ODP Proposal Log Sheet **532-Full**

☐ Environment ☐ *Interior*

Proposal received: Apr 1, 1999
Proposal reviewed:

☐ *New proposal* ☒ **Revised proposal** ☐ *Addendum to proposal* ☐ *Other*

Drilling the Kane Megamullion on the Mid-Atlantic Ridge: Investigating the Evolution of a Long-Lived Normal Fault and the Lithology of Slow-Spreading Ocean Crust and Upper Mantle

B.E. Tucholke, S.R. Allerton, F.R. Cann, H.J.B. Dick, G. Hirth, B.E.John, C.J. MacLeod, M.A. Tivey

Abbrev. Title: Kane Megamullion on the MAR	Key: Kane Megamullion	Area:

Contact:

Dr. Brian E. Tucholke
Department of Geology and Geophysics
Woods Hole Oceanographic Institution
Woods Hole, MA 02543 (US)

Tel: (508) 289-2494
FAX: (508) 457-2187
Internet: btucholke@whoi.edu

Brief Description:

Recently discovered "megamullions" at inside corners of spreading segments on the Mid-Atlantic Ridge have been interpreted as exhumed footwall blocks of individual, long-lived (~1-2.6 m.y.) normal (detachment) faults. These features are thought to result from extreme tectonic extension, so they are ideal for investigating processes and products of tectonic extension that is pervasive in oceanic lithosphere. In addition, megamullions expose extensive sections of the crust and uppermost mantle in an environment that is tectonically uncomplicated and logistically amenable to drilling. Thus, they offer an opportunity to document the character of subvolcanic lithosphere at slower-spreading ridges with minimal difficulty. We propose six drill sites in two transects on one of the best-developed megamullions, located south of Kane Fracture Zone. The first transect consists of four holes aligned in the dip direction of the fault. The holes will penetrate through highly deformed rocks near the detachment surface and into deeper, less deformed to undeformed rocks far from the surface. Cores are expected to record the history of deformation and metamorphism associated with the fault, beginning at depths near the brittle-plastic transition and continuing through brittle deformation and hydrothermal metamorphism at shallower levels. Less deformed and undeformed rocks beneath the detachment surface should document evolution of the lithospheric conditions that existed at the spreading axis over a ~1.0 m.y. period. These conditions may have been magmatic (generating relatively continuous gabbroic lower crust), weakly magmatic (generating gabbroic bodies in peridotite screens), or amagmatic (resulting in exhumation of mantle). This transect will provide significant new insights into the lithologic architecture of the crust and mantle in slow-spreading environments and also into the interplay between tectonic extension and magmatism. Two additional holes in the strike direction of the fault will examine segment-scale variations in deformation and lithology from segment center to segment end, providing data on how melt is derived and dispersed within segments at slow -spreading ridges. Holes drilled along the dip transect will recover subvolcanic rocks from both normal- and reverse-polarity chrons. Paleomagnetic analysis of these rocks will document the character of magnetization in lower crust and upper mantle and its contribution to the marine magnetic field.

Specific area: Kane Megamullion

Proposed Sites:

Site Name	Position	Water depth	Penetration Sed	Bsm	Total	Brief site-specific objectives
KM 1A	23°31.0'N; 45°26.1'W	3220	0	200	200	Deformation hist. and strain localization at a major fault
KM 2A	23°30.5'N; 45°22.4'W	2455	0	200	200	Deformation hist. and strain localization at a major fault
KM 3A	23°29.5'N; 45°19.7'W	2270	0	200	200	Deformation hist. and strain localization at a major fault
KM 4A	23°29.1'N; 45°16.5'W	2210	0	200	200	Deformation hist. and strain localization at a major fault
KM 5	23°24.4'N; 45°19.2'W	2815	0	200	200	Deformation hist. and strain localization at a major fault
KM 6	23°34.2'N; 45°17.4'W	2730	0	200	200	Deformation hist. and strain localization at a major fault

ODP Proposal Log Sheet

☐ *Environment* ☐ *Interior*

532-Full

Proposal received: Apr 1, 1999
Proposal reviewed:

☐ *New proposal* ☒ **Revised proposal** ☐ *Addendum to proposal* ☐ *Other*

Drilling the Kane Megamullion on the Mid-Atlantic Ridge: Investigating the Evolution of a Long-Lived Normal Fault and the Lithology of Slow-Spreading Ocean Crust and Upper Mantle

B.E. Tucholke, S.R. Allerton, F.R. Cann, H.J.B. Dick, G. Hirth, B.E.John, C.J. MacLeod, M.A. Tivey

Abbrev. Title: Kane Megamullion on the MAR	Key: Kane Megamullion	Area:

Contact:

Dr. Brian E. Tucholke
Department of Geology and Geophysics
Woods Hole Oceanographic Institution
Woods Hole, MA 02543 (US)

Tel: (508) 289-2494
FAX: (508) 457-2187
Internet: btucholke@whoi.edu

Objectives:

Proposal acknowledged by JOIDES Office: Apr 1, 1999 to : Tucholke, B.E.
Proposal forwarded for review: Apr 14, 1999 to : SSEPs
Proposal copies: Apr 14, 1999 to : JOI Inc., SO (ODP/TAMU), SSDB