IODP EXPEDITION 304:
OCEANIC CORE COMPLEX FORMATION, ATLANTIS MASSIF
WEEK 6 REPORT

December 27, 2004

OPERATIONS

Hole U1311A

After the first core had been cut at Hole U1311A (alternate site AMHW-02A) there was at least 3 m of fill in the 12 m deep hole. We attempted to clear the hole for several hours, without success, and the hole was abandoned. Based on our prespud bottom survey, we elected to move ~ 100 m north, survey another location, and attempt another hole at this site.

Hole U1311B

Since we had not been able to keep a hole clear of fill in the young basalts cored at Site U1310 or in Hole U1311A, we decided to attempt to drill a large diameter bore without coring. We hoped this strategy would allow deployment of a casing to isolate the upper part of the formation and allow deeper penetration. The two options left in our arsenal of drilling tools were a large rotary bit and the wing-style, reaming hammer bit. We surmised that the rotary bit was not likely to be successful, based on our attempts with rotary coring bits. The larger bit face would translate to less weight on bit per unit area, thus yielding even slower penetration rates. In addition, the size difference between the top of the bit and the BHA would provide ample space for rocks falling into the hole to trap the bit. After a brief subsea camera survey, we chose a location with a smooth sediment cover to deploy the hammer bit. Although buoyed by an initial rapid penetration rate, at a depth of only a few meters below seafloor penetration virtually ceased. High torque would stall rotation, and picking the bit up off bottom to regain rotation allowed rock to cascade into the hole underneath the bit. We hammered for ~19 hr, but could gain no headway, so operations at Site U1311 were terminated.

Hole U1309D (Prospectus site AMFW-01A)

Following a pipe trip to install an RCB BHA, we reentered Hole U1309D through the HRRS and recommenced coring at 131mbsf. Cores U1309D-23R to -47R (131.0 to 252.4 mbsf) were cut, with an average recovery of 64%. We made a pipe trip to pick up a fresh bit, and cut Cores U1309D-48R and 49R (252.4 to 262.0 mbsf) with 43% recovery).

SITE U1311 INITIAL SCIENTIFIC RESULTS

Coring at the alternate location for hanging wall objectives (Site U1311) produced fresh, vesicular, moderately plagioclase-olivine phyric basalt. The single recovered core barrel from Hole U1311A contained 1.5 m of broken pieces from the 9 m section immediately below the sediment cover. When forced to relocate due to loss of the lower portion of the BHA, we moved 100 m NNW, beyond the top of a ~20 m high subvertical scarp that exposed pillow basalts. Unfortunately we were not able to recover any rock from Hole U1311B; we encountered continual hole instability similar to what had occurred during prior hanging wall attempts.

On December 22 we returned to the footwall site and continued deepening Hole U1309D (30°10.1195'N, 42°07.1131'W). Re-entry went smoothly and we have cored from 131 to 262 mbsf (Cores U1309D-23R to -49R, average recovery 63%). This interval continues the pattern of intimately interfingered gabbro and troctolitic gabbro, with intervals of orthopyroxene-bearing gabbro, troctolite, and oxide gabbro. No in situ diabase has been - recovered from below 128 mbsf. Undeformed, coarse-grained oxide gabbro was recovered between 191 and 195 mbsf (Core U1309D-35R). A thin zone of protomylonitic oxide gabbro was recovered at ~226 mbsf (Core U1309D-42R). To date, four intervals of serpentinized peridotite (3 of which are clearly in place) at ~61, 132, 172 -173, and 224 mbsf have been recovered from this hole (Cores U1309D-10R, -23R, -31R, and -42R, respectively). Samples from cores down to ~200 mbsf remain predominately reversely magnetized, and show little horizontal axis rotation of the magnetic inclination. Evidence of deformation continues to be rare and localized; alteration is predominantly greenschist grade, and decreasing downsection.

Christmas was widely celebrated on the ship, with many of the science party participating in the entertaining JOIDES RESOLUTION revue.

LABORATORY STATUS

What a difference in drilling conditions, moving back to Site 1309D. Once again, high recovery hard rock cores are expected every 3-4 hours. All cores from previous sites have been boxed and stored to make room for new recovery. All laboratory equipment is working satisfactorily. DIS artifacts are being attributed to ship vibrations. Drill site surveys and re-entries have expended the available VHS tapes aboard. These events are now being recorded on digital video cassettes with the intent to transfer the images to DVDs. Totals to date, 392 m were drilled and 187 m have been recovered. 22 Boxes of cores are stored. The Fast Track dual sensor magnetic susceptibility equipment has been running test cores to expose problems seen on Expedition 303. So far, no problems have been revealed, collecting, processing or uploading the data. Following a few hours of Christmas entertainment and a bountiful and wonderful holiday meal, a pipe trip for a new bit allowed lab personnel time to finish cutting the collected cores and take shipboard samples.

HSE

Monday's boat drill was to familiarize the IODP technical staff with the hands on operation of lowering a lifeboat. It is easy to become complacent watching others go through this operation. The selected individuals did get the boats lowered to the embarkation deck.