

**IODP EXPEDITION 309 DAILY SCIENCE REPORTS
12 July–28 August 2005**

TO: Tom Davies
FM: Neil Banerjee

JA Daily Science Report for Expedition 309, 12 July 2005

LOCATION: in transit to Site 1256

SCIENCE UPDATE: Today we left port and transited through the Panama Canal. The first science meeting was held with an introduction to life on the ship for scientists. We also conducted our first safety meeting and boat drill. Lab preparations are underway. We cleared the Bridge of the Americas shortly after 0100, July 13 and are in transit to Site 1256.

JA Daily Science Report for Expedition 309, 13 July 2005

LOCATION: in transit to Site 1256

SCIENCE UPDATE: Today we had a science meeting to reviewed the success of Leg 206 and discuss the objectives of Exp 309. We also had a pre-spud operations meeting. Lab preparations are continuing. We are in transit to Site 1256.

JA Daily Science Report for Expedition 309, 14 July 2005

LOCATION: in transit to Site 1256

SCIENCE UPDATE: Today we held a sampling meeting. The archive halves of several Leg 206 cores have been laid out in the core lab so the scientists can see what we might expect during Expedition 309. The corresponding VCDs have been printed to help ensure continuity of description. Lab preparations are continuing. We are in transit to Site 1256.

JA Daily Science Report for Expedition 309, 15 July 2005

LOCATION: in transit to Site 1256

SCIENCE UPDATE: Today we held a core description meeting. Scientists are working on explanatory notes. Lab preparations are continuing. The WSTP has been cleaned and purged and is being prepared for deployment once on site. We are in transit to Site 1256.

JA Daily Science Report for Expedition 309, 16 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: We arrived at Site 1256 at 1040 on July 16, made up the logging BHA, and reentered Hole 1256D at 1950. Predicted depth for the bottom of Hole 1256D was 4397 mbrf. Our target depth was 4377 mbrf but we touched bottom at 4370 mbrf indicating approximately 27 m of fill at the bottom of the Hole. Preparations continued for deployment of the WSTP to collect a basement fluid sample and measure the temperature at the bottom of the Hole.

JA Daily Science Report for Expedition 309, 17 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: The drill string was raised to a depth of 4368 mbrf and the WSTP was lowered into the drill string to obtain a water sample and temperature measurement at 724.6 mbsf (4369.6 mbrf). Upon return of the WSTP the water sample was found to be murky and a low salinity (26 per mil) indicated the filters had become clogged with silt before the sampler was completely purged of nanopure water. The WSTP temperature measurement gave a flat line temperature of 60°C due to installation of the incorrect thermistor in the tool. It was decided to run the WSTP again to get a better water sample. While the WSTP was cleaned for its second run, the Adara tool was deployed to obtain accurate temperature readings above 60°C. Temperature at 712.6 mbsf was 64.5°C and at 724.6 mbsf was 65.8°C. Our best estimate for temperature at the bottom of the hole is 68°C. The second run of the WSTP, taken at 4357.6 mbrf, returned a better water sample. The drill string was raised to 3907 mbrf and preparations were made for logging. The Schlumberger logging tools were lowered into the drill string at 1200 hr on 17 July.

JA Daily Science Report for Expedition 309, 18 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Logging operations in Hole 1256D started at 1200 July 17 with the Triple Combo tool string. The Triple Combo pass provided good data, that appear to be in very good agreement with Leg 206 data. The maximum temperature measured by the TAP tool at the bottom of the hole is 68.7°C. The second tool string was the FMS/Sonic. A single pass was realized and good quality acoustic velocities and FMS images were recorded. Initial comparisons of caliper data from Leg 206 and Exp 309 appear very similar with an average hole diameter of 11 inches and only one apparent tight spot (9.3 inches) at approximately 500 mbsf. So far this has not seemed to have affected the passage of either the drill string or the wireline tools. Logging operations were completed at 0530 July 18, the drill string was retrieved, and a CC-9 RCB bit was installed. Hole 1256D was reentered at 2325 July 18.

