Week 4 Drilling and Scientific Report for IODP Expedition 325
Great Barrier Reef Environmental Changes

5th March – 11th March 2010

1. Operations

A couple of core barrel problems, mis-assembles and sediment in latch head, plagued the first few hours of March 5th. The next run was a spectacular coral core of 99% recovery. This was followed by short core runs as course gravel size pieces were jamming between the hard coral core and liner and thus stopping the core entering the liner tube. By midday hole M0039A was complete with 12 core runs. This is the last site on HYD-01C.

By midnight on March 6th, the 1st site on HYD-02A had been surveyed to check there were no live corals and the 3rd core run of M0040A was being completed. After the 3rd core run, an electrical problem with the draw works held up operations for an hour and a half. Following that, there was a very smooth run of coring, with excellent core recovery and quality, completing the hole within 15 hours. After deploying the camera for post site inspection, it became stuck in the BHA. It couldn't be freed and the cable was cut 100m above the camera. The API string was pulled, all the time threading and holding onto camera cable. Just above the collars the camera became free. The API and seabed transponder were recovered, and by the time the API had been run into the next site 6km distant in WD of 50m, the camera was re terminated and ready to perform a pre site survey on site M0042A.

March 7th started with running the API string to just above seabed. With the camera survey completed, the coring commenced to 9.5 mbsf, at which point the string appeared to be sufficiently spudded into the seabed on a hard formation to allow HQ coring to commence. The seabed template was suspended in the moonpool and tied back to reduce motion. The API string was then disconnected above the template to decouple from the vessel heave, and secured from possible loss with an elevator above the seabed template. The HQ string was run and HQ coring commenced. The first 2 runs of HQ resulted in zero core recovery, and what had appeared to be solid ground was washed away. This resulted in the API dropping further into the hole and sitting on the elevator. Now not decoupled from the vessel, the API was effectively swabbing the hole. It was decided to pull the HQ string and continue with API coring until a sustained harder formation was encountered. By midnight 18 runs had been completed and no sustained hard formations had been encountered.

In addition to the coring operation, the small light weight ESO ROV was deployed twice during March 7th at slack water. This provided a good overall view of the area around the drill string, transponder beacon and general reef life. The seabed transponder was shown to be located on a sandy seabed devoid of life with the drill string on the edge of a small exposed reef close by.

Coring continued with API on March 8th. After the 29th run the hole was halted, as the lithology suggested we were well into the Pleistocene. The wireline logging tools were made ready, and through pipe gamma run. The drill string was then tripped to 7 mbsf, the seabed template lowered to the seabed and the API clamped. Logging recommenced with the Dual Induction log, Acoustic Borehole Imager, Spectral Gamma, Magnetic Susceptibility, Sonic, Optical Borehole Imager and finally Caliper runs. Apart from an initial infill reducing the TD for the sondes, and a gradual infill after each run, the hole remained stable, and open, for the entire period of logging.

The caliper log was completed just after midnight on March 9th. De-rigging the rooster box, recovering the seabed template and the seabed transponder followed. The vessel then transited 6km to the next site (M0043A) deployed the seabed transponder, the drill string to just above the seabed and the downhole camera. With no live coral found coring began and continued uninterrupted until the hole was completed at midnight. During this period the wind had dropped slightly and the seas moderated sufficiently for the supply boat to come close enough to offload coring and other ships spares.

The drill string was pulled to 7m above seabed and the downhole camera deployed early on March 10th. The vessel then moved ~52m to M0044A. Three runs were completed before the ALN PCD bit failed, and was replaced with a short nose impreg. After Core 9, the core barrel would not release from the BHA. Several hours were spent trying to release it until the wireline wire broke and the drill string had to be tripped. With the core barrel recovered and the drill string run in, the camera was deployed to view the site. The hole was clearly visible, demonstrating the vessel had stayed on station and there is less current pushing the drill string

off position than Hyd-01 area. The vessel was moved 3m, the camera surveyed the seabed and coring commenced on hole M0045A. The 1st core run indicated that the BHA had slipped down a slope as it dropped 3m further than the observed seabed indicated from the camera survey. This continued to happen on repeated core runs. It was decided to trip the string to above seabed, move the vessel 3m and have a 2nd attempt.

