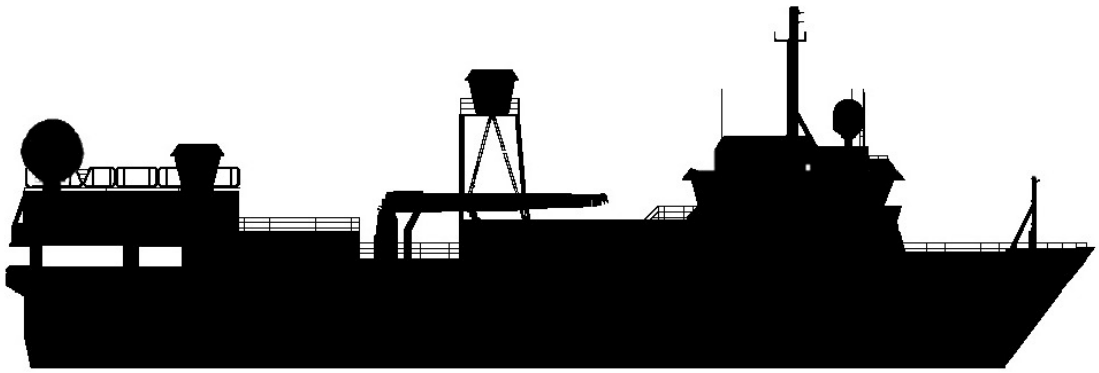
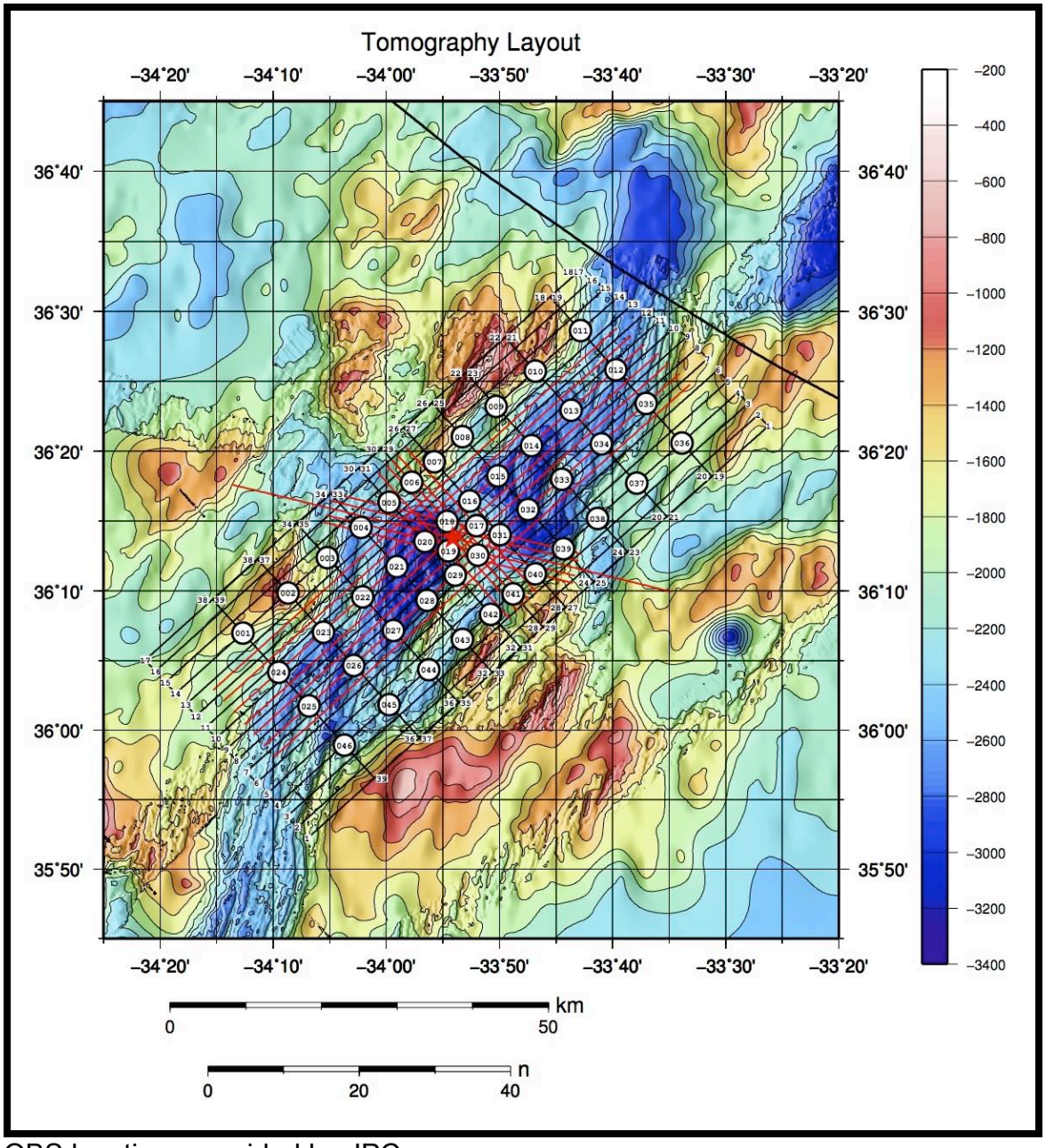
Cruise: RAINBOW (MGL1305)
IRIS Network Code: X3
SIO Purpose: Deploy 46 OBS, Recover 46 OBS, Deploy 15 OBS
Vessel: M/V Marcus G Langseth
Ports: St George's, Bermuda – Ponta DelGada, Portugal
Master/Captain: Mark Landow
Chief Scientists: JPC, Rob Dunn
SIO Personnel (OBSIP): Mark Gibaud, Ernest Aaron, Phil Thai
WHOI Personnel: Steve Swift
Marine Technician: Bern McIntyre, Tom Spoto
Cruise Dates: 04/11/13 – 05/21/13



M/V Marcus G Langseth

I. Summary of SIO OBS Activities

We will be performing a total of 61 OBS deployments, utilizing 46 Scripps OBS (36- L28/Hyd SP's & 10- L22/Hyd modified LP's). We will recover all 46 OBS in two recovery phases, and then redeploy 15 of the L28/Hyd SP's for a longer-term portion of the experiment- to be recovered in approximately 6-months.

