IODP Expedition 349: South China Sea Tectonics

Week 1 Report (26–31 January 2014)

Operations

Week 1 of Expedition 349, South China Sea Tectonics, began with the first line ashore in Hong Kong at China Merchants Wharf at 0848 h on 26 January 2014. The science party and technical staff boarded on the day of arrival. The majority of incoming cargo and off-going cargo was loaded and unloaded on 26 January. The following day the Siem Offshore crew change was completed. All main port call activities, including preparation of the passage plan were completed. Public relation tours were given on all three days of the port call in Hong Kong. After taking on 2200 metric tons of marine gas oil, the vessel was secured for sea with the final maintenance checks performed prior to departure. On the morning of 29 January, two tug boats and the harbor pilot arrived at our location. The last line was released from shore at 1238 h, beginning the 463 nmi voyage to Site U1431 (SCS-3G). The pilot departed the vessel at 1326 h and the vessel began the sea passage to the first site.

After a 463 nmi transit from Hong Kong averaging 11.0 kt, the vessel arrived at the first expedition site. A pre-spud meeting was held prior to arrival to review operations at the first site. The vessel stabilized and switched from cruise mode to dynamic positioning over Site U1431 at 0640 h (UTC + 8 h) on 31 January. The positioning beacon was then deployed at 0712 h.

The bottom-hole assembly (BHA) was picked up and assembled, then run in hole (RIH) with drill pipe to 4215.14 m below rig floor (mbrf). All drill pipe was measured (strapped) and the internal diameter verified (drifted) during the pipe trip. The top drive was then picked up and the drill string was circulated out with a pig installed to remove any debris that might have accumulated in the string. The calculated precision depth recorder (PDR) water depth for the site was 4252.1 mbrf, and after some consideration 4248 mbrf was selected as the bit depth for taking the first core. At week's end, the non-magnetic core barrels were being dressed with core liners in preparation for starting Hole U1431A.

Science Results

Expedition 349, based on Integrated Ocean Drilling Program Proposal 735-CPP2, addresses the history and mechanisms of opening of the South China Sea (SCS), and its implications for East Asian and western Pacific tectonic and paleoenvironmental evolution. During the expedition we plan to core through the sediment and into the oceanic basement at three sites, with total penetrations up to 1.9 km in 3.3 to 4.4 km water depths, to determine the breakup and basin formation history of the SCS since the late Mesozoic. Geochemical sampling of basement rocks of different ages within different magnetic zones and around key tectonic events will provide

critical information on how the crust and mantle evolved at various stages of basin evolution. The primary objectives of the expedition are:

1. To examine mechanisms, timing, and sequences of Cenozoic seafloor spreading and establish the complex opening history of different sub-basins and styles of oceanic crustal accretion in the SCS and constrain the tectonic controls (such as spreading rate) on distinct magnetic contrasts among the three sub-basins;

2. To examine oceanic crustal accretion and mantle evolution and reveal the crustal nature and affinities of different sub-basins and understand oceanic crustal and deep mantle processes associated with tectonic extrusion, magmatism, and magnetization;

3. To examine paleoceanographic and sedimentary responses to tectonic evolution of the SCS and develop a more complete 3-D sedimentation and subsidence model and link it to regional climatic processes in response to various tectonic events; and

4. To examine late Mesozoic and early Cenozoic prerifting tectonic transitions and driving forces leading to continental margin breakup and seafloor spreading; to test various hypotheses of dynamic processes controlling the transition from a Mesozoic active continental margin to a Cenozoic passive one and from continental rifting and breakup to seafloor spreading; and to constrain whether the forces driving the opening of the SCS were far-field (triggered by the tectonic extrusion of the Indochina block), near-field (due to backarc spreading or slab pull), or in situ (mantle plume and magmatism driven). This will deepen our general understanding of the geodynamic interplay of mantle and lithosphere processes that led to the development of continental margin basins in the geological past and today.

The science party for Expedition 349 includes scientists of 11 nationalities from eight IODP member countries and two observers. In addition, a TV reporter from Dragon TV in Shanghai, China is participating on board to conduct outreach activities.

The first six days of the expedition were spent familiarizing the scientists with the ship, laboratories, core flow, curation, sampling, and publication procedures used on the *JOIDES Resolution*. The core description team and paleontologists worked with the technical staff to learn how to enter descriptive data into DESClogik. They also worked with the imaging specialist to setup microscopes for analysis of microfossils, smear slides, and thin sections. The core describers practiced operating the Section Half Imaging Logger (SHIL) and Section Half Multisensor Logger (SHMSL). They also finalized core description templates and visual core description (VCD) templates for both sedimentary and hard rock cores. The physical properties scientists and paleomagnetists worked with the technical staff to review physical properties measurements conducted on whole-round and section half cores, as well as discrete samples. The physical properties specialists also practiced operating the Whole-Round Multisensor Logger (WRMSL), Natural Gamma Radiation Logger (NGRL), and the Section Half Measurement

Gantry (SHMG) systems. The geochemists worked with the chemistry lab technicians to learn how to operate the equipment and use the software. The microbiologists familiarized themselves with the laboratory instruments and facilities and also developed a contamination-testing plan using perfluorocarbon tracers (PFTs) and microspheres. This plan was presented to the science party to discuss any implications for other measurements.

The science party also converged on a shipboard sampling plan for ephemeral properties, shipboard measurements sampling, and personal sampling for post-expedition research. The Curator held two training sessions for the scientists to learn how to take samples and enter the information into Sample Master. Each lab group also prepared the first draft of the Methods section and turned it in before the start of coring operations for a first round of review.

Technical Support and HSE Activities

The following technical support activities took place:

Logistics:

- IODP technical staff boarded the vessel on 26 January at 0945 h and cross over was completed.

Laboratory:

- The new chemistry technician underwent training.
- The chemistry lab was prepared for upcoming coring operations.
- A water sample was taken at 20 m below sea level with the water sampler for microbiology.
- The expedition microbiologists/organic geochemists developed a contamination-testing plan using PFTs and microspheres.
- The X-ray diffraction (XRD) is out of commission and parts were sent to shore for repair.
- The expedition project management team discussed the possibility of a vertical seismic profile (VSP) at the second site (U1432), but will make a final decision at a later time.
- All scientists were introduced to the labs and shipboard sampling procedures.

Freight:

- The ship received an IODP airfreight shipment and hand-carried packages.
- XRD repair parts and crucibles were offloaded and shipped via air freight.

The following technical support activities took place:

- All participants completed the required IODP and ship's crew introduction and safety meetings.
- Lab safety tours were given to all scientists on 26 January.
- A boat and fire drill was held on 30 January.
- Safety awareness documents were completed for chemistry, physical properties, whole round multisensory track, and paleomagnetics areas.
- The laboratory safety showers and eyewash stations were tested.
- All fume hoods were checked.