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NSF Award Abstract - #0305564

Mantle Dynamics of the Izu-Bonin Subduction System

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Program Manager	David Fountain EAR DIVISION OF EARTH SCIENCES GEO DIRECTORATE FOR GEOSCIENCES
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Abstract

This study provides new constraints on mantle flow and dynamics within the Izu-Bonin subduction system through a combination of seismic observations and numerical modeling experiments. Results of this work are providing key information regarding mantle processes in convergent margins, including the means of mantle magma transport and the geometry of strain partitioning between tectonic plates and the sublithospheric mantle. In this coupled approach, the following issues are being addressed specifically: 1) the 3-D distribution of upper mantle anisotropy and its implications for strain partitioning and mantle flow in the Izu-Bonin subduction zone; and 2) the interpretation of seismic anisotropy results, particularly their relationship to both mantle transport processes and the degree of coupling between tectonic plates and sublithospheric mantle. The seismic component of the project involves shear wave splitting analysis for a unique set of shear phases, including local S, teleseismic SKS, and sS-S differential splitting. The Izu-Bonin region is particularly well-suited for the proposed seismic studies, as earthquakes generated in Izu-Bonin provide an excellent dataset of seismic phases that sample a broad portion of the study area. The availability of broadband waveforms of Izu-Bonin earthquakes have been recorded by many high-resolution seismographs and allows constraint of both lateral variations and the depth distribution of anisotropy for the Izu-Bonin system. The numerical modeling component of the project involves calculation of 3-D models of mantle flow for a range of physical model parameters. To determine the relationship of mantle flow to the seismic anisotropy observations, flow models are being used to calculate predicted anisotropy using appropriate elastic parameter values from a range of deformation studies, and comparing the modeling results with the seismic anisotropy results.

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