Just after midnight on March 11th, the vessel had moved to the new site M0046A. A similar situation occurred as at the previous site (M0045A), where the core barrel skipped down the edge of a slope. However, once spudded in, the coring operation proceeded well with the hole ending by mid-morning after 13 core runs at a depth of 31.2 mbsf. By midnight 14 core runs had been completed on site M0047A.

2. Hole summary

Hole	M0039A	M0040A	M0041A	M0042A
Latitude	19^0 40.29 S	19^0 47.77716 S	19^0 47.77946 S	19^0 50.6388 S
Longitude	150^0 14.69326 E	150^0 28.885 E	150^0 28.8902 E	150^0 26.8818 E
First core	05/03/2010 at 04:00	05/03/2010 at 22:50	06/03/2010 at 10:05	07/03/2010 at 03:30
Cores recovered	10R – 21R	1R – 12R	1R – 12R	1R – 29R
Drilled length	15.4m	21.5m	22.1m	33.2m
Recovered length	5.15m	11.73m	10.06m	3.79m
Core recovery	33.44%	54.56%	45.52%	11.42%
Depth reached	28.4 mbsf	21.5 mbsf	22.1 mbsf	33.2 mbsf

Hole	M0043A	M0044A	M0045A	M0046A	M0047A
Latitude	19^0 47.93105 S	19^0 47.9072 S	19^0 47.90526 S	19^0 47.90808 S	19^0 47.98513 S
Longitude	150^0 28.76188 E	150^0 28.77703 E	150^0 28.77651 E	150^0 28.77748 E	150^0 28.73131 E
First core	09/03/2010 at 08:40	10/03/2010 at 03:20	10/03/2010 at 21:30	11/03/2010 at 01:30	11/03/2010 at 14:30
Cores recovered	1R – 23R	1R – 9R	1R – 4R	1R – 13R	1R – 13R
Drilled length	35m	11m	14.6m	32.2m	31.7m
Recovered length	6.04m	1.67m	0m	2.78m	3.48m
Core recovery	17.26%	15.18%	0%	8.63%	10.98%
Depth reached	35 mbsf	11 mbsf	14.6 mbsf	32.2 mbsf	31.7 mbsf

3. Science summary

Hole	Core	Sediment Description	Comments
M0039A cont.	10R & 11R	Massive coral framestones and microbialites	Massive and branching *Acropora*, *Pocillopora*
	12R	Coral framestone	
	13R	Carbonate sediments	Pebbles jammed between barrel and liner
	14R	Medium unlithified sands at top of core and continuous massive coral (*Faviid*) and microbialite framestones at the base	Sandy layer / cavity in first 1m?
	15R – 18R	Framestones, coralline algal crusts and thick microbialite with some internal lithified bioclastic sediments	Massive *Faviids, Acropora*, branching *Acropora* and *Tubipora*
	19R	No recovery	
	20R	Grainstone and gravels	
	21R	Grainstone	
M0040A	1R	Fine lime mud with benthic and planktonic foraminifera	
	2R	Lime gravel and carbonate mud	
	3R	Broken fragments of microbialite, with thin coralline algal crusts and encrusting corals	
	4R	Broken framestone composed of encrusting corals and thick microbialite crusts	
	5R	Massive microbialite and *Acropora* framestones	
	6R	Framestone with several massive corals observed through the liner	Possibly internal lithified sediments
	7R	As with 6R	

