CENTER FOR MARINE RESOURCES AND ENVIRONMENTAL TECHNOLOGY and
SEABED TECHNOLOGY RESEARCH CENTER
UNIVERSITY OF MISSISSIPPI

ACTIVITIES REPORT FOR THE CRUISE GOM03-10-MC118 ABOARD THE R/V
PELICAN

MISSISSIPPI CANYON FEDERAL LEASE BLOCK 118
NORTHERN GULF OF MEXICO

June 14-26, 2010

OPERATIONS REPORT AND EVENT LOG OF DEPLOYMENTS AND RECOVERIES
OF MAJOR COMPONENTS OF THE SEAFLOOR OBSERVATORY USING THE
STATION SERVICE DEVICE AND GEOCHEMICAL SURVEYING EFFORTS AT
MC118, SITE OF THE SEAFLOOR OBSERVATORY

By

Carol B. Lutken¹ and Ken Sleeper²

¹Center for Marine Resources and Environmental Technology
²Seabed Technology Research Center
111 Brevard Hall
University of Mississippi
University, MS 38677

Scientific Staff:
CMRET/STRC  Carol Lutken – Chief Scientist
Ken Sleeper – Scientist
Leonardo Macelloni – Geophysicist
Marco D’Emidio – GIS and Navigation specialist
Matt Lowe – Research Systems Specialist
Brian Noakes – Research Systems Specialist
Andy Gossett – Research Systems Specialist
Larry Overstreet – Electronics Systems Specialist

Specialty Devices, Inc.  Paul Higley - Engineer
Scott Sharpe – Data Acquisition Consultant

Florida State University  Jeff Chanton - Geochemist
SRI  Tim Short, Ryan Bell - Geochemists

Pelican crew:  Craig LaBoeuf – Captain
Max Wike – Mate
Joe Thomas - Mate
Jack Pennington – Chief Engineer
Sam LaBeouf – Engineer
Jordan Westmoreland - Technician
Kelly - cook
Tad Biercke – cabin boy
INTRODUCTION
A scientific research cruise was undertaken to Mississippi Canyon Federal Lease Block 118 (Fig. 1) June 14 – 26, 2010 aboard the R/V Pelican. A portion of the block has been reserved by the Minerals Management Services (MMS) for use by the Gulf of Mexico Hydrates Research Consortium to investigate marine gas hydrates in situ. The Consortium has chosen the site for the installation of a seafloor observatory to monitor and evaluate the forcing factors involved with the formation and dissociation of gas hydrates. The objectives of this cruise were to use the SSD to survey the area immediately around the Integrated Data Power Unit (IDP) for appropriate ground and orientations for POD and Horizontal Line Array (HLA) deployments, deploy at least one HLA and survey it in. If time allowed we hoped to refit the Station Service Device (SSD), custom ROV with geochemical instruments and conduct geochemical surveying in the area for possible fallout from the Macondo spill (April-the present).

Figure 1. Location of Mississippi Canyon Federal Lease Block 118.

During an April, 2010 cruise, a revised plan for deployment of the HLAs, a major component of the Seafloor Observatory and of the Consortium’s hydrates research strategy, was carried out in Pensacola Bay. The design is for a POD to serve as the hub for the arrays and for the four 500m-long hydrophone arrays to extend in four directions oriented at approximately 90 degrees from their nearest neighbors. Previous cruises to Mississippi Canyon 118 to deploy the arrays have me with failure due to weather and
sea state as parts of the scenario are delicate and cannot be accomplished in rough seas or with damaged or otherwise faulty equipment. This plan would test the capabilities of the SSD but to purposes relating directly to a major SFO installation.

This plan involved unspooling each HLA from the POD where its data-logger had first been installed. Installing an HLA array with its deployment spool on the SSD not only adds significantly to the size and weight of the SSD during deployment but also nearly doubles the virtual mass of the vehicle during the dive to operating depth. This large increase in virtual mass makes the SSD significantly more susceptible to ship heave and the resulting snap loading on the vehicle, cage and deployment lines. So extreme care had to be exercised in only ideal sea conditions.

