FALL 2013 SEMINAR SERIES

DEPARTMENT OF OCEAN, EARTH, AND ATMOSPHERIC SCIENCES
3PM – ROOM 200 IN THE OCEANOGRAPHY/PHYSICS BUILDING
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"MANTLE PLUME PROCESSES AT TECTONIC PLATE BOUNDARIES: IMPLICATIONS FOR OCEANIC PLATEAU FORMATION"

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ABSTRACT

Upwelling of mantle material along the Earth's mid-ocean ridge system produces oceanic crust and creates an undersea volcanic mountain chain spanning approximately 60,000 km. Another important contribution to global volcanic activity comes from mantle plumes. In locations where mid-ocean ridges are located near mantle plumes, excess melting of mantle rock can occur, resulting in thickened oceanic crust, broad regions of shallow seafloor, geochemical anomalies in erupted basalts, and a pronounced signature in the gravity field. Along the worldwide plate boundary system, triple junctions are locations with unique underlying mantle convection patterns. Defined as the point where three tectonic plates meet, triple junctions offer the opportunity to explore aspects of mantle flow and crustal generation that are absent or subdued at the more prevalent, two-plate-boundary systems. Examples of triple junctions include the Azores in the northern Atlantic Ocean, the Rodrigues in the central Indian Ocean, and the Galapagos in the eastern Pacific Ocean. Although many studies address tectonic plate kinematics at triple junctions, few dynamic investigations exist. This talk will present results from a series of three-dimensional finite element numerical models that calculate the dynamical interaction of a mantle plume and a triple junction formed by three mid-ocean ridges. Models predict mantle flow and temperature fields, the spatial dispersion of plume material, and seafloor bathymetry variation, all of which can be compared to observational data. Importantly, understanding the interactions between a mantle plume and an oceanic ridge-ridge-ridge triple junction may yield insight into the generation of large igneous plateaus, which are expansive areas of shallow bathymetry that can be as large as the state of Alaska or California.

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