Gulf of Mexico Seafloor Brine Ecosystems - 2

Research Cruise AT26-13

On board the R/V Atlantis with the HOV ALVIN

30 March to 22 April 2014

Chief Scientist, Samantha Joye

University of Georgia

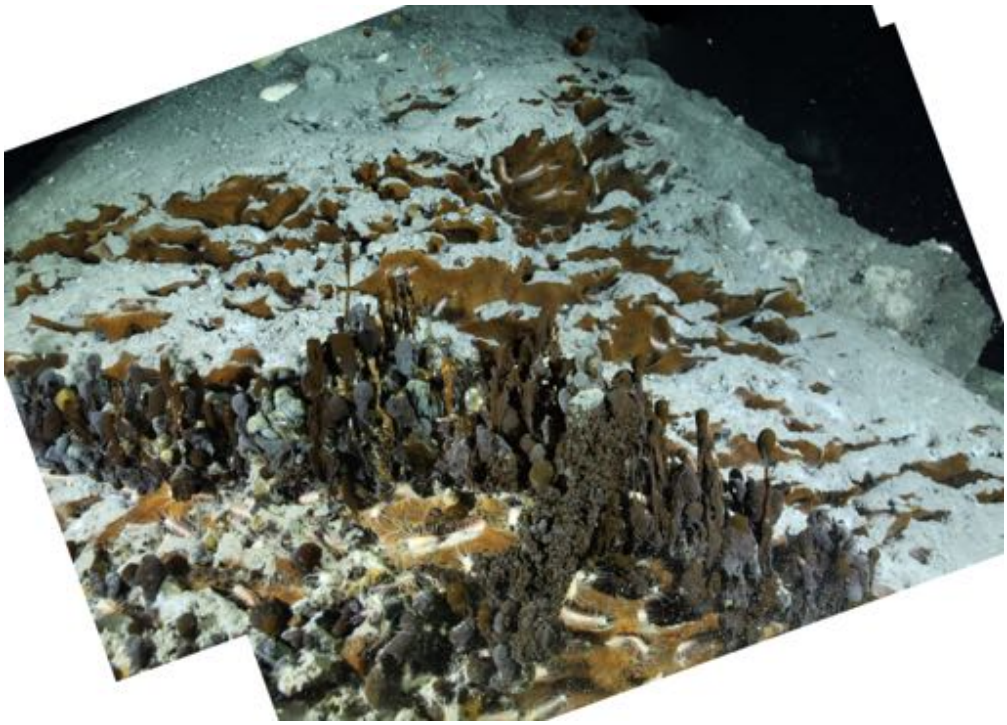

Image Mosaic of a Gas Hydrate Mound at GC600; credit: I. MacDonald

Chief Scientist contact information:
Samantha Joye
Department of Marine Sciences
University of Georgia, Athens, GA, 30602-3636
direct: 706.542.5893
fax: 706.542.5888
electronic mail: mjoye@uga.edu

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Science Party

Name	Affiliation
Samantha Joye (Chief Scientist, PI/PD)	University of Georgia
Ian MacDonald (Scientist, co-PI)	Florida State University
Andreas Teske (Scientist, co-PI)	University of North Carolina
Barbara MacGregor (Scientist, co-PI)	University of North Carolina
Vladimir Samarkin (Scientist, co-PI)	University of Georgia
Joseph Montoya (Scientist)	Georgia Inst. of Technology
Richard Peterson (Scientist)	Coastal Carolina University
Richard Viso (Scientist)	Coastal Carolina University
Matthew Saxton (Post Doc)	University of Georgia
Sairah Malkin (Post Doc)	University of Georgia
Lindsay Fields (Post Doc)	University of Georgia
Kimberly Takagi (Post Doc)	University of Georgia
Verena Salman (Post Doc)	University of North Carolina
Kristen Jolley (Technician)	Georgia Inst. of Technology
Howard Mendlovitz (Engineer)	University of North Carolina
Daniel Hoer (PhD Student)	University of North Carolina
Caroline Johansen (PhD Student)	Florida State University
Sarah Weber (MSc Student)	Georgia Inst. of Technology
Ryan Sibert (PhD Student)	University of Georgia
Mary-Katherine Rogener (PhD Student)	University of Georgia
Jessica Battles (MSc Student)	University of Georgia
Leigha Peterson (PhD Student)	Coastal Carolina University
Mauricio Silva (PhD Student)	Florida State University

Members of the Media

Name	Affiliation
Antonia Juhasz	Independent Journalist
Todd Dickey	University of Georgia

Background, objectives and goals, and cruise synopsis

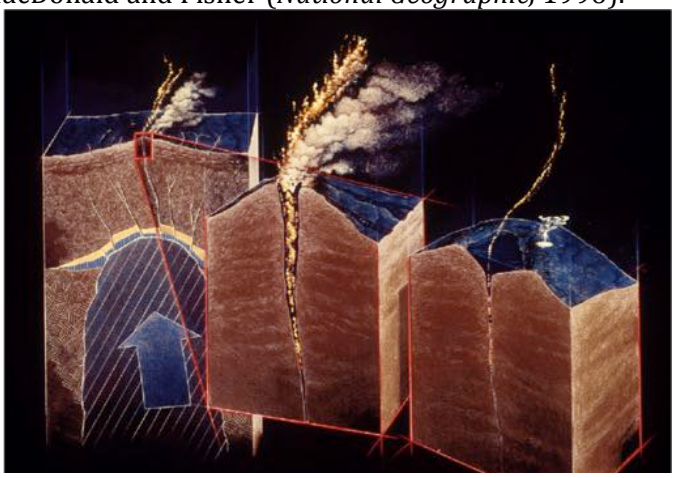
Background

This is the second expedition of an NSF funded project exploring hypersaline ecosystems in the deep sea, "Gulf of Mexico Seafloor Brine Ecosystems". The first expedition, R/V Atlantis AT 18-2, was carried out in November-December 2010. On this expedition, we expanded and advanced the work we began then. The introductory text below is identical to that in the AT 18-2 cruise report and is provided as context for readers who have not read that document.