The April, 2010 explosion of the Deep Water Horizon oil rig continues to impact our research site at Mississippi Canyon 118 (MC118), as seen in Figures 2 and 3.

![Figure 2. Onsite, MC118, controlled burning of Macondo oil.](image)

**OBJECTIVES**
1. Using the SSD, survey the area around the IDP for an appropriate deployment site for the POD – the hub of the four 500m HLAs;
2. Deploy the POD;
3. Deploy HLA1 – using SSD, land near POD, place transponder on POD, unspool array (SSD in cage);
4. Return to POD. Connect HLA1 to IDP.
5. Survey the array in and test it using an active source;
6. Run noise survey.
7. Collect data from Data Recovery System (DRS) via pop-up buoy;
8. Redeploy pop-up buoy;
9. Continue with HLAs 2, 3, 4, as allowed;
10. Refit the SSD to carry an assortment of chemical sensors - CTD, MIMS, fluorometer, Contros - to survey the observatory vicinity for signs of Macondo fallout;
11. Collect probes;
12. Deploy additional probes;
13. Collect targeted push-cores.

Figure 3. Oil spill "product" at MC118, June, 2010.

CRUISE ACTIVITIES
The purpose of the initial dive of the SSD was to survey the area on all sides of the IDP. When we reached the seafloor, near the IDP, we discovered a cable – probably our cable to the Data Recovery System – draped over one of the braces of the IDP. This presented an unexpected hazard to working around the IDP though not to its functioning. We flew the SSD around the IDP from both directions up to the cable, selected what we determined to be the preferred site for the POD and returned the SSD to the deck. The shop team rigged the POD, USBL and floats for deployment (Figure 4) from our fiber-optic cable and the POD was deployed. A second dive with the SSD confirmed the location of the POD – 10m south of the IDP – and orientation to be optimal. Unfortunately, when the SSD was rigged with an HLA and data-logger and deployed from the ship (Figure 5), a significant bottom current developed and the
Captain was unable to maintain position within the watch circle for safe operation of the vehicle and we had to abort the mission.

Figure 4. Deployment of the POD. The POD is the hub of the 4 HLAs. Note receivers at each corner for attachment of the 4 data-loggers and anchoring of each array.

The SSD was recovered safely and adjustments made to the cable attachment to reduce the pitch. During the subsequent dive, all communications with the cameras and lights were lost. The vehicle was recovered and evaluated with the result that we had blown the communications card. This began a lengthy ordeal of replacing the card while time remained on the cruise. While this effort was ongoing, we began to make adjustments to our chemical sensors so that we could conduct our chemical surveying during the down time for the SSD. We had to leave our site during this period to improve ship to land communications.

Eventually, a new card arrived in New Orleans and was delivered, along with the chemists who would run much of the chemical surveying late in the cruise. Unfortunately, this card also “blew” so we are faced with determining how and where the electronics failure in the SSD might be. Although this marked a disappointing end to the HLA deployment effort for this trip, it did result in additional time that was devoted to chemical surveying. Since the SSD could not be used, as intended, as the platform for geochemical surveying, we attached and integrated the sensors into the CTD rosette and used it as a deployment/surveying platform. Five dives were made. During this effort, we were successful in identifying two water-column plumes of methane, at
approximately 600m and 800m water depth, using, primarily, SRI’s membrane induction mass spectrometer or MIMS, a cooperative project we have pursued for several years. Water column samples were collected in order to link – or not – the hydrocarbon signature to that of Macondo oil. Air samples were collected for the University of California-Santa Barbara and sent to them from Cocodrie.

All the while we were onsite, we were aware of the clean-up effort at MC252. We were kept off our site for some time so that clean-up procedures could proceed. The “spill” continues in full force.

Figure 5. The SSD, rigged with a spooled HLA, left, and data-logger, right, ready for deployment via the SSD.

CONCLUSIONS
This cruise was designed to effect the deployment, navigation and data-collecting possibilities of the HLA-transponder system. Following a successful reconnaissance dive and a successful POD deployment and verification dive, the communications on the SSD failed on the fourth dive. Difficulties relating to the spill were real but minor contributors to the challenges of this situation. Every possible effort was made to replace the destroyed communications card. After 3+ days of effort, these resulted in a replacement card being delivered via special transit. Unfortunately, it too failed. At this juncture, we decided to devote the remaining cruise time entirely to geochemical surveying as we had arranged to use several sensors reputed to be capable of
surveying for methane. The entire electronics system of the SSD will be evaluated upon return to shore. Sea casts and data recovered using the Contros are included in the Appendix to this report.

