

# **Cruise Report for R/V *Kilo Moana* KM-14-23: ALOHA Cabled Observatory Service**

**29 October – 3 November 2014**

3 November 2014

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## **Summary**

The purpose of this NSF-funded cruise on the R/V *Kilo Moana* was to service the infrastructure and instrumentation on the ALOHA Cabled Observatory (ACO). ACO is the deepest operating cabled observatory on the planet. Specifically a new camera and light system and a basic sensor package were installed, and the (faulted) AMM secondary node was recovered. The remotely operated vehicle ROV *Jason* was essential to performing the required tasks. At the end of the cruise, an Argo float with a pH sensor was deployed.

The cruise was 5 days long, from 1200 Wednesday 29 October – 1200 Monday 3 November 2014. The ship departed Honolulu after a 4-hour load-and-go mobilization, and proceeded directly to Station ALOHA, 100 km north. Weather had deteriorated such that operations could not begin until 3 days later on Saturday morning. The single dive operation took 30 hours start to finish, with 20 hours on the bottom. The cruise was very successful.

## **Narrative**

The basic tasks and timeline are summarized in Table 1 and are largely self-explanatory. The dive took 30 hours total, with 20 hours on the bottom. The line diagram map shows the planned locations of the various components (Figure 1); actual locations were very close. The following figures show the components deployed (Figures 1 – 6).

*Jason* was deployed first and held at 500 m depth as the camera and light package were deployed by free fall (CAM2 with video camera, two lights, and a hydrophone + LIGHT1) and the basic sensor package (CTDO2, FLNTU, acoustic modem, ADCP, pressure).

The MBARI port test tool (PTT) was very useful in both testing all the unused ports (to tell us they would be suitable for future use) as well as giving us direct access, via *Jason*, to the ACO observatory, so we could control the infrastructure itself as well as look at instruments as they were connected and act accordingly. For instance, we had a ground fault on the BSP. Since we were plugged in directly to an adjacent port, we could sequentially turn off sensors to find the offending one (the FLNTU fluorometer, unfortunately). Also, it allowed us to increase the light intensity from the initial mid-power level to maximum very soon after deployment, and to “see” through the camera and hear the audio. The PTT eliminated to some extent our dependence on conventional ship-shore communications, and the need to have shore people on duty around the clock.

Table 1 Cruise tasks and times (local HST time) (provisional)

	Task	Start	hh:mm	End
1	Transit to Station ALOHA and ACO	10/29 12:00	11:30	10/29 23:30
2	Weather and equipment delay	10/29 23:30	57:30	11/01 09:00
3	Dive	11/01 09:00	7:07	11/01 16:07
4	Free-Fall CAM2+LIGHT1 (concurrent ROV OPS)	11/01 16:07	0:00	11/01 16:07
5	Free-Fall BSP (concurrent ROV ops)	11/01 16:07	0:00	11/01 16:07
6	Find and move CAM2+LIGHT1	11/01 16:07	0:15	11/01 16:22
7	Connect LIGHT1	11/01 16:22	1:07	11/01 17:29
8	Prep for CAM2, adjust LIGHT1 and CAM1	11/01 17:29	0:32	11/01 18:01
9	Connect CAM2	11/01 18:01	3:29	11/01 21:30
10	Find, move, and connect BSP	11/01 21:30	7:46	11/02 05:16
11	Prepare AMM for recovery	11/02 05:16	3:10	11/02 08:26
12	Clean up TAAM	11/02 08:26	0:08	11/02 08:34
13	Photos, Housekeeping, and ascent	11/02 08:34	1:40	11/02 10:14
14	ROV releases AMM+3-ball float, completes BSP	11/02 10:14	0:15	11/02 10:29
15	ROV and AMM ascend, recovered	11/02 10:29	4:00	11/02 14:29
16	Contingency	11/02 14:29	9:31	11/03 00:00
17	Transit to Honolulu	11/03 00:00	12:00	11/03 12:00

