Week 2 Drilling and Scientific Report for IODP Expedition 357 Atlantis Massif Serpentinization and Life

2nd November 2015 – 8th November 2015

1. Hole summary

Hole	M0068A	M0069A	M0070A
Latitude	30^0 7.493	30^0 7.944	30^0 8.553
Longitude	42^0 5.743	42^0 7.202	42^0 8.188
First core	06/11/15	06/11/15	08/11/15
Last core	06/11/15	08/11/15	09/11/15
Cores recovered	1	10	3
Drilled length (Coring)	1.965m	16.44m	4m
Drilled Length (Open Hole)	0m	0m	0m
Recovered length	0.47m	12.33m	2.09m
Final depth	1.965mbsf	16.44mbsf	4m
Hole recovery	23.92%	75%	52.25%

2. Science

After an 10-day transit from Southampton, the expedition arrived over Atlantis Massif on 05/11/2015 and immediately began a multibeam survey over several of the proposal sites (AM-01, AM-02, AM-04, AM-06, AM-07 and AM-11) to resolve seafloor slope angles for rock drill deployment. During the week, the RD2 rock drill was deployed at Sites M0068 (proposal site AM-02) and M0069 (proposal site AM-06), and the MeBo rock drill was deployed at Site M0070 (proposal site AM-07). Prior to coring at each site, a background water column profile for geochemistry and microbiology was collected with the ship's CTD Niskin rosette. Recovered cores were run through the shipboard MSCL, and samples were taken from some cores for microbiological and geochemical analysis and OSP thin section/bulk rock analyses.

RD2 coring at M0068A (proposal site AM-02A) terminated early due to a technical issue (air in a hydraulic hose). A 47 cm core was recovered (23.9% recovery), composed of rubble and intact pieces of coarse-grained metagabbro with strong talc-amphibole alteration. Deformation is heterogeneous but predominantly protomylonitic. Two generations of veins are identifiable: talc-amphibole veins and calcite veins. Patches of manganese crust and pelagic, foraminiferous carbonate were observed on the surface. One whole round core sample was collected for ephemeral microbiological and geochemical analysis.

RD2 coring at Hole M0069A (proposal site AM-06A) resulted in ten cores with 12.33 m of material (75% recovery). The four uppermost cores consisted of unlithified, fine pelagic carbonate sand with varying degrees of recovery, while cores 5-9 consisted of variably deformed gabbros, metagabbros and serpentinite. Core 10 appears to be olivine-rich and troctolitic in composition. Core logging revealed that cores 9R and 10R had higher levels of magnetic susceptibility, and Core 5R had higher electrical resistivity. Five whole round core samples for ephemeral microbiology, geochemistry and contamination testing, as well as subsamples for OSP thin section billets, were collected from cores 4R, 5R, 7R, 9R, and 10R, with the rest of the material archived for OSP sampling.

MeBo coring at Hole M0070A (proposal site AM-07A) resulted in three cores with 2.09 m of material (52.3% recovery). The cores consisted of lithified basaltic breccia with variably sized blocks set in fine pelagic carbonate sand. Two whole round core samples for ephemeral microbiology, geochemistry and contamination testing were collected from cores 2R and 3R, with the rest of the material archived for OSP sampling.

In summary, 14.89 m of core was collected in this week from three Holes, accompanied by 8 rock drill mounted Niskin water samples and 21 water column Niskin water samples.

Both rock drills were outfitted with new technologies to enable contextual data to be gathered during drilling. While drilling, a sensor package on the rock drills collected logs of methane, pH, redox, temperature and conductivity of fluids exiting the borehole, and dissolved oxygen was included at Site M0070; these logs were viewable in real-time. A tracer delivery system injected concentrated perfluoromethylcyclohexane (PFC) into the drill pipe flushing water as a tracer of potential drilling-induced contamination of samples for microbiological and geochemical analysis. Immediately after coring stopped each site, fluids exiting the boreholes were collected in three Niskin bottles mounted on the drills. Finally, both drills carried memory logging tools and a three-component system for plugging boreholes for future observatories. In the first week, the sensor package, tracer delivery system, and Niskin bottle water collection were proven to work. The logging tools and borehole packer system have yet to be tested, pending suitable borehole conditions.