Figure 6. The CTD rosette rigged with additional sensors for geochemical surveying.

Figure 7. The spill-dispersant was cleared from the starboard side of the Pelican prior to deploying the geochemical surveying sensor platform.
Figure 8. A water-spout added to the unusual quality of this cruise!
Event Log
SSDR Cruise on RV Pelican
14-26 June, 2010

06/14/10 - mobilization
17:10 – Carol, Ken, Leo, Marco arrive onsight (MMRI’s van), in Cocodrie. Brian, Andy, Matt, Larry already onsight engaged in mobilization, having arrived earlier with MMRI/CMRET’s equipment loaded in MMRI/CMRET’s vehicles. SDI already onsight as well.
- Weather: sunny, very hot and humid.
- Cable already swapped out (our fiber-optic cable on LUMCON’s winch drum loaded), heave compensator installed, SSD, MMRI container Shop, 3 (Horizontal Line Arrays) HLAs, 3 transporters, data-loggers, electronics all loaded.

06/15/10 – mobilization, continued
09:00 – Carol, Leo, Marco go to New Orleans and to Houma to pick up replacement SSD recharge cable, 9v batteries, sheets to protect and cool cables during transit.
- Shop guys continue to load and lock down equipment. SDI testing functions of the SSD.
- Science Planning meeting:
  Calibration run
- Dive 1 – verify navigation; locate IDP (Integrated Data Processor); check current direction(s); determine where best to place POD
- Deploy POD
- Dive 2 – use SSD to verify location and orientation of POD in relation to IDP; IDP;
- Dive 3 – carry data-logger and cable to pod; connect to IDP; unspool HLA in direction appointed (depending upon which arm of the X currents dictate);
- Subsequent dives, repeat for additional arrays;
- Re-rig SSD to carry geochemical sensors while in survey mode;
- Survey vicinities of known vents as well as areas clear of vents.

06/16/10 – transit to MC118; make calibration run and complete first dive of SSD
06:00 – onsight; seas flat; weather partly cloudy/hazy
06:30 – assemble calibration mooring: transponder, releases, floats, mount transducer.
07:35 – collect air sample.
08:35 – mooring in; proceed to calibration run.
10:10 – mooring recovered.
13:00 – Scott talked to IDP which had been set to “sleep” until 6/15/2010. Transducers covered with sludge upon recovery.
13:40 – Dive 1; Following float test, SSD deployed without the heave compensator (no heave). Floats attached to cable to keep it suspended in the water column and from piling onto the vehicle. Lead weights (4x118 + USBL) added to cable to serve as a mid-water weight for stabilization during vehicle deployment.
Float test of the SSD to determine appropriate weigh and cable attachment. Note that the surface had to be sprayed with detergent to disperse oil.

14:40 - on bottom. 886, water depth.
14:42 - IDP spotted due north of landing site.
   Polypropylene rope - current meter - shows no current. Let out 25m cable from ship’s winch to drop midweight; ship’s captain maintains watch circle.
14:55 - SSD out of cage; swimming to IDP, located on SSD’s sonar, 12m NNW of expected location.
   Current now out of NNE ~.25 knts.
   We swim the SSD to either side of the IDP, surveying the area for POD and HLA deployment possibilities as well as hazards.
   Cable falls off the NE brace of the IDP (cable to pop-up buoy?) then disappears into the mud, presenting a hazard to swimming the SSD in that quarter.
16:30 - signal Jack to retrieve the SSD.
16:32 - SSD off bottom.
18:30 - Shop team working on the POD, preparing it for deployment. Possible orientation of POD: arms oriented at 75*, 165*, 255*, 345*
SDI working on SSD: post-dive check, adjusting ballast, checking valves
19:00 - We have moved offsite (of the IDP) to take a CTD cast – C-DOM, oxygen, temp, salinity over the SW vent complex: Start of cast: 28*51.230’; 88829.507’.
   EOC: 28*51.202’; 88*29.530’
19:27 - completed cast
20:15 - CTD cast 2 – new vent
21:05 - CTD cast 3 – new vent
23:00 - collected air sample.

