

IODP Proposal Cover Sheet

 New

 Revised

 Addendum


Please fill out information in all gray boxes

Above For Official Use Only

Title:	Atlantis Bank Deep: The Nature of the Lower Crust at an Ultra-slow Ridge		
Proponent(s):	Henry J.B. Dick, Woods Hole Oceanographic Institution, James H. Natland, University of Miami, Eiichi Kikawa, JAMSTEC, Paul T. Robinson, Dalhousie University, Jay Miller, Ocean Drilling Program, Christopher J. MacLeod, University of Wales, Ralph A. Stephen, Woods Hole Oceanographic Institution, Maurice Tivey, Woods Hole Oceanographic Institution		
Keywords: (5 or less)	Ocean crust, Gabbro, Peridotite, Moho	Area:	Indian Ocean, SW Indian Ridge

Contact Information:

Contact Person:	Henry J.B. Dick		
Department:	Geology & Geophysics		
Organization:	Woods Hole Oceanographic Institution		
Address:	McLean Laboratory, MS#8, Woods Hole, MA 02543-1539 USA		
Tel.:	508-289-2590	Fax:	508-457-2183
E-mail:	hdick@whoi.edu		

Permission to post abstract on IODP-MI Web site: Yes No

Abstract: (400 words or less)

This proposal is to drill a 3-km deep hole into the Atlantis Bank gabbroic massif some 6.5 km to the NE of 1.5 km deep Hole 735B. Atlantis Bank is an oceanic core complex where the plutonic foundation of the oceanic crust has been exposed by detachment faulting over a 400 km² area in the rift mountains of the ultraslow spreading SW Indian Ridge. The primary objectives include obtaining a long section of the lower crust at a seismically meaningful scale, to determine its lateral heterogeneity, and to test the ophiolite paradigm. It also seeks for the first time to penetrate magnetic anomaly transitions within the lower crust to determine their origin. A major question to be answered is whether the deep crust beneath a typical magmatic accretionary ridge segment consists of massive gabbro, or whether it is comprised of intercalated small gabbro intrusions in partially serpentinized mantle peridotite. The drilling may also determine whether the oceanic Moho at this location is a serpentinization front rather than the petrologic crust-mantle boundary and could penetrate the crust-mantle boundary. As is the case for mid-ocean ridge basalts, the 1.5 km the Hole 735B section is too evolved to represent a primary magma composition intruded from the mantle. This is not the case for IODP Hole U1309D, and this drilling seeks to determine if the Atlantis Bank Massif is laterally homogeneous, and if primitive cumulates occur at greater depth in the lower crust, as in ophiolite sections. If primitive cumulates are not found, combined with their general scarcity found during mapping across the massif, it will support fractionation of MORB in the mantle prior to intrusion to the crust. This is a critical issue for assessing the bulk composition of the ocean crust, which is tied to the melt composition intruded from the mantle. Using ODP/TAMU time estimates based on prior operations at Hole 735B, this can be done in two 55 day legs with Cape Town or Mauritius as ports.



Scientific Objectives: (250 words or less)

- Test competing models for the nature of the lower ocean crust beneath a typical magmatic accretionary ridge segment.
- Constrain the nature of the Moho at a location where it has been suggested that it is a serpentinization front.
- Determine the lateral heterogeneity of the lower ocean crust and the scale and manner of melt intrusion.
- Determine the Nature of magnetic anomaly transitions in the lower crust.

Please describe below any non-standard measurements technology needed to achieve the proposed scientific objectives.

None

Proposed Sites:

Site Name	Position	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
AtBk-1A	32°42.75'S 57°17.11'E	700	0	3000	3000	Complete penetration of the lower ocean crust and the crust-mantle boundary.