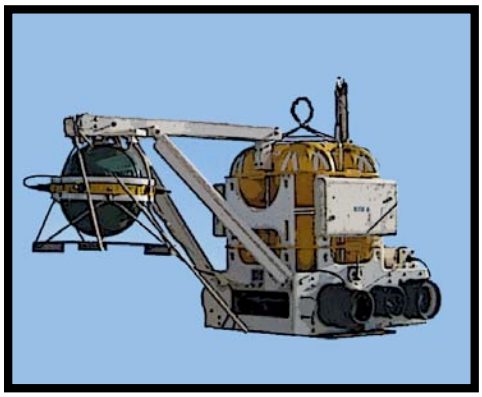


OBS locations provided by JPC

II. Instrumentation

SIO LC4X4, LPOBS

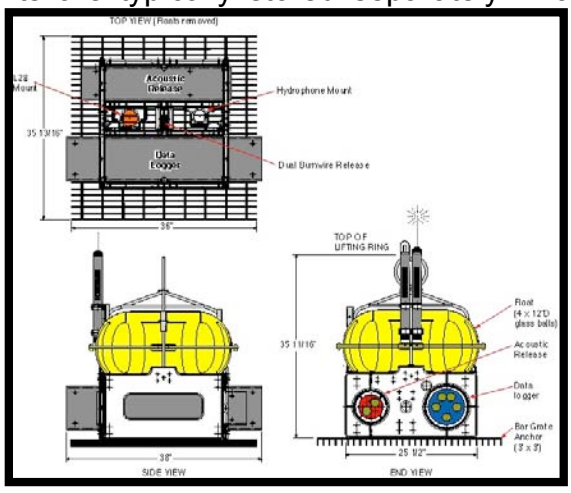
Scripps provided 10 modified long period LC4X4s for this experiment. The sensors associated with these instruments are L22 single channel geophone and a hydrophone. Each instrument consists of a 160# anchor and an eight glass-ball McLane float assembly. The polyethylene frame holds the acoustic release transponder the data logger, the battery bottle, and a dual mechanical release system.



After the anchor is released for recovery, this instrument will ascend at more than 50 m/min. To increase visibility once at the surface, an orange flag on a 48" fiberglass staff is attached to the lift bale. Also, a Novatech low-pressure activated strobe-beacon and radio are mounted near the base of the flag on the lift bale. The radio operates at 160.725 MHz.

The acoustic release transponder developed in conjunction with ORE/EdgeTech is interrogated at 11kHz and responds at 13kHz. Alkaline batteries provide 18 volts power for the burn, 12 volts power for the transponder, and 9 volts power for the circuit board logic. The release mechanism includes two double wire burn elements. When fresh, two battery strings are combined to provide the 18 volts to burn one of two release wires in an average of 7-minutes for water depths encountered during this experiment.

The SP-OBS float and frame components are typically stored separately in a custom rack system, and are assembled and tested prior to deployment. The complete instrument weighs approximately 400 pounds in air. This is inclusive of the 100-pound iron anchor grate held to the base of the poly frame, by a single 2" oval quick-link. When the anchor is released for recovery, the four 12" glass spherical floats, as well as the syntactic foam blocks provide sufficient buoyancy to lift the instrument at about 42 m/min to the sea surface.



III. Areas of Concern

At the end of the experiment we will be deploying 15 SP's to remain for ~6 months time. It would be best if we used the Langseth to relocate/survey these OBS before we leave the area because the ship slated for the recovery will most likely be a "vessel of opportunity", which means it will be a local fishing vessel. This "vessel of opportunity" will not have a hull mounted 12kHz transducer and will not be an ideal platform to use for the relocation process.

IV. Ships Equipment and Condition

Excellent. There have been many improvements made to the Langseth, which is a reflection of the lessons learned over the years. A few of these enhancements are:

-Replacement of the plastic deck plugs with stainless plugs.
-CTD winch functionality and preparedness.
-Hull transducer cabling upgrade to incorporate a grounded shield.
-Convenient clean power receptacles in the dry lab overhead.
-Willingness to provide use of the entire wet lab space for our instruments.

V. Journal of Events in Chronological Order

All times and dates in this report are UTC/GMT unless otherwise noted as local.

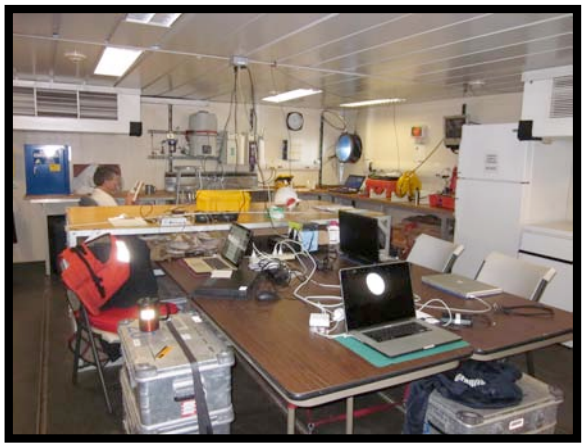
1. Loading & Setup

03/28/13 Galveston, TX

Martin and I arrived at Pier 37 at 08:00 to meet the Langseth and wait for the truck to show with our gear. After some gate access issues, we were able to get the truck through security and to the Pier. Everything was loaded, and secured for the transit to Bermuda by days end.

04/07/13 St. Georges, Bermuda

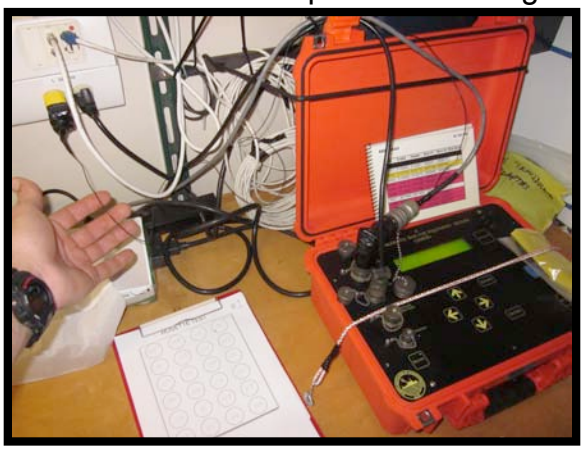
We arrived in Bermuda on the afternoon of the 7th and the Langseth arrived the morning of the 8th. We spent the day reorganizing our gear, setting up the lab and testing the new logger electronics and ships transducer connection.



2. Transit
04/11/13 19:00 Local Bermuda
We just pulled away from the dock and expect a 4-5 day transit to the first deployment station. Our departure was delayed a little over one day in Bermuda due to a bushing issue on the starboard rudder.

3. Acoustic Rosette Tests
Test #1- 2013:103:12:22:00
Saber deck box #2
Bottom depth = 5050M
All stop at 500M to enable one acoustic
Test depth = 3000M
Winch payout speed = 50 M/min

I asked Bern to replace the Langseth's transducer cable with 2-conductor, shielded cable so that the entire length would be shielded, which was not the case previously. I also soldered a wire to the shield and attached it to the ground pin of a standard receptacle plug so that we could plug it into the ships ground (clean power).



