



NSF Award Abstract - #0405572

Collaborative Research: Seismic Measurements of Magma Flux, Arc Composition, and Lower-Plate Serpentinization in the Central American Subduction Factory

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Abstract

Under this award, the PIs will carry out an active-source seismic investigation of the volcanic arc, backarc, and downgoing plate in the Costa Rican portion of the Central American Focus Site. The program focuses on the central Costa Rican segment of the arc, a site of marked transitions in lava chemistry, because the narrow isthmus here is well-suited for detailed seismic imaging using onshore-offshore techniques. This location also enables the incorporation of data from the regional Costa Rican seismic network with the proposed areal active-source array. This

combination will result in a detailed 3D image of arc crustal structure in the area. The goals are to determine the basic crustal architecture, composition, integrated magma flux, and fractionation processes of the arc, and to constrain the degree of hydration (e.g., serpentinization) in the downgoing Cocos Plate lithosphere. The work addresses the following: (1) What is the bulk composition of the Central American arc and, by inference, of its primary magma? (2) What is the long-term magma flux into the arc, and how does it compare to other arcs? (3) What are the length scales and degree of lateral variability in the Costa Rica arc? (4) Does the state of hydration of oceanic crust and upper mantle vary along the arc, and if so, does it correlate with changes in the "fluid signal" (e.g., Ba/La) of arc lavas? The program entails two ships (seismic ship and OBS ship), including about 80 days of ship time, OBS's, and extensive collaborative efforts with Germans and other ongoing seismic studies on land. The study has a number of broader impacts, including the extensive involvement of graduate students, teacher training activities, international collaboration with German and Costa Rican scientists, and high importance to the goals of the MARGINS program.

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