Data processing note

21th December, 2012

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Depth Index

mBRT : meter below the rotary table (rig floor)

mbsf : meter below sea floor

mWRF : meter below the rotary table (rig floor) in wireline depth

mWSF : meter below sea floor in wireline depth

MSL : mean sea level

Well Information

Expedition: 337

Site: C0020

Hole: C0020A

Field: Off-shore Shimokita

Location: 41°10.5983'N, 142° 12.0328'E

Water Depth: 1180.0m (1208.5 mBRT)

Total depth - driller: 2466.0mbsf (3674.5mBRT)

Total depth - logger: 2466.0mbsf (3674.5mBRT)

Max hole deviation: 1.22 deg

Casing

- 36"CSG 55.5mbsf (1264.0mBRT) set in 2006
- 20"CSG 511.0mbsf (1719.5mBRT) set in 2006
- 13-3/8"CSG 1252.9mbsf (2461.4mBRT)

Seismic section

- (x, y)=(600698.8, 4559060.5)
- E-W line: ODSR03-8W (C0020A@CDP=1056, SP=1205)
- N-S line: ODSR03-BS (C0020A@CDP=1483, SP=1311)

Elevation Information

Log measured from (in raw data): Drilling floor

Rig floor to MSL Elevation: 28.5 m

Water Depth: 1180.0m (1208.5 mBRT)

Operation and Logging Summary

Upper section (511.0 - 1263.0mbsf)

The wireline logging was canceled due to time limitation.

Drilled down to 1263.0mbsf (2471.5mBRT) with 17-1/2” bit, set 13-3/8”CSG till 1252.9mbsf (2461.4mBRT), and cemented.

Lower section (1252 - 2466mbsf)

Logging runs

Run1: PEX(TLD-CNL-MCFL)-SP-HRLA-HNGS

Run2: FMI-DSI-EMS

Run3: CMR

Run4: MDT

Run5: VSI

Logging date:

- 3:00 September 9, 2012 (Circulation stopped)
- September 9-11, 2012 (Wireline Runs 1, 2, 3)
- September 12-14, 2012 (Wireline Run 4)
- September 14, 2012 (Wireline Runs 5)

Logging intervals in chronological order

Run	Top	Bottom	Interval	Remarks
Run1 Main	1196.4 mWSF (2404.9 mWRF)	2465.1mWSF (3673.6mWRF)	1268.7m	
Run1 Repeat	1868.8 mWSF (3077.3 mWRF)	2011.6 mWSF (3220.1 mWRF)	142.8m	
Run1 in 13-3/8”casing	470.5 mWSF (1679 mWRF)	1271.5 mWSF (2480 mWRF)	801.0m	GR
Run2 short session(repeat)	1865.6 mWSF (3074.1 mWRF)	2039.1 mWSF (3247.6 mWRF)	173.5m	
Run2 Main	1240.3 mWSF (2448.8 mWRF)	2466.8 mWSF (3675.3 mWRF)	1226.5m	
Run2 in 13-3/8”casing	1191.5 mWSF (2400.0 m WRF)	1297.9 mWSF (2506.4 mWRF)	106.4m	Sonic log till the top of cement
Run3 short session(repeat)	1880.4 mWSF (3088.9 mWRF)	2019.6mWSF (3228.1 mWRF)	139.2m	
Run3 Main	1240.0 mWSF	2465.1 mWSF	1225.1m	

	(2448.5mWRF)	(3673.6mWRF)		
Run 4	1274.5mWSF (2483.0 mWRF)	2421.0mWSF (3629.5 mWRF)	1146.5m	MDT station log
Run 5	521.2 mWSF (1729.7 m WRF)	2441.5mWSF (3650.0 m WRF)	1920.3m	VSP station log

Last casing: 13-3/8"CSG 1252.9mbsf (2461.4mBRT)

Bottom depth driller: 2466.0mbsf (3674.5mBRT)

Bit size: 10-5/8"

Borehole: open hole

Mud properties

- Type: KNPP
- Weight: 1.11g/cm3
- Viscosity: 102s
- pH: 10.5
- Mud resistivity: 0.0820 ohm-m @24.6 degC
- Mud filtrate: 0.0728 ohm-m @23.3 degC
- Mud cake: 0.0949 ohm-m @ 25.6degC

Maximum recorded temperature

- Run1: 48, 48, 48 degC
- Run2: 48, 48, 48 degC
- Run3: 48, 48, 48 degC

The wireline logging started after drilling and cutting cores till 2466.0mbsf (3674.5mBRT). The passive heave compensator (see "Methods" chapter in Expedition Report) was set up.

