**Oman Drilling Project – GT3 – Lead Scientist On-Site Log (LSOS).**

**February 11th 2017 to March 2nd 2017**

This is an electronic version of the blue on-site logbook.

**GT3 23.11409N, 58.21172E, Altitude 789 m (±8 m).**

Hole GT3A. Vertical.

***Overview***

**DAILY UPDATES**

**11th February 2017, Saturday**

**On-site: DT, MH, JC, NB (later JM, GFG, JN)**

Tarp up and everything unpacked into tent. Lunch. Preparing to receive first cores.Started drilling Hole GT3A in afternoon.

Arrived on site: Already on site since morning

Rig started:

Rotation started: 14:30

15:00 Rig stopped, hydraulic leak

15:25 Rig re-started.

pm Blue truck arrived to fill science team water tank.

Geology:

1Z Fractured diabase with epidote-rich altered interval.

2Z Phyric epidotized diabase with contact to finer grained diabase/basalt, possibly chilled margin, pieces fractured along veins.

3Z Similar to previous core.

**12th February 2017, Sunday**

**On-site: DT, JC, MH, NB, GFG, NW (JM to GT1 for core loading)**

Arrived on site:

Rig started: 07:03

Rotation started: 07:20

Water loss from 5.35 m onwards.

After getting stuck rock out of core catcher, trip out HQ, putting in temporary casing to stabilise hole and maintain circulation.

HW casing installed to 9 m (HW casing is 114 mm in diameter)

JM waited at GT1 but no truck. Left to go to meeting in Muscat.

Geology:

Diabase dikes with chilled margins. Epidote alteration and veins in 5-2. Pieces tend to break up and create rubble intervals. Cut by thin calcite veins. Quite a few pieces are phyric with plag phenocrysts.

7Z-1 could not be scanned as too much rubble.

9Z – 2.33 m: relatively coherent core with phyr. plg diabase, chilled margins not apparent 🡪 could be one large continuous dike. Contains calcite veins, continuous except for top.

10Z1 Nearly continuous core with chilled margins 🡪 change in orientation of red/blue lines to have good preservation of margins in cut core in section 1.

**13th February 2017, Monday**

**On-site: DT, JC, MH, NB, GFG, NW**

Arrived on site: 07:05

Rig started: 07:25

Rotation started:

Continuing to put in last rod of casing. Slow going because formation very hard. At top a lot of fall in and unstable conditions.

09:05 Casing in, preparing to RIH.

09:30 Start to RIH with HQ

09:40 Start drilling, looks like good water circulation.

Hole deviated – first core 🡪 redrilled core with rubble from top.

10:23 Stopped rotating

10:27 Retrieved core

Core 12M Re-cored coherent section + rubble (all bagged together)

Core 13M Coherent pieces at top 1.45 m + rubble (put together at bottom)

Cores 14 and 15M Top continuous but still re-drilled

After core 16 should be back at 11.85 m 🡪 Bottom depth before casing.

~13:00 Johan, Lyderic, Emma, Louise and Marine arrived and were introduced to core flow.

17Z Epidote-rich zone w/ 🡪 Magm/Tect/Hydrothermal alteration in one zone. Offset chilled margin.

19-20Z Nice contacts between intrusions, bottom of core has beautiful chilled margin. Multiple intrusions visible down core, top section contains oliv + is coarser-grained.

Lost circulation in 21Z 🡪 complete loss.

JC left for Muscat at end of day.

**14th February 2017, Tuesday**

**On-site: DT, MH, NB, GFG, NW, JL, LF, LK, EB, MB**

Arrived on site:

Rig started: 07:00

Rotation started: 07:10

Still lack of water circulation.

Continued in diabase with nice chilled margins preserved. Cut by carbonate veins.

25Z Was 2.16 m long but broke while cleaning. Contains coarse-grained segments that are nearly micro-gabbro in texture.

Rotated way up lines at start of 25Z.

26Z Top of core has multiple chilled margins/intrusions.

30Z Highly altered zones w/ epidote also hydrofractures + soft brecciated zones (like fault breccia).

From then on more homogeneous, FG-MG diabase. Local intrusive dykes w/ chills.

MH and GFG left after 30Z to fly out tonight.

Rig switch off at 17:20 – Thank God!

Advance today = 39.65 m – NEW RECORD!

