Joint Inversion of Body-wave Arrival Times and Surface-wave Dispersion in Alaska

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We present a preliminary statewide velocity model of Alaska at grid spacing 0.8°x0.4° from joint inversion of body-wave arrival times and surface-wave dispersion derived from ambient noise cross-correlations. We combine data from recent (TA, SALMON, onshore AACSE stations) and past temporary deployments with data from permanent stations. First, we inverted body-wave and surface-wave data separately. Automatic picking of body-waves on waveforms of ~5,000 earthquakes in Alaska results in a large dataset of P-wave and S-wave wave arrival times that are combined with previous active source data for body-wave tomography. For surface-wave tomography, we derived ambient noise cross-correlations from continuously recording stations. We use Love-wave and Rayleigh-wave phase velocity dispersion measurements at periods 5.5-35 s and 7.5-35 s, respectively, to invert for phase velocity maps. At each grid point, we extract phase velocities from the phase velocity maps at all periods and invert for 1D depth-Vs profiles that are stitched to construct a 3D Vs model derived from surface-wave data. We use a weighted average of final velocity models from separate body-wave and surface-wave tomography as the initial model for joint inversion. The joint inversion of body-wave arrival times and surface-wave dispersion using the method of Fang et al. (2016) provides simultaneous constraints on both shallow and deeper V_P and V_S structure.

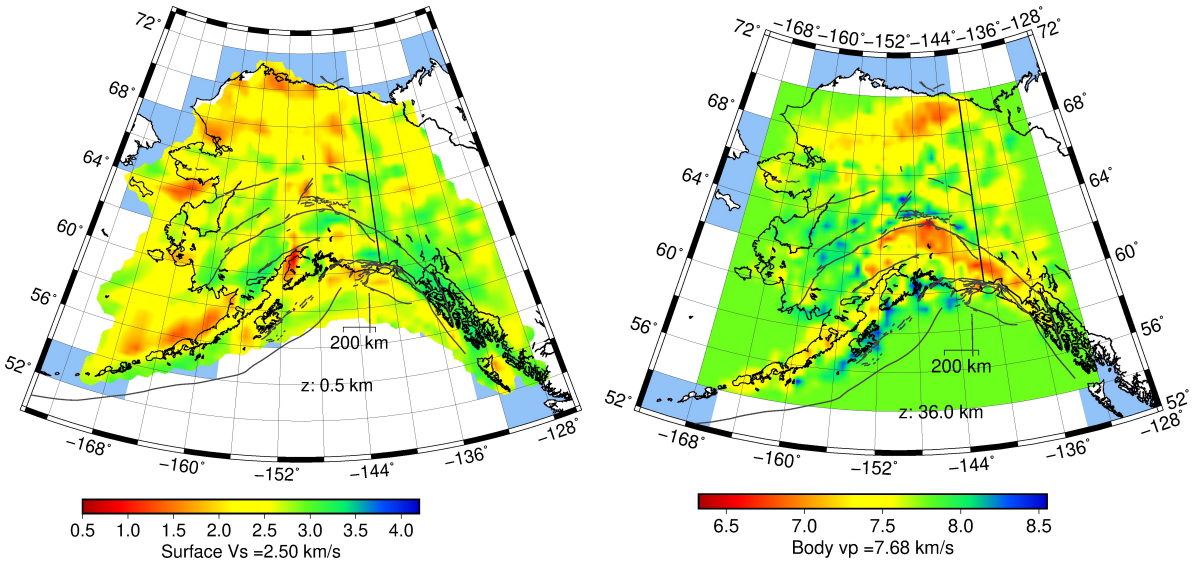

Figure 1. Left: V_S at depth 0.5 km derived from Rayleigh-wave and Love-wave phase velocities. Black lines are major surface faults traces. Right: V_P at depth 36 km derived from body-wave arrival times.