The first wireline logging consisted of PEX(TLD-CNL-MCFL)-SP-HRLA-HNGS tool string. Density, porosity, gamma ray, one arm caliper, laterolog resistivity, mud properties, spontaneous potential, and spectral gamma-ray were measured up to 2404.9 m WRF (1196.4 m WSF) during this run. A repeat session of 142.8m was logged from 3220.1 m WRF (2011.6 m WSF) to 3077.3 m WRF (1868.8 m WSF). Gamma-ray was logged in 13-3/8 inch casing pipe from 2480 m WRF (1271.5 m WSF) to 1679 m WRF (470.5 m WSF).

The second wireline run was conducted with a tool string consisting of FMI, DSI, and EMS tools. Gamma-ray, electrical borehole image, compressional and shear sonic velocity, mud resistivity, mud temperature, and 6-arm caliper were measured. A short (repeat) session of 173.5m was logged before main log from 3247.6 m WRF (2039.1 m WSF) to 3074.1 m WRF (1865.6 m WSF). A main log of 3675.3 m WRF (2466.8 m WSF) to 2448.8 m WRF (1240.3 m WSF) was logged. DSI was logged in 13-3/8 inch casing pipe from 2506.4 m WRF (1297.9 m WSF). The coherence weaken due to poor cementing, log was stopped at 2400.0 m WRF (1191.5 m WSF).

The third wireline run consisted of CMR-GR. A short (repeat) session of 139.2m was logged from 3228.1 m WRF (2019.6m WSF) to 3088.9 m WRF (1880.4 m WSF). A main log of 1225.1m was logged from 3673.6m WRF (2465.1 m WSF) to 2448.5m WRF (1240.0 m WSF).

Wipper trip was conducted before the fourth wireline run. The fourth wireline run consisted of the modular formation dynamic tester (MDT) for pore-pressure, formation temperature, permeability measurement, and formation fluid sampling, with gamma ray for precise depth targeting of measurement intervals. Data collected from the first three logging runs were used to select the locations of the MDT tests.

The fifth wireline run consisted of VSI-GR. 4 shuttles of VSI with 15.2m spacing were used for checkshot and zero off-set VSP till 521.2 mWSF (1729.7 m WRF) (below 20" casing shoe).

Data processing

The raw data was delivered by Schlumberger field engineers to LSS, and was sent to shore-base Schlumberger specialists for data quality check and data processing. Depth match among Run 1-3 and environmental correction (mud correction) were carried out by the onboard Schlumberger Petrotechnical Services engineer. Depth of data in Run1 and 3 are matched with a speed corrected FMI resistivity curve from Run2 FMI-DSI. Environmental correction was applied with the mud properties from the mud report and the mud temperature and resistivities Schlumberger field engineers measured from the mud tank. LSS applied depth-shift of -1208.5m from the rig floor to the sea floor. Compressional and shear sonic velocities were processed by shore-base Schlumberger Petrotechnical Services engineer, and sent back to the ship though the internet. LSS applied depth-shift and converted unit from micro second/foot to meter/second. The raw VSP data was processed to synthetic seismogram and corridor stack by shore-base Schlumberger Petrotechnical Services engineer, and sent back to the ship though the internet.

LSS generated FMI resistivity borehole image using GeoFrame 4.4. The static image was processed with 128 colors gradation. The dynamic image was processed with 128 colors gradation and window length of 1m.

Logging data quality control

The quality of the logging data is generally excellent. This is probably due to very good borehole condition without elongation or irregularity of the borehole wall. The lithology encountered may also contribute to the log data quality, and the relatively simple rock type, sandstone, siltstone, shale, coal, and conglomerates, made identification of lithology based on the characteristics of the logging data straightforward. Since most lithology shows typical log response and is intercalated by a number of marker layers (coal and cemented sandstones), correlation of the logging data to cores can also be done straightforward.

There are some concerns in term of the data quality. The quality of FMI borehole image, resistivity scanning on the borehole wall, is significantly affected by the contact situation of the electrode pads and flaps. In the images acquired during expedition 337, noise can be seen only in those taken by the flaps. This may be due to weaker contact force of the flaps than that of the pads. When any material stuck to the pad and flap, those on the flap may remain longer before being removed by the friction to the borehole wall.

Some logging data (GR, DSI sonic, VSP) were also acquired in the casing pipe of 13 3/8 inches and the quality of these data was affected by the size of the borehole (17.5 inch) and the situation of the casing cement that fills the gap between the casing pipe and the borehole. GR signals simply weakened because of the increased distance from the tool to the borehole wall, and this decreased the characteristics of the GR pattern. Among the sonic measurements performed in the bottom 150 m part of the cased hole, S-wave was not acquired and this may be due to the imperfect contact situation behind the casing pipe. P-wave quality was also significantly affected by this situation. VSP signals showed poor quality at the top 100 m interval of the cased hole, and this may be due to the 'ringing effect' to the shallow 20 inches casing pipe.

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