3. HSE Activity

N/A

4. Figures and Photographs

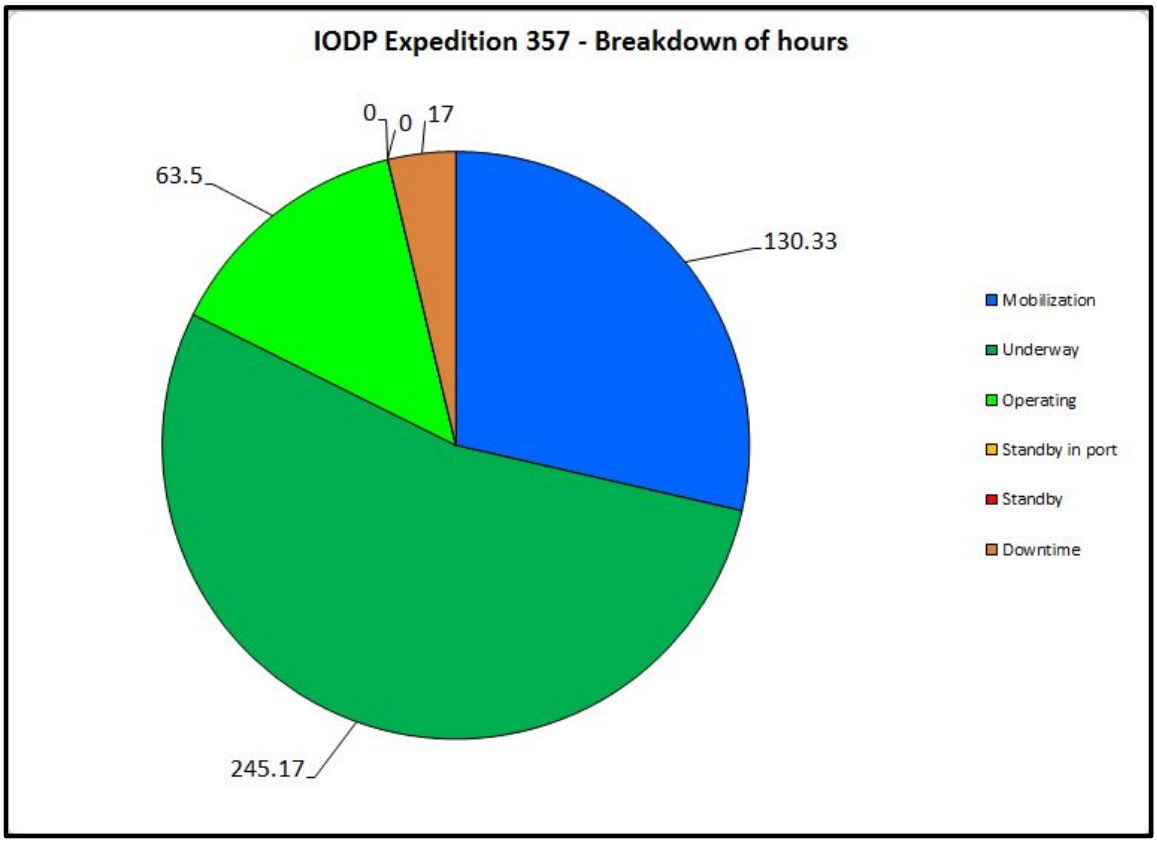

Figure1: Breakdown of hours from the start of mobilisation to midnight on November 8th.