So far the acoustic communications are very clear. We had a little trouble with the first acoustic unit at 100M depth, but at 500M all was fine.

Test #2- 2013:103:16:15:00
Saber deck box #1 and 8011-M
Bottom depth = 5050M
All stop at 500M to enable one acoustic
Test depth = 3000M
Winch payout speed = 50 M/min

We have two acoustic units that will not talk to us (15 & 88). We had the rosette retrieved to 2000M and no still luck; we then came up to 1000M and no luck. All other acoustics are talking loud and clear.

We asked for the rosette to be brought to the surface, so that we can inspect the two faulty acoustic units.

After inspection in the lab we found that acoustic #15 had flooded at the ducer face seal where there is one o-ring sealing it to the mounting plate. All of the electronics were ruined. The pressure from the alkaline/seawater reaction was great enough to blow the head off as I separated the poly split-ring spacer. It shot halfway out of the tube and puked black acrid water on the floor. Luckily no one was in the path of the splash. The battery pack was hot, so it was jettisoned.

Acoustic #88 looked fine. All o-rings looked good, batteries looked fine and it passed all bench testing you'd expect from a good unit. It just wouldn't communicate with us in the water. Our best guess is that there is an issue with the ITC ducer head. We have a spare, so we swapped it out, replaced the ducer face o-ring and retested it. We told the PI's that we'd be willing to use it if we did one rosette test with it at 1000M to ensure that it was talking under pressure.

04/15/13 14:30 Local
We attempted a 1000-meter rosette deployment for the retesting of acoustic #88. It passed all tests in the lab and was confirmed enabled on the deck in the vertical orientation of the 24-rosette package. Upon submersion in saltwater the acoustic failed to respond to commands from the hull transducer. We were able to communicate with neighboring acoustics, but not #88. After recovery of the rosette we inspected the unit again and there was no flooding, or anything apparently wrong.

And then I decided to look at the dip-switch settings on the board of acoustic #88. They are supposed to be open-open-closed-open (1234), but were set to open-open-closed-closed, which changed the frequency that the acoustic uses for response chirps. This is why we could hear it fine on deck, but the acoustic boxes would ignore its reply pings in the water because they were not at 13kHz. After all of this, we have decided to use this acoustic unit for this experiment at the last station.

4. OBS Deployments (Phase I- 46 OBS)

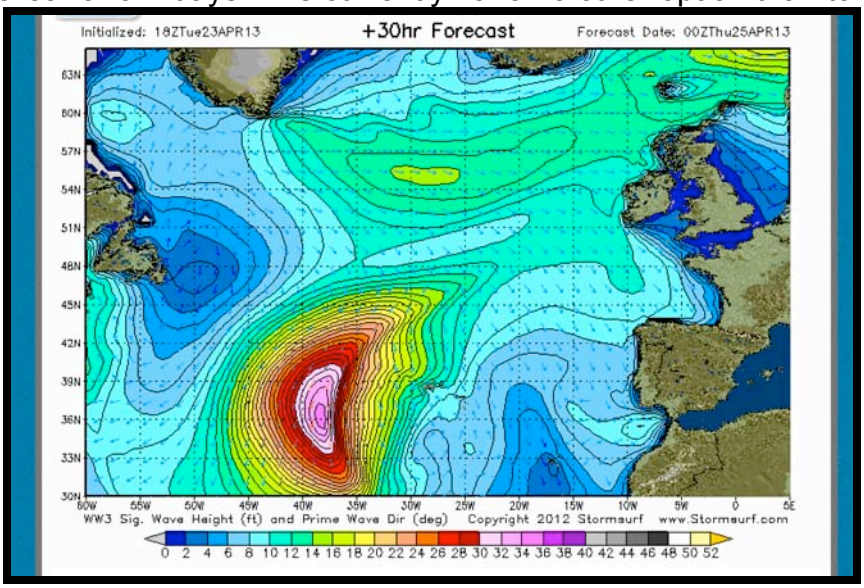
Station	Comp	S/N	AC	LAT	LON	Depth
OBS1	3	13005	30	36.11773	-34.21014	1503
OBS2	3	13007	106	36.163727	-34.144841	1536
OBS3	3	13008	20	36.204097	-34.089568	1689
OBS4	2	LP119	100	36.242114	-34.037506	2506
OBS5	2	LP126	77	36.272362	-33.995543	2339
OBS6	3	13004	149	36.296373	-33.962775	1895
OBS7	3	13003	89	36.318517	-33.929698	1612
OBS8	3	13001	49	36.350436	-33.888317	2117
OBS9	3	13015	57	36.386497	-33.838458	1823
OBS10	3	13014	122	36.428546	-33.778848	1693
OBS11	3	13002	55	36.477182	-33.715698	1908
OBS12	2	LP115	50	36.430331	-33.662221	2534
OBS13	3	13021	104	36.381596	-33.727922	2751
OBS14	3	13023	75	36.340366	-33.786088	2865
OBS15	3	13024	80	36.30397	-33.835859	2871
OBS16	3	13022	139	36.273674	-33.877482	2475
OBS17	3	13020	65	36.24475	-33.867589	2141
OBS18	3	13026	99	36.249569	-33.9103	2721
OBS19	3	13025	43	36.214657	-33.909331	2452
OBS20	3	13034	129	36.225317	-33.943089	3219
OBS21	3	13035	7	36.195199	-33.984742	3035
OBS22	3	13030	94	36.159697	-34.034753	2231
OBS23	3	13019	124	36.117154	-34.092858	2506
OBS24	2	LP117	119	36.069147	-34.158895	2321
OBS25	2	LP113	110	36.028607	-34.11482	2268
OBS26	3	13018	137	36.077292	-34.048671	2620
OBS27	3	13031	135	36.119315	-33.990522	2801
OBS28	3	13027	123	36.155411	-33.940563	2693
OBS29	3	13029	1	36.18579	-33.899467	2219
OBS30	3	13017	131	36.209443	-33.866079	2071
OBS31	3	13028	127	36.233733	-33.832303	2736
OBS32	3	13016	101	36.263659	-33.79085	2836
OBS33	3	13036	113	36.299903	-33.74165	2547
OBS34	3	13032	136	36.341979	-33.6837	2786
OBS35	2	LP124	115	36.390592	-33.617659	2212
OBS36	3	13013	47	36.343535	-33.565265	1918
OBS37	3	13012	107	36.295553	-33.631209	1966
OBS38	2	LP129	112	36.253315	-33.689169	2277
OBS39	2	LP130	41	36.217308	-33.738661	2435
OBS40	3	13006	140	36.187138	-33.780248	2087
OBS41	3	13010	117	36.163057	-33.813307	1878
OBS42	3	13009	142	36.139041	-33.846388	2266
OBS43	2	LP125	111	36.108927	-33.887727	2147
OBS44	3	13011	130	36.072544	-33.937177	2315
OBS45	2	LP121	118	36.030141	-33.997854	2234
OBS46	3	13033	88	35.982284	-34.061708	2422

We started deploying the OBS at 16:00 on 04/17/13, local time. We deployed the last instrument (OBS46) at 23:00 on 04/18/13, local time.