06/17/10 – MC118 – POD deployed. SSD dive 2 verified position, orientation.
08:00 – sunny/hazy; calm seas.
   POD is rigged and ready to go; connected to Rochester (fiber optic) cable with USBL, releases and floats.
09:20 – Navigating to position. Clean-up vessels are on-sight. They have been in communication with Captain Craig and have agreed to move out so that we can work, due to the small amount of “product” now at our site (on the surface).
10:20 – collect air sample
   Moving to updrift location in preparation for POD deployment.
11:25 – stop paying out cable at 857m. USBL reads 882 at bottom (top of POD, which resides beneath the USBL).
11:35 – POD released. Recovering USBL, floats, etc.
12:20 – recovery complete.
15:25 – Dive 2 of the SSD (Max on the bridge)
   SSD launched
   Air sample recovered
15:40 – USBLs not responding. Deduced that there must be a bad cable on the transponder (on the stiff arm). Raised the arm to replace the cable.
16:29 – SSD touch-down 3m from POD, 17m from IDP. POD and IDP are 13m apart, determined from sonar screen. Current is to the NE. Due to the bottom cable hazard and current direction, we make a controlled recovery: Captain heads south while we watch the drift of the SSD.

The POD on the seafloor, perfectly positioned to receive tranporter hook-ups.
17:06 – SSD off the bottom
   The POD is perfectly positioned, erect and oriented slightly off true N-S-E-W, 13m SSE of the IDP. All receivers are visible. Feet clearly slid some distance – ~1.5m – upon landing. Cable from the IDP is visible underneath the NE foot.
   3 hydrocasts completed
19:50 – CTD cast 4 – new vent
21:05 – CTD cast 5 – SW vent
22:25 – CTD cast 6 – Leo’s new vent
22:40 – air sample collected.

06/18/10 – SSD dove to carry HLA to POD but stiff current caused the mission to be aborted
   Morning spent adapting SSD to carry an HLA, transporter (data-logger+cable to link to IDP).

MMRI and SDI engineers affix a transporter to the SSD which will carry it to the POD.

08:45 – air sample collected
14:45 – air sample collected
   The new plan for deployment is to swim the SSD down to the deployment site, lock data-logger into the POD, connect the data-logger to the IDP, talk to the IDP from the ship, then unspool the 500m array in whichever direction the seafloor current dictates: 73*, 163*, 253*, 343*.
15:15 – checking the SSD. Check approach strategy with Captain Craig, on the bridge.
19:43 – Mobilize to deploy the SSD. Current is 1.5knts. We motor to 1km updrift of the target. Current is opposing a slight wind.
19:45 – Dive 3 SSD. SSD is over the stern with a pitch of ~16-17°
19:49 – Retrieving SSD to adjust cable attachment.
19:54 – SSD back on deck. Matt adjusts cable attachment
20:08 – SSD redeployed
21:20 – air sample collected
21:25 – SSD dive 3 aborted. Too difficult for Captain (Craig) to position vessel.

The SSD, rigged with an HLA, aft, and transporter - data-logger (out of view) and cable, fore - to unspool and link to the IDP.

The surface current has moved around from SSW to WSW to W. It appears to derive from the River (Mississippi) water entering the Gulf.

? Perhaps it is related to the spill? Might the massive spill be creating an impediment to this flow spreading over the water’s surface? Concentrating where the spill is not?

22:00 – SSD back on deck. Appears to be fine in spite of being towed at 650m (cable) at up to 2knts.

06/19/10 – HLA deployment attempt
08:00 – Weather is bright – hazy with clouds. Storms are visible on horizon. Wind is higher than previously and the waves are ~1’. Current is ~.5knt. Wind seems to be moving around, making efforts to drift onto sight difficult.

09:50 – Dive 4 SSD is over the stern. Floats, weights, USBL attached to cable. We have trouble navigating to our site.