	8R	Coral and microbial framestones, Numerous thin encrusting (and foliaceous?) and massive (*Porites*) corals	
	9R	Framestone transitioning to cemented grainstone / rudstone and into unlithified carbonate sands	
	10R – 13R	Light grey fine carbonate sands and large benthic forams	
M0041A	1R	Unlithified grey/green carbonate mud / fine sand. Broken fragments of well lithified material in core catcher	Microbialite ?
	2R	Broken framestone with corals and microbialite	
	3R	Broken microbialite, corals and unlithified carbonate sediments	
	4R	Lime pebbles with fractured framestone in main section, and solid framestone in the core catcher.	
	5R	Lime pebbles and framestone in core catcher	
	6R	Framestone with coral fragments and forams	
	7R	Lime gravel and sand with benthic foraminifers, radiolarians, molluscs and echinoids	
	8R	Lime mud and sand, and Faviid coral fragments	Benthic forams in core catcher
	9R	No recovery	
	10R & 11R	Silty sand with benthic foraminifers	
	12R	Silty clay with benthic forams	
M0042A	1R	Recent gravel and sand sediments with 10cm branching coral (*Pocillopora*) with thin microbialite crust	
	2R & 3R	Broken massive coral framestones. Corymbose *Acropora* in core catcher.	*Faviidae, Acropora, Montipora*
	4R	Framestones with in-situ massive and branching corals, thick coralline crusts and microbialite	
	5R	Broken microbialite and coral material	*Acropora / Porites* (?)
	6R – 8R	HQ cores – no recovery	
	9R	Massive coral and coralline algal crust in framestone	
	10R	Framestone	
	11R	*Halimeda* rudstone with pieces of fractured corals	5cm cored massive coral on top of the rudstone
	12R	Rudstone with fractured Halimeda	
	13R	Fractured coral and lime pebbles	Core catcher contained framestone
	14R – 16R	Lime pebbles in main sections, with framestone and fractured corals in the core catchers	
	17R	Lime pebbles with brownish stained rhodoliths in the core catcher	
	18R	Broken *Halimeda* grainstone and coral fragments with carbonate gravels	
	19R	Broken Halimeda grainstone and coral fragments, with some carbonate gravels	
	20R – 22R	Carbonate gravels and broken corals and grainstones. Moldic porosity observed in 21R	Abundant benthic foraminifera
	23R	Vuggy limestone and some loose carbonate gravels. Broken white rudstones with coralline rhodoliths in the core catcher	Branching coral fragments compose many of the algal nodules
	24R & 25R	Several continuous sequences similar to 23R.	Unlithified sands / cavities for last 70cm of coring
	26R	Unlithified carbonate sands dominated by oval benthic forams	Loose coralline algae nodules also present
	27R & 28R	*Halimeda* (molds?) and benthic foraminifera dominated by rudstones / grainstones	Thin encrusting *Montipora / Porites* in core ctacher
	29R	Unlithified fine carbonate sands	
M0043A	1R	Recent carbonate sediments	
	2R & 3R	Carbonate sands and gravels	
	4R	No recovery	
	5R	Disturbed sediments and broken coral fragments	
	6R	Lime pebbly framestone and some microbialite	
	7R	Framestone and some microbialite	
	8R	Reef framework and massive *Acropora palifera / cuneata*	

	9R	Reef framework and massive *Acropora palifera / cuneata* and *Tubipora*	Robust framework
	10R	Framestone with small branching coralline algae coated fragments in the core catcher	Few massive corals
	11R	Massive Faviid in the core catcher	
	12R	Coral framework and mildly cemented sediments	
	13R – 15R	Framestone	
	16R	Lesser corals observed	Microbialite dominant component
	17R	Framestone fragments	
	18R	Sand containing benthic foraminifers and massive coral (*Acropora*?) in core catcher	
	19R	Fragments of branching *Pocillopora* sp., *Acropora* sp. and massive *Acropora*, coated with grainstone	Core catcher material only
	20R	Sand and pebbles	
	21R	Sand, *Halimeda* and benthic foraminifers	
	22R	Grainstone and serpulids	
	23R	Fine carbonate sands	
M0044A	1R	Broken coral fragments	
	2R	Well preserved corymbose *Acropora*	Sample jammed in core catcher
	3R – 8R	Coral framestone	
	9R	Coral framestone and a massive tabular *Acropora* sp.	
M0045A	1R – 4R	No recovery	
M0046A	1R & 2R	Broken coral fragments, recent (deep water crust) bindstones and sediments	Core barrel passing over a steeply sloping limestone surface?
	3R	Massive *Faviid* coral in core catcher with other broken corals and internal grainstone / rudstone	*Acropora* and *Porites*
	4R	Massive *Faviidae* corals	
	5R	Coral framestones composed of numerous massive corals and unlithified carbonate sediments	*Porites* ? *Halimeda*
	6R	Broken fragments of coralline algal bindstone in a matrix of unlithified carbonate sediments.	*Halimeda* flakes and broken coral frags.
	7R	Broken massive coral fragments and carbonate sediments	
	8R	No recovery	
	9R	Framestone composed of massive corals encrusted by thick coralline algae with vermitids and abundant microbialite coatings	*Faviid, Porites*
	10R	Carbonate gravels and coral rubble and broken coral	9 different coral genera observed
	11R – 13R	Coral rubble	*Pocillopora, Seriatopora, Porites, Acropora, Faviids*
M0047A	1R	No recovery	
	2R	Algal crusts, coralline algae and bryozoans.	In-situ tubeworms at the top
	3R	Bioclast rubble	
	4R	Fragments of Faviid and branching corals	
	5R	Coral framestone fragments and reddish grainstone	
	6R & 7R	Coral framestone	
	8R	Sandy sediments with small pebbles. Core catcher contained massive *Acropora* and benthic foraminifers	
	9R	Broken coral framestone with many branching coral fragments	
	10R – 13R	Sand with coral fragments. Branching corals and Faviid in the core catchers	

