2006 Fall Meeting

Cite abstracts as **Author(s) (2006), Title, *Eos Trans. AGU, 87*(52), Fall Meet. Suppl., Abstract xxxxx-xx**

T23C-0508

Rayleigh Wave Tomography in the Nicaragua-Costa Rica Subduction Zone

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The goal of this study is to image crust and mantle structure in the Nicaragua-Costa Rica subduction zone by applying Rayleigh wave tomography to waveforms recorded by the TUCAN Broadband Seismometer Experiment. The 48-station TUCAN array included two dense station lines normal to the arc, one in Nicaragua and the other in Costa Rica, and two sparser lines along the fore-arc and in the back-arc. Stations were in the field from July, 2004, until March, 2006. The method we employ inverts teleseismic event phase and amplitude measurements at different periods for 1) phase velocity in a grid surrounding the array and 2) six parameters that describe the incoming wavefield (the phase, amplitude and propagation direction of two interfering plane waves). We are analyzing events at epicentral distances of 35° to 120° at 19 periods ranging from 15 s to 167 s. Phase velocity maps will then be inverted for regional shear-wave structure. Ample sources with a good azimuthal distribution were recorded over the duration of the array, and, given the station distribution, we anticipate that good resolution of the overriding plate beneath the region will be possible. Geochemical data in this region contain strong along-arc variations; these are consistent with a mantle wedge beneath Nicaragua that contains a greater depth and extent of melting and larger input of slab fluids than are present in the mantle wedge beneath Costa Rica. Constraints on the thickness of the upper plate lithosphere and its velocity contrast with the mantle wedge should provide useful constraints on subduction zone thermal structure and may help to explain the source of the along-arc geochemical variation.

1219 Gravity anomalies and Earth structure (0920, 7205, 7240)
7208 Mantle (1212, 1213, 8124)
7218 Lithosphere (1236)
7240 Subduction zones (1207, 1219, 1240)
7255 Surface waves and free oscillations
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