AGU FALL MEETING
San Francisco | 12–16 December 2016

T22C-04: Constraining the velocity structure of the Juan de Fuca plate from ridge to trench with a 2D tomographic study of wide angle OBS data

Tuesday, 13 December 2016
11:05 - 11:20
Moscone South - 306

We conduct a two-dimensional travel time tomography study of a cross-plate, 300-km long, ocean bottom seismometer (OBS) transect collected as part of the Ridge to Trench (R2T) program to investigate the structure, evolution and state of hydration of the Juan de Fuca (JdF) plate from the ridge axis to subduction at the Cascadia margin offshore Washington. Our study employs the methodology of Korenaga et al. (2000) to derive a P-wave velocity model using wide-angle data from 15 OBSs spaced on average 15 km apart, spanning from the Endeavour segment of the JdF ridge to the Cascadia accretionary prism. A top down modeling approach is employed, first assessing velocities of the sediment layer, then the crust, and finally the upper mantle; at each stage of the inversion we fix the structure of the overlaying layers. Quality of data fit is evaluated using the root mean square value of the difference between predicted and observed travel times normalized by pick uncertainty. Previous studies provide a well-resolved multi-channel seismic (MCS) reflection image of this transect (Han et al., 2016), affording good constraints of the location of basement and Moho reflectors while allowing for comparison of the relationship between velocities and crustal structure. MCS results along this transect suggest evidence of little bending faulting confined to the sediment and upper-middle crust. An initial velocity model of the sediment layer above igneous crust is constructed utilizing the MCS derived sediment velocities. A one-dimensional velocity starting model of the oceanic crust is generated using the results of Horning et al. (in press) from a quasi-parallel cross-plate transect also acquired as part of the R2T study. Seismic velocities are compared to predicted velocities for crustal and mantle lithologies at temperatures estimated from a plate-cooling model and are used to provide constraints on water contents in these layers.

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