P-Wave Undershooting the Alaskan Subduction Zone

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This figure, taken from Ofori and Menke (2020), is an exceptionally clear example of the influence of a subduction zone on seismic wave travel times.

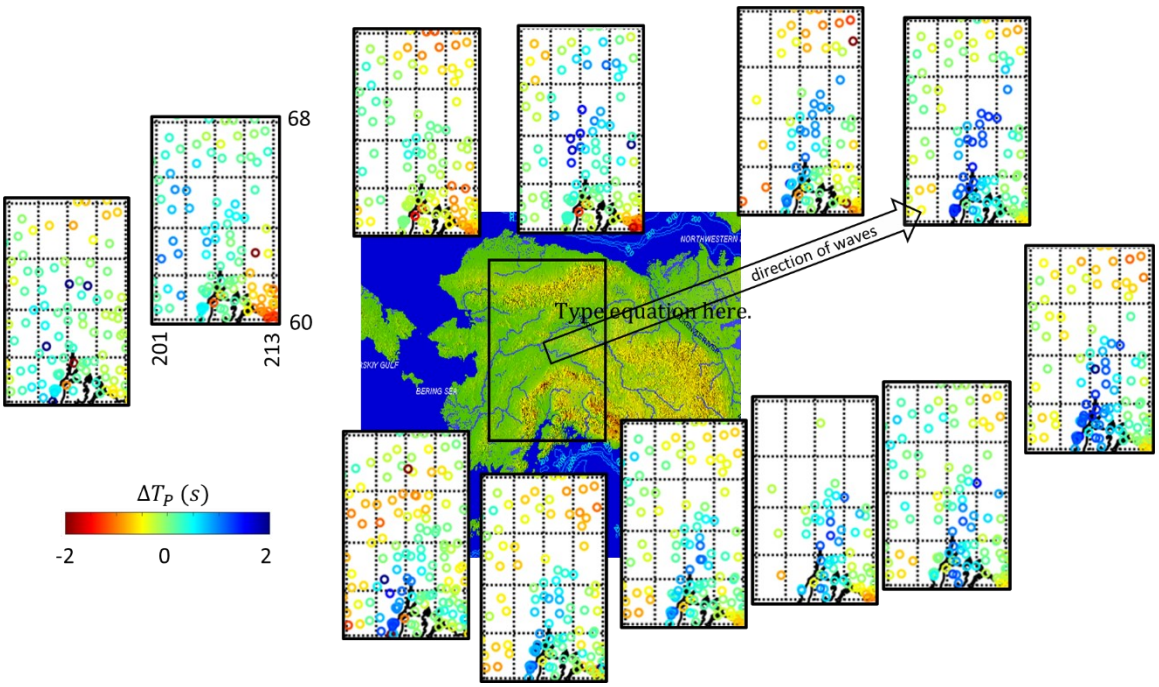

Fig. 1. Maps of P-wave travel time anomalies (rectangles with colored circles) for Alaska Array stations (circles), each for a different earthquake. Maps are arranged according to the direction of propagation of the P-waves. Earthquakes are all large (magnitude≥6) with distances of 30-70 degrees from central Alaska, so that the P-waves are impinging upon Alaska at a steep angle that is approximately 30 degrees from vertical. Stations with early arrivals are shown in blue, those with late arrivals arrival, in red. The band of early (blue) arrivals, especially prominent in maps at the right-hand side of the figure, are caused by P-waves propagating edge-on to the cold, seismically-fast subduction zone (and thus interacting with it over a long distance). The band of blue is less intense and more diffuse for the maps at the left-hand side of the figure are caused by the P-wave propagating face-on to the subduction zone (and thus interacting with it over a short distance). Note also that the band of early (blue) arrivals extends further north for in the mas at the top of the figure than in maps at the bottom. This effect is called parallax, and is due to the subduction zone extending deep (about 300 km) into the earth. The apparent position of its northern end extends further to the north for P-waves propagating to the north than for P-waves propagating to the south.

Ofori S. and Menke, W. (2020) Lithospheric and Asthenospheric Structure Beneath Alaska Using Travel Time Anomalies from TeleseismicP and S Waves, Fall Meeting Abstract DI015-0011, American Geophysical Union (Washington, D.C., USA),