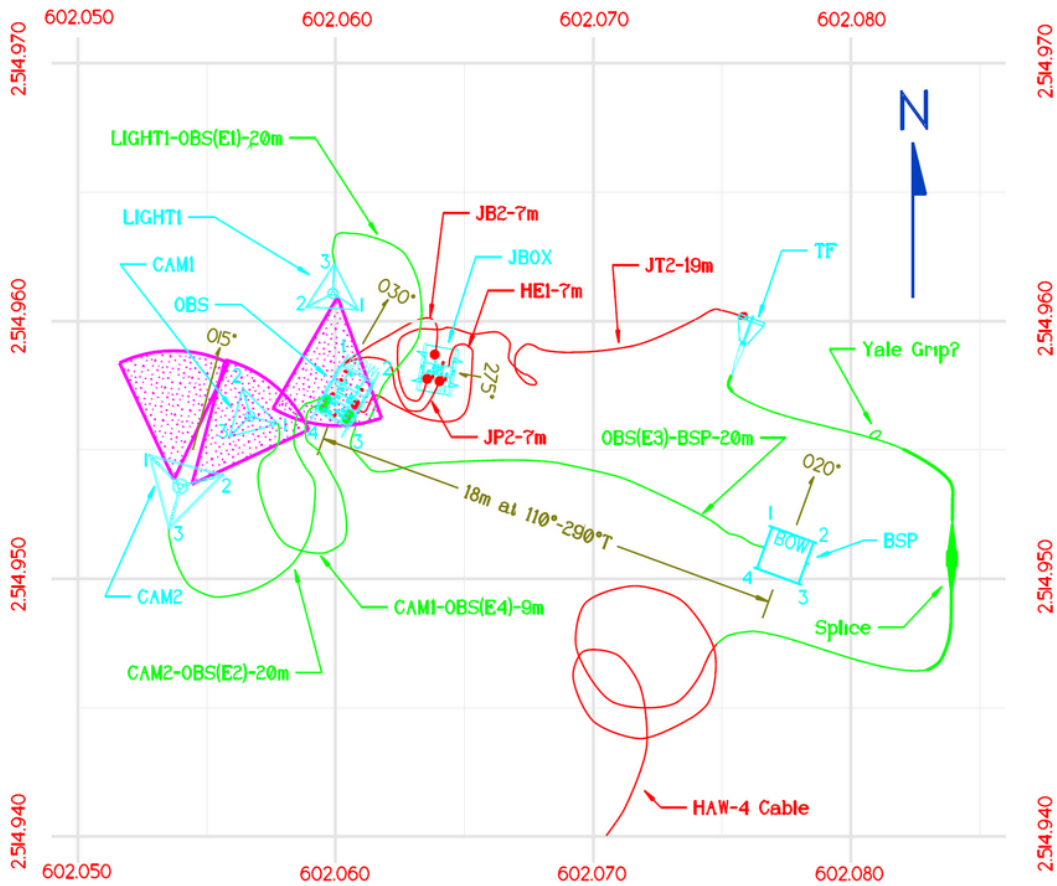
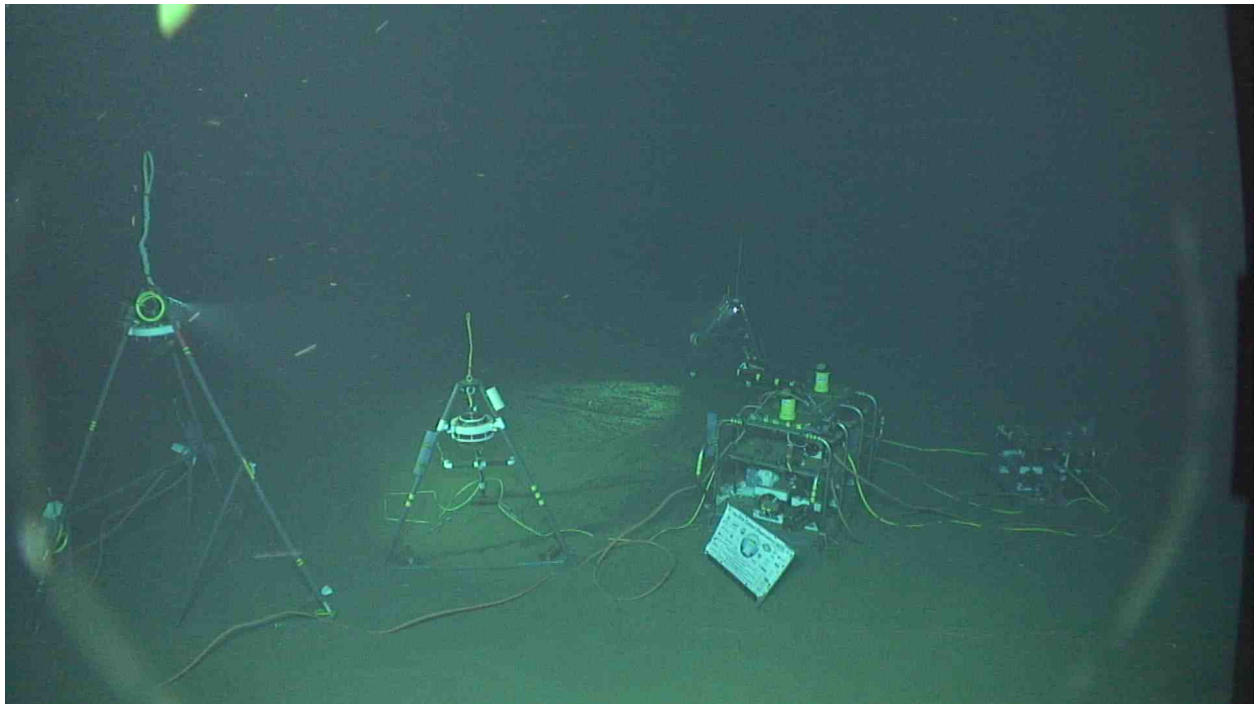