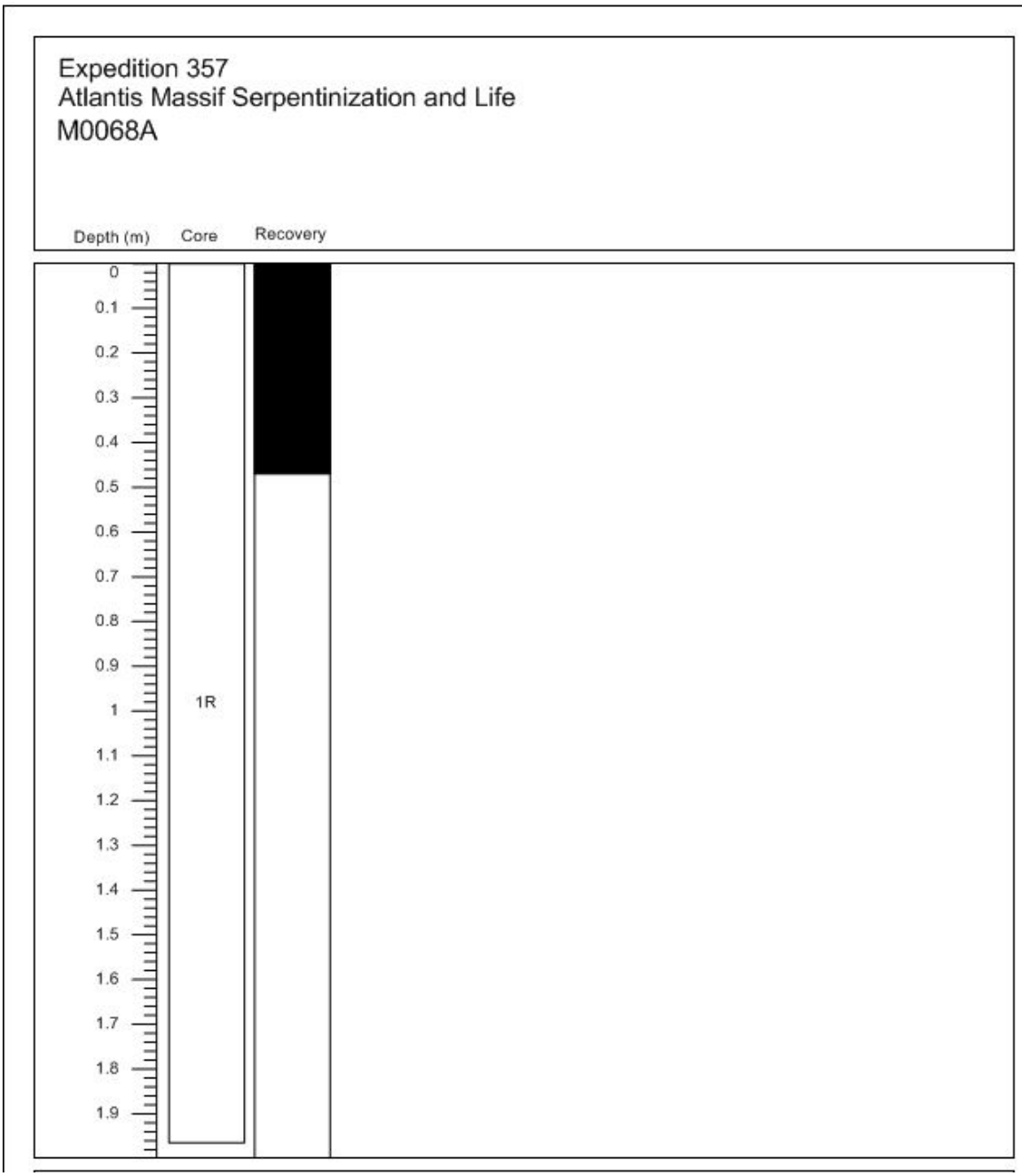

Figure 2: Core runs and recovery (Black shading) for site AM-02A, M0068A.