In the northern Gulf of Mexico (GoM), enormous reservoirs of liquid and gaseous hydrocarbons rest upon Jurassic-age salt deposits. Sediment loading on these salt bodies causes movement and adjustment of salts and is referred to as salt-tectonics. Salt tectonics creates fault networks that serve as conduits for the rapid transfer of oil, gas and brines from deep reservoirs through the sediments to the seafloor (**Fig. 1**).

Brine expulsion generates brine pools, brine-filled basins, and mud volcanoes. This observatory project examines three types of brine ecosystems in the GoM. **Brine pools** occur where brine fills surface depressions creating "lake-like" features on the seafloor. **Mud volcanoes** occur where brine, oil, gas and fluidized mud are actively expelled, inducing large temperature fluctuations and seabed alterations. **Brine basins** occur when brine fills broad basins, leading to accumulation and segregation of brine fluids and creating habitats that are unique compared to brine pools and mud volcanoes.

Fig. 1. Salt tectonics: Fluid flow along the faults associated with the salt diapir (hatched block, L image) result in surface features including mud volcanoes (middle image) and brine pools (R image). From MacDonald and Fisher (*National Geographic,* 1996).



The chemical composition and salinity of brines is certain to influence the structure and activity of the resident microbial community. **The primary hypothesis addressed by this project is that differences in fluid flow generate variability in brine chemical composition, which strongly influences microbial community composition and activity within and between sites.** This hypothesis implies that identifying and quantifying the physical and chemical constraints and their effects on microbial community

composition and activity is essential for developing an ecosystem-level understanding of brine-impacted cold seeps, which are globally distributed marine habitats with the unique role of re-injecting fossil carbon into the living biosphere. Sampling different brine habitats exploits the different fluid flow rates and chemistry of the study sites as natural experimental variables. Fluid flow rates will be characterized by modeling temperature and salinity profiles collected during each visit and monitored between cruises using in-situ sensors to document episodic events. Chemical composition, microbial abundance and community structure, and rates of microbial activity will be quantified using standard methods. Metabolically active microorganisms will be identified using molecular (biomarker; RNA) and stable isotope tracer (^{13}C SIP) methods. Standard techniques will be used to isolate and characterize novel microorganisms.

We will apply a suite of microbiological, biogeochemical, isotopic, molecular, and physiological techniques to document the activity and distribution of microorganisms at brine seeps. Our overall goal is to identify and analyze the microbial populations inhabiting brine seeps characterized by different fluid flow rates and chemical regimes.

Research objectives and goals

This research program has six main objectives:

(1) Quantify the abundance, diversity and activity of microorganisms mediating carbon and sulfur transformations in brine seep habitats;

(2) Quantify the relationship between microbial diversity and activity and environmental gradients;

(3) Identify the environmental controls on microbial activity and distributions;

(4) Identify metabolically active microorganisms;

(5) Elucidate carbon and sulfur flow in the microbial food web using stable isotope studies of biomarkers, DNA and RNA;

(6) Isolate and characterize microorganisms from brine seep habitats.

The project has several **research goals,** aimed at addressing the primary hypothesis and research objectives:

1. Spatio-temporal Variability: Document differences in microbial populations and activity between brine pool and mud volcano sites and between years within a given site (objectives 1, 2).

2. Chemical Composition: Determine how brine chemical composition influences microbial abundance, community composition and activity (objectives 2, 3).

3. Functional and Phylogenetic Diversity: Quantify the microbial metabolisms and key functional genes found across habitats and evaluate how metabolic diversity relates to overall phylogenetic diversity as determined by 16S rDNA and rRNA analysis (objectives 1, 4).

4. Regulation of Microbial Activity: Elucidate the factors – community composition, physiological constraints (e.g., limitation by nutrients or bioactive trace metals, inhibition by salt, or competition for substrates), or environmental factors – that regulate the distribution and activity of microorganisms in seafloor brines (objective 3).

5. Flow of Energy and Carbon: Determine which chemicals serve as primary sources of metabolic energy and cell carbon to support microbial growth (objective 5).