4. HSE Activities / Environmental

The vessel conducted a test of the Fire Alarm system at 12:45 on March 7th. This was followed by a muster "Man Overboard" drill at 13:00

A near miss incident occurred at 00:30 on March 9th during de-rigging of the rooster box, following the completion of logging operations. A scaffolding pole was dropped from the box, close to where 3 ESO personnel were standing. A near miss report was completed and mitigating actions were put in place by ESO. The matter is now undergoing a full investigation by Bluestone.

There was a general meeting on March 10th for all personnel onboard, which covered housekeeping, health and safety and general vessel policies with regards to accessing certain areas of the vessel, and smoking areas.

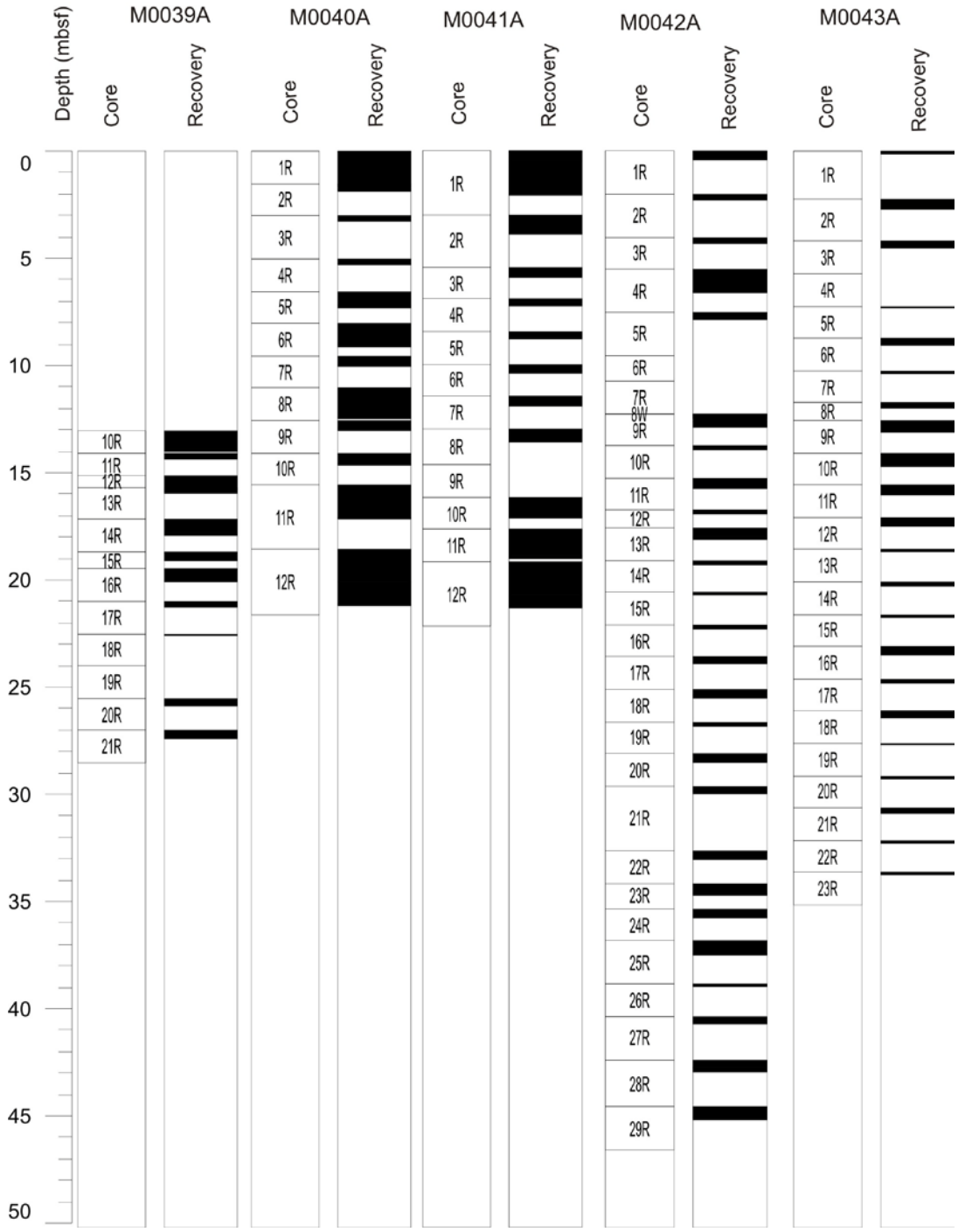
5. Figures

On next three pages:

Figure 1 – Recovery and depth plot for Holes M0039A – M0047A

Figure 2 – Breakdown of hours up to 2400 hrs on 11th March. No contractual implications can be made from this summary.

Expedition 325
Week 4
HYD_01C - Site 11
HYD_02A - Sites 7, 8, 10 &12



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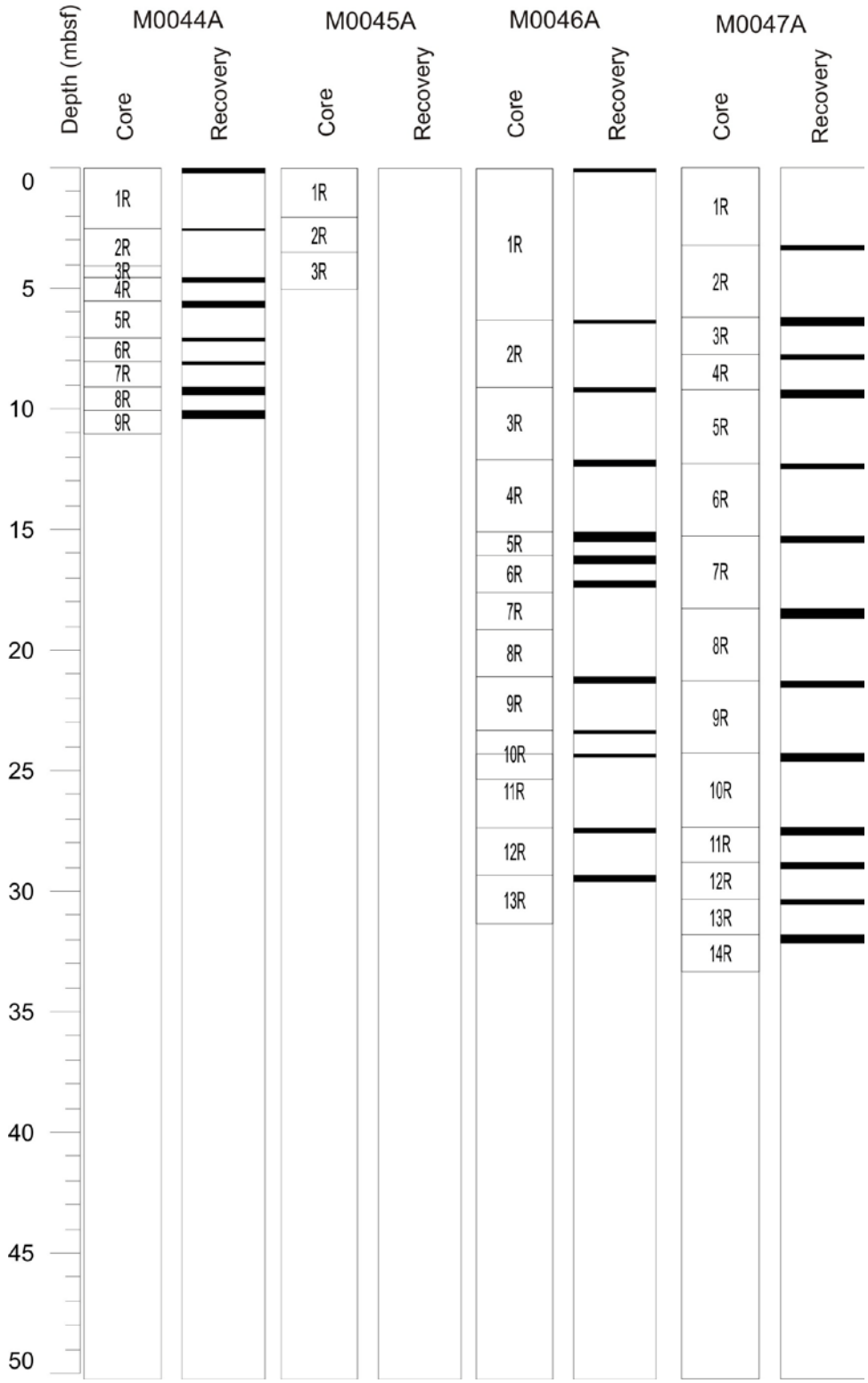

