Site 1027[1]

Expedition 327 Scientists[2]

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Background and objectives

During Ocean Drilling Program (ODP) Leg 168, Hole 1027C was drilled to 632 meters below seafloor (mbsf), 2.2 km east of Hole 1026C, where sediment thickness is 575 m above a buried basement low (Figs. F1, F2). The upper part of the hole was cased through sediments and uppermost basement, with 54 m of open hole. The open interval near the base of Hole 1027C comprises a diabase sill, intercalated sediments, and basalt breccia overlying 26 m of extrusive volcanic rocks (Shipboard Scientific Party, 1997). A subseafloor borehole observatory ("CORK") that included a data logger, pressure sensors, thermistors at multiple depths, and a fluid sampler was installed in Hole 1027C during Leg 168. Observatory instruments were retrieved in 1999, and the pressure logging system was replaced. The CORK in Hole 1027C was scheduled to be replaced during Integrated Ocean Drilling Program (IODP) Expedition 301, but problems setting the CORK in Hole U1301B and a lack of time and materials prevented the completion of any Hole 1027C operations during that expedition. Hole 1027C was fully sealed and continued to record formation pressure before, during, and after Expedition 301. The pressure record from this hole provided evidence of a long-term, cross-hole response to drilling and other operations in Hole U1301B as well as a subsequent period of fluid flow down into Hole U1301B, which was not completely sealed (Fisher et al., 2008; Davis et al., 2010).

Researchers visited Hole 1027C with DSRV *Alvin* during summer 2009 to prepare the CORK for replacement by retrieving a battery pack and communications package from the remotely operated vehicle (ROV) platform and removing an underwater electrical connector from the top of the wellhead. Unfortunately, the connector was corroded in place and could not be removed, but the ROV platform was cleared for CORK retrieval operations.

The primary scientific objectives at Site 1027 during Expedition 327 were to recover the existing CORK in Hole 1027C, core and deepen the hole by ~40–50 m, run hydrologic tests of the open hole, and deploy a new multilevel CORK for monitoring, sampling, and associated experiments. These operations could not be completed because the CORK in Hole 1027C could not be unlatched from the reentry cone and casing system (see "Operations"). Thus, the old observatory remains in place, and additional servicing will be attempted during future dive operations to

[1] Expedition 327 Scientists, 2011. Site 1027. *In* Fisher, A.T., Tsuji, T., Petronotis, K., and the Expedition 327 Scientists, *Proc. IODP,* 327: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.327.105.2011
[2] Expedition 327 Scientists' addresses.

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replace the pressure logging system with modern instrumentation.

Operations

Following operations in Hole U1301B (see **"Operations"** in the "Site U1301" chapter), the ship was offset in dynamic positioning mode to Hole 1027C. At 1000 h on 18 August 2010 a CORK recovery tool was slipped onto the CORK head, and engagement of the J-slots with the CORK lugs was verified by 1015 h. Another 3.5 h was spent in an unsuccessful attempt to recover the CORK, including pulling to 140,000 lb of overpull. Ultimately, we realized that in order to release this type of CORK another set of lugs below the CORK platform had to be engaged, but this required a release tool that had not been brought to sea. The recovery tool used for the initial recovery attempt during Expedition 327 was not long enough to reach the second set of lugs, so the drill string was recovered to the surface while options were considered. Finally, we decided that the crew could fabricate an appropriate CORK recovery tool using the existing tool as a basis. This fabrication took 36 h to complete: a test-fitting jig was built to emulate the CORK head to be recovered, a section of 20 inch casing was used to extend the length of the recovery tool so it could reach deep enough to engage the lower set of CORK lugs, the lower section of the tool was enlarged to the correct inside diameter, and the small reverse cone used to enhance the tool's ability to get over the CORK head was cut down to a 32 inch diameter. Everything was welded back together, doubler plates were added for extra strength, and the tool was fit over the test jig for the final time.

The drill string was tripped to the seafloor, and at 1200 h on 20 August the new recovery tool was slipped over the CORK head. The tool was lowered down through the 48 inch hole in the center of the CORK platform, and by 1245 h the lower latches on the CORK head were engaged with the modified recovery tool J-slots. The next 3.5 h was spent trying to pull the CORK, but the latching mechanism still would not release. Attempts were cycled between allowing the recovery tool to hammer down on the CORK head with 10,000 lb to exerting an overpull up to 100,000 lb, again without success. It is unclear why the CORK could not be released from the hole once the proper recovery tool was deployed, but with limited time available to complete other high-priority activities and no additional options for resolving the problem, the attempt to recover the CORK from Hole 1027C was abandoned. At 1615 h the recovery tool was disengaged from the CORK head and the drill string was recovered back to the surface. The subsea TV was recovered, and at 2130 h on 20 August the recovery tool cleared the rotary table, ending operations in Hole 1027C.

