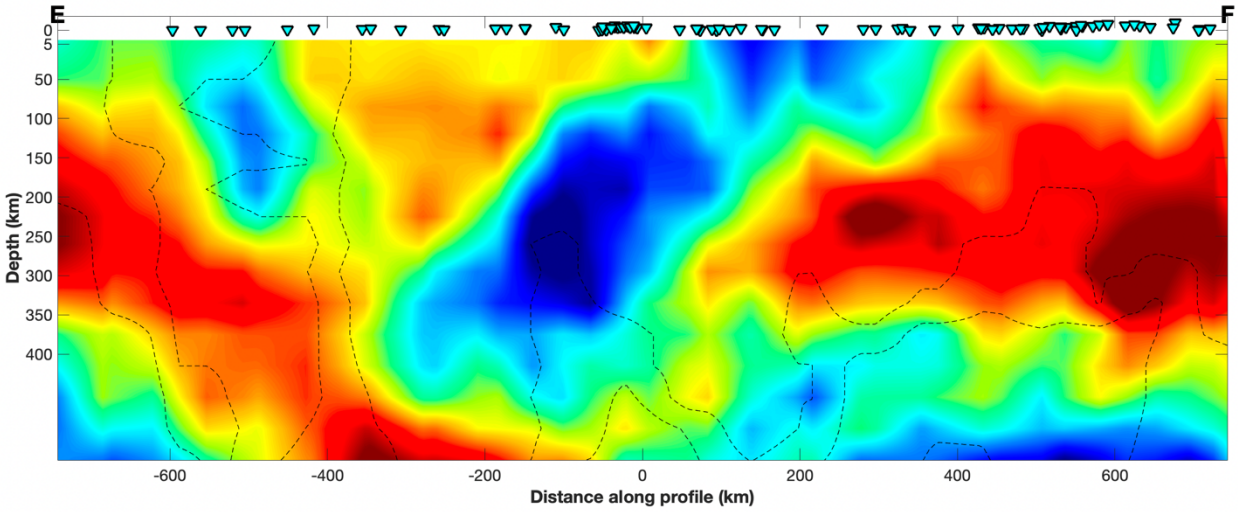


*Figure 1: East-west cross-section of our S-wave velocity model. The triangles on top represent the stations within 50km from the cross-section location. Black dashed lines represent confidence intervals of our model.*