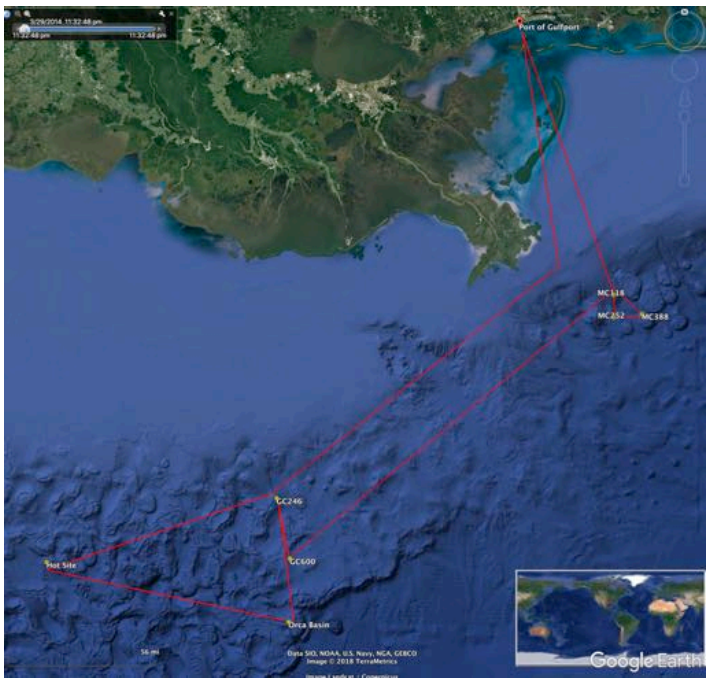
6. Regulation of Sulfur Isotopes**:** Quantify sulfur isotopic fractionation during sulfate reduction to understand the sulfur isotope composition of sulfate and reduced sulfur (objective 5).

7. Novel Microorganisms: Isolate and characterize brine microorganisms (objective 6).

Cruise synopsis

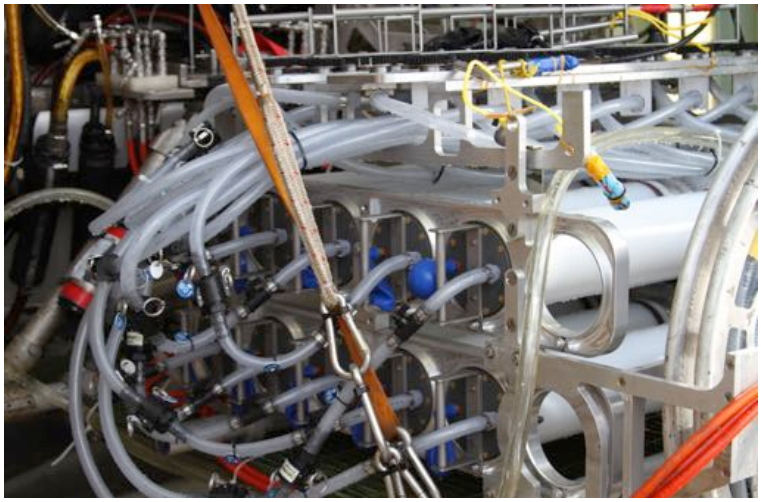
The AT 26-13 Brine Ecosystems cruise track took us from Gulfport, Mississippi to sites across the continental slope (Fig. 2). We conducted seventeen Alvin dives, nos. 4686 to 4702, targeting active mud volcanoes and brine flows, hydrate-derived brine sites, and a brine basin. The general work area was between 27° 19.138N, 92° 06.467W and 28° 51.114N, 88° 29.521W (GB697 to MC118). Operations were conducted around the clock, with Alvin dives occupying our days and CTD casts, multiple coring, and multibeam surveys occupying our nights. Alvin dives were tasked with collecting sample sediments or brine fluid samples. On sediment sampling dives, we used push cores to collect material for biogeochemical, microbial activity, and molecular biological

Fig. 2. 2014 Seafloor Brine Ecosystems Cruise Track.



analyses. Also on sediment sampling dives, small volumes of bottom water were collected with 1L Niskin bottles. On brine sampling dives, discrete profiles of brine fluid were obtained using the Brine Trapper (Fig. 3). The brine trapper consists of a submersible pump, tubing, and gas tight bottles that were opened, flushed, filled, and closed using a hydraulic actuator.

Fig. 3. The Brine Trapper mounted on the front of Alvin (entire instrument, top; and close up of sampling inlets, bottom).



The Brine Trapper was developed at UGA and was first utilized in 2010, on our first Gulf Brine Ecosystems expedition. We modified the instrument substantially after the 2010 cruise and it worked much better on this expedition. We obtained deep brine profiles at variable depth resolution (0.5 to 3m spacing) through the Orca Basin chemocline for biogeochemistry, microbial activity and molecular studies.

Night operations included CTD casts (we completed 26 CTD casts), multiple-coring (we completed 22 MUC collections), and geophysical surveys of each site with the Atlantis' multibeam system.

We lost three dives due to inclement weather and another due to issues with the vehicle. Several other dives were cut short because of issues related to vehicle deployment or battery issues. The loss of these four dives and limited bottom time on others meant that we had to forego operations at three of our study sites (AC601, GC233, and GB425). Bad weather also led us to conduct additional operations at GC600 because we knew that we could conduct successful over-the-side operations in the event of missed ALVIN dives.

Site Descriptions

Hot Site (GB697)

Location: 27˚19.105ºN, 92˚06.422ºW

Depth: 1017m

The Hot Site lies in the Garden Banks 697 (GB697) lease block. This site is characterized by active salt tectonics and gas and oil seepage along the flanks of salt diapirs. The seafloor geology is characterized by numerous topographic highs, overlying shallow salt. The Hot Site is home to a small, highly active, brine pool that discharges copious gas and fluidized mud. The salinity of the discharging fluid is approximately 210‰ and the temperature was elevated substantially above the bottom water. This active brine flow is believed to be geologically young; it lies atop a strong positive amplitude anomaly. There are multiple gas and brine chimneys emanating from flank of salt along the edge of the mound and basin below. The site is characterized more by hydrocarbon flow than mud flow, though some active mud flows are present in the area. Microbial mats, animals, and amazing flow features characterized this site. The Hot Site (GB697) was sampled on dive 4701.