This operation went very well and we were seeing transit times of 20-30 minutes between stations, which was about how long it was taking us to fully prepare an OBS. It helped that we had decided to checkout all of the new electronics loggers beforehand. The downside to this was the additional labor of moving the loggers back and forth between labs. We then had to pull the loggers and place them in a cradle before moving the frames for buildup, and then back into the frames. This was not a task for the weak, or uncoordinated.

The new SP launch/recovery table has been working great although it can slide a little on the pallet-jack forks in rough seas, so I'll need to add some antiskid below the lower rack, or to the surface of our pallet jacks.

2013:114:20:00:00 (4/24/13 19:00, Local time)
We are currently sitting at Lat 37N, Lon 30W because of a very big storm that moved over our study area. The StormSurf models predict that it will linger over our study area for 3-4 days. We currently have no other option than to wait it out.



StormSurf image, 4/24/13 07:00 Local (Study area center: Lat 36N, Lon 34W)

5. OBS Recoveries (Phase I- 26 OBS)

Station	S/N	AC	Depth	LAT	LON	Type	Comment	CH0-X	CH1-Y	CH2-Z	CH3-HYD
OBS1	13005	30	1503	36.11781	-34.21040	3-comp lithium		Y	Y	Y	Y
OBS2	13007	106	1536	36.16386	-34.14491	3-comp lithium		N	Y	Y	Noisy
OBS3	13008	20	1689	36.20420	-34.08961	3-comp lithium		Y	Y	Y	Y
OBS4	LP119	100	2506	36.24222	-34.03740	2-comp	Run-plug short - no data	NA	NA	N	N
OBS5	LP126	77	2339	36.27255	-33.99559	2-comp		NA	NA	Y	Y
OBS6	13004	149	1895	36.29640	-33.96266	3-comp lithium		Y	Y	Y	Y
OBS7	13003	89	1612	36.31870	-33.92976	3-comp lithium		Y	Y	Y	Y
OBS8	13001	49	2117	36.35060	-33.88821	3-comp lithium		Y	Y	Y	Y
OBS9	13015	57	1823	36.38668	-33.83832	3-comp lithium		Y	Y	Y	Y
OBS10	13014	122	1693	36.42862	-33.77868	3-comp lithium		Y	Y	Y	Y
OBS11	13002	55	1908	36.47736	-33.71575	3-comp lithium		Y	Y	OFFSET	Y
OBS12	LP115	50	2534	36.43038	-33.66202	2-comp		NA	NA	Y	Y
OBS13	13021	104	2751	36.38074	-33.72792	3-comp alkaline					
OBS14	13023	75	2865	36.34018	-33.78602	3-comp alkaline					
OBS15	13024	80	2871	36.30381	-33.83574	3-comp alkaline					
OBS16	13022	139	2475	36.27352	-33.87733	3-comp alkaline					
OBS17	13020	65	2141	36.24466	-33.86739	3-comp alkaline					
OBS18	13026	99	2721	36.24974	-33.91034	3-comp alkaline					
OBS19	13025	43	2452	36.21456	-33.90916	3-comp alkaline					
OBS20	13034	129	3219	36.22547	-33.94320	3-comp alkaline					
OBS21	13035	7	3035	36.19504	-33.98465	3-comp alkaline					
OBS22	13030	94	2231	36.15954	-34.03473	3-comp alkaline					
OBS23	13019	124	2506	36.11701	-34.09273	3-comp alkaline					
OBS24	LP117	119	2321	36.06898	-34.15878	2-comp		NA	NA	Y	Y
OBS25	LP113	110	2268	36.02865	-34.11458	2-comp		NA	NA	Y	Y
OBS26	13018	137	2620	36.07739	-34.04847	3-comp alkaline					
OBS27	13031	135	2801	36.11940	-33.99030	3-comp alkaline					
OBS28	13027	123	2693	36.15550	-33.94035	3-comp alkaline					
OBS29	13029	1	2219	36.18582	-33.89922	3-comp alkaline					
OBS30	13017	131	2071	36.20956	-33.86589	3-comp alkaline					
OBS31	13028	127	2736	36.23379	-33.83210	3-comp alkaline					
OBS32	13016	101	2836	36.26394	-33.79074	3-comp alkaline					
OBS33	13036	113	2547	36.30010	-33.74169	3-comp alkaline					
OBS34	13032	136	2786	36.34203	-33.68356	3-comp alkaline					
OBS35	LP124	115	2212	36.39039	-33.61755	2-comp		NA	NA	Y	Y
OBS36	13013	47	1918	36.34358	-33.56527	3-comp lithium		Y	Y	OFFSET	N
OBS37	13012	107	1966	36.29551	-33.63141	3-comp lithium		Y	Y	Y	Y
OBS38	LP129	112	2277	36.25339	-33.68889	2-comp		NA	NA	Y	Y
OBS39	LP130	41	2435	36.21707	-33.73883	2-comp		NA	NA	Y	Y
OBS40	13006	140	2087	36.18699	-33.78007	3-comp lithium	No response - lost OBS	N	N	N	N
OBS41	13010	117	1878	36.16287	-33.81322	3-comp lithium		Y	Y	Y	Y
OBS42	13009	142	2266	36.13886	-33.84628	3-comp lithium	Logger flooded - no data	N	N	N	N
OBS43	LP125	111	2147	36.10881	-33.88760	2-comp		NA	NA	Y	Y
OBS44	13011	130	2315	36.07237	-33.93733	3-comp lithium		Y	N	Y	Y
OBS45	LP121	118	2234	36.03031	-33.99781	2-comp		NA	NA	Y	Y
OBS46	13033	88	2422	35.98215	-34.06173	3-comp alkaline		Y	Y	Y	Y

- Phase I Recoveries
- Phase II Recoveries
- Phase II A Deployments
- Phase II B Deployments

05/01/13 21:00, Local
Site OBS01 recovery went very smooth. The acoustic wouldn't respond to us until we were almost directly over the OBS. The new logger recorded a full set of data and all four channels look good.