**15th February 2017, Wednesday**

**On-site: DT, JM, NB, NW, JL, LF, LK, EB, MB, JK**

Arrived on site:

Rig started: 07:05

Rotation started: 07:14

Johan running the book!

37Z Got trapped in the core barrel 🡪 recovered early. With core 38Z advancing only 2.25 m we are back on rod from end of 38Z.

Discontinuity within 37Z-1 & between 37Z-1 and 38Z-1; and within 48Z-4.

Recovering mostly FG dykes w/ occasional chilled margins.

Rotated way up lines at 45Z; and again at 46Z; and at 48Z.

15:50 Rig off, having reached a depth of >100 m.

Advance today: 36.6 m

Need to take sample tomorrow am of core 49Z 🡪 was too shattered around 100 m depth.

**16th February 2017, Thursday**

**On-site: DT, JM, NB, NW, JL, LF, LK, EB, MB, JK**

Arrived on site:

Rig started: 07:00

Rotation started: 07:17

First recovery of gabbro @ 101.30 m! Two decimeter-sized varitextured patches in contact with dykes.

Rotated way up lines at 49Z-1 to cut across gabbro patches.

During drilling of 51Z conditions became difficult due to fractured rock pieces at bottom of the hole 🡪 pulled out early, advancing only 40 cm. Back to normal afterwards.

During morning drilling recovered dykes with dm-m scale screens of gabbro. Gabbro often highly altered, but some less altered domains occur.

55Z contains long (~2 m) interval of varitextured, M-CG gabbro.

After 57Z there was a brief interruption of drilling 🡪 waiting for water.

Update: Brief turned out to be the end of the day.

Advance today = 24.40 m

**17th February 2017, Friday**

**On-site: DT, JM, NB, NW, JL, LF, LK, EB, MB, JK**

Arrived on site:

Rig started: 07:06

Rotation started: 07:11

During drilling of 59Z we drilled through an interval (~50 cm) of heavily epidotized diabase, which was soft and crumbly. Drillers commented that they could feel this soft interval during drilling. This core was stuck in the core barrel and was recovered by hammering the barrel while vertical. Rocks around the soft interval were recovered from both the top and bottom of the barrel, leading to some confusion over way up of parts of the soft interval. Most pieces were puzzled back together so orientation now likely to be ok.

09:46 Drill rig off – water had run out after 2 m of advance during coring of 60Z.

Rocks recovered today is 50:50 dykes and gabbro.

Advance today = 8.10 m

Issue with ExpeditionDIS\_OMAN.adp file not in usual destination! Copied backup.adp to usual folder. Hopefully this fixes issue.

**18th February 2017, Saturday**

**On-site: DT, NB, NW, JL, LF, LK, EB, MB, JK**

Arrived on site: 07:07

Rig started: already started

Rotation started: Slow rotation to stop drill string sticking.

Waiting for water. New card payment system installed at local water source (NB. drinking water although in green Lalbuksh truck). Valve broken at water facility/New payment system. Now water from nearby source.

09:45 Water arrived.

Mostly diabase dikes – minor varitextured gabbro

* A continuous water supply is greatest concern.
* Diabase drilling well

Advance today = 28.40 m

BOH = 161.20 m

**19th February 2017, Sunday**

**On-site: DT, JM, NB, NW, JL, LF, LK, EB, MB, JK, Salim and Saif from PAM**

Arrived on site:

Rig started:

Rotation started: 07:15

10:23 Rotation stopped – Diesel?

Wali says water to midday… water truck – green – 10:10, 12:30, 15??

71Z – 74Z Some rotation of way-up lines due to different orientations of faults, fracture networks and intrusive/chilled margins

Advance today = 30 m… Unfortunately all in diabase.

With 1256D – like irony, DT returns to the UK still in the sheeted dikes and as yet unable to claim to have fully crossed the dike-gabbro boundary… perhaps it does not exist

Good luck!

**20th February 2017, Monday**

**On-site: JL, LF, NB, NW, LK, EB, MB, JK, Salim and Saif (PAM)**

Arrived on site: 07:00

Rig started: already started

Rotation started: 07:13

Rotated way-up line at 82Z-1 to cut through hydrothermal fault zone.

Cores recovered in morning comprised series of fault splays in predominantly diabase, with minor gabbro/coarse diabase.

\*New Record 🡪 85Z intact piece of 2.35 m\*

Afternoon cores are much less brecciated. 87Z has spectacular plagiogranite brecciating dykes.