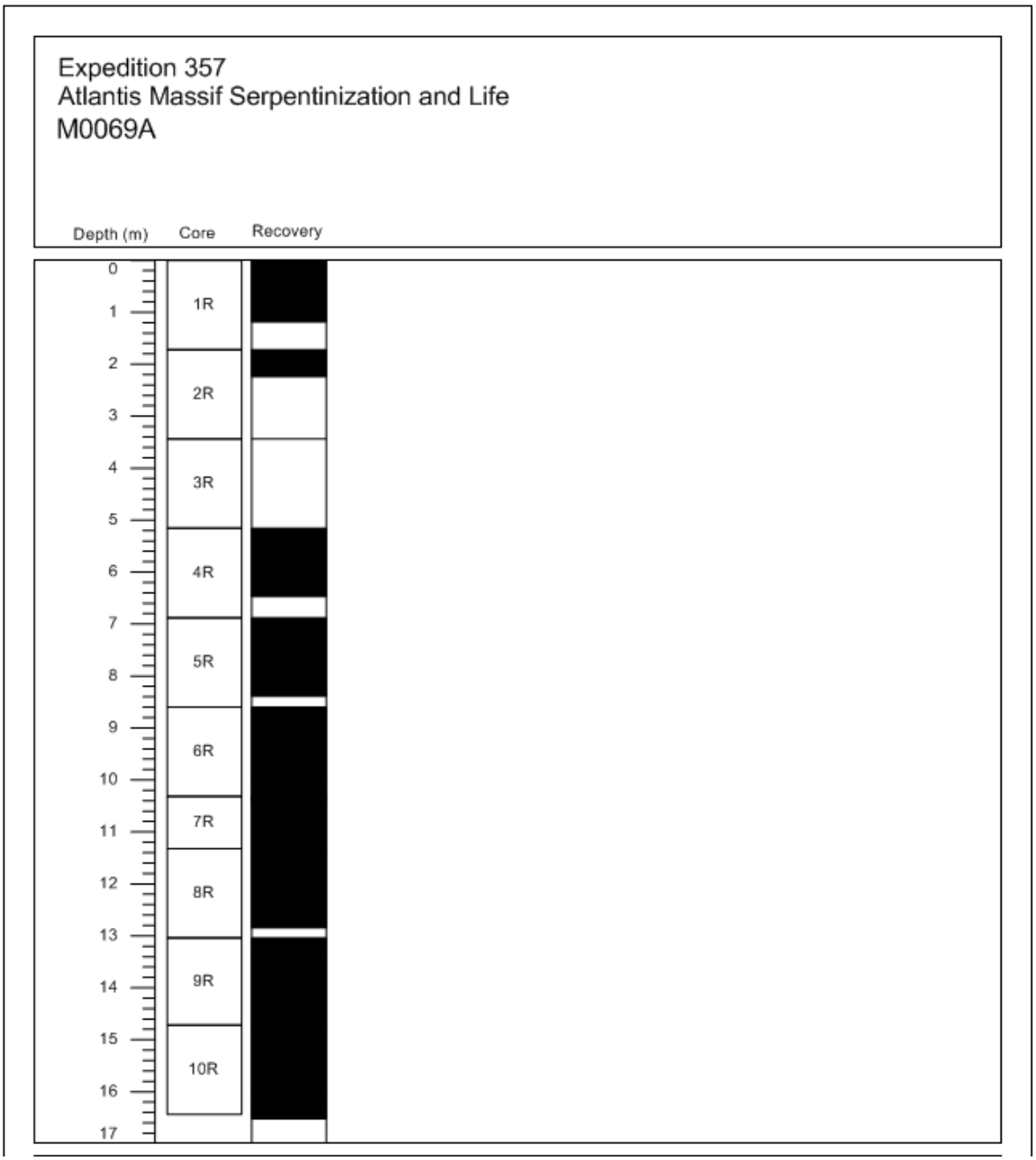

Figure 3: Core runs and recovery (Black shading) for site AM-06A, M0069A.

