Title: Imaging the Alaskan subduction zone with joint inversion of ambient noise and teleseismic surface waves

Abstract: Alaska consists of a complex arrangement of terranes of various geological affinities, most of which have been accreted to the margin of North America over the last 200Myr. Today, the southern margin of Alaska is a site of active subduction, displaying a myriad of enigmatic tectonic features. These include transition from compressional to strike-slip dominated deformation, accretion of the over-thickened Yakutat terrane, termination of Aleutian arc magnetism and the Wrangell Volcanic Field, whose magma source remains debated. The ongoing deployment of Transportable Array (TA) seismometers across Alaska provides an unprecedented opportunity to image these features in detail and learn more about the tectonic history of the region. Here we present a three dimensional model of shear wave (Vsv) velocity beneath Alaska constructed using joint inversion of phase velocity maps derived from ambient noise and teleseismic surface wave tomography. This model possesses good resolution from the upper crust to about 150km depth, thus complementing recent body wave models of the region, which lack resolution above 100km. In the upper crust, we are able to distinguish major sedimentary basins and the cores of mountain belts. At mid-crustal depths, we see a sharp velocity contrast across the Denali fault, suggesting that it marks a significant step in crustal thickness. In the mantle wedge above the subducting Yakutat terrane we observe a high velocity anomaly that may be related to paucity of volcanism in this region. At greater depths, we image the subducting Pacific-Yakutat slab as an elongate, high velocity anomaly that terminates abruptly at ~145ºW, slightly further east than suggested by the Wadati-Benioff zone alone. There is a large, low velocity anomaly beneath the Wrangell Volcanic Field, hinting that magmatism here may be related to mantle upwelling around the slab edge.