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Figure F1. Site maps showing location of Hole 1027C. **A.** Regional bathymetry (Davis, Fisher, Firth, et al., 1997) showing locations of ODP and IODP drill sites. Contour interval is 10 m. Solid circle is Hole 1027C; open circles are other holes drilled during earlier expeditions (blue) or Expedition 327 (black). Gold contours show locations of basement exposure on Baby Bare, Mama Bare, and Papa Bare outcrops. Area of dashed box is shown in B. **B.** Track chart of seismic lines around Site 1027 collected during the 2000 ImageFlux expedition (Zühlsdorff et al., 2005; Hutnak et al., 2006). Part of seismic Line GeoB00-203 (thick dashed line) is shown in Figure F2.

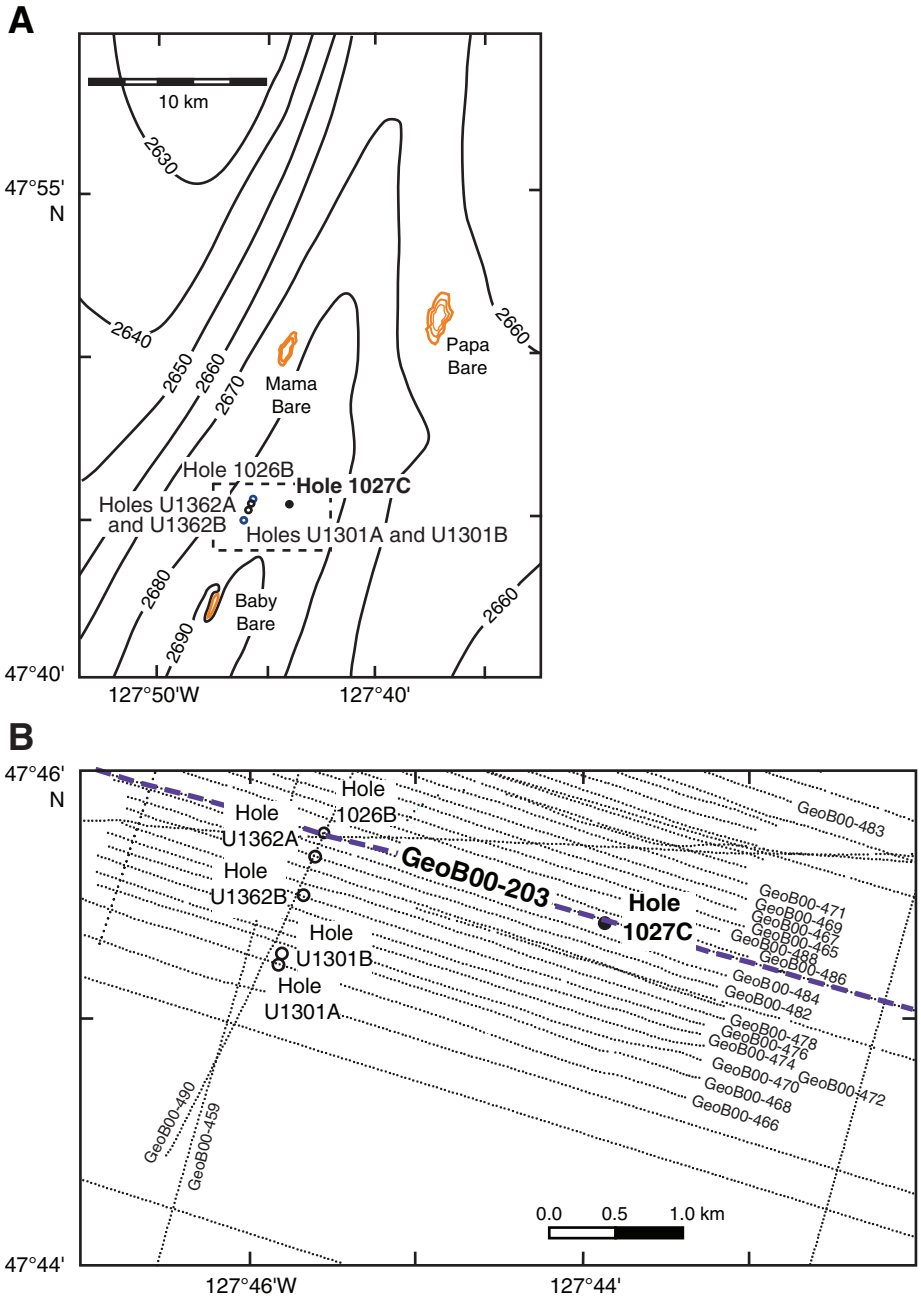

Figure F2. Seismic Line GeoB00-203 across ODP Holes 1026B and 1027C. Sediment structures and the sediment/basalt interface are clearly visible, as are steeply dipping normal faults to the west of Hole 1026B and a small basement high about halfway between the holes. Hole 1027C is located below the center of a major distributary channel for turbidites that flowed off the North American continental shelf (Davis et al., 1992; Zühlsdorff et al., 2005; Underwood et al., 2005; Hutnak et al., 2006).