Orca Basin

Location: 26˚56'N, 91˚20'W

Depth: 2500m

The Orca Basin is a deep intraslope basin in the northern Gulf of Mexico, located 345 km SW of New Orleans on the outer continental slope. It straddles the Green Canyon and Walker Ridge lease blocks on the Outer Continental Shelf at depths between 1650 and 2470 m. Orca Basin is an area of numerous sub-basins, salt ridges, salt canopies, breaching salt diapirs, brine lakes, brine flows, and anoxic sediments. The basin occupies ~400 km^2 of seafloor and contains a large, dual-lobed, J-shaped, 220 m deep anoxic brine lake (~260‰). The basin is partially separated into two distinct sub-basins (North and South) by a small, submerged, central ridge. The Orca Basin brines are sourced from a sediment breaching salt sill of Jurassic-aged, Louann salt deposits above the eastern basin flank, rather than from below the seawater-brine interface like many other seafloor brine accumulations. The donated salts are likely comprised at least partially of gypsum, as evidenced by higher sulfate concentrations in the brine as compared to the overlying seawater.

Flowing brine enters the basin from above at a depth of ~2200 m, and mixes with the seawater to produce a chemocline characterized by a ~50 m meter gradient in salt, oxygen, methane, nutrients, metals, and dissolved organic carbon concentrations. The large density differences at the chemocline effectively suppress vertical transport of solutes into and out of the basin, and act as a particle trap. Oxidation of sulfide, ferrous iron, and reduction of manganese

oxides, ferric oxides, and sulfate all occur along the Orca chemocline. Discrete laminations of particulate organic carbon and elevated microbial biomass within the chemocline suggest a trove of complex heterotrophic and chemosynthetic communities that have yet to be identified. High concentrations of biogenic methane at salinities > 200 PSU (>600 μM) suggest viable microbial activity at salinities > 260 PSU.

The sediments in Orca show signs of highly reducing conditions; jet black, pyrite and organic-rich sediments, brilliant red, hematite and cinnabar rich sediments, and pink sediments have all been documented at Orca Basin. Evidence from XRD analysis of red-colored cores retrieved from Orca Basin suggests both periodic and continuous deposition of allochthonous hematite, lending the distinct red hue to the sediments. Levels of iron in the anoxic portions of the brine are nearly 1000 times higher than that of the overriding seawater. There are no detectable levels of sulfide in the anoxic portions of the brine, so hematite and pyrite formation is likely controlled by the availability of sulfide, or the rate of sulfate reduction.

Few studies have focused on the microbial biology in the Orca Basin. The work of Van Cappellen et al. suggests manganese-reducing bacteria within the chemocline, and the presence of biogenic methane hints at methanogenic microbial communities in the deep anoxic brine. Numerous glass sponge gardens, crabs, and shrimp have been observed on past Alvin dives. Future investigations of Orca Basin will illuminate the structure and diversity of microbial communities within Orca. Orca Basin sites were sampled on dives 4698, 4699, and 4700.

GC 246 (Dead Crab Lake)

Location: 27˚42.097N, 90˚38.905W

Depth: ~830m

Green Canyon block 246 (GC246) is located approximately 200 km SW of the Mississippi Delta on the flank of the upper-middle continental slope in the Gulf of Mexico. The GC246 block consists of featureless mud plains rising to a pockmarked bathymetric mound approximately 830 m below the surface of the Gulf. The GC246 mound is complex terrain of slopes, depressions, and plateaus, punctuated by active brine seeps and flows, brine pools, mud-flows, and massive mud volcanoes. Mottled grey sediments cover much of GC246, interrupted occasionally by carbonate outcrops, coral communities, black to milky colored brine flows, ochre mud-flows, white to orange *Beggiatoa* meadows, fields of spent mussel (*Bathymodiolus*) and crab carcasses, and communities of live mussels (*Bathymodiolus*) and snails. With the exception of these few communities of mussels, crabs, bacterial mats, and corals, GC246 is largely devoid of benthic macrofaunal life. Of particular interest at GC246 is Dead Crab Lake (DCL), a brine lake approximately 15 to 25 cm deep. DCL is an active brine seep, ringed with orange mineral crusts, dead mussels, and dead crabs. DSV Alvin dive 4651

revealed a small copse of gas-rich sulfide chimneys surrounded by sulfide-oxidizing mussels, near the DCL site. Sulfide chimneys are usually associated with hydrothermal activity. Given that GC246 is a cold seep, these chimneys suggest exotic subsurface mineralogy, geochemistry, or chemically distinct source fluids.

Both white and orange *Beggiatoa* meadows are common in GC246. Small communities of soft corals (*Callagorgia*) and brittle stars (*ophiuroidea*) inhabit the occasional carbonate hardground outcrop in GC246. *Bathmodiolus* mussels, snails, crabs, sea cucumbers (*Benthodytes*), and isopods (*Bathynomus giganteous*) have all been identified in varying degrees of abundance at GC 246, usually in close proximity to active seep sites. GC246/Dead Crab Lake was sampled on dives 4694 and 4702.