11:37 – SSD touch down. Unable to locate IDP or POD visually or with sonar. With equipment both fore and aft, both views (SSD cameras) are obstructed.

Scientists monitor seafloor operations from the feeds to the support vessel. Top row is camera feed; Bottom row is location, orientation and sonar screen.

11:56 – Pick up and land again to change view.
   Error of 180m between navigation systems. Restore correct ellipsoid to projection on HyPack. Proceed to new site.

12:50 – approaching new target. IDP visible on sonar.

13:00 – touchdown of the SSD. IDP in clear view. Float is loose. Vehicle pitch is still extreme. Retrieve vehicle to adjust cable and decrease pitch and to fix clutch.
   Adjusted cable and 2 clutches on SSD. Ready to dive again.

~14:00 – SSD redeployed. Nearing the seafloor, while adjusting camera view, all video and lights were lost. Altimeter still active.
   Retrieved SSD.
   Removed computer from SSD. Paul and Scott analyzed SSD communications both ways. Of 2 com cards, one seems to be bad.

16:55 – CTD cast 7 w/CDOM – block to SSW of mound
All hands are brainstorming how to get a replacement communications card so that we can get the vehicle back in the water while this weather holds. The cards are made by Focal Technologies in Halifax, Nova Scotia. Paul has left messages all over North America explaining what we are trying to do and the importance of making it happen quickly. Matt is in touch with other ROV operators, hoping to find a replacement card among the spares that others are able to keep.

We motored to Tiger Bay, west of the Birdfoot Delta, where we have better cell signal and accessibility to New Orleans in case we need to go ashore to pick up someone or a delivery.

06/20/10 – Attempts to replace the communications card in the SSD

00:00 –Today was spent attempting to find a replacement for the destroyed communications card on the SSD. This frustrating effort was made more so by its being Sunday, so most folks are not at work or their phones and companies have message machines handling emergencies. Matt contacted people at Stennis where we thought we could likely beg, borrow or steal a card from a vehicle not currently in use. We had no luck there. Paul has personal contact information for John Purdy, at Focal but did not manage to do better than a message. An additional concern to getting parts out of the country is Customs.

Ken and Andy are working to get the Contros methane sensor wired into the CTD so that we can do some chemical profiling. We were hoping – and prepared – to do this from the SSD but cannot count on that now.

I have contacted Tim Short and Ryan Bell from Florida Southern University and Jeff Chanton from Florida State University, who were on schedule to join this cruise, that we are “down” but hoping to get a replacement card which they would then be picking up and bring out with them.

06/21/10 – Attempts to replace the communications card in the SSD

We heard from John Purdy (Focal) that they do not have a card in stock but that they can make one today. After much figuring and communicating, we have decided to take our chances with FedEx shipping the card. There is one flight a day from Halifax. That leaves the problem of customs. We may be able to pay a carrier to hand carry the card through.

We charged the card on the MMRI UM Visa but learned later that the purchase was stopped due to an unitemized B&B (electronics) bill. Barbara had this faxed but the bank stopped payment this time because it is an international purchase. Paul offered to use his card to make the purchase and it was accepted with both ours and Paul’s (SDI’s) information, something we will have to straighten out when we return.
12:00 – Tim, Ryan and Jeff remain on stand-by though I have given Tim the “go-ahead” to get started (from St. Petersburg) so that he can be close when the card arrives. He will collect Jeff in Tallahassee, then possibly the card in NOLA.

Joe Thomas arrived and Max has returned to LUMCON. They used a new “fast boat” LUMCON is considering purchasing.

**06/22/10 – Attempts to replace the communications card in the SSD; rewire the Contros though the CTD**
The card did not arrive. FedEx cites mechanical difficulties…. We will wait one more day. If the card does not arrive Wednesday, we will abort the cruise.

Andy is in conversation with Arne and Contros, in Germany. He and Ken are continuing to try to get the Contros to work through the CTD coms. They have set up a test bed in the wet lab.

Marco has designed a GIS site for our webpage, one that will enable users to access data that we have from the seafloor observatory.