JA Daily Science Report for Expedition 309, 19 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: The drill string was lowered to 4370 mbrf (725 mbsf), a center bit installed, and Hole 1256D washed and reamed to remove fill at the bottom. The drill string began taking weight at 4395 mbrf (750 mbsf), the center bit was retrieved, a 50 barrel mud sweep of 90 viscosity sepiolite was pumped down to clean the hole, and enough strokes were applied to ensure the mud pill had cleared. The core barrel was dropped and RCB coring began from 752 to 753.9 mbsf to adjust the space-out for the kelley. Core 1256D-75R was on deck at 0945 with 1.3 m of recovery. Coring continued from 753.7 to 755.7 (Core 76R) with 1.23 m of recovery at 1425 and from 755.7 to 763.5 mbsf (Core 77R) with 1.65 m of recovery at 2030. Rate of penetration is between 1 to 1.5 m/hr. Cores 75R and 76R are aphyric, cryptocrystalline to microcrystalline, slightly altered dark grey basalt sheet flows separated by chilled margins, broadly similar to basalts recovered at the end of Leg 206.

JA Daily Science Report for Expedition 309, 20 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 1256D-78R to 81R were cored from 763.5 to 792.2 mbsf with recovery of 9.31 m (32%). Rate of penetration varies from 1 to 1.5 m/hr. Cores 77R to 79R are aphyric to sparsely phyric, cryptocrystalline to microcrystalline, slightly altered dark grey basalt sheet flows separated by chilled margins. Phenocryst phases are olivine, plagioclase, and clinopyroxene in order of increasing abundance. Evenly distributed moderate fracturing is common along with 0.1 mm to 1 mm irregular veins filled with saponite, iron-oxyhydroxide, celadonite and minor silica and sulfides. Some mixed black and brown and brown halos occur adjacent to fractures.

JA Daily Science Report for Expedition 309, 21 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 1256D-82R to 85R were cored from 792.2 to 811.4 mbsf with the following breakdown:

Core Depth Cored(m) Rec(m) Rec(%) Date Time

82R	792.20	7.0	1.20	17.1	07/21/05	0550
83R	799.20	2.6	1.38	53.1	07/21/05	0930
84R	801.80	9.6	2.04	21.2	07/21/05	1535
85R	811.40	9.6	7.11	74.1	07/22/05	0125

Rate of penetration continues at approximately 1.3 m/hr. Cores 82R to 84R are aphyric, cryptocrystalline to fine-grained, slightly altered dark grey basalt sheet flows separated by glassy chilled margins and minor hyaloclastite. Core 85R is a massive, aphyric, fine-grained basalt unlike the cores above, which explains the excellent recovery.

Initial shipboard analyses of the borehole fluid (~65 C) taken with the WSTP, indicate that the fluid is significantly different from sea water. Instead, the borehole fluid approaches the basement fluid composition for Site 1256 estimated on Leg 206 from the projection of the basal sediment porewaters. The borehole fluids have higher Ca, Sr, Li, B, Mn, and Fe concentrations but lower Mg and K when compared to sea water.

JA Daily Science Report for Expedition 309, 22 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Core 85R was on deck at 0125 after coring from 811.40 to 821.00 mbsf with 7.11 m of recovery (74.1%). Core 85R marks a transition from predominantly thin basaltic sheet flows above to a basaltic massive flow greater than 3 m in thickness. The degree of alteration in Core 85R increases overall as indicated by abundant brown and mixed brown and black halos in Sections 1 to 5. The brown color comes from an abundance of iron-oxyhydroxides. Section 85R-6 contains no brown halos but vesicles filled with saponite are common, possibly indicating more reducing conditions. Below Section 85R-1 the distribution of fracturing also changes. Fracturing is more heterogeneously distributed and partitioned into 20-40 mm thick fault zones characterized by nearly parallel and anastomosing veins and shear veins with local protocataclasis. Slickenfibers in the faults are consistent with a normal sense of shear. Veins (0.2 to 10 mm) in the fault zones are filled with iron-oxyhydroxides, saponite, minor silica and sulfides.

JA Daily Science Report for Expedition 309, 23 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Following retrieval of the core barrel (Core 86R) all the core catcher dogs were missing and pump pressures increased ~500 psi. The deplugger was dropped twice to clear the throat of the bit. After the second pass the pressure decreased, a core barrel was dropped, and coring continued to 840.20 mbsf. Core 86R recovered 3.65 m (38%) and Core 87R recovered 3.25 m (34%), both over 9.6 m intervals. Cores 86R and 87R are part of the same fine grained, slightly altered, massive flow unit described in Core 85R (Unit 30). Some fine igneous layering is present. Veins and vesicles filled with saponite + pyrite + amorphous silica are common but generally decrease in abundance down hole in these two cores. Oxidized alteration halos are not present.