05/02/13 14:30:00, Local
Site OBS04 recovery went as anticipated. The instrument ascended at a rate near 75 meters/min because of all of the additional flotation, being a converted LP unit. The unfortunate discovery identified upon securing the OBS on deck was that the run-plug had been knocked askew during the deployment operation. This allowed seawater to enter the 3-pin HPD and short out the batteries. Fortunately

the logger did not flood. The instrument recorded for ~15 hours before the batteries died.

05/03/13 01:50, Local
Site OBS40, AC# 140 is not responding. We have passed over the drop coordinates, circumnavigated the OBS at a 1km radius, and are now sitting on station over the OBS. We will stay on station for 1-hour (estimated rise time from last release command) and then send disable and move on. We should be able to return to this station at least one more time before the end of this cruise and then again during the recoveries of the lithium OBS in six months time.

02:45, Local
We have sent disable commands and will abandon this station for now. We did not receive a single indication of acoustic life for this site.

05/03/13 05:30, Local
Site OBS42 has a flooded logger, which was identified at recovery. The lithium

reaction was finished as far as I could tell, so we were able to recover the instrument, unbolt the retaining rings and then jettison the logger (13009) overboard. There was nothing in the logger worth salvaging and opening it was too dangerous to consider. The black mess flushing out of the logger was acrid and irritating to the skin, so we got the mess cleaned up as quickly and safely as possible. The logger appeared to have reacted from the back end cap, which Phil noted had no seal screws, so it must have leaked from the rear bore seals. Aside from the logger and data loss, all other components of this OBS were saved.

05/04/13
Because of the instrumentation losses from those OBS designated for the long-term deployments and containing lithium batteries, we have been exploring a few ideas on how we might be able to redistribute some of the remaining lithium battery packs and convert two alkaline powered OBS to lithium, which would get us back to 15-OBS for the final deployment schme.

Email correspondence:

On May 8, 2013, at 12:18 AM, Aaron, Ernest wrote:

Rob and Pablo,
Phil and I have revisited the power numbers for the proposed 3-lithium pack powered loggers and based on your recovery dates find that it will be close, but doable if you are willing to accept the risk of ship schedule change, which is not uncommon.

The numbers:
3 lithium packs will run for ~234 days Alkaline clock backup packs (modified 4-packs) will run for ~90 days

Total days without safety factor = 324

These instruments have been running since their setup date of 4/5/13

If we recover on 1/5/14 that will be 275 days of runtime, recovery on 1/15/14 will be 290 days of runtime

324-290 = 34 days of clock backup buffer

Please let us know how you would like to proceed as soon as possible so that we can begin preparation of these loggers (13-obs, or 15-obs). We have a good bit of prep work to do with the instruments, those that are currently onboard, regardless of the battery configurations, but we are waiting until we know which way we are going before getting started so that we don't have to make additional changes later.

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Phase II A Deployments, Lithium powered station locations:

Station	Latitude	Longitude
OBS 55	36.252463	-33.942908
OBS 54	36.242191	-33.889423
OBS 53	36.237229	-33.867382
OBS 50	36.221843	-33.860324
OBS 49	36.208282	-33.876709
OBS 48	36.213327	-33.898227
OBS 57	36.230077	-33.903190

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6. OBS Deployments (Phase II A- 07 OBS)

Station	S/N	AC	Depth	LAT	LON	Type	Comment	CH0-X	CH1-Y	CH2-Z	CH3-HYD
OBS47	13023	75	3153	36.18469	-33.93060	3-comp lithium	Surveyed				
OBS48	13014	122	2227	36.21333	-33.89823	3-comp lithium	Shot to (MCS)				
OBS49	13003	89	2021	36.20828	-33.87671	3-comp lithium	Shot to (MCS)				
OBS50	13004	149	2169	36.22184	-33.86032	3-comp lithium	Shot to (MCS)				
OBS51	13036	113	2550	36.20261	-33.82282	3-comp lithium	Surveyed				
OBS52	13021	104	2588	36.26930	-33.84217	3-comp lithium	Surveyed				
OBS53	13001	49	2120	36.23723	-33.86738	3-comp lithium	Shot to (MCS)				
OBS54	13005	30	2282	36.24219	-33.88942	3-comp lithium	Shot to (MCS)				
OBS55	13008	20	3016	36.25246	-33.94291	3-comp lithium	Surveyed				
OBS56	13012	107	2345	36.22865	-33.90509	3-comp lithium	Surveyed				
OBS57	13015	57	2377	36.23008	-33.90319	3-comp lithium	Surveyed				
OBS58	13033	88	2296	36.23039	-33.90227	3-comp lithium	Surveyed				
OBS59	13002	65	2248	36.22939	-33.90087	3-comp lithium	Surveyed				
OBS60	13010	117	2237	36.22809	-33.90138	3-comp lithium	Surveyed				
OBS61	13011	142	2294	36.22762	-33.90347	3-comp lithium	Surveyed				

- Phase I Recoveries
- Phase II Recoveries
- Phase II A Deployments
- Phase II B Deployments

2013:123:16:30:00
Upon the completion of the Phase I recoveries we immediately deployed seven, of the fifteen, lithium powered SP OBS, to remain out here until January of 2014. The remaining 6-lithium powered OBS were held aboard until a decision is made as to using one lithium power pack from each of the six and creating two additional lithium powered OBS for the long-term deployment scheme, or not.

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Response email from Rob Sohn:

Sent: Wednesday, May 08, 2013 6:20 AM
To: Juan Pablo Canales [jpcanales@whoi.edu]
Cc: Stephen Swift; Babcock, Jeffrey; Gibaud, Mark; Thai, Philip; Aaron, Ernest

Pablo et al.,
Word from NSF is that the recovery leg aboard a British vessel for Jan 2014 is firm. We all know that 'firm' is no guarantee in this business, but based on that input I'm comfortable making the decision to reconfigure some of the OBSs to allow for deployment of the full complement of 15 passive instruments. In terms of the remaining deployments, I guess the best thing would be to put as many of the reconfigured (i.e., smaller battery pack) instruments in the center of the network as possible. So load up the vent field network with the reconfigured instruments, and then put a few more in the middle ring, if necessary.

Thanks to the SIO OBS group for their willingness to go the extra mile for our experiment.

Cheers, Rob

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We anticipate starting Phase II recoveries on Monday, May 13 before noon. This will give us approximately 1.25 days of contingency (based on my calculations) after all work is complete and all goes well. We can then revisit site OBS40 and attempt to get it to talk to us.

