IODP Expedition 327: Juan de Fuca Ridge-Flank Hydrogeology

Site U1301 Summary

24 August 2010

Background

Expedition 301 returned to the Juan de Fuca area and drilled deeper into basement, sampled additional sediment, basalt, and microbiological materials, replaced the borehole observatory in Hole 1026B, and established two additional CORK observatories at Site U1301 for use in long-term three-dimensional hydrogeologic experiments (Fisher, Urabe, Klaus, et al., 2005). One of the primary objectives of this expedition was to recover the CORK instrument string deployed in Hole U1301B, which researchers were unable to recover during submersible operations in the summer of 2009 because it was being held at depth, and deploy a replacement instrument string. Depending on the length of the recovered string and the space available in the CORK, we were prepared to deploy a new string that included thermal sensors, fluid samplers, and microbial growth experiments.

Operations

Following operations at Hole U1362A, the ship offset in dynamic positioning mode to Hole U1301B, 800 m to the south-southwest. A new bottom-hole assembly (BHA) that included the CORK recovery tool was made up and tripped to the seafloor by 1615 hr on 17 August. At 1730 hr the recovery tool engaged the Hole U1301B CORK head but before the J-tool could be engaged the recovery tool heaved off. This required a second engagement attempt and by 1815 hr the tool was back on the CORK head. Engagement of the J-slot tool was ineffectual so 10,000 lbs weight was applied to the top of the CORK, allowing us to proceed with string recovery operations. It was subsequently determined that the CORK recovery tool used for these operations was incompatible with the wellhead on the Hole U1301B CORK, which has long lugs that prevented engagement of the J-slot. Fortunately, we were able to complete subsequent string recovery and deployment operations despite having the wrong CORK recovery tool on the drill string.

The sinker bars were lowered and after multiple attempts the GS overshot engaged the instrument string top plug. Although tension was applied to the instrument string, the instrument string appeared to be stuck in place, as had been found during the Summer 2009 *Atlantis* operations. After working the sandline with various amounts of overpull the instrument string either stretched or creeped by several meters upward. At 0920 hr on 17 August the instrument string parted. The CORK recovery tool was disengaged and a portion of the instrument string was recovered back to the surface. Upon recovery it was found that a splice in the Spectra rope had failed directly above the middle plug of the installed instrument string. Five temperature data loggers and 377 m of Spectra rope were recovered. After laying out the recovered portion of the instrument string the CORK head was re-engaged at 2225 hr. Another sandline run was made to log the inside of the CORK using an autonomous temperature logger to obtain a temperature profile (indicating conditions in the surrounding hole) and to determine the depth of the available open hole for new instruments. This allowed proper configuration of the replacement instrument string. The logging tool was stopped for 5 minutes at 5 m increments in the upper 50 m of the CORK, and subsequently at 25 m intervals. The bottom of the open CORK casing was tagged at 3037 m (370 m below seafloor). The recovery tool was disengaged once again at 0130 hr on 18 August. Make-up of the replacement instrument string began at 0145 hr. This included the rigging of the Schlumberger electric logging line. The new Electronic Release System (ERS), under development by Stress Engineering for use with the developmental SCIMPI CORK system, was used for this deployment since the Hole U1301B CORK system was not configured with an instrument string latch-down system. Historically there have

been a lot of problems jarring off the instrument string without dislodging the upper landing/seal sub. Therefore it was hoped that the ERS system would work. The replacement instrument string, which included three thermistor probes and extended to a depth of ~50 mbsf, was ready for deployment at 0330 hr and the CORK running tool was engaged once again at 0435 hr. The instrument string was successfully landed and released using the ERS without incident and the Schlumberger logging line was recovered and rigged down. At 0530 hr on 18 August the CORK recovery tool was disengaged, ending operations at Hole U1301B.

Science Results

Of the five autonomous temperature loggers deployed in Hole U1301B on Expedition 301, one would communicate and download data. This is not surprising, as all of the tools were deployed well beyond their intended 4-5 year battery life. The four tools that would not wake up are to be returned to the manufacturer for servicing and data download (data are stored in nonvolatile memory). The one tool that did respond and provided data shows that temperatures at depth began to rise beginning in Summer 2009, soon after cementing on Expedition 321T. In addition, the temperature log collected in the upper 370 m of the open CORK casing shows that the thermal gradient in Hole 1301B has nearly returned to a pre-drilling state. Collectively, these data suggest that the remedial cementing conducted in Summer 2009 on Expedition 321T was successful in sealing the hole.

References

Fisher, A.T., Urabe, T., Klaus, A., and the Expedition 301 Scientists, 2005. *Proc. IODP,* 301: College Station, TX (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.301.2005