Figure 1 ACO planned bottom configuration (final is very similar).

To recover the non-functional AMM secondary node, we transferred a 3-ball buoyancy package from the BSP to the AMM (initial testing on the ship after recovery indicated a dead short on the AMM, indicating the fault is internal, and not the connecting cable). The seawater ground had built up a shell of aragonite that was easily removed. We recovered several ODI connectors and pin-protecting dummies from the previously deployed TAAM mooring. A banner was emplaced that shows all the organizations that have contributed to the ACO.

The pre-cruise planned layout of components has been shown in Figure 1. The actual layout is almost the same, the single exception is we did not move the main sea cable, but laid the BSP cable over it. After the photo-mosaic data is worked up a new map will be made. A block schematic of components and connections is given in Appendix A.



*Figure 2* ACO as viewed by Jason. The Basic Sensor Package (BSP) is to the right 18 m.

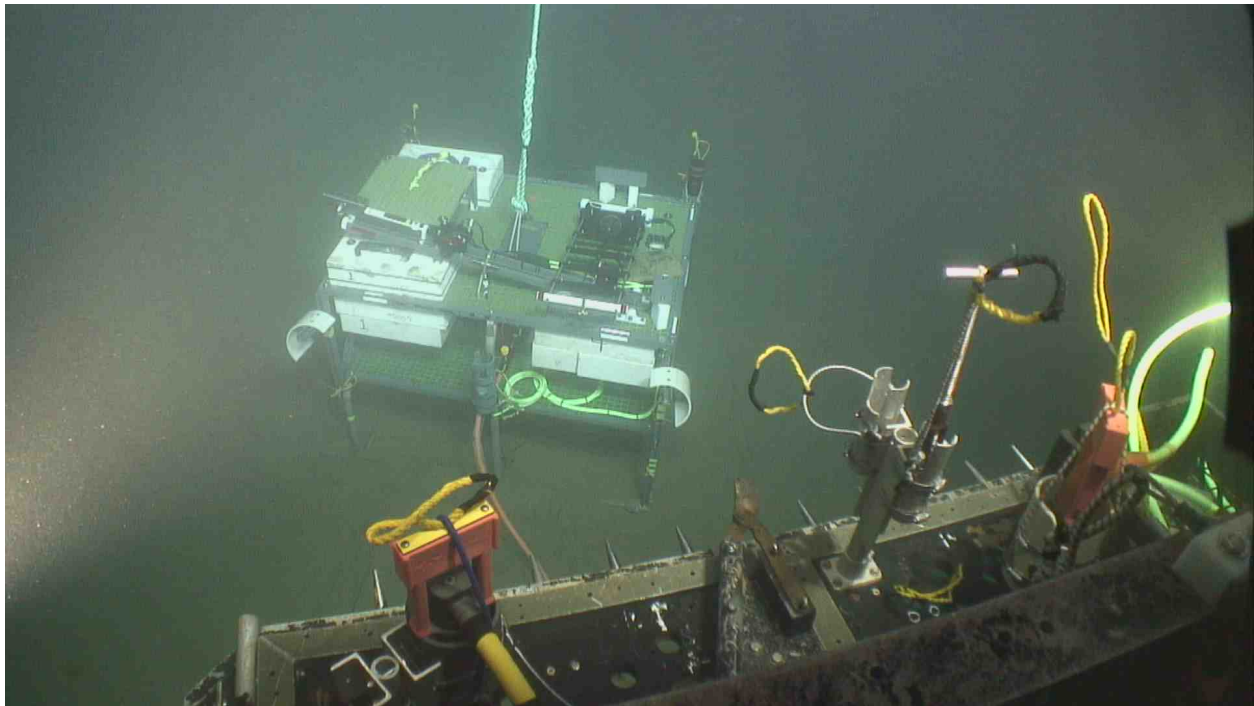


Figure 3 ACO Basic Sensor Package (BSP) as viewed by Jason, just prior to raising masts and preparing for transfer of buoyancy to the AMM secondary node.