GC600

Location: 27.36961N -90.56930W

Depth: 1180 m

Green Canyon Block 600 (GC600) is located at a depth of 1180 m approximately 260 km SW of the Mississippi Delta, on the upper-middle continental slope of the GoM. GC600 is one of the largest natural oil seeps in the GoM, ejecting enough oil and gas reserves into the water column to produce numerous persistent oil slicks at the surface. Active fluid-gas expulsion of hydrocarbons at GC600 supports numerous chemosynthetic communities at the seafloor. A NW-SW trending bathymetric ridge is the dominant feature at GC600. This ridge bifurcates the site into two intraslope basins. Observational data obtained through drift camera work with the DSV Alvin confirms a heterogeneous patchwork of fractured carbonate hardground outcrops and blocs, oil-laden anoxic sediments, brine pools and flows, gas hydrate mounds, barite deposits, fluid-gas discharge, and chemosynthetic communities dominating the local geology. Previous work by Roberts et al. (2010) shows that carbonate species are predominantly composed of authigenic high-magnesium calcite and aragonite.

The highly fractured carbonate pavements of GC600 act as conduits for oil and gas expulsion. The flux of oil and gas through these fissures provide ideal habitat for a number of benthic chemosynthetic fauna, including tube-worms, mussels, and bacterial mats. *Lamellibrachia* occupy GC600 as single individuals or as small communities growing out of active fissures. Colonial cnidarians (i.e. *Gorgonian*), mollusks (predominantly *Bathymodiolus brooksi* and *Calyptogena ponderosa*), and bacterial mats (*Thiomargarita* and *Beggiatoa*) are also commonly observed near active seepage of oil and gas. Seepage of gas at GC600 and similar sites across the GoM results in spontaneous formation of gas hydrate and this results in formation of residual brine. GC600 was sampled on dives 4689, 4690, 4691, 4692, and 4693 as well as dives 4695 and 4696.

MC118

Location: 28˚51.47N 88˚29.52W

Depth: 880 m

Mississippi Canyon Block 118 (MC118) is located approximately 80 km SE of the Mississippi Delta on the upper continental slope of Louisiana. At 880m depth, the MC118 range supports abundant chemosynthetic fauna in a complex terrain of hydrocarbon seeps, authigenic carbonate pavements, brine flows, mud volcanoes, and exposed methane hydrate outcrops. MC118 overrides a salt diapir, the movement of which results in a complex fault architecture that act as a conduits for oil and gas export to benthic sediments. Benthic oil and gas expulsion at MC118 gives rise to gas and oil laden sediments, providing ample substrate for chemosynthetic mussels and bacterial colonies.

Seep sites and breaching hydrates at MC118 are host to fields of white *Beggiatoa* mats, *Siboglinidae* tube worms, and *Hesiocaeca methanicola* worms. Moderate methane flux and the persistence of bacterial *Beggiatoa* mats and other subsurface microbial communities have resulted in carbonate pavements and poorly cemented carbonate hardgrounds, ideal habitat for clams (*Calyptogena ponderosa*), corals (*Gorgonacea*, *Chrysogaorgia sp*, and *Madrepora*), and brittle stars (*Astroschema ophiuroid*). Golden crabs, hagfish, and sea cucumbers (*Holothuroidae*) have all been identified at MC118. MC118 was sampled on dive 4686.

MC253

Location: 28° 43.375'N, -88°19.581'W

Depth: 1500m

The MC253 site is an area of mounded topography and carbonate pavement to the east of the MC252 site. The dive target lies on the NW edge of Biloxi Dome, a flat-topped salt dome at about 1500 m depth. The purpose of this dive was to assess the possibility for brine and oil seepage at this site. No active oil plumes were observed but abundant carbonate outcrops and pavements were noted as were small tar/asphalt discharges. Some of the recovered cores were oily. The carbonate outcrops were colonized by meiofauna but there were not many corals or bryozoans. A few small mounds were observed and a subset of these appeared to have either tar or asphalt wicking from topographic highs. No significant seepage of oil, gas or brine was observed at the site. The sediments are oily but rates of discharge are clearly low here. This appears to have supported higher rates of seepage in the past and is less active now. MC253 was sampled on dive 4688.

MC252

Location: 28° 42.184' N, 88° 21.653'W

Depth: 1620 m

Mississippi Canyon Block 252 (MC252) is located in the Northern Gulf of Mexico on the mid continental slope south of the Louisiana coastline. At a depth of ~1620 m, MC252 is home to the now infamous Macondo prospect; the deep-sea drilling platform *Deepwater Horizon* (hired by BP) exploded on April 20th, 2010 during drilling operations in the Macondo prospect, killing 11 workers, releasing an estimated 62,000 to 84,000 barrels of oil per day (159 L per barrel) into the Gulf of Mexico for a duration of 84 days. Sediment breaching methane hydrates, deeply incised sediments (presumably from the Mississippi river), carbonate hardgrounds, salt diapirism, salt tectonics, and massive reserves of gas and liquid hydrocarbons are common features at MC252. Thick sediment layers override the massive Jurassic-aged Louann salts deposits common to the continental slope in the GoM. Prior to the Macondo well blowout, sediments were composed of predominantly grey mud. Now, sediments near the wellhead in MC252 have a distinct top layer (~5 cm) of brown, recently sedimented oil, displaying varying degrees of microbial degradation. MC252 was sampled on dive 4687.