JA Daily Science Report for Expedition 309, 24 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Recovery in Cores 88R to 92R (840.2 to 873.8 mbsf) decreased significantly to only 5.11 m (15.2%) along with a concomitant increase in rate of penetration, likely due to the rubbly and fractured nature of the formation. The rocks

are aphyric, cryptocrystalline to microcrystalline, slightly altered dark grey basalt sheet flows with some glass and altered hyaloclastite. In order to try and boost recovery half cores were taken from Core 90R and Cores 91R and 92R were drilled without liners but high recovery remains elusive.

JA Daily Science Report for Expedition 309, 25 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Recovery in Cores 93R to 96R (873.8 to 897.8 mbsf) increased slightly to 6 m (25%). At the end of Core 96R the bit had accumulated 52.1 hours of rotation so the pipe was tripped for a bit change. The rocks remain predominantly aphyric, cryptocrystalline to microcrystalline, slightly altered dark grey basalt sheet flows with some glass and altered hyaloclastite.

JA Daily Science Report for Expedition 309, 26 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Hole 1256D was reentered after the bit change for the fourth time. The drill string began taking weight at 4525 mbrf (880 mbsf) so the pipe was picked up to 4523 mbrf, a core barrel dropped, and the hole was washed and reamed to bottom. Coring has resumed from 897.8 mbsf. The first shipboard ICP analyses confirm that the cores recovered are actually basalt. XRD analyses confirm the presence of laumontite and anhydrite in veins.

JA Daily Science Report for Expedition 309, 27 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 97R to 100R recovered 6.06 m of basalts from 897.8 to 917.0 mbsf (31.6%). The recovery was boosted by an interval of fine grained massive basalt in Core 99R (3.0 m recovered, 3.2 m cored). The abundance of vertical fractures has increased relative to gently dipping structures below Core 96R. The top of Core 100R contains an interval of basaltic breccia displaying angular, cryptocrystalline to glassy clasts supported in a matrix of green, waxy, phyllosilicate minerals. Pore spaces in the breccia contain euhedral carbonate crystals and minor copper sulfides. With the arrival of each new core, anticipation of dikes heightens among the science party.

JA Daily Science Report for Expedition 309, 28 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 101R to 103R recovered 5.52 m of basalts from 917.0 to 940.8 mbsf (23.2%). Drilling times increased to over 9 hours for Cores 101R and 102R (9.6 m cored). In both cases the first ~4 m cored in 2-3 hours followed by much slower rates of penetration. We decided to proceed by taking half cores (4.8 m cored) since the wireline trip takes only 80 min from the time we pull off bottom until the time there is weight on bit. The rocks are cryptocrystalline to fine grained basalt sheet flows less than 3 m thick. The continued presence of glass indicates these rocks were erupted onto the ocean floor. Vertical fractures filled with green phyllosilicates and silica minerals occur locally. During the next bit change shipboard sampling will take place for the cores recovered so far. With the changing of the bit we hope to reveal the next chapter in our epic quest for rocks beneath the extrusive lavas.

JA Daily Science Report for Expedition 309, 29 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 104R to 107R recovered 3.27 m of basalts from 940.8 to 958.8 mbsf (18.2%). Penetration rates continue to average ~1 m/hr. The rocks are cryptocrystalline to fine grained, aphyric to sparsely phyric, basalt sheet flows separated locally by chilled or glassy margins. Vertical fractures filled with green phyllosilicates and silica minerals are common. At 1600 the bit had accumulated 52.8 hrs so the pipe was tripped for a bit change. The science party met to discuss the results and observations made in the first 30 cores (75R to 105R) recovered on Expedition 309.

JA Daily Science Report for Expedition 309, 30 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Following the recovery of Core 107R on 29 July, the bit was tripped and the 4th RCB CC-9 bit installed. Before the 5th re-entry of Hole 1256D, the WSTP was successfully run and a sample of bottom seawater collected from ~4 m above the ocean floor. Hole 1256D was re-entered at 1013 and coring resumed following hole conditioning. Core 108R landed at 1925 and recovered 2.90 m of basalts from 958.8 to 964.8 mbsf (48%). Penetration rates continue to average ~1 m/hr. The rocks remain cryptocrystalline to fine grained, aphyric to sparsely phyric, basalt sheet flows. An excellently unique feature in this core is the presence of a fractured, chilled flow base and a number of pieces of quenched fractured basalt cemented by dark green saponite.