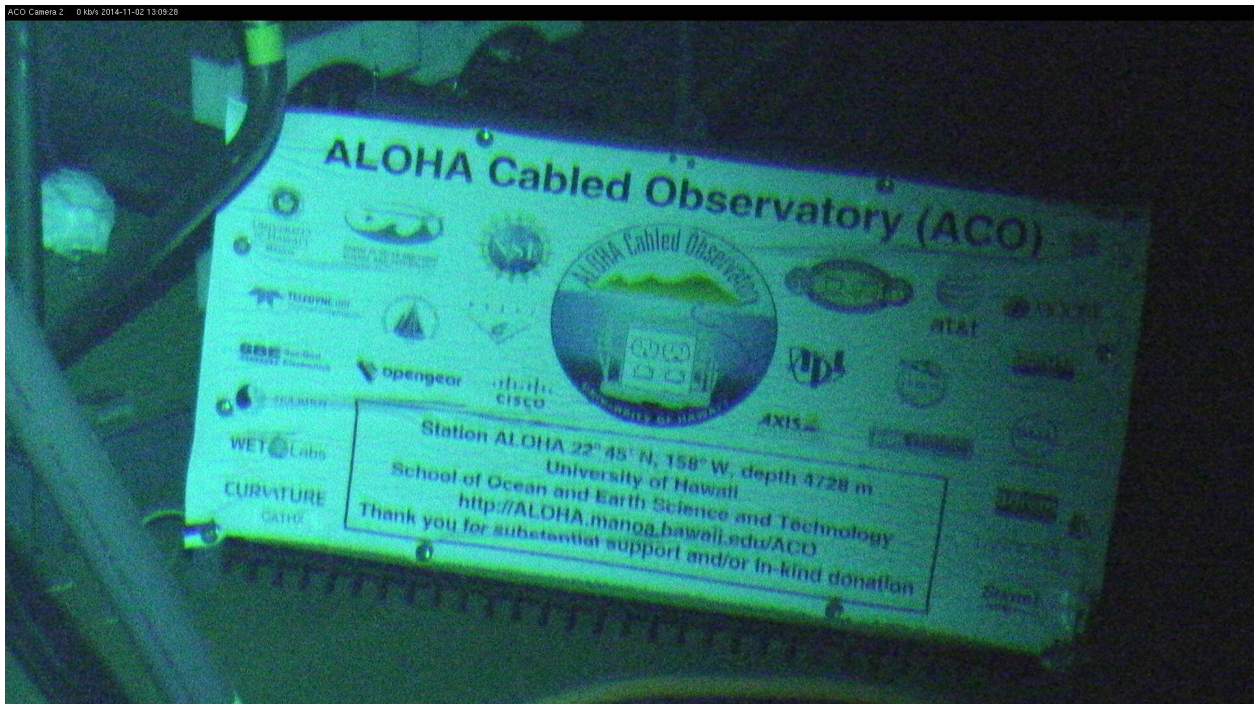
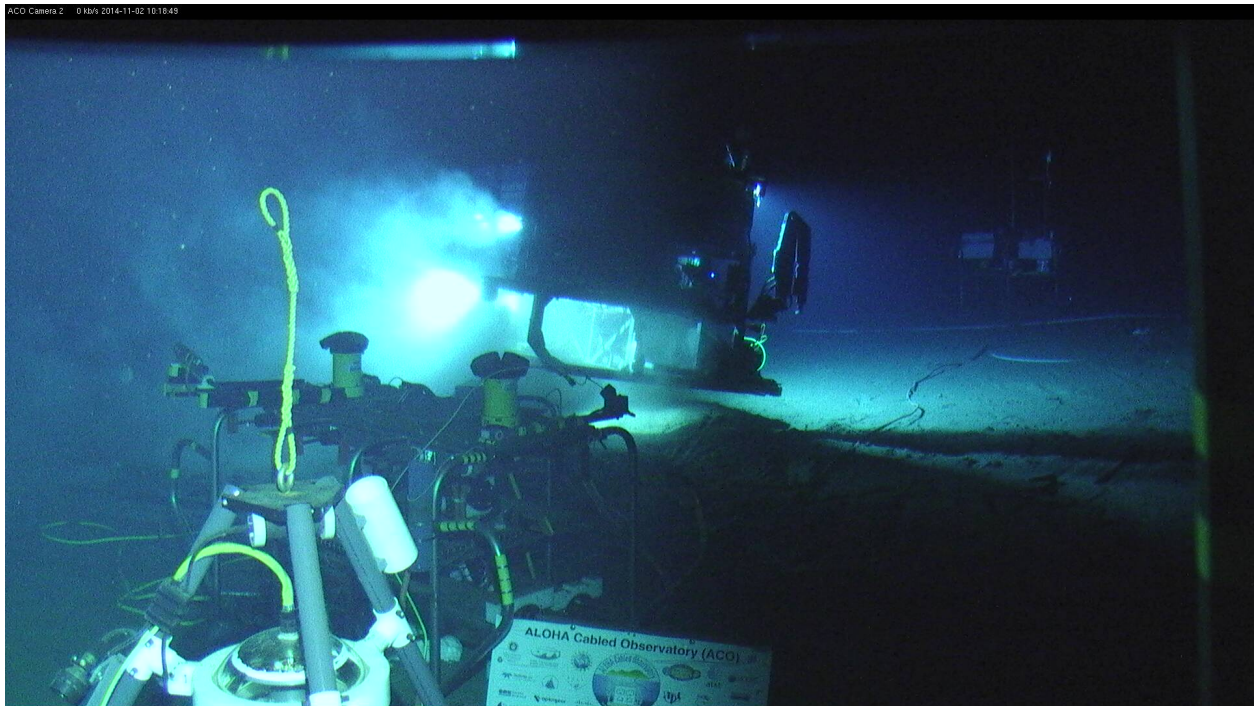
