AGU Fall Meeting 2009

ID#	S52A-06
Location:	2005 (Moscone West)
Time of Presentation:	Dec 18 11:35 AM - 11:50 AM

Upper Crustal Structure of the Cleft Segment of the Juan de Fuca Ridge using 2D Streamer travel time tomography

S. Ghosh[1]*; J. Canales*[2]*; S. M. Carbotte*[3]*; M. R. Nedimovic*[4]
1. Geology and Geophysics, IIT Kharagpur, Kharagpur, West Bengal, India.
2. Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA, USA.
3. Lamont-Doherty Earth Observatory, Columbia University, New York, NY, USA.
4. Department of Earth Sciences , Dalhousie University, Halifax, NS, Canada.

We use long off-set (6 km) multichannel seismic reflection data to obtain the P-wave seismic structure of the upper ~2 km of the crust along the southern part of the intermediate-spreading Juan de Fuca Ridge (Cleft segment). Along this segment, the top of the Axial Magma Chamber (AMC) deepens from south to north from about 2.0 km at the southern end of the segment to about 2.3 km at the northern end. Both segment ends are characterized by high-temperature hydrothermal venting. Our objective is to study the effects of high temperature hydrothermal circulation on the seismic structure of the shallow crust. We jointly inverted refracted and reflected travel times (from the top of the AMC) to obtain the 2 dimensional velocity structure of the earth along ~60 km of the ridge axis. Prior to tomographic inversion, processing of marine seismic data included trace editing, trapezoidal band pass filtering (3-5-15-30 Hz), formation of partial off-set stacks of 5 shots (i.e, supershots) to increase the signal to noise ratio and downward continuation of the wavefield to a datum just above the sea floor (i.e, phase shift in the frequency-wave number domain of both source and receiver gathers to extract travel time information from refracted arrivals at near offset. Traveltime picking of the arrivals was done using a semi automated first break routine. The picked travel times of the first refracted arrivals and the reflected arrivals from the AMC are then input into a tomography inversion algorithm to build a 2D velocity model. Our results do not show detectable velocity variations associated with the presence of active high-temperature hydrothermal discharge, probably because the length scale of hydrothermal alteration is smaller than the resolving power of traveltime tomography. However our results are a first step towards higher-resolution seismic imaging models using waveform inversion. We will also present results from off-axis data to understand the early evolution of the structure of seismic layer 2B within young crust (younger than 300 ka).