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Variations in Seismic Structure of the Incoming Juan de Fuca Plate Along the Cascadia Deformation Front

Details

Meeting	2013 Fall Meeting
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Session	Understanding the Cascadia Subduction Zone: Contributions From the Cascadia Initiative and Multidisciplinary Studies III Posters
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Abstract

The Cascadia subduction zone displays regional-scale variations in its structural characteristics, rupture zones of paleo-earthquakes, intra-slab seismicity and episodic tremor and slip, and submarine morphology. In Summer 2012 we conducted an active-source multichannel seismic (MCS) reflection and wide-angle ocean bottom seismometer (OBS) study of the Juan de Fuca plate to investigate the north-south structural segmentation of the incoming plate and its role in contributing to regional variations in Cascadia subduction zone processes. Here we present travelttime P-wave tomography results from a combined MCS OBS ~400-km-long seismic profile extending from offshore Northern Washington to offshore Central Oregon, ~10 km seaward from the Cascadia deformation front. Data were acquired with a single 8-km-long, 636-hydrophone streamer (shot spacing of 37.5 m), and with 26 OBSs spaced ~15 km apart (shot spacing of 500 m). Preliminary results from the southern 120-km section of the profile indicate that offshore Oregon, sediment thickness varies between 2.4 and 3.0 km. In this region at latitude 45°N, the profile crosses a 9-m.y.-old pseudofault formed at the paleo Juan de

Fuca Ridge. Across the pseudofault, P-wave velocities in the upper ~2 km of the igneous crust are 3-4% lower than average, indicating localized increased porosity and hydration. However there is no evidence for such anomaly extending deeper into the lower crust. Along the examined section of the profile, crustal thickness is relatively homogeneous (6 km) but mantle velocities vary laterally between 7.5 km/s and 8.2 km/s at lateral scales of ~30 km. These results thus suggest along-margin variations in the state of alteration of the sub-oceanic mantle prior to subduction, although further data analysis is needed to assess their spatial correlation with the segmentation inherited from the ridge axis. Results from the complete profile will be presented at the meeting.

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