JA Daily Science Report for Expedition 309, 31 July 2005

LOCATION: Site 1256

SCIENCE UPDATE: Three cores (109R to 111R) were recovered with 14.4 m of penetration yielding 6.6 m of core (46%). Low and variable pump pressures led to

concerns that there were problems with either the pumps or the bottom hole assembly. Although maintenance of both pumps identified and replaced a broken valve seat, low pump pressures continued to be detected when the bit was lifted from the base of the hole and the BHA was in tension. It was decided to trip the drill string to inspect the BHA for possible cracks. Although we still do not have firm evidence for the presence of dikes, non-glassy, aphanitic, chilled margins on brecciated basalt pieces from Core 108R at 960.8 mbsf suggest an intrusive contact.

JA Daily Science Report for Expedition 309, 01 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Following the identification of pump pressure loss somewhere in the bottom hole assembly on 31 July the drill string was tripped back to the rig floor and the BHA inspected for cracks. Drilling collars started to be landed and inspected at 0300 and the bit was on the rig floor at 0500. Major damage was clear to the 8.5 inch bit-sub assembly, which sits directly above the drill bit. A straight horizontal gash had opened for approximately 150 degrees (11 inches) of the circumference of the 3/4 inch-thick bit-sub wall, with more ragged fracture tips propagating a further ~75 degrees (~5-6 inches) around the pipe from each end of the clean fracture. When in tension with the drill bit hanging from the sub the fracture opened up to ~1 cm and the bit was held on by only about 4.25 inches of the bit-sub wall. Such a failure of the bit-sub assembly had not been witnessed before in the shipboard memory of scientific ocean drilling and the rapid diagnosis and response of the Transocean operations team certainly averted a time consuming major equipment loss in Hole 1256D. A new BHA was made up with a new CC-9 RCB bit and Hole 1256D was re-entered for the 6th time at 1423 and coring operations recommenced at 1945 with Core 112R landed at 0200, 02 August 2005.

JA Daily Science Report for Expedition 309, 02 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 112R to 116R recovered 7.41 m of basalt over 24 m of penetration representing 30.9% recovery from 979.20 to 1003.2 mbsf. Penetration rates continue to average a grueling ~1 m/hr. The rocks are cryptocrystalline to fine grained, aphyric to sparsely phyrlic, basalt sheet flows and are sub-divided into 3 igneous units. The continued presence of quenched glassy margins and vesicles indicates that these rocks are eruptive as opposed to intrusive. Portions of Core 114R are highly vesicular. Saponite remains the dominant secondary mineral but it is accompanied by abundant pyrite in veins, along quenched glassy margins, and as irregular mm-scale clots disseminated throughout the fine-grained flow groundmass.

JA Daily Science Report for Expedition 309, 03 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 117R to 121R recovered 7.11 m of basalt from 1003.2 to 1027.3 mbsf (~30% recovery). Three igneous units (39-41) were distinguished on the basis of chilled contacts and phenocryst content. Cryptocrystalline to fine grained sheet flows continue to predominate although other intriguing features are present. The upper part (117R-1 90-130 cm) of Igneous Unit 40 has a complex texture with fine grained basalt intruded into and enveloping brecciated cryptocrystalline basalt. The fine grained basalt is irregularly quenched to glass in places and disrupted by an intense network of very fine saponite veins that strongly alter the surrounding groundmass imparting an incipient brecciation texture. A 3 mm-thick quenched intrusive margin is present in Core 120R that is tantalizingly reminiscent of a dike margin, but such is the capricious nature of hard rock basement drilling, the precise nature of this contact remains elusive. Saponite, silica and pyrite continue to be the major secondary minerals.