Day-by-day narrative

March 28, Friday: Arrival in Gulfport and boarding RV Atlantis

The science parties arrived from across the USA along with their personal gear and all of the equipment and supplies for the cruise. Unpacking of boxes and equipment and organization of the shipboard labs began in earnest.

March 29, Saturday: Mobilization and Set up

Mobilization continues with the goal of setting up, calibrating and testing all the instruments before we sail on March 30. One of the biggest jobs is setting up the Brine Trapper—it's H.E.A.V.Y. and we had to optimize it for working with Alvin. UGA scientists and Alvin crew were up late into the night doing this critical job. The science party also spent part of the morning doing the mandatory safety training, including trying on those comfy survival suits.

March 30, Sunday: Departure of Gulfport Mobilization and Set up, initial sampling

The ship sailed from Gulfport around 0900 en route to our first sampling site, OC26. Instrumentation set up and configuration of the labs continued during transit. The Alvin safety training was completed during the transit as well. Upon arrival at OC26 the PIT trap was deployed (PIT-1) at 22:00. This was followed by the first multiple corer deployment (MUC-1) and the collection of several oily sediment cores.

March 31, Monday: MC118

Dive-4686; Pilot-B. Strickrott; Science-Mandy Joye, Joe Montoya

Before leaving OC26 we conducted a CTD cast (CTD-1). Following the cast we transited to MC118, the site of the first Alvin dive. This site is a natural seep and the site of a long-term gas hydrate microbial observatory. A "marine oil-snow" layer was observed across this area in 2010. Diverse animal life was observed as expected at an active methane seep. The Sleeping Dragon hydrate mound was visited and extensive high definition video was collected. The ALVIN experienced a hard ground fault on the starboard battery, so bottom time was cut in half. Despite this, we accomplished most of objectives in the dive plan, collecting 10 oily push cores, 5 Niskins and 2 carbonate rocks. The Alivin dive was followed by a MUC-2 and a Mocness deployment (MOC-1).

April 1, Tuesday. OC26/MC252

Dive-4687; Pilot-R. Waters; Science-Mandy Joye, Antonia Juhasz

At 03:10 we conducted a final CTD deployment at MC118 followed by transit to OC26/MC252 for an Alvin dive. On this dive, we re-sampled and re-surveyed areas that were sampled on expedition AT_18-2 in December 2010. Significantly more animal life was observed on this dive, compared to that observed during

the 2010 dive. The "marine oil snow" layer is still there and was apparent. During coring, 1 to 2 inch layer of brown, caramel-colored material was observed to overlay the sediment. We surveyed a broad area traveling almost 2.5 km during the dive. We collected 4 sets of sediment cores and 5 Niskins; we did not see any mussels, clams or carbonate. Following the dive, the PIT-1 was recovered at 18:45. We then returned MC118 for two CTD deployments, one directly into a bubble plume and one ~100m adjacent (CTD-3 & 4).

April 2, Wednesday. MC253

Dive-4688; Pilot-P. Hickey, Science-Ian MacDonald, Caroline Johansen.

We transited to OC26 to perform a multibeam survey in the area of the Deepwater Horizon wellhead (MB-1). This was followed by a short transit (1.5 hrs) to MC253 for an Alvin dive. The dive site is on the NW edge of Biloxi Dome, a flat-topped salt dome at about 1500 m depth. Following initial difficulty identifying active seepage, a seep site was located. All cores release oil and gas bubbles. All of our subsequent sampling was done at this location or at white mats less than 20 m from this location. Following the dive we transited 14hrs to GC600.

April 3, Thursday. GC600 (dive 1 of 7)

Dive-4640; Pilot-B. Strickrott, Science-Mandy Joye, Kim Takagi.

This dive targeted the GC600 site, a very active natural oil and gas seepage field that is known for hydrate-derived brine seepage. The dive had to be aborted early (we were called to the surface around 11:30) because of an injury onboard the ship that required immediate transport of the injured sailor to shore. Despite the short dive, we obtained exceptional video of hydrates, oil chimneys, and ice worms, collected 17 sediment cores from a control site (no oil and no gas flux) and 5 brine trapper bottles. We also collected 4 very large mussels that were living in a pool of oil.

April 4, Friday. GC600 (dive 2 of 7)

Dive-4641; Pilot-R. Waters, Science-Ian MacDonald, Barb MacGregor.

Prior to the Alvin dive the PIT (PIT-2) was deployed. This dive targeted the Birthday Candles site in block GC600. This site is home to active oil and gas co-seepage. Hi-dev video and photos of the Birthday Candles area were collected. Ten sediment cores were collected from a brine flow as were several mussels and carbonate rocks. A deployed high definition time-series camera was also deployed near an active seep. Following the dive, an elevator with ADCP, laser METS, O2, pCO2 sensors was deployed for positioning on a subsequent dive. With the remainder of the night a multibeam survey (MB-2) and two CTD casts were performed (CTD-5 &6).

April 5, Saturday. GC600 (dive 3 of 7)

Dive-4691; Pilot-P. Hickey, Science-Andreas Teske, PIT

This dive targeted the Megaplume oil and gas seepage site. In total, 24 sediment cores were collected from several microbial mats. Microbial mat dye chambers were also deployed on this dive. Additional deployments on this date included two CTD casts (CTD-7 & 8).

April 6, Sunday. GC600 (dive 4 of 7)

Dive-4692; Pilot-B. Strickrott, Science-Mandy Joye, Matt Saxton.

