

IODP EXP 358 Daily Geomechanics Report

Report #020 20181129 Final 4990

RTG Team

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|------------------------------|--|
| RTG Supervisor(s) | David Castillo / Thomas Finkbeiner / Demian Saffer |
| RTG Watch Lead (00:00-12:00) | Kan Aoike |
| RTG Watch Lead (12:00-24:00) | Adam Wspanialy |
| RTG Office Support | N/A |

Well Status (as of 06:00 Nov.30 2018)

| | | | |
|----------------------------------|--|-------------------|------------------------------|
| Site Name: | C0002 | Hole Name: | Q |
| Water Depth: | 1,939.0 m | RT-MSL: | 28.5 m |
| Current Depth: | 4,990.0 mBRT (4,988.0) mTVD | Section TD: | 4,990 mBRT (4,988.0) mTVD |
| Section #: | 1 | CSG Depth / Size: | (4855.0) mBRT 11-3/4 " |
| Static MW: | 1.37 sg | Current ECD: | 1.43 sg |
| FIT/LOT/XLOT: | FIT maximum pressure = 1.45 sg, Possible "LOP" = 1.43 sg @4855 mBRT | | |
| Current formation/ lithology: | Shale | | |
| Sensor Offsets from the Bit: | PDC Bit: 0 m arcVision 675: (APWD: 3.59 m, Resistivity: 4.30 m, GR: 4.35 m) TeleScope 675: (IWOB: 8.47 m, Direction + Inclination: 11.84 m) | | |
| Current Operations: | Continued reaming down with 8-1/2" x 12-1/4" BHA. Encountered stuck pipe at 4938 mBRT at 07:47. Performed work pipe with jarring 3 times and released. Resumed reaming down at 08:05. Reached the revised TD 4955 mBRT at 10:40. Commenced reaming up to the window and pulled the entire BHA back into CSG to 4848 mBRT at 13:40. Conducted IBOP maintenance from 13:40 to 23:30. Commenced RIH BHA at 01:07. Took high TOR and SPP spike at 4874.5~4875.5 mBRT. Dropped the ball at 4894 mBRT at 03:37 Nov.30. Activated Z-reamer at 04:22. Commenced reaming down with 12-1/4" Z-reamer at 04:30. Took excess torque at 4903 mBRT at 05:59. 4903 mBRT as of 06:00 Nov.30. | | |

2Geomechanics Alert

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|---|---|
| GREEN | <p>Green = Projected model remains accurate White = Unanticipated deviation from model which <i>should not</i> affect drilling Yellow = Unanticipated deviation from model which <i>may</i> affect drilling Red = Imminent requirement to stop drilling</p> |
| Basis for Alert Level + Recommendations | No issue with 1.37 sg MW for Section 1 |

Principal Findings

N/A

Observations Summary

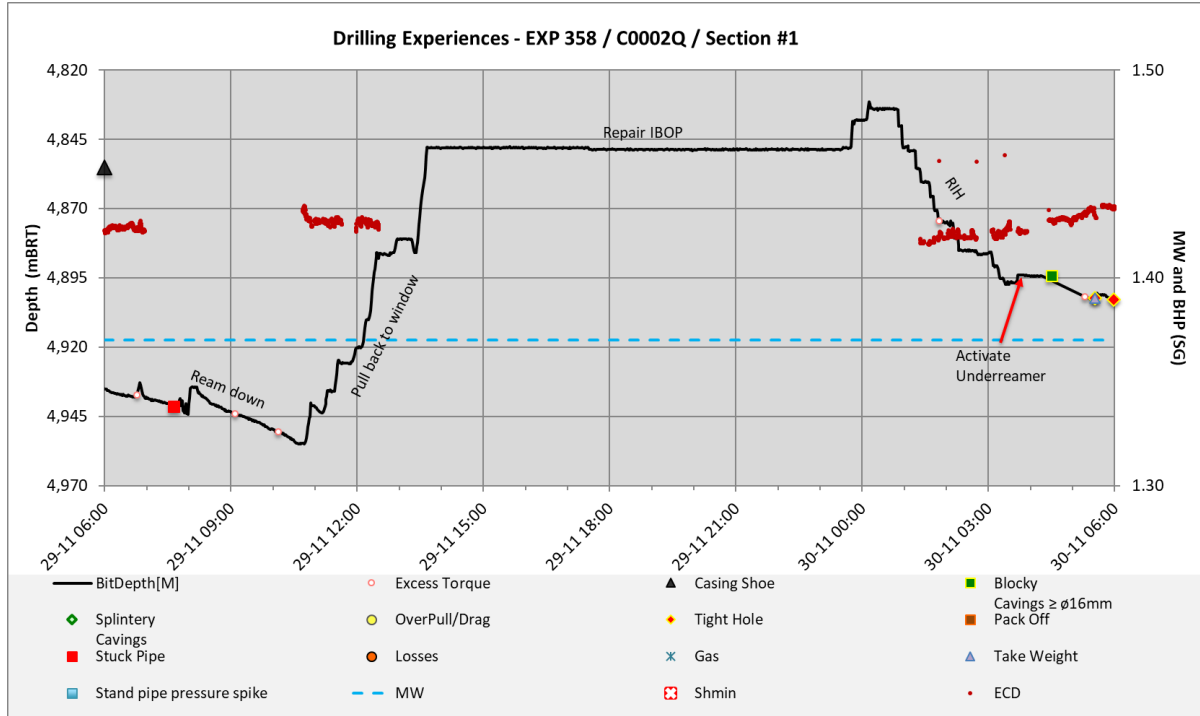
Use this space to discuss any observations while drilling, running casing etc.