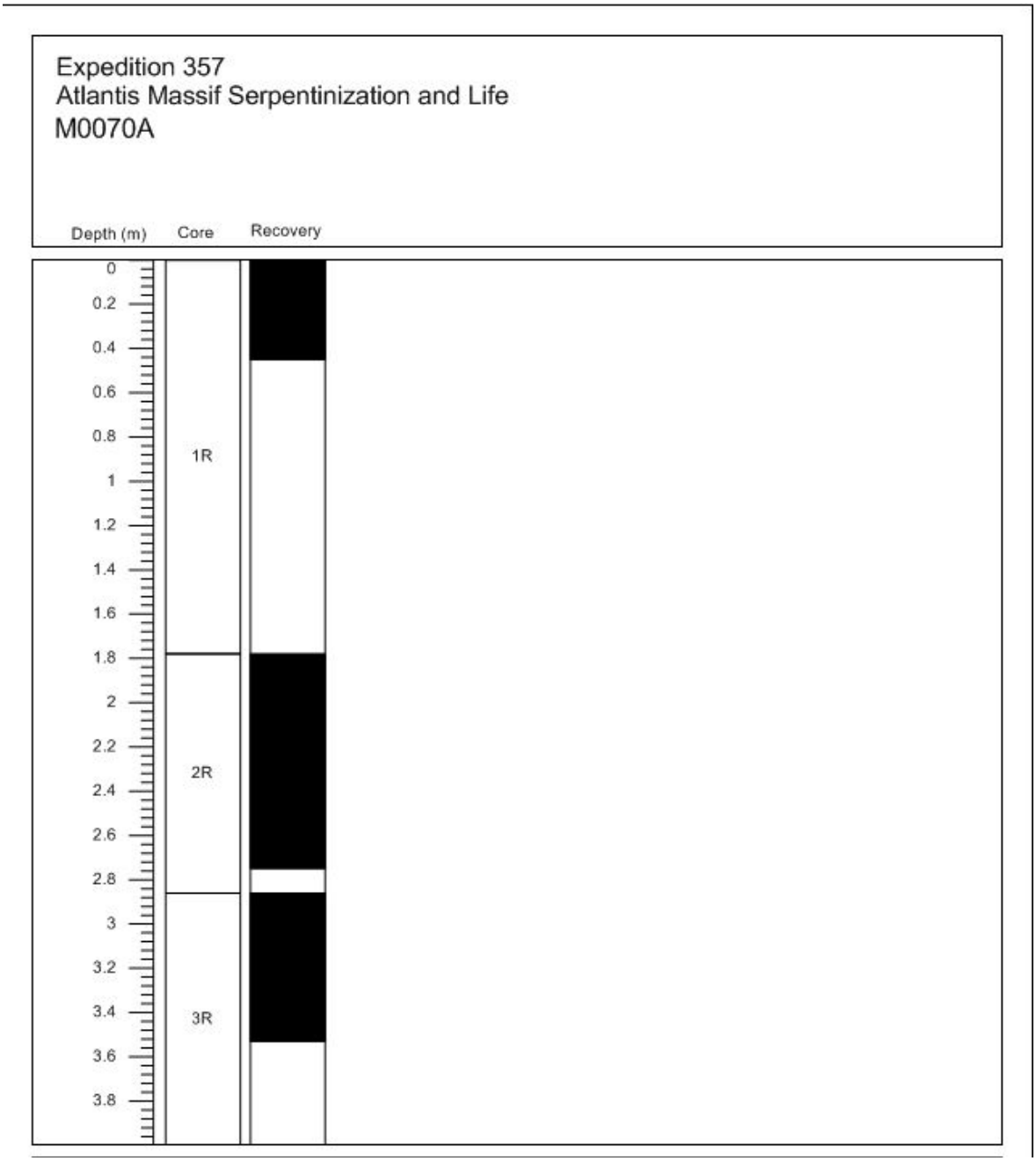

Figure 4: Core runs and recovery (Black shading) for site AM-07A, M0070A.