JA Daily Science Report for Expedition 309, 04 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Hump day was celebrated with the arrival, shortly after the stroke of midnight, of Core 122R. This core contains numerous semi-contiguous pieces of a spectacular sulfide-quartz-clay-carbonate cemented hyaloclastite breccia with common cm-scale, highly altered basaltic clasts. A 1 to 4 cm-thick vertical quartz-sulfide vein, cross-cutting basaltic breccia, occurs in Pieces 9 to 11 of Section 122R-2 immediately below the hyaloclastite breccia. Core 122R recovered 2.23 m from 1027.3 to 1032.1 mbsf (46.5%). Cores 123R to 126R recovered 3.81 m of aphyric to sparsely phyrical, cryptocrystalline to fine-grained, slightly altered dark grey basalt from 1032.1 to 1051.30 mbsf (19.8%). After Core 126R was retrieved the bit had accumulated 50.1 hours of rotation and the pipe was tripped for a bit change. CC-9 RCB Bit #5 achieved a penetration of 72.1 m at an average rate of 1.44 m/hr. This hiatus in coring has allowed the science party respite in their scouring of the core for signs of dikes and greenschist facies alteration.

JA Daily Science Report for Expedition 309, 05 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: A new CC-9 RCB Bit (#6) was installed and Hole 1256D was re-entered for the seventh time on Expedition 309 at 0951. Coring resumed at 1051.3 and progressed to 1060.9 mbsf with recovery of 2.43 m of basalts in Cores 127R and 128R (25.3%). The rocks are aphyric cryptocrystalline-microcrystalline, slightly altered dark grey basalt sheet flows. Some pieces are volcanic breccias containing cryptocrystalline clasts and altered glass cemented by silica, green phyllosilicates, and sulfides. Chilled and glassy margins continue to be present, indicating an eruptive as opposed to intrusive emplacement of these lavas.

JA Daily Science Report for Expedition 309, 06 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 129R to 132R recovered 8.91 m of basalts from 1060.9 to 1081.6 mbsf (46.4%). A spherulitic flow margin in Core 129R-1 Piece 1 marks the beginning of Unit 44, which comprises aphyric microcrystalline basalt flows. Unit 44 is divided into four subunits, on the basis of reduction of grain size or presence of chilled margins, with minimum thicknesses of 1.96, 2.34, 4.41 and 0.70 m.

JA Daily Science Report for Expedition 309, 07 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 133R to 136R recovered 6.97 m of basalts from 1080.1 to 1099.3 mbsf (36.3%). From Section 133R-1 to 135R-2 two massive aphyric microcrystalline basalt flows (Unit 44 and 45) were identified. Hyaloclastite breccia consisting of angular-subrounded microcrystalline-cryptocrystalline basaltic clasts (0.5-4 cm) and altered glass (0.1-1.2 cm) cemented by anhydrite and saponite occurs in Pieces 10 to 14 of Section 135R-1 marking the top of Unit 45. Core 136R retrieved a number of spectacular intrusive contacts with cryptocrystalline to glassy basalt quenched against fine-grained basalt.

JA Daily Science Report for Expedition 309, 08 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 137R and 138R recovered 3.14 m of basalts from 1099.3 to 1108.9 mbsf (32.7% recovery). Two massive aphyric microcrystalline basalt flow units (45 and 46) were identified. Pieces 13 to 15 of Section 137R-1 contain brecciated clasts of altered cryptocrystalline basalt and altered glass cemented by saponite and anhydrite. After retrieval of Core 138R the bit had accumulated 50.8 hrs of rotation (57.6 m cored; 21.45 m recovered; 37.2 % recovery) so the pipe was tripped for a bit change. The cone was cleared at 1215 and Bit #6 completed the >4750 m journey back to the rig floor at 1800. Bit #7 and a new BHA were made up and the pipe was tripped back to Hole 1256D for reentry #8.

JA Daily Science Report for Expedition 309, 09 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Shortly after midnight the VIT was launched and Hole 1256D was re-entered for the eighth time on Expedition 309 at 0148 with the seventh CC-9 rotary coring bit. Discussions the previous evening between the science and operations teams considered changing to CC-7 drill bits with more conical cutting teeth that might improve penetration rates. However, because of the flush nature of the gauge-cutters on the CC-7 bit as opposed to their more durable bulbous profile on a CC-9, it was decided to continue with the CC-9 coring bits, as these had performed admirably to date. Approximately 3 m of fill was encountered at the

bottom of the hole and this was reamed and washed before coring recommenced at 0800.

