

Planning and operation of wireline logging in riser hole in IODP Exp319

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The first riser hole was drilled by JAMSTEC D/V Chikyu in IODP Expedition 319 in 2009, and wireline logging was conducted. This is the first drilling with riser system and well logging in the riser hole in IODP history. Well logging with new tools, downhole stress measurement, and two-ship long offset walkaway VSP (Vertical Seismic Profiling) were conducted. The hole is drilled at TD 1603.7mbsf under 2054m sea water. Cores sampling, cuttings analysis, gas monitoring were conducted as well. The expedition 319 is one of series of NanTroSEIZE Project, which goal is to reveal earthquake mechanism in Nankai trough seismogenic zone in Japan. This presentation reports the operational planning and review.

IODP standard wireline logging items: natural gamma-ray, resistivity, density, porosity, sonic velocity, resistivity image were measured. The advantages of riser dilled hole against riserless drilled hole for wireline logging are 1) stable hole condition, 2) accurate environmental correction by controlled drilling mud, and 3) large variation of tool selection because of regular hole size instead of slim hole by conventional IODP riser drilling. A couple of new tools were used for new measurement and improvement of the data quality. The Sonic Scanner (trademark of Schlumberger) successfully measured compressional and shear velocity in very low velocities at the soft sediment, where it has been difficult to measure them with conventional DSI tool. The stress and pore pressure in the borehole were measured with the wireline logging tool, (Schlumberger MDT). The single probe tool enable to measure temporal formation fluid pressure. The double packer tool enable to fracture test by sealing and pumping in the borehole. These in-situ measurement and stress experiment data are very important to understand physical properties and mechanism of fault zone.

Super long offset walkaway VSP was conducted to reveal detail subsurface structure and velocity distribution. The 16 sets of the no planned 3-C geophone are clumped with 15m spacing at ~1300-1600mbsf in the cased C0009 hole by Chikyu. Eight OBS (Ocean Bottom Seismometer)s deployed at the seafloor. JAMSTEC R/V Kairei shot along 53km line (maximum offset from the hole is ~30 km) and round 3.5km circle with 16-array tuned air-gun. Zero-offset VSP was conducted to measure velocity and create seismogram along the well as well. Using high resolution data obtained from the equipment, detailed structural interpretation, anisotropy analysis, and shear velocity analysis are being carried out.

Riser drilling takes not only operational advantages such as deeper and safety hole, but also scientific advantage such as increasing measurement items which has never done in riserless drilling and improving data quality. It enlarges the options to approach new discovery and Science.

Keywords: well logging, riser drilling, Nankai trough, IODP