Calculations for remaining OBS work:
Recover 20 SP OBS @ 2-hours per station and 30-minutes transit time between sites. **~50 hours**

Deploy and survey 8 SP OBS @ 1.5-hours per station and 30-minutes transit time between sites. **~16 hours**

66-hours = 2.75 days
If we start at 12:00 on May 13th we'll have 4-days
Contingency = 1.25 days

7. OBS Recoveries (Phase II- 20 OBS)

Station	S/N	AC	Depth	LAT	LON	Type	Comment	CH0-X	CH1-Y	CH2-Z	CH3-HYD
OBS1	13005	30	1503	36.11781	-34.21040	3-comp lithium		Y	Y	Y	Y
OBS2	13007	106	1536	36.16386	-34.14491	3-comp lithium		N	Y	Y	Noisy
OBS3	13008	20	1689	36.20420	-34.08961	3-comp lithium		Y	Y	Y	Y
OBS4	LP119	100	2506	36.24222	-34.03740	2-comp	Run-plug short - no data	NA	NA	N	N
OBS5	LP126	77	2339	36.27255	-33.99559	2-comp		NA	NA	Y	Y
OBS6	13004	149	1895	36.29640	-33.96266	3-comp lithium		Y	Y	Y	Y
OBS7	13003	89	1612	36.31870	-33.92976	3-comp lithium		Y	Y	Y	Y
OBS8	13001	49	2117	36.35060	-33.88821	3-comp lithium		Y	Y	Y	Y
OBS9	13015	57	1823	36.38668	-33.83832	3-comp lithium		Y	Y	Y	Y
OBS10	13014	122	1693	36.42862	-33.77868	3-comp lithium		Y	Y	Y	Y
OBS11	13002	55	1908	36.47736	-33.71575	3-comp lithium		Y	Y	OFFSET	Y
OBS12	LP115	50	2534	36.43038	-33.66202	2-comp		NA	NA	Y	Y
OBS13	13021	104	2751	36.38074	-33.72792	3-comp alkaline		Y	Y	Y	Y
OBS14	13023	75	2865	36.34018	-33.78602	3-comp alkaline		Y	Y	Y	Y
OBS15	13024	80	2871	36.30381	-33.83574	3-comp alkaline		Y	Y	Weak	Y
OBS16	13022	139	2475	36.27352	-33.87733	3-comp alkaline		Y	Y	Weak	Y
OBS17	13020	65	2141	36.24466	-33.86739	3-comp alkaline		Y	Y	Weak	N
OBS18	13026	99	2721	36.24974	-33.91034	3-comp alkaline		Y	Y	Y	Y
OBS19	13025	43	2452	36.21456	-33.90916	3-comp alkaline		Y	Y	Weak	Y
OBS20	13034	129	3219	36.22547	-33.94320	3-comp alkaline		Y	Y	Y	Y
OBS21	13035	7	3035	36.19504	-33.98465	3-comp alkaline		Y	Y	Y	Y
OBS22	13030	94	2231	36.15954	-34.03473	3-comp alkaline		Y	Y	Y	N
OBS23	13019	124	2506	36.11701	-34.09273	3-comp alkaline		Y	Y	Y	Y
OBS24	LP117	119	2321	36.06898	-34.15878	2-comp		NA	NA	Y	Y
OBS25	LP113	110	2268	36.02865	-34.11458	2-comp		NA	NA	Y	Y
OBS26	13018	137	2620	36.07739	-34.04847	3-comp alkaline		Y	Y	Y	Y
OBS27	13031	135	2801	36.11940	-33.99030	3-comp alkaline		Y	Y	Y	Y
OBS28	13027	123	2693	36.15550	-33.94035	3-comp alkaline		Y	Y	Y	Y
OBS29	13029	1	2219	36.18582	-33.89922	3-comp alkaline		Y	Y	Y	Y
OBS30	13017	131	2071	36.20956	-33.86589	3-comp alkaline		N	Y	Y	Y
OBS31	13028	127	2736	36.23379	-33.83210	3-comp alkaline		Y	Y	Weak	Y
OBS32	13016	101	2836	36.26394	-33.79074	3-comp alkaline		Y	Weak	Weak	Y
OBS33	13036	113	2547	36.30010	-33.74169	3-comp alkaline		Y	Y	Y	Y
OBS34	13032	136	2786	36.34203	-33.68356	3-comp alkaline		Y	Y	Weak	Y
OBS35	LP124	115	2212	36.39039	-33.61755	2-comp		NA	NA	Y	Y
OBS36	13013	47	1918	36.34358	-33.56527	3-comp lithium		Y	Y	OFFSET	N
OBS37	13012	107	1966	36.29551	-33.63141	3-comp lithium		Y	Y	Y	Y
OBS38	LP129	112	2277	36.25339	-33.68889	2-comp		NA	NA	Y	Y
OBS39	LP130	41	2435	36.21707	-33.73883	2-comp		NA	NA	Y	Y
OBS40	13006	140	2087	36.18699	-33.78007	3-comp lithium	No response - lost OBS	N	N	N	N
OBS41	13010	117	1878	36.16287	-33.81322	3-comp lithium		Y	Y	Y	Y
OBS42	13009	142	2266	36.13886	-33.84628	3-comp lithium	Logger flooded - no data	N	N	N	N
OBS43	LP125	111	2147	36.10881	-33.88760	2-comp		NA	NA	Y	Y
OBS44	13011	130	2315	36.07237	-33.93733	3-comp lithium		Y	N	Y	Y
OBS45	LP121	118	2234	36.03031	-33.99781	2-comp		NA	NA	Y	Y
OBS46	13033	88	2422	35.98215	-34.06173	3-comp alkaline		Y	Y	Y	Y

- Phase I Recoveries
- Phase II Recoveries
- Phase II A Deployments
- Phase II B Deployments

2013:133:07:00:00
The air guns and the six kilometers of streamers have been recovered. We expect to be at site OBS30 in about two hours to begin recoveries.

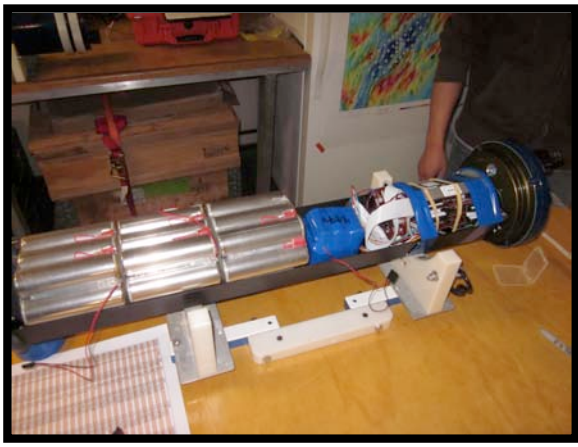
We are on station at site OBS30 @ 07:30 local time, which according to my earlier calculations, will give us 22.5 hours of contingency time if all goes well.

Site OBS16 we recovered a small white'ish crayfish looking crustacean that likely lives on, or near a black smoker (hydrothermal vent). This means that we were pretty damn close to a vent and are lucky we didn't suffer any damage.