Drilling progressed in Hole 1256D from 1108.9 to 1118.5 mbsf and returned 2.78 m of core (29 % recovery). Core 139R comprises cryptocrystalline to microcrystalline basalt with some saponite + anhydrite + pyrite vein networks that strongly disrupt the igneous fabric. Core 140R includes more than 50 cm of spectacular, sulfide impregnated dike margin breccia with complex intrusive relationships and intricate multiple, margin-parallel sulfide veins and cross-cutting anhydrite veins. In addition to split core photographs, the outside surfaces of these breccias were also photographed. The photogenic appearance of these cores was greatly improved by the use of the nylon-bristled core grooming tool.

JA Daily Science Report for Expedition 309, 10 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Coring of hard formations continued with penetration from 1118.5 to 1132.5 mbsf returning 14 m of core (Cores 141R to 143R; 42 % recovery), much of it lengthy continuous pieces that will be useful for core re-orientation and core-log integration. The uppermost pieces in Section 141R-1 include many complex cm-scale pyrite-rich halos developed along chilled margins and veins similar to the spectacular altered dike contact recovered in Core 140R. Igneous Unit 48 starts ~60 cm into Section 141R-1 and is a microcrystalline to fine grained aphyric to sparsely ol-phyric basalt with the irregular development of ophitic textures in some pieces. An angular xenolith of cryptocrystalline basalt is captured within this unit in Section 142R-2. The base of Unit 48 is marked by ~60 cm of brittly veined cryptocrystalline olivine-phyric basalt in Section 143R-1. Unit 49 is an aphyric microcrystalline basalt and a change in phenocryst abundance and a subtle grain size decrease delineates the beginning of Unit 50, an olivine-phyric microcrystalline basalt (Section 143R-2). Throughout these cores numerous blotchy to well defined light alteration patches are developed in groundmass and along some vein margins. These appear to result from the alteration of primary igneous minerals to albite, chlorite +/- pyrite.

JA Daily Science Report for Expedition 309, 11 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 144R to 146R recovered 8.98 m of basalts from 1132.5 to 1145.2 mbsf (70.7% recovery). The rocks are massive sparsely (clinopyroxene)-plagioclase-olivine phyric microcrystalline basalt with some phenocrysts forming glomerocrysts. Patchy development of a subophitic texture is distributed within the fine grained groundmass. These cores also display the first development of light green alteration patches consisting of moderate to strong replacement of groundmass by chlorite and albite.

Following the satisfying retrieval by the rig floor day crew of Core 146R with 117% recovery, a 350 psi pressure drop was noticed when the drill string was lifted off bottom. Because these symptoms were similar to those manifest by the failed bit-

sub earlier in the expedition it was decided that it would be prudent to trip the pipe so the BHA could be inspected.

JA Daily Science Report for Expedition 309, 12 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: The pipe was tripped to inspect the BHA for possible cracks after the driller identified a 350 psi pump pressure loss following recovery of Core 146R. The BHA was at the rotary table at 2300 on 11 August and the drill collars were inspected using the magnaflux until 0415 12 August but no cracks were found. A crossover sub, tapered drill collar, and one stand of 5-1/2 transition pipe were laid out and replaced due to wear. A new CC-9 bit (#8) was made up and a core barrel was dropped so that drill-stand pressures could be checked as the pipe was lowered. The drill string was filled with seawater every 25 stands and the pressure checked. Pump pressure increases were noted at 25 and 50 stands but because there was no further pressure increases with 75 and 100 stands deployed, a crack in the drill string was suspected. The VIT sled was lowered and a high-viscosity mud pill displaced to try to locate any breaches in the drill string. As the VIT was lowered towards the BHA, a vigorous jet of drilling mud was observed streaming from the 5 pipe one stand above the 5-1/2 transition pipe. The drill string was pulled back up to the rig floor. This time the bottom two stands of 5 drill pipe were replaced. Hole 1256D was successfully reentered for the ninth time at 0230 13 August and coring was resumed.

Once again, careful monitoring of drilling conditions and exhaustive diagnosis work by the *JOIDES Resolution* operations team has averted a major drill string failure and loss of equipment in Hole 1256D.

JA Daily Science Report for Expedition 309, 13 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 147R to 148R recovered 1.48 m of basalts from 1145.2 to 1156.1 mbsf (13.6% recovery) Unit 50, consisting of massive sparsely phyric microcrystalline basalt, continues to Piece 4 of Section 147R-1 and aphyric fine-grained doleritic basalt defining Unit 51 is present from Piece 5 to the end of the section. The beginning of Section 148R-1 marks a new unit (52) composed of small (< 5 cm) pieces of aphyric cryptocrystalline to microcrystalline basalt with a chilled margin in Piece 9 of Section 148R-1.