During this dive, the elevator was retrieved and positioned directly adjacent to bubble plume Megaplume; the intake was about 50 cm from the bubble plume. While transiting to possible brine pool position we stopped to collect mussels that were living in an oiled area. Several large mussel clusters were attached to a carbonate rock. Many other large mussel clusters observed in transit to brine pool. We discovered brine seepage and a brine pool and subsequently referred to this area as "Cobra Brine". We collected 22 sediment cores and 3 brine trapper bottles. We experienced a CO_2 scrubber issue that caused us to abort the dive and conduct and emergency ascent; we left the bottom several hours early. Remainder of the day included Mocness deployment (MOC-3), PIT-2 recovery, MUC-3, and CTD 9.

April 7, Monday. GC600 (no dive)

DIVE cancelled due to technical issues associated with CO_2 scrubber.

Since we were unable to dive, we focused on multiple coring (MUCs 4 & 5), a CTD (CTD-10) cast, and two Mocness deployments (MOC-4 & 5).

April 8, Tuesday. GC600 (no dive)

DIVE cancelled due to bad weather

As with the previous day, with no Alvin dive operations focused on multiple coring (MUCs 6, 7 & 8) and CTD (CTD-11 & 12) collections, in addition to a multibeam survey (MB-3).

April 9, Wednesday. GC600 (dive 5 of 7)

Dive-4693; Pilot-R. Waters, Science-Howard Meldolvitz, PIT.

Dive 4693 turned into a short afternoon dive due to a weather-associated delay in launch time. We had less the two-hours to conduct operations. We the major task of retrieving both the lander and VTLC, both of which were positioned at megaplume. We also collect water using the Niskins around this area. Cores were collected in front of the VTLC and across from the rim of the MegaPlume crater. Collections from the remainder of the day included four CTD deployments (CTD-13, 14, 15 & 16).

April 10, Thursday. GC246 (dive 1 of 2)

Dive-4647; Pilot-P. Hickey, Science-Andreas Teske, Verena Salman

The target for this dive was the "Dead Crab Lake" brine pool. To our surprise

to pool appeared to have filled in with cement-colored grey sediment since it was last sampled. Twenty-four sediment cores were collected across the site, including several in the previous position of the lake bed and along the periphery. A VTLC was positioned facing small brine pool. Dive surfaced 2.5 hours early because of battery issues. Following Alvin dive, multiple coring (MUC-6, 7, 8 & 9) and CTD (CTD-17 &18) collections were performed, in addition to a multibeam survey (MB-4).

April 11, Friday. GC600 (dive 6 of 7)

Dive-4695; Pilot-B. Strickrott, Science-Mandy Joye, Mary-Kate Rogener.

This dive experienced significant navigational issues. There was an offset between the targets in the dive computer and those in the dive plan (this was later shown to be a systematic problem with the dive computer). The goals of this dive were to reposition a VTLC to the Birthday Candles site, collect high definition video while there, and visit the nearby Cobra Brine Pool to collect mussels and sediment. Navigation issues made it difficult to locate Birthday Candles. As a result VTLC was deployed at a small oil chimney. We collected 21 cores, 5 Niskins, 2 brine bottles and a bunch of mussels. Following Alvin dive, multiple coring (MUC-10) and CTD (CTD-19, 20 & 21) collections were performed

April 12, Saturday. GC600 (dive 7 of 7)

Dive-4696; Pilot-R. Waters, Science-Ian MacDonald, Mauricio Silva.

We returned to the large hydrate mound documented on dives 4689 and 4690. The objective was to collect gas and oil chimney samples as well as to use the "Beast Cam" to obtain high definition pictures of the asphalt chimneys. A VTLC to monitor gas/oil seepage rates over the long term was deployed during the dive. From there we searched for coring sites including dark mats, sulfidic mats, and orange mats. Mussels and carbonate rocks were collected. The dive surfaced 2.5 hours early because of battery issues. Multiple coring (MUC-11) and CTD (CTD-22, 23 & 24) collections were performed before the 4hr transit to Orca Basin.

April 13, Sunday. Orca Basin (dive 1 of 4)

Dive-4650; Pilot-P. Hickey, Science-Mandy Joye, Sairah Malkin.

Prior to the dive the PIT (PIT-3) was deployed and a CTD cast (CTD-25) was conducted with methane sensors added to the rosette to locate the methano-clines. The target for this dive was the north Orca Basin brine basin. As descending through brine numerus layers of animals – shrimp, amphipods, copepods, gel, zooplankton, salps and larvaceans were observed. Samples of these various layers were collected using the brine trapper but we were unable to core along the bottom because the ALVIN was not heavy enough. Following the dive two CTD casts (CTD-26 & 27) and multibeam mapping were performed.

April 14, Monday. Orca Basin (no dive)

DIVE cancelled due to weather

Since we were unable to dive, we collected PIT-3 and then focused on multiple coring (MUCs 12 & 13) and CTD (CTD-28) collections. MUC collections on this date resulted in sediment cores without overlying water. MUCs at this site are difficult due to soupy sediments. Night ops were canceled due to inclement weather.

April 15, Tuesday. Orca Basin (no dive)

DIVE cancelled due to weather

Several multiple coring attempts (MUC-14, 15 & 16) were carried out, resulting in collection several acceptable cores (but over penetration remained a problem).

April 16, Wednesday. Orca Basin (dive 2 of 4)

Dive-4698; Pilot-B. Strickrott, Science-Joe Montoya, Sarah Weber.