???? - CTD cast 10 NE of Woolsey Mound

**06/23/10 – Back onsight, MC118**
Sunny/partly cloudy. Seas continue to be calm.

06:45 – preparing Contros for test dive at the Bravo vent (Camilli’s terminology from 2006 and 2009 cruises with the Tethys mass spectrometer).

08:10 – on drift site. Heading for vent.


Leo has discovered the cause of the discrepancy in the ship’s navigation and our locations in HyPak. A change in March – when we updated our software – appears to have caused the problem. We didn’t notice it then because we didn’t dive on known locations. In fact, we didn’t dive the SSD at all. When we dove it in April, we all remarked how we couldn’t find anything we had had no trouble finding before and blamed it on turbidity. We had 1 successful dive but no successful locations of features or instruments.

We have now replotted the IDP and POD and will check other locations and rotate the X for the arrays to fit with the new bathymetric indicators.

09:05 – steaming back to drift/sample site.

10:15 – CTD cast 11 w/CDOM, Contros, pump shroud with pump off – missed target

10:45 – CTD cast 12 w/CDOM, Contros, pump shroud with pump off – bravo vent

~16:00 – Tim, Ryan and Jeff arrive via fast boat with Max at the helm.

**06/24/10 – SSD dive…**
Sunny, partly cloudy – beautiful weather. Seas continue calm with low frequency rollers.

06:00 – SSD is on deck, new card installed, ready to dive.

New navigation files on Andy’s computer. X rotated to accommodate new positions.
06:20 – SSD off stern
06:25 – SSD lost communications when the cable – which was not feeding through the heave compensator evenly – jerked. Paul, Scott and Larry are evaluating the difficulty.

Additional CTD casts made
Niskin bottles with triggers set to bracket methane plumes found on the sea-cast using the SRI MIMS (membrane induction mass spectrometer)
Water samples collected and returned to FSU to confirm/refute the isotope signature of the DWH.

Tim and Ryan are set to run the MIMS from the CTD frame using its communications. Three casts are made and one recovers remarkable methane plumes at ~600m and ~800m water depths.

13:10 – Contros w/pump and Niskins – E of Woolsey Mound - coms lost; Contros failing
15:30 – mass spec 1 – SW of mound
21:20 – MS2 – lost coms
???? – MS3 – blue fault (northern portion of mound)
6/24/10 – CTD casts….post-dive analyses Contros, SSD.
Paul and Scott and Larry continue to work on the SSD.
12:30 – CTD/CDOM only. Contros keeps shutting down communications – Bravo vent
Niskins are sent to depths that bracket methane spikes detected by the MIMS.
Paul is bench-testing the Contros.
???? – MS4

Jeff Chanton, Florida State ecochemist, collects water samples from Niskin bottles sent to collect
water samples bracketing the methane plumes detected with the MIMS.

Commence Bucket tests of Contros.
18:10 – Contros in clean bucket, no pump – spike to 1.75um/L, drifted down to
0.022um/L
18:34 – Contros in dirty tank, no pump – immediate change; 2 min 0 to 1.5
(standard=2.65), then drifted back down
19:10 – Contros in clean water w/pump – computer hung up
19:34 - Contros in dirty water w/pump - ~5min 0-2um/L; another 5min to 2.5um/L
19:50 - Contros in clean water w/pump - ~5min to drop to 0 again.

–Evening – head back in to port
At MC118, the sea's surface is teeming with life in spite of the spill (or because of it?) and the scientific research cruise.
Appendix A. Contros HydroC/CH4 Methane Sensor

Features:
Non-destructive Infrared Detector
Membrane diffusion
Calibrated for methane (and other light alkenes like ethane, propane etc)
Low detection limit (~ 30 or 40 nano moles per liter (nmol/l) similar to 40ppb
Good to 2000m bsl

Method: We did five casts from the rosette with the Contros and CDOM fluorometer added to the normal CTD suite of instruments

On the way back to land we did some controlled tests with the instrument. The significant results of these tests showed that we were indeed detecting methane with the instrument. The response time was too slow for our cast rates though and, therefore, results are hard to interpret. Especially with respect to depth / concentration profiles as the readings are some average concentration smeared over a fairly long vertical distance.