Site OBS19 had a leaked alkaline cell in the NovaTech radio, which killed it. There was no water intrusion. On a different site when one of the NoveTechs were being installed it must have hung up on the polly mounting bracket and the installer must have twisted it (rotated) to get it to slide all the way down. The problem was that it was rotated counterclockwise and the switch-base was unscrewed a half turn from the body and it caused the unit to leak. If it had been twisted clockwise it would have been fine.

The instrument at site OBS22 had acoustic #94 inside, which is a 5-minute burn cycle unit. The OBS released from its anchor within the 5-minute burn window. Inspection of the mechanical release after recovery revealed that the burn wire was the single thread type, which are the newer ones we have recently switched to in hopes of shortening the release times from the anchor, or in the case of a faltering battery pack, a shorter amount of time spent coaxing it off the bottom.

2013:134:09:00:00
The eight lithium powered loggers, which are to be deployed after we finish the



alkaline SP recoveries, are setup and ready to go. We made two clock battery backup packs by soldering four of the 3-C cell alkaline packs together, in parallel. This should be enough amp hours to support the clocks for more than three months.

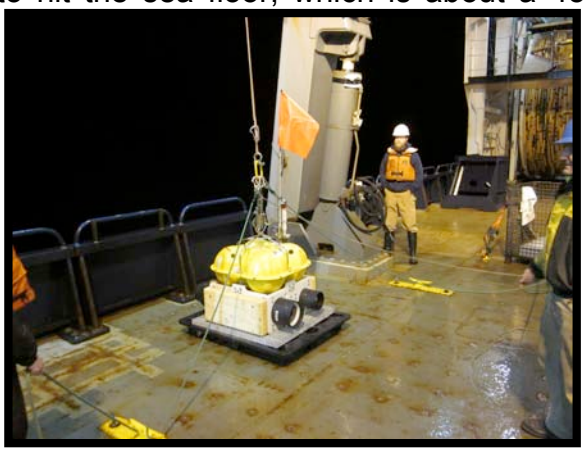
8. OBS Deployments (Phase II B- 08 OBS)

Station	S/N	AC	Depth	LAT	LON	Type	Comment	CH0-X	CH1-Y	CH2-Z	CH3-HYD
OBS47	13023	75	3153	36.18469	-33.93060	3-comp lithium	Surveyed				
OBS48	13014	122	2227	36.21333	-33.89823	3-comp lithium	Shot to (MCS)				
OBS49	13003	89	2021	36.20828	-33.87671	3-comp lithium	Shot to (MCS)				
OBS50	13004	149	2169	36.22184	-33.86032	3-comp lithium	Shot to (MCS)				
OBS51	13036	113	2550	36.20261	-33.82282	3-comp lithium	Surveyed				
OBS52	13021	104	2588	36.26930	-33.84217	3-comp lithium	Surveyed				
OBS53	13001	49	2120	36.23723	-33.86738	3-comp lithium	Shot to (MCS)				
OBS54	13005	30	2282	36.24219	-33.88942	3-comp lithium	Shot to (MCS)				
OBS55	13008	20	3016	36.25246	-33.94291	3-comp lithium	Surveyed				
OBS56	13012	107	2345	36.22865	-33.90509	3-comp lithium	Surveyed				
OBS57	13015	57	2377	36.23008	-33.90319	3-comp lithium	Surveyed				
OBS58	13033	88	2296	36.23039	-33.90227	3-comp lithium	Surveyed				
OBS59	13002	65	2248	36.22939	-33.90087	3-comp lithium	Surveyed				
OBS60	13010	117	2237	36.22809	-33.90138	3-comp lithium	Surveyed				
OBS61	13011	142	2294	36.22762	-33.90347	3-comp lithium	Surveyed				

- Phase I Recoveries
- Phase II Recoveries
- Phase II A Deployments
- Phase II B Deployments

For the first three of these deployments we will wait for the OBS to touchdown on the seafloor, and then we will begin the relocation survey. For the last five of these deployments we will deploy them disabled and in rapid sequence because they are relatively close to one another. Once these five OBS are deployed we will enable the first (OBS58), determine that it is stable, and then begin the relocation survey- repeating this for the remaining four sites.

2013:134:19:10:00 Site OBS47, 3175 meters
It took about 70-minutes for the OBS to hit the sea floor, which is about a 45 m/min sink rate.



The instrument prepped for site OBS59 originally had acoustic #55, which was replaced with acoustic #65 because acoustic #55 displayed an erratic, broken sound from the ITC 3013 transducer head- possibly an issue with the ceramic.

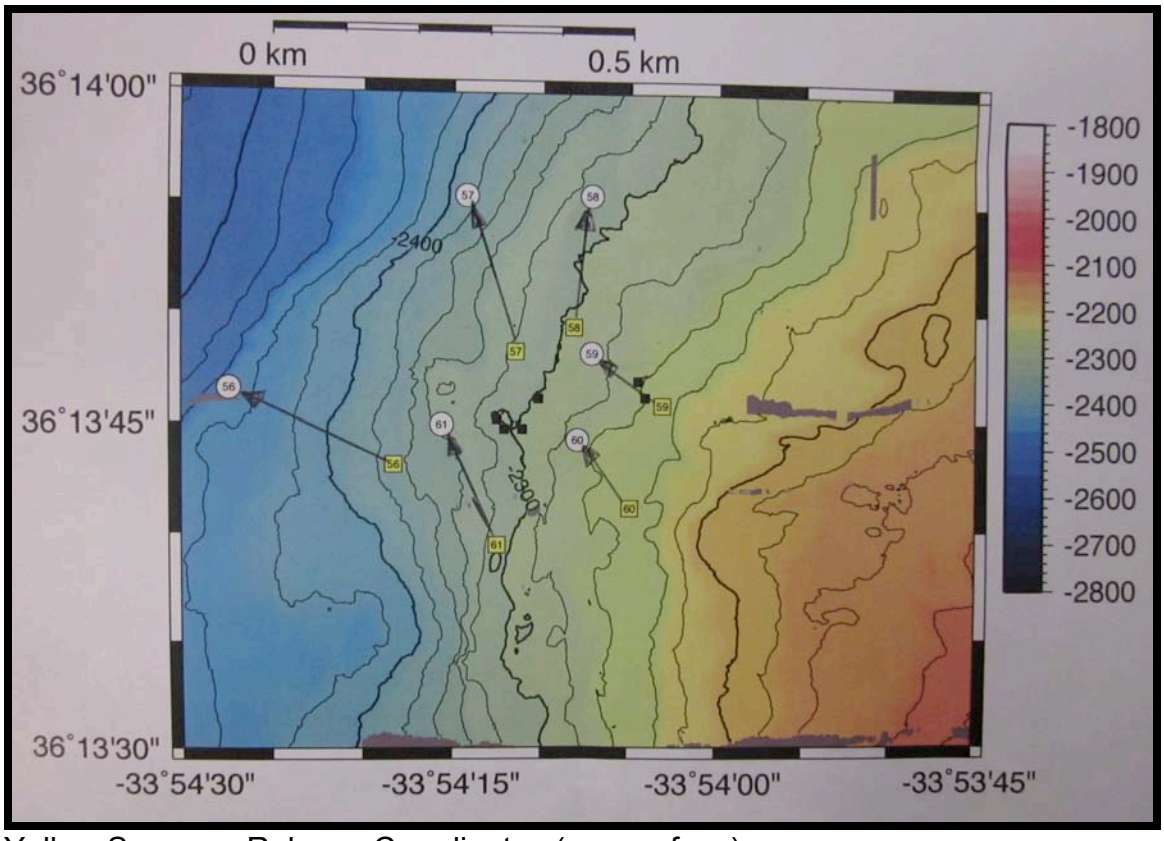
Phil has fixed the script for the Saber acoustic box so we are now able to perform our relocation surveys with it instead of the 8011-M. The saber seems to be working fine.

