Report from JOIDES Resolution

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Two months between cores, storms, King Neptune and mummies

This was my first time on a ship, it see-sawed, waves pounded on the bow and we were heading into the Pacific. During the two months we were drilling Shatsky Rise Plateau – analyzed sediment and igneous cores, produced oodles of data and argued about theories.

Rig floor of the JOIDES RESOLUTION.

Scientific objective – Why we drilled Shatsky Rise Plateau?

One of the most basic problems of modern geodynamics is the process of mantle convection and its influence on Earth's surface through volcanism. The greatest source of nonocean-ridge volcanism appears to be immense eruptions that formed oceanic plateaus. A commonly accepted theory for this type of volcanism is that it results from the head of a starting plume that rises from the deep mantle, spreads out beneath the lithosphere, and melts in a gigantic outpouring of volcanic activity. Regardless of the broad acceptance of this theory, a convincing case for a plume head origin has never been made for any oceanic plateau.

Shatsky Rise Plateau, located ~1500 km east of Japan, is exceptional in solely being a considerable oceanic plateau formed for the period of magnetic reversals, allowing to interpret its geological history. Thanks to its exceptional combination of features, Shatsky Rise may be the best location on Earth to test plume versus plate-tectonic hypotheses of ocean plateau formation. During Expedition 324, we cored igneous rocks at five sites on Shatsky Rise to investigate the past, source(s), and growth of this plateau. The results of our expedition will help to put the question to test of whether oceanic plateaus like this were formed from deep-sourced mantle plumes or interaction of plate movements. For more information check the prospectus at *http://publications.iodp.org/scientific_prospectus/324sp_4.htm.*

Sediments and RCB drilling – What does a micropaleontologist do on an igneous cruise?

I took part as micropaleontologist on Expedition 324 where I was responsible for the nannoplankton. My task was to take the first samples from the core catcher – the core sections at a later point – and determine the age of the cored formation based on the observed assemblage. Combined with the observations of my colleague, who was investigating foraminifera within the same sample, we established age models for the sediments covering the basement. The fossil-based age model is important for the seismologist and igneous geochemists to verify their age models for the plateau established on magnetic reversals and isotopes.

During Expedition 324 rotary core barrel (RCB) drilling was exclusively employed. Thereby, a rotating drilling head penetrates into the rock. As our main objective was to core igneous rocks, this technique provided the best combination for recovery and fast drilling progress. On the other hand, this method implies potentially disorientated and incomplete recovery for the sediment sections.

When drilling the sediments of Expedition 324, the first recovered pieces on each site were chert nodules in broad color variations – red, yellow, black. Luckily, small bits and pieces of limestone were attached that could be investigated for calcareous microfossils. At each site, an exceptional sequence of sediments of chalk, limestone, sandstone, and/or clastic sediments and calcareous ooze followed the deeper we drilled. Hence, each core was unique and lots of work needed to be done. For more details refer to: *http://iodp.tamu.edu/scienceops/sitesumm/324/*.

RCB drilling head (left), core catcher with chert piece (middle), Cretaceous coccoliths (right, magnification: 63x, crossed polarized light).

Logging – drawing the big picture

Logging is a method where physical, chemical and structural features of the cored geologic formation is measured by means of so-called *logging tools*, which are lowered into the borehole. In doing so, acoustic, nuclear and/or electric signals – depending on the tool composition – are sent into the formation, where measurements of sonic velocity, density and electrical conductivity are acquired to obtain information on structure, stratigraphy, lithology and mineralogy of the rocks. Hence, logging gives perspective to the cores and a bigger picture can be drawn.

After drilling one of the sites on Expedition 324 was finished, the sky was blue and the sun was shinning when the loggers tested their equipment. Lots of times during our expedition the weather changed right away and they needed to work during heavy storms and rain. During logging Site

U1350, the initial ship heave conditions of around 2 m changed to around 4 m with wind gusts of up to 56 knots. Those weather conditions combined with technical problems resulted in the decision to terminate logging on that site.

Logging tools on the Helicopter deck – the quiet before the storm (left). Helen Evans (top right) prepares herself for the heavy storm during logging is under progress (bottom right).

Davy Jones and Halloween

All unworthy pollywogs will be dropped into the Neptune's Ocean to swim across the equator...

After drilling and logging is finished and all our energy was spend on writing reports, a message from Davy Jones was spread on board and we started to imagine what might happen to the pollywogs. I was one of them. I needed to turn up in front of King Neptune and my sins were judged. As chastisement I had to crawl through a mud bath and my hair was primped with lots of rubbish. After all I was a Shellback. I even have a certificate to proof it – shouldn't loose it, otherwise I have to go through this punishment again.

We had one day to recover from these stresses and strains before the ship mutated into the Flying Dutchman – it's Halloween! In the course of the day more and more evidence of a mysterious party in the evening showed up, where Japanese soldiers, astronauts, pirates and mummies turned up.

That night we cruised past Papua New Guinea and the end of the expedition was foreseeable –

Australia we are coming!

Photo credits: John Beck, Sandra Herrmann, Gerry Iturrino.