Rotated way-up line at 87Z-4 to cut through chill fragments in plagiogranite and again at 88Z-1.

Advance was a bit slower during coring of 88Z. Wali mentioned that there appears to be harder & regular (as in the diabase we’ve had so far) parts in this interval. At 214 m advance was unusually fast, so Wali reduced thrust. Should be an interesting core…

Turned out to be thoroughly epidotised dyke interval. Continued in dykes to the bottom, with some highly epidotised intervals.

17:08 Rig off

Advance today = 27.00 m

**21st February 2017, Tuesday**

**On-site: JK, NB, NW, LF, EB, MB, AM, CJM, JL, JM, Salim and Saif (PAM)**

Arrived on site:

Rig started: <07:57

Rotation started: 07:57

Advance was a bit slower during coring of 94Z. Wali said that he feels that cored rock is harder.

🡪 This level was mostly diabase with intercalated gabbros, Wali said that it may be related to the small magmatic breccia that is present at 2.30 m (94Z-3).

🡪 Advance was very slow during coring of 95Z [Torque = 240 kgcm-2]

🡪 Advance continues to be slow during 96Z and 97Z. Wali said that “there are no difficulties to drill, it will just take longer as these rocks are harder, these are not pure basalts”. LF and JL think that we may be drilling some granoblastic rocks since 94Z.

🡪 97Z took 2hr to drill; it is composed of “diabase” at the top and then gabbro. This gabbro may be special as gabbro is usually easier to drill.

**22nd February 2017, Wednesday**

**On-site: AM, CJM, NB, NW, LK, JK, Salim and Saif (PAM)**

Arrived on site:

Rig started: 07:55

Rotation started: ~07:55

Stop with HQ after 103Z; system pressure was too high ~250; engine overload 🡪 smoke was visible so we decided to change down to NQ as the drillers suggested. Now the HQ drill assembly is POOH and RIH with HQ shoe bit; then RIH with NQ assembly 🡪 Then continue with NQ coring.

17:45 Rest of day POOHing HQ

**23rd February 2017, Thursday**

**On-site: AM, CJM, LK, NB, NW, JM, JC**

Arrived on site: 10:00

Rig started:

Rotation started:

Late start at site today with science party arriving at 10:00 due to drill team installing NW casing down to 257 m using shoe bit, followed by installing NQ drill string to same depth.

Science team continued core description and box scanning.

JC arrived from airport. At lunchtime JM and JC departed to visit rotary site BA1.

15:45 Rotation with NQ bit began

Series of problems bedding in last section of casing and falling debris blocking circulation.

No new core today.

**24th February 2017, Friday**

**On-site: AM, CJM, JC, NB, LK, NW**

Arrived on site: ~07.30

Rig started:

Rotation started:

Drillers still attempting to resume coring using NQ bit, having installed casing.

11:10 Finished receiving core. Drillers stopping for day – still not a full box here (of NQ) – rest of stations are clear, today’s cores curated – finish.

Tony, Chris and Louise off to look for lavas locally.

Jude and Nico back to base for lunch w/Juerg + set up of new toughbooks etc.

**25th February 2017, Saturday**

**On-site: AM, CJM, JC, LK, NW**

Arrived on site: ~07.15

Rig started: Already started

Rotation started:

08:48 Rig System Pressure (kgcm-2): ~165, steady Pull Down (kgcm-2): ~35, steady

PK arrived on site ~ midday. Stayed until ~14:00. Left to head to BA1 to meet JM and NB.

Very windy in pm – had to spend some time securing the tent + tightening the guy ropes. One sample bag may have been blown away?

Geology:

After a slow couple of days the NQ cores arrived in earnest. Complicated! – just when we think we’re into gabbros proper we recover more diabase… then gabbro, and so on. Beautiful varitextured oxide-gabbros through, and a finer facies that may be granoblastic; lots of mutually contradictory relations.

**26th February 2017, Sunday**

**On-site: AM, CJM, JC, LK, NW**

Arrived on site: 07.15

Rig started:

Rotation started: Already rotating

Wali asked if it is confirmed that we will extend this hole deeper than 400 m – he needs to arrange for transport of more NQ pipes to site if so.

Nehal will tell Wali to arrange for 100 m more anyway, in case.