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|------------------------|---|
| Fracture Gradient | N/A |
| Pore Pressure | N/A |
| Wellbore Breakout | N/A |
| Tensile Failure | N/A |
| Drilling Parameters | Steady ECD 1.43 sg. DTOR ~2.5~6 kNm while higher STOR ~30 kNm during reaming with 8-1/2" bit. DTOR 5.5 kNm while STOR 14 kNm, DWOB -37 kN |

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| | while WOB 30 kN, before Z-reamer activation. DTOR 6~6.3 kNm while STOR 12~19~30kNm after Z-reamer activation. DWOB -8~-9kN. 600 gpm, 40~60 rpm. |
| Other | No seepage losses have been observed in last 30hrs. |



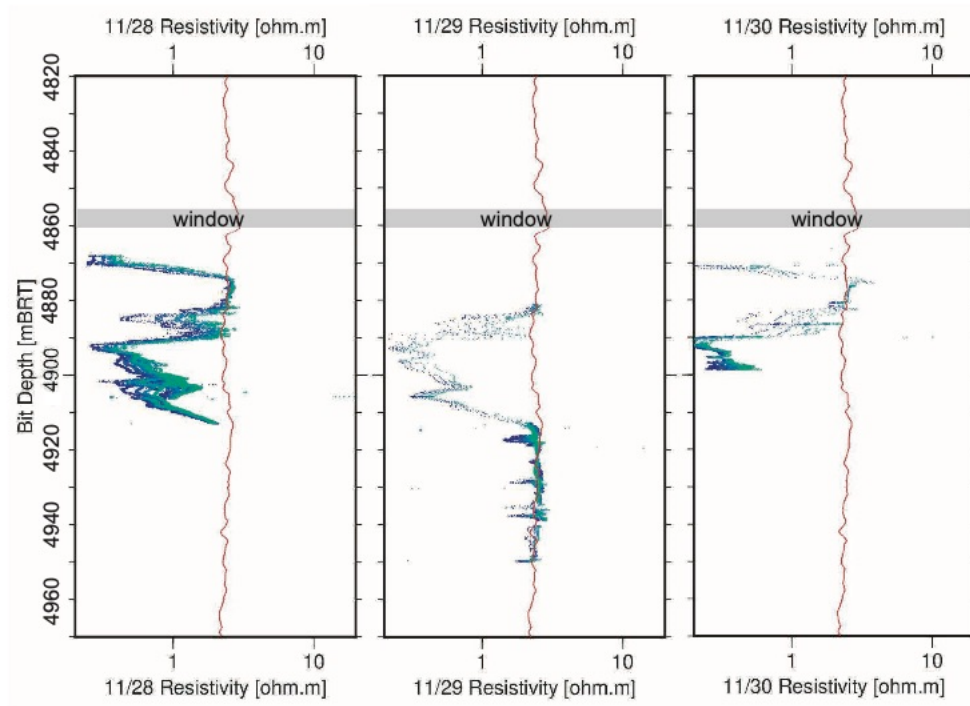
Analysis

LWD Data Analysis

The figure below is showing LWD resistivity comparisons between (arcVISION) collected on Nov.28, 29 and 30 2018 (blue to green dots) and that resistivity collected in 2013 during Exp.348 (red line) (after Yabe, Logging Scientist). The intervals with steady resistivities, around 4875~4880 mBRT and below 4910 mBRT, show the identical values of that of Exp.348, suggesting reasonably good hole condition, at least on the 29th of November. We have no new information to document hole condition beyond 4910 mBRT after the 29th of November. On the other hand, the resistivities around 4900 mBRT indicate obviously low values and have shifted negatively with time. This suggests that hole enlargement is likely occurring. The steady and systematic stream of cavings material is consistent with a hole enlargement hypothesis.

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Drilling Experience Analysis

N/A

Cuttings Analysis

N/A

Cavings Analysis

As of this report, cuttings/cavings coming out to the shakers may be sourced near the junction of the kick-off section and the window. Volume of the cuttings/cavings increased from around 0500 hrs where fragments $>\phi 4\text{mm}$ made up $\sim 20\%$ per unit volume of all solids. Angular blocky cavings, $\sim \phi 1\text{cm}$ in diameters made up $\sim 50\%$ of the residues after sieving. Rounded blocky and angular cavings made up 20 and 30%, respectively. About 1-3% of the residues was composed of angular platy shaped cavings (perhaps, splintery), or cutting samples. Cement fragments were rare. Scratches due to mechanical impact are evident in some grains.

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SFIB Analysis

N/A

Geomechanical Model Review (a review of the FIT results)

Potentially no changes to the pre-drill geomechanical model because FIT (Formation Integrity Test) does not directly contribute sufficient information for constraining or refining subsurface earth stresses. By design, FIT is intended to determine whether the planned mud weight can be supported by the formation.

The planned mud weight of 1.37 sg with an operational safety upper margin of +0.06 sg (surge pressure), required a formation pressure integrity up to 1.43 sg. The FIT in the C0002Q rat-hole achieved that objective. It is possible that a leak-off pressure of 1.43 sg may have occurred, but a maximum pressure of 1.45 sg was achieved before the pumps were shut-in. If a leak-off pressure of 1.43 sg did occur, this implies a leak-off-test (LOT) had occurred (no longer a FIT). A leak-off-pressure of 1.43 sg may be interpreted as a possible approximation of S_3 or S_{hmin} stress magnitudes.

This interpretation would require a pass of the LWD image log across the rat-hole section to identify whether a new tensile was created, or drilling fluids leaked into a pre-existing bedding plane or natural fracture. The former would have direct implications of S_3 , while the latter would require further information such as bedding plane orientation.

However, since no LWD data acquisition is planned for the rat hole section, we will have no chance to confirm which case occurred. Therefore, we continue to call this test a FIT.

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