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Mantle anisotropy beneath Costa Rica and Nicaragua and the TUCAN Broadband Seismometer Array

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From Nicaragua to Costa Rica, arc volcanics manifest large variations in major and trace element geochemistry, and these trends may be explained by several hypotheses, including decreases in the depth and extent of melting and the amount of slab-derived fluids. To better understand melt generation and transport processes in this subduction zone, we deployed 48 broadband IRIS/PASSCAL seismometers in four intersecting lines across and along the arc in Nicaragua and Costa Rica in July and August of 2004. The array is part of the NSF MARGINS program and will remain in place until March of 2006. Plans for analysis of array data include imaging of velocity and attenuation in the mantle wedge, subducting slab, and overlying plate with body and surface wave tomography, scattered wave migration and guided phases in combination with earthquake relocation. This presentation will focus on anisotropy in the mantle wedge constrained by shear-wave splitting in waveforms from local earthquakes, using data recorded at permanent stations and during the initial months of the TUCAN experiment. In other subduction zones, the orientation of the fast symmetry axis of anisotropy in the mantle wedge beneath the arc ranges from arc-parallel in many to arc-normal in a few. In some cases, the fast direction of anisotropy varies laterally from the arc to the back-arc, such as the arc-parallel to arc-normal trend observed in Tonga. These observations may be explained by three-dimensional solid flow in the mantle wedge, or, as suggested by recent laboratory studies, a strain field that is closer to two-dimensional corner flow but in which the development of olivine lattice-preferred orientation is influenced by higher volatile content or concentrated zones of partial melt. Our eventual goal is to interpret observed anisotropy in conjunction with velocity and attenuation patterns in order to place better constraints on flow and the distribution of melt, volatiles, and temperature

within the mantle wedge.

8120 Dynamics of lithosphere and mantle--general
8145 Physics of magma and magma bodies
7218 Lithosphere and upper mantle
Volcanology, Geochemistry, Petrology [V]

2004 AGU Fall Meeting

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