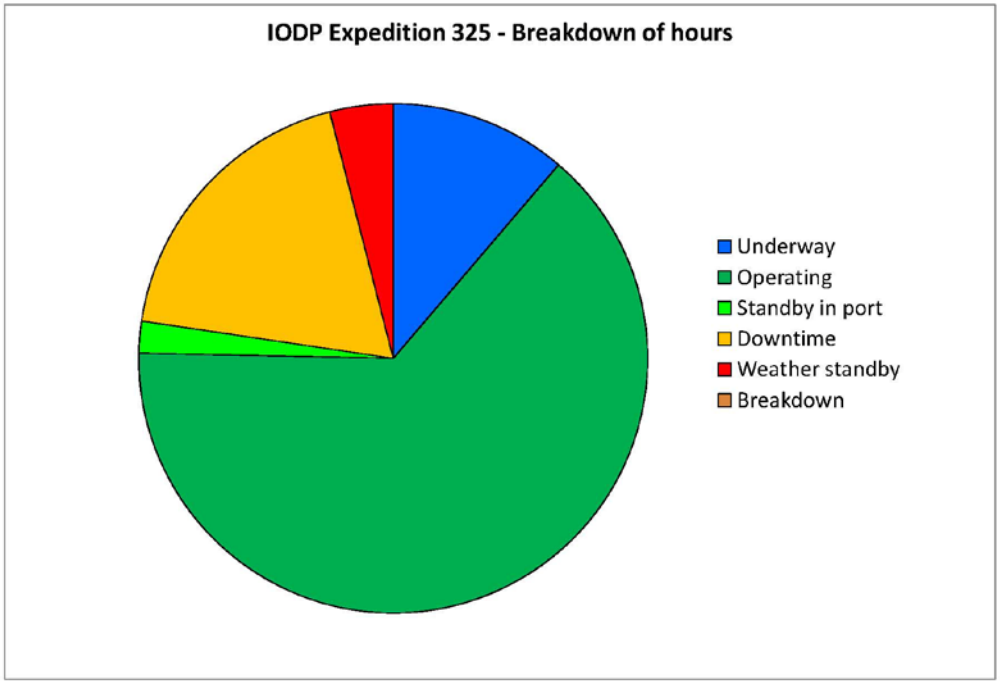

Note on Figure 2. The diagram above includes an estimated “downtime” of 14 hours, “standby in port” of 13.5 hours and “underway” of 45.75 hours that occurred off contract.