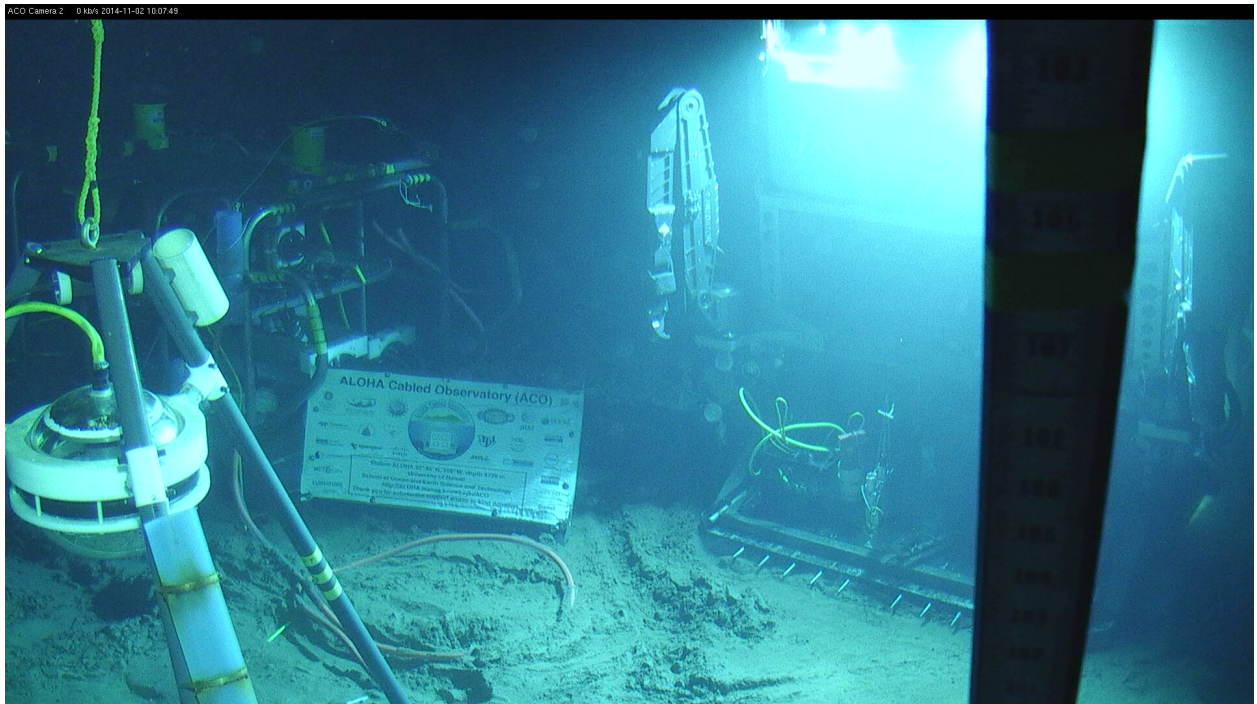


