

Expedition 321: Pacific Equatorial Age Transect (PEAT II)

Week 1 Report (4-9 May 2009)

10 May 2009

OPERATIONS

Expedition 321, the Pacific Equatorial Age Transect (PEAT II), officially began at 0736 hr 4 May 2009 with the first line ashore Pier 2B, Honolulu, Hawaii. The *JOIDES Resolution* (JR) arrived a full day early having been scheduled in at 0700 hr 5 May. The early arrival added a bonus day to a schedule that already was planned as a 4-day port call.

The ship arrived with two propulsion motors out of service requiring field coil replacement. This was the first priority activity upon arrival. The first day also included offloading of all refrigerated core samples and replacement of the logging winch transmission. During port call, vendor representatives were aboard working on the elevator replacing mechanical interlocks with a solenoid actuated variety, HVAC system balancing, and Rigwatch rig instrumentation system repairs and calibrations. The normal on and offloading activities took place including the loading of 10 short tons of Attapulgate drilling mud left over from the Honolulu 1 port call and 1537 metric tons of marine gas oil were bunkered. Training was conducted on the Rigwatch RIS system and on operation of the Schlumberger logging line winch and wireline heave compensator systems. Other activities included a Det Norske Veritas (DNV) International Safety Management (ISM) audit of the ship and CDEX engineers came aboard to discuss the JR core winch regenerative braking system and the JR's coring tools.

PR activities were conducted dockside at the Pier 2B cruise ship terminal, the Waikiki Aquarium, and the Marriott Hotel Waikiki. These included several high level dignitaries and other management personnel including the Director of the National Science Foundation, Ocean Leadership, the University of Hawaii, and Texas A&M University. Ship tours were conducted for dignitaries as well as University of Hawaii faculty and students, and high school students and teachers.

The ship departed Honolulu with the last line away from Pier 2B at 0512 hr. Approximately 10 nm offshore the ship switched over from cruise mode to DP control, lowered thrusters, and 7-3/4 hr of DP trials were conducted to optimize the system performance after changes in the ship profile were made during the Singapore refit. During this period a representative from L3, the Nautronics parent company, collected data and made adjustments to the internal windage modeling program that impacts the anticipatory commands of the system. The vendor was transferred from the JR to the V/L *Karake* at the Honolulu Harbor outer sea buoy and at 1636 hr the vessel got underway for Site U1336 (PEAT-5C). Transit speed en route to the first site averaged 10.7 knots over the 79.0 nm covered by midnight on 9 May 2009.

SCIENCE RESULTS

The equatorial Pacific is a major locus of solar warming, a region of high primary productivity, and a primary region for CO₂ exchange from the deep ocean to the atmosphere. It is also the source region for one of the strongest multiyear climate oscillations, the *el Niño-Southern Oscillation*. The wind-driven circulation and productivity system of the equatorial Pacific are sensitive to climate change. The equatorial Pacific also helps to maintain global climates and drive climate change as well.

Over the past 55 million years global climate has varied dramatically from extreme warmth to glacial cold, and these climate variations have all been imprinted on the biogenic-rich sediments that accumulate in the equatorial zone. The *Pacific Equatorial Age Transect* (PEAT, IODP Expeditions 320 and 321) is recovering sediments to study equatorial Pacific circulation and productivity at a time resolution where the effects of orbitally driven solar insolation cycles can be resolved.

PEAT drilling will help scientists to understand how the earth maintained very warm climates in the distant past relative to the 20th century even though solar heating has remained nearly constant in that time frame. PEAT drilling will also help scientists understand earth's transient response to large changes in greenhouse gas composition during several important events in the Cenozoic.

Expedition 321 is the second part of the PEAT program and will explore the time period from roughly 25 Ma forward. Drilling, coring and logging are planned at Sites PEAT 7C and 8C. Between 25 and 12 million years ago global temperatures were much warmer than modern conditions and the water cycle was stronger, but CO₂ was only slightly elevated relative to the Holocene. Understanding how the equatorial Pacific upwelling system operated under warm temperatures but moderate CO₂ levels is one of the primary objectives of Expedition 321.

The equatorial Pacific ecosystem underwent several important transitions that are poorly understood with respect to climate. Another primary objective is to understand the relative importance of changes in ocean configuration (tectonics) vs chaotic climate drivers to change nutrient exchange and productivity in the equatorial Pacific. Better constrained age models will provide critical information about the rates of climate change so that climate scientists can better understand the rates of response of important earth systems. Drilling will also be the ground-truth to calibrate seismic reflection studies of regional sedimentation to better understand carbon burial in this important locus of sedimentation.

The scientists spent the first week of the expedition learning their laboratories, instrumentation, documenting methods, and practicing core flow using Expedition 320T practice core.

HSE AND TECHNICAL SUPPORT ACTIVITIES

The Expedition 321 technical staff boarded the vessel on May 5 at 0900 hrs. Crossover and training with the off coming crew begun the same day and continued through the

remainder of the port call for most of the laboratories. Expedition 320 cores were off-loaded on May 4 and D-tube boxes were loaded. The rest of the freight was loaded during May 5 and 6.

On May 7th an introduction meeting was held with the science crew. All trash was collected and offloaded before departure. Laboratory safety and marine mammal observer training were conducted on May 7 and May 8. Equipment and laboratory spaces were secured for sea prior to departure. The first boat and fire drill was held on May 9.