Other Issues we had on the cruise with the Contros:
Getting it to work on the rosette proved challenging
    First hurdle:
        - Contros set for digital output (for use on SSD). Rosette works best with Analog
        - Baud rate: Contros set to 115200 (again for the SSD) and the one digital channel on the rosette only works at 19600. Worked with manufacturer and were able to open the bottle and re-set baud rate.

    Second hurdle: power. System kept crashing so turned off the pump and it worked
        - Later did a power spectrum test on the instrument and found the instrument with pump drew more than the modem on the rosette could supply (hence the shut down). Disabled redundant systems on the seabird modem and were able to run the Contros with the pump... sort of.

    Third hurdle: running it without the pump. A face plate was fabricated to protect the membrane once the cowling from the pump was removed. Needed to have free flow across the membrane, the pump cowling limited free flow of water over the instrument.
<table>
<thead>
<tr>
<th>Sea Cast</th>
<th>Time/date</th>
<th>Instruments</th>
<th>Target</th>
<th>general results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1855 6-16</td>
<td>CTD w/CDOM</td>
<td>SW vent</td>
<td>Andy's NAV was off (wrong ellipsoid) 1</td>
</tr>
<tr>
<td>2</td>
<td>2015 6-16</td>
<td>CTD w/CDOM</td>
<td>New vent</td>
<td>Andy's NAV was off (wrong ellipsoid) 2</td>
</tr>
<tr>
<td>3</td>
<td>2105 6-16</td>
<td>&quot;</td>
<td>&quot;</td>
<td>difficult d 3</td>
</tr>
<tr>
<td>4</td>
<td>1950 6-17</td>
<td>CTD w/CDOM</td>
<td>New vent</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>2105 6-17</td>
<td>CTD w/CDOM</td>
<td>SW vent</td>
<td>good dirft (bad nav though) hit vent and drifted alo 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>find that Hypack is set to Clark ellipsoid change to NAD83/WGS84</td>
</tr>
<tr>
<td>6</td>
<td>2225 6-17</td>
<td>CTD w/CDOM</td>
<td>Leo's new vent</td>
<td>6</td>
</tr>
</tbody>
</table>

6-19: SSD dive with HLA array 1. Target is the central POD. Supposedly set down 6m from IDP and 6 m form POD. Cant see anything!!!

Changing the ellipsoid has landed us in the wrong place
The IDP and POD were set down using Clark ellipsoid
Hypack up grade this winter must have resulted in ellipsoid reverting to Clark
IDP and POD locatalbe with Clark but not really in that location

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1655 6-19</td>
<td>CTDw/CDOM</td>
<td>block to S, SSW of mound</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>1850 6-19</td>
<td>CTDw/CDOM</td>
<td>Further SW of mound</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>2015 6-19</td>
<td>CTDw/CDOM</td>
<td>Due S of 118</td>
<td>small hit on CDOM @ 1080-1100m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Head in toward delta for cell coverage</td>
</tr>
</tbody>
</table>

10

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>? 6-22</td>
<td>CTDw/CDOM</td>
<td>NE of mound</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Start messing with Contros</td>
</tr>
</tbody>
</table>

RESOLVE NAV: wrong ellipsoid!

11

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>1015 6-23</td>
<td>CTD, CDOM and Contros, pump shroud w/pump off</td>
<td>missed target opportunity and just went in here</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>1045 6-23</td>
<td>pump shroud w/pump off</td>
<td>Camilli vent</td>
<td>held on bottom and drifted for about 200m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>maybe a hit at new vent on contros</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jeff, Tim and Ryan come on board</td>
</tr>
</tbody>
</table>

13

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>1310 6-24</td>
<td>Contros w/pump and niskin bottles</td>
<td>East of mound (moved to let them spray)</td>
<td>13</td>
</tr>
<tr>
<td>MS1</td>
<td>1530 6-24</td>
<td>MASS Spec</td>
<td>SW mound?</td>
<td>comms lost at 700m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>several attempts w/ Contros and all crapped out</td>
</tr>
<tr>
<td>MS2</td>
<td>2120 6-24</td>
<td>Mass Spec</td>
<td>lost comms right off</td>
<td>13</td>
</tr>
</tbody>
</table>

Double click inside the table to expand.