Figure 4 From CAM2, banner acknowledging organizations who have contributed to ACO.

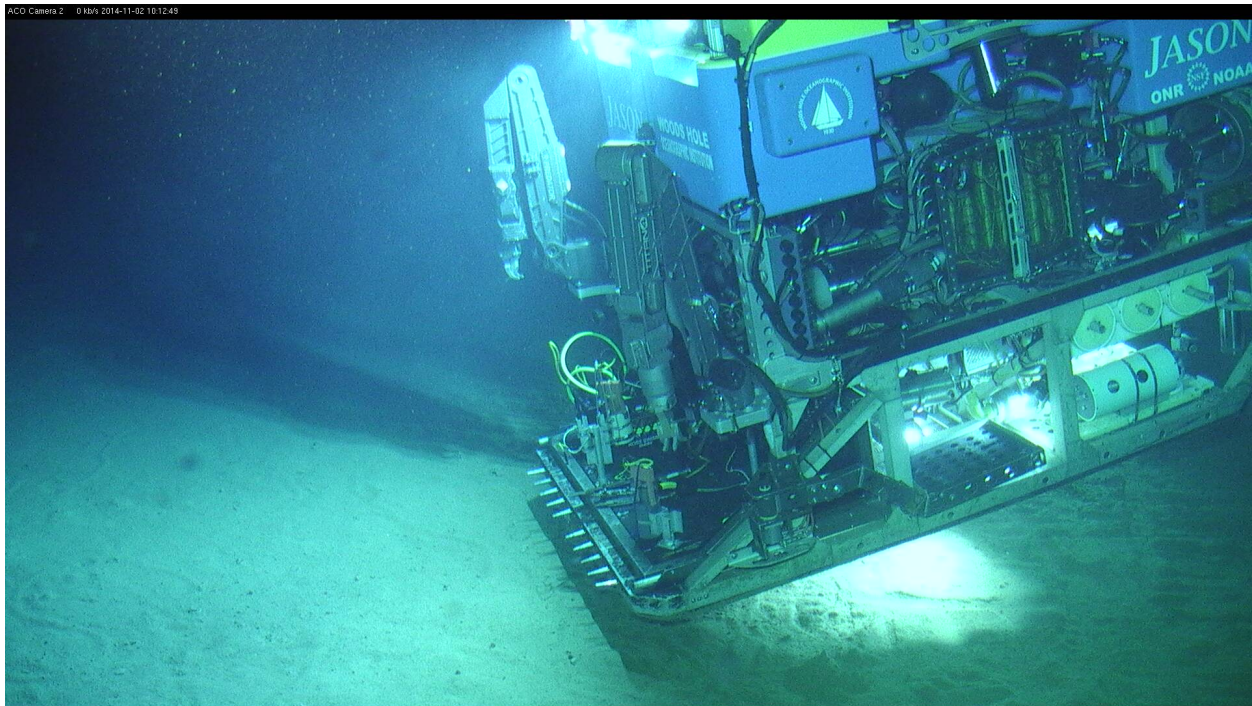




*Figure 5 From CAM2, Jason flying away toward BSP in background right.*



*Figure 6 CAM1, OBS, banner, and Jason, from CAM2.*



*Figure 7 Jason.*

### **Acknowledgments**

We thank the captain and crew of the R/V *Kilo Moana* for their support during the cruise. The *Jason* team was excellent, very professionally and efficiently executing the necessary tasks with good cheer even when at times operations were stressful.

The Monterey Bay Aquarium Research Institute very graciously provided their port test tool; Jared Figurski worked through the interfacing challenges and operated the tool for us.