Noted today that the tablet and stylus used to sketch cores both contain strong magnets – powerful enough to pick up a steel 1m ruler! If these come into contact with core pieces, they will impart a spurious isothermal remnant magnetization (at least to the outer ~1cm) of the core surface). This will be a serious problem for palaeomagnetic analysis of these cores. Shipboard palaeomag team should be aware of this potential problem. Suggest that tablet and stylus are kept to a minimum of 5 cm from core samples or better still that the sketches are made by hand on paper copies. AM 11:30 26/02/2017

15:40 Changing bit 🡪 so POOHing.

Nehal thinks whole process of POOH, change bit, RIH, will take ~5 hours. Should be ready to start drilling ~ 10 am tomorrow.

17:00 Finished POOHing (so looks like coring will begin earlier than Nehal predicts)

**27th February 2017, Monday**

**On-site: AM, CJM, JC, LK, NW**

Arrived on site: 07.45

Rig started:

Rotation started:

Drill team still RIH when we arrived.

09:45 First COD drilled with new bit.

16:10 Rig stopped.

Heavy rain this afternoon with thunder! Needed to cover all sockets and unplug saw for safety, plus cover all boxes that were exposed. Rain halted progress with gluing of labels on samples and prevented further sketching of core using tablet. Also needed to regularly drain puddles from the roof of the tent to stop weight building up.

17:00 AM took NW back to Ibra. JC, CJM, LK stayed on to try to get more boxes described and keep up with core flow.

18:00 JC, CJM, LK left site.

**28th February 2017, Tuesday**

**On-site: AM, CJM, JC, LK, NW (PK collected DZ from airport then on site around lunchtime)**

Arrived on site: 07.35

Rig started:

Rotation started: Already rotating

Today saw a marked increase in proportion of the core consisting of gabbro, but still numerous diabase units are present. Visited in late afternoon by the US microbiology group, who observed coring and curation. Provided them with a 15cm sample (whole-round, taken at very end of coreflow, = “background” diabase, for testing methods and contamination). Samples of drilling fluid were also taken.

Last day on site for Chris, Tony and Louise, who are moving on to palaeomagnetic sampling in the region surrounding GT3 to provide context for the shipboard pmag analyses.

**1st March 2017, Wednesday**

**On-site: PK, JC, DN, DZ, NW (RL arrived from airport late morning)**

Arrived on site: 07:45

Rig started:

Rotation started: Already rotating

11:10 Romain Lafay arrived onsite from airport

Geology:

Mixed varitextured gabbro & diabase all day; we had a nine meter run of gabbro, and thought we were “there”, but then a nine meter run of diabase. Any trend is not detectable.

**2nd March 2017, Thursday**

**On-site: PK, JC, DN, DZ, NW, RL (and later EP)**

Arrived on site: 07:30

Rig started:

Rotation started: Already rotating

Yesterday was Nehal’s 33rd birthday, so PK gave him Harrods ginger biscuits as gift from science team.

DZ and RL went to airport to add DZ as a driver on the landcruiser and collect Eric. Arrived on site after lunch.

Drilled last 7.00 m to reach 400 m final depth!

Geology:

Last 3 or 4 boxes in highly deformed gabbro.

GT3 is now finished, now complicated move to BT1, including housing move. Many new arrivals, milling around, getting used to the climate and the busy bosses who are focused on logging tasks.

Packed up contents of tent into landcruisers. Scanner and a few small items of hardware left.

PK, JC, NW and DN visited freshly bulldozed BT1 site with Wali – met Gopi there. Decided on position for rig and other items on pad.

**3rd March 2017, Friday**

Drillers taking full day off.

Gopi moved Office, tables and generator to new site.

PK took RL, EP, DN and DZ to Wadi Fins for a day trip.

JC and NB stayed at apartment to catch up on emails and other work. Toughbooks put online on TeamViewer for Potsdam to update etc.

**4th March, Saturday**

PK and NB to BA2

JC, RL, DN, EP, DZ, NW to GT3.

Packed up scanner, took down tent and tarp.

Moved to BT1. Sultan dropped off scanner (using his pick-up truck) and Gopi delivered tent poles and boards for scanner to sit on (and spare matresses for packing boxes) using his pick-up truck. Lalbuksh truck delivered water container, saw, toilet. Pitched tent and tarp. Late lunch delivered by Sultan. Rig arrived at site. Wali having trouble getting the truck with the rest of his gear across the wadi as the track is so windy and sandy. Trying to make a straighter route, w/digger.

JC and DN went to GT3 to supervise loading of core boxes. All back to base.