JA Daily Science Report for Expedition 309, 14 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 149R to 152R recovered 3.51 m of basalts from 1156.1 to 1174.9 mbsf (18.7% recovery). Aphyric microcrystalline to fine-grained basalts are

intruded by aphyric cryptocrystalline to glassy, black basalts. Vertical chilled margins, up to 5 mm-thick, occur in numerous pieces in Sections 149R-1, Section 150R-1, and Section 151R-1. These complex contact zones are commonly brecciated and mineralized with quartz, anhydrite, epidote, and pyrite.

JA Daily Science Report for Expedition 309, 15 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 153R to 156R recovered 9.85 m of basalts from 1174.9 to 1194.2 mbsf (51% recovery) that were divided into three lithological units (53-55) because of systematic changes in grain size and/or occurrences of chilled margins. These units consist of aphyric microcrystalline to fine-grained basalts (Subunits 53A, 54A and Unit 55). In Pieces 20, 21, and 24 of Section 155R-1, the host basalts (Subunit 54A) are intruded by an aphyric cryptocrystalline basaltic dike (Subunit 54B).

JA Daily Science Report for Expedition 309, 16 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 157R and 158R recovered 2.9 m of basalts from 1194.2 to 1203.8 mbsf (30.2 % recovery) that consist of aphyric cryptocrystalline to microcrystalline basalt (Unit 55A). In Section 157R-1 Piece 4, the host basalt (Subunit 55A) is intruded by an aphyric glassy to cryptocrystalline basaltic dike (Subunit 55B). Chilled contacts between the host basalt and the dike are also observed in Pieces 6, 8, and 13 of Section 157R-1. Section 157R-2 Pieces 7 and 9a are brecciated, with angular to subrounded cryptocrystalline basaltic clasts (2-6 mm), cemented by sulfides, chlorite, and anhydrite.

At 1045 the bit had accumulated 57.8 hrs of rotation and the pipe was tripped for a bit change. Bit #8 cored 58.6 m and recovered 19.96 m of basalts (34.06 % recovery) at an average ROP of 1.01 m/hr. The bit cleared the cone at 1340 and was on deck at 1945. The bearings in two of the cones were loose and several inserts were missing from the cones. A new CC-9 bit (#9) was made up and the pipe was tripped back to the seafloor.

JA Daily Science Report for Expedition 309, 17 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 159R to 161R recovered 4.55 m of aphyric cryptocrystalline to microcrystalline basalt with fine-grained patches from 1203.8 to 1213.4 mbsf (47.4 % recovery). Core 161R-1 contains multiple spectacular mutually intrusive contacts defining thin cm-scale dikelets enveloped by elaborate green alteration halos.

JA Daily Science Report for Expedition 309, 18 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 162R to 164R recovered 10.28 m of aphyric cryptocrystalline to microcrystalline basalt from 1213.4 to 1227.8 mbsf (71.4 % recovery) that is divided into five units (56A, 57A, 58, 59, and 60A) based on grain size increase from the top of the units. Basalts in Units 56A and 57A are intruded by basaltic dikes (Units 56B and 57B) with sharp to irregular and/or brecciated glassy to cryptocrystalline chilled margins. The breccias consist of acicular to subrounded cryptocrystalline basalt clasts and altered glass fragments cemented by chlorite. Section 163R-1, Piece 14 (57A) has an intricate and irregular dike (57B) contact indicating intrusion at hypersolidus temperatures.

JA Daily Science Report for Expedition 309, 19 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: Cores 165R to 168R recovered 16.57 m of rock from 1227.8 to 1247.0 mbsf at the spectacular recovery rate for ocean floor basalt of 86%. From Section 165R-1 to 168R-5 four igneous units (60, 61, 62, and 63) were identified based on the occurrence of breccia and/or grain size changes. Units 60 and 61 are subdivided into two subunits based on cross-cutting intrusions (B subunits). Units 60A, 61A and 63 consist of aphyric cryptocrystalline to microcrystalline basalts and Unit 62 is sparsely (clinopyroxene-) plagioclase-phyric microcrystalline basalt. Pieces 2-4, 6, 10 and 11 of Section 165R-3 have intricate and irregular dike (60B) contacts, and Pieces 14 and 16 of Section 166R-1 display multiple, cm-wide dike (61B) intrusions. The dike contacts are sharp to irregular chilled margins that are not brecciated. A xenolith of microcrystalline basalt (11 mm) is present in Piece 3 of Section 165R-1. Grey-green patches, where hydrothermal alteration to greenschist facies minerals is more intense, are commonly developed both in zones of more abundant mesostasis as well as along the margins of chlorite, quartz, pyrite ± anhydrite veins.