The cruise and shore party participants are given in Appendix B. This work represents the effort of a large team – everyone was essential and contributed to the success. Ethan Roth, the previous project engineer designed much of the new equipment. Grant Blackinton, project engineer during the ACO installation phase, assisted in the cruise planning and shared the direction of the *Jason* operations.

This work is supported by the National Science Foundation.



## Appendix A – ACO Diagram

The following diagram shows components of ACO in a schematic form, naming frames, connectors and cables, pressure cases and endcaps, sensors, etc. The FLNTU had a ground fault and is not working. It is unknown at this time if the pressure sensor is functional – it is communicating, but reporting off-scale values.

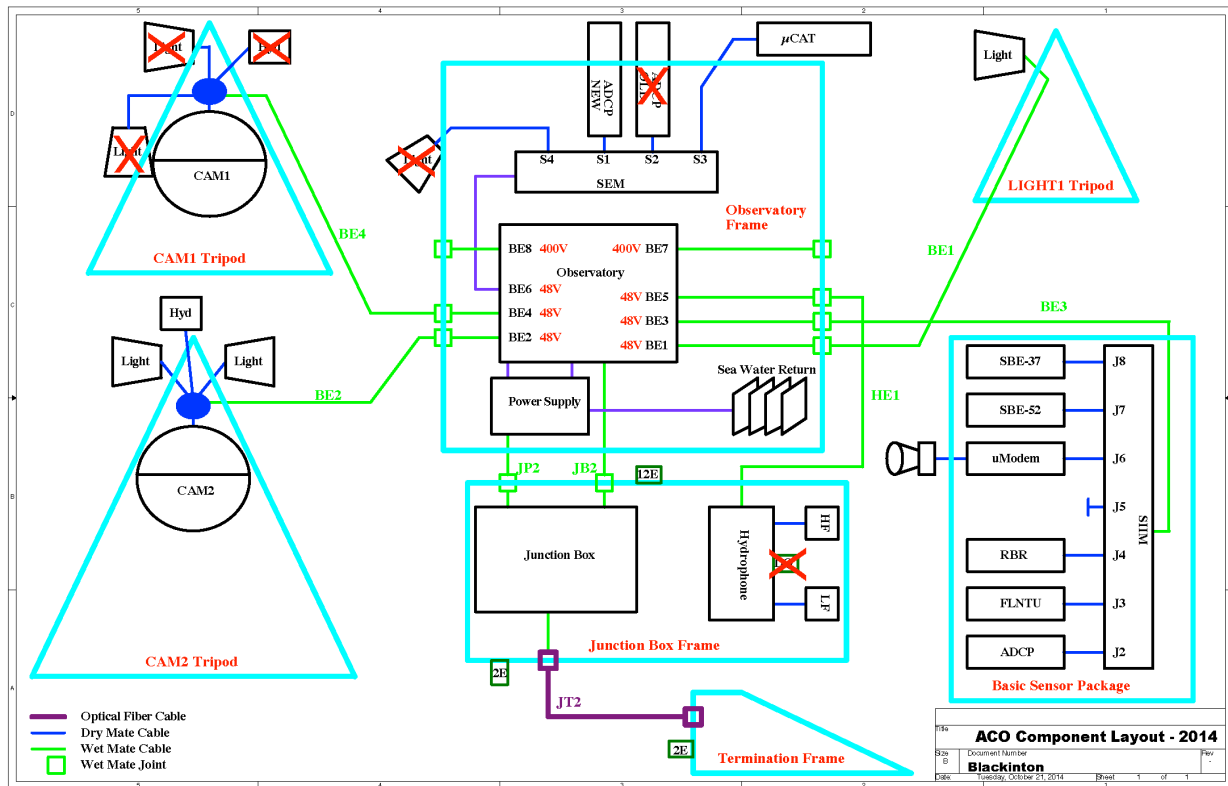


Figure A-1 ACO bottom interconnection diagram – 2 November 2014

## Appendix B – Cruise and Shore Party Participants

Name	Position	Email
<b>Cruise participants</b>		
<b>ACO</b>		
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Jim Varnum	Pilot	
Scott McCue	Engineer/Data	
James Pelowski	Engineer	
Mario Fernandez	Engineer	
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Jon Imai	Machinist	
Karynne Morgan	Project Asst	<a href="mailto:karynnem@hawaii.edu">karynnem@hawaii.edu</a>
Kellie Terada	Project Asst	<a href="mailto:kterada@hawaii.edu">kterada@hawaii.edu</a>