For a few of our sites we are seeing a shadowing effect, like a dead acoustic side of the survey pattern. It could be topography, OBS orientation, distance from the drop location, or any combination of the three.

2013:135:07:00:00
We have finished with the Phase II B deployments, which consisted of the remaining eight lithium powered SP OBS. The final five instruments were deployed around a series of hydrothermal vents in a fairly tight pattern; therefore they were deployed in rapid succession and with acoustics disabled.

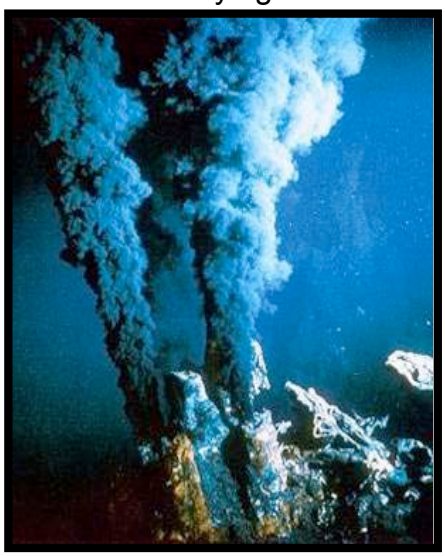
Instruments that required survey relocation:

Station	Corrected Positions
OBS 47	**Lat: 36 11.1316 (36.1855), Lon: -33 55.9637 (-33.9327), depth: 3153**
OBS 51	**Lat: 36 12.2122 (36.2035), Lon: -33 49.5618 (-33.8260), depth: 2550**
OBS 52	**Lat: 36 16.2169 (36.2703), Lon: -33 50.5704 (-33.8428), depth: 2597**
OBS 55	**Lat: 36 15.1597 (36.2527), Lon: -33 56.6773 (-33.9446), depth: 3016**
OBS 56	**Lat: 36 13.7761 (36.2296), Lon: -33 54.4569 (-33.9076), depth: 2345**
OBS 57	**Lat: 36 13.9226 (36.2320), Lon: -33 54.2377 (-33.9040), depth: 2377**
OBS 58	**Lat: 36 13.9230 (36.2321), Lon: -33 54.1200 (-33.9020), depth: 2296**
OBS 59	**Lat: 36 13.8034 (36.2301), Lon: -33 54.1194 (-33.9020), depth: 2248**
OBS 60	**Lat: 36 13.7375 (36.2290), Lon: -33 54.1323 (-33.9022), depth: 2237**
OBS 61	**Lat: 36 13.7488 (36.2291), Lon: -33 54.2604 (-33.9043), depth: 2294**



Yellow Square = Release Coordinates (sea surface)
White Circle = Surveyed Location (actual seafloor location)
Black Square = Known Hydrothermal Vents

2013:135:13:15:00
The final surveying of the lithium powered SP's is complete. We surveyed 10 of 15 sites. OBS55 and OBS57, which were deployed before the streamer work, were also surveyed because their seafloor positions are needed fairly immediately. Some of these OBS are deployed very near known hydrothermal vents so their positions need to be shared with any other deep-sea science cruises operating in this area, which may be collecting physical samples, images and video from these sites. It would be really cool if we received images of our OBS near one of these vents.



Example of a Mid-Atlantic Ridge hydrothermal vent

9. Data Processing & Instrument assessment
By Phil Thai

Of the 46 instruments that were deployed 43 returned capable of having data extracted. Of these 43 instruments 37 came back with data on all 4 channels. On three instruments the hydrophones failed (OBS36, OBS22, OBS17)

10. Cruise Summary
This was a successful cruise as we were able to deploy, and then recover 45 of our 46 OBS. For the final 15 OBS deployments we adapted to the loss of two of our lithium powered loggers by altering the battery configurations of six loggers. This allowed us to provide the 15 lithium powered OBS for the longer-term deployment portion of this experiment. These 15 OBS are to remain in operation until January 2014.

The deck operations went very well. We have had ample experience with OBS operations on this ship allowing for a routine work environment.

The majority of the logger electronics (36 of 46) were assembled and tested just before the shipping deadline for this cruise, so in many ways this cruise was a test of our latest version of the new logger system, GUI setup interface, and processing software.

The acoustic operations were much improved as a result of having a grounded shield associated with the 12kHz hull-mounted transducer cable. There was absolutely no background noise, or static reflections that have plagued us in the past. The acoustic returns were not 100%, but the elimination of the background

noise greatly simplified our ability to discern direct returns from bounces, as well as defining specific shadow zones, which were unique to each OBS station.

11. Room for improvement

As requested many times in the past, it would be very helpful if there were a repeated display of the ships GUI navigation, for our viewing in the dry lab. We do have a monitor displaying the ship's heading, position coordinates, speed (SOG), etc., but having an active display of the ship and its vector in relation to the drop, or recovery site locations is invaluable. It would eliminate more than half of the lab to bridge communications required to help us (in the dry lab) understand our distance and bearing from station with respect to the evolving science objectives.

12. Other Documentation

Instrument attrition:

- SP lost, Site OBS40
- SP logger flooded, Site OBS42
- Acoustic unit flooded at face seal, AC#15
- Two NovaTech radios flooded
- Two NovaTech radios with battery leaks
- Run-plug damaged during deployment, LP-119
- Recovery tag pole bent
- Acoustic release cable leaked and corroded 4-pin connectors, AC#47
- Acoustic transducer head sounds damaged, AC#55