JA Daily Science Report for Expedition 309, 20 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: A 150 barrel mud sweep was pumped before pulling the final core barrel, which was retrieved at 1100 hr on 20 August. The bit was then pulled to the casing shoe and lowered back to bottom. No fill was encountered. Another 150 barrel mud sweep was pumped to clean the hole. The bit was then pulled out of the hole and cleared the cone at 2025 hr. After Core 170R was retrieved the bit had accumulated 53.1 hours of rotation. Bit #9 had cored 51.3 m with a recovery of 37.57 m (73%) and an ROP of 0.97 m/hr. The bit was in very good condition and the bearings were effective. Four gauge cutters and some inserts from the cones were damaged or missing. Logging operations are currently underway.

The last two cores of Expedition 309 (Cores 169R and 170R) recovered 6.17 m of basalt from 1247.0 to 1255.1 mbsf at the impressive recovery rate of 76%. Three lithological units consisting of aphyric microcrystalline basalt (63, 64, and 65) were identified based on systematic changes in grain size. Piece 17 of Section 169R-1 shows an intrusive contact with a cryptocrystalline dike. The dike material is present in numerous brecciated angular to subangular pieces (0.1-1 cm size), which seem to be embedded in a chloritic matrix. Some phenocrysts form glomerocrysts in Unit 65.

Hole 1256D has now been deepened into basement by 503 m on Expedition 309 to a total depth of 1255 mbsf or 1005 msb.

JA Daily Science Report for Expedition 309, 21 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: RCB Bit #9 was laid out and a logging BHA made up. Hole 1256D was reentered for the eleventh time at ~0800 on 21 August. The bit was set approximately 6 m above the casing shoe and preparations were made for logging Hole 1256D. Planned logging operations include the triple combo, FMS, UBI, and WST (cetaceans and pinnipeds willing).

JA Daily Science Report for Expedition 309, 22 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: The triple combo was lowered to 1225.6 below which a tight spot was encountered and the tool could not pass. The hole was logged up to 554.6 mbsf then the triple combo was run back to 944.6 mbsf. The hole was logged up to 844.6 mbsf after which the tool was recovered and preparations were made to deploy the FMS.

The FMS was unable to pass at 1222.6 mbsf due to the same tight spot encountered by the triple combo. The hole was logged up to 654.6 mbsf at which point the calipers failed to close and the tool could not be lowered for a second pass. The tool was delicately extricated from the open hole, with 700 lbs of overpull, into the pipe. The calipers continued to read open over the ~4000 m trip within the drill pipe. The FMS caliper measurements were in very close agreement with the 4 1/8 inch predicted pipe ID. As expected, the FMS calipers sprung open when it exited the drill pipe and the FMS was returned intact.

The UBI was then successfully deployed.

JA Daily Science Report for Expedition 309, 23 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: The UBI logged up from 1219.6 mbsf with a repeat interval as planned and was retrieved at 0400. The WST was made up and worked down with drill water. The WST began taking weight at 274.6 mbsf and the tool was worked down to 374.6 mbsf. The WST was pulled back into the pipe and a second attempt was made to reenter in the open hole but the tool again began taking weight. The WST was pulled out of the hole resulting in the abandonment of the deployment.

The WST was on deck at 1315 and several kinks in the Schlumberger wireline were noted. The wireline was trimmed and a new head made up. It was decided to run the backup FMS due to the caliper problems with the initial deployment. The backup FMS was lowered to 1215.6 mbsf and logged up to 304.6 mbsf. After completion of the FMS pass a wireline heave compensator test was performed.

JA Daily Science Report for Expedition 309, 24 August 2005

LOCATION: Site 1256

SCIENCE UPDATE: The second FMS-sonic log was completed at 0500 hr on 24 August. The drill string was pulled out of the hole and the ship secured for transit at 1300 hr on 24 August.

JA Daily Science Report for Expedition 309, 25–28 August 2005

LOCATION: In transit to Balboa, Panama.