Prior to the dive, an overnight multibeam survey (MB-6) and two CTD casts were conducted (CTD-29 & 30). This dive aimed to sample the chemocline of the Southern Orca Basin with the goal of collecting a profile of samples through the upper layer of brine using the brine trapper. During the descent, we saw a great deal of marine snow and numerous mucilaginous flocs, particularly below 1000 m depth. We used the brine trapper to collect triplicate samples at five depths starting at the greatest depth the sub could reach (2195 m). After filling 15 sample chambers, we ascended to ca. 2186m to try to collect zooplankton using the 16th brine trapper chamber. The weight at the end of the brine trapper hose made it difficult to use in collecting zooplankton, but we laid the probe on the basket and attempted to collect both zooplankton and marine snow. Following the dive two sediment (MUC-17 &18) and two CTD (CTD-31 & 32) were performed, as well as one multibeam survey (MB-7).

April 17, Thursday. Orca Basin (dive 3 of 4)

Dive-4699; Pilot-R. Waters, Science-Mandy Joye, Ryan Sibert.

The target of this dive was the saddle between the two deep basins that comprise Orca Basin. A primary goal was to observe and describe the large salt diapirs that are the source of the Orca Basin brine. A large salt diapir with apparent flow features was observed. Glass sponges were observed and collected as were sediment cores. Around 11:30 AM, we received a report of very bad weather at the surface and the dive was aborted. The ALVIN was parked on a salt diapir to await further instructions. The dive party then waited for several hours on the bottom to find an acceptable recovery window. Recovery took place in heavy seas and as a result the basket broke off. The safety lines held so the basket and most samples were not lost. One CTD cast (CTD-33) was performed after the dive.

April 18, Friday. Orca Basin (no dive)

DIVE cancelled because of junction box repairs.

Since we were unable to dive, we focused on multiple coring (MUC-19 & 22) and CTD (CTD-34, 35 & 36) collections as well as a Mocness deployment (MOC-6). Continued issues with weighting on multiple corer resulted in multiple three failed and one successful attempts. A multibeam survey (MB-8) was also performed.

April 19, Friday. Orca Basin (dive 4 of 4)

Dive-4700; Pilot-R. Waters, Science-Rich Viso, PIT.

The goal of this dive was to sample the glass sponge gardens and sediments of the large salt diapir observed in dive 4699. The top of the escarpment was covered in several centimeters of brown sediment with a crusty white layer about 1-2 cm thick. Beneath were pink and white mineral exposures. We selected this escarpment for our first coring site and had a mechanical failure on the port manipulator, with hydraulic oil leaking from near the wrist. This limited coring activity and four cores, three Niskins, and a brine trapper sample were taken at the escarpment. We then transited to the sponge garden and collected 4 sponges, two more niskins, and one core. Following sponge collection, we cored a very steep seepage face. We were able to target horizontal cores of pink and white/light tan mineral exposure. In general, cores were very loosely consolidated at both sites and multiple efforts were required on several of the coring attempts. Following the dive MUC-23 and CTD casts 37 & 38 were performed before transiting to GB697.

April 20, Saturday. GB697

Dive-4701; Pilot-B, Strickrott, Science -Mandy Joye, Lindsey Fields.

After arriving on site at 05:00 a multibeam survey of the hot site was performed (MB-9). The targets of this dive are large mud flow features around a central salt diapir. A large mud flow feature was quickly observed and several sediment cores collected. Several large microbial mats were observed and sediment cores and water at these sites were sampled. A VTLC was deployed at the start of the dive and collected before ascent. In all, 21 sediment cores were collected along with water samples collected with brine trapper and Niskins. Following the dive two CTDs (CTD-39 & 40) and one multiple core (MUC-24) sample collection were performed.

April 21, Sunday. GC246 (dive 2 of 2)

Dive-4657; Pilot-R. Waters, Science-Rick Peterson, Joy Battles.

This dive returned to Dead Crab Lake. The goals of this dive were to collect microbial mat sediments, recover a VTLC, and collect mussels. We accomplished most of objectives laid out in the dive plan, collecting 22 push cores (including a dyed sediment transect through an orange mat, lake sediments, and various other colored mineral crusts), a photo-mosaic survey of the site, 5 Niskins, 1 brine trapper bottle, mussel collection, and recovery of the VTLC and a thermister mooring. After the dive, we began the transit to Gulfport.

April 22, Monday, arrival, and April 24, Tuesday, de-mobilization.

Atlantis arrived in Gulfport harbor overnight April 21. Instruments were taken down, the gear and supplies in the labs were packed back up, and samples were prepared for shipment back to our respective home institutions. De-mob was uneventful and everyone departed the ship by early afternoon on April 24th.

Plans of the Day

POD-1: AT-2613 - 3/30/14 (through early AM 4/1/14)

ETA on Station OC26 03/30/14 @ 22:30.

Stations:	**latitude**	**longitude**	**depth (m)**
1. OC26 (PIT)	28 42.184	88 21.653	1625
2. Asphaltene Hwy (MUC-1)	28 43.458	88 21.870	1621
3. OC26 (MUC-2)	28 42.001	88 21.673	1625
4. OC26 (CTD-1)	28 42.001	88 21.673	1625
5. dive @ MC118 (#4686)	28 51.069	88 29.582	950
6. MC118 (MUC-3)	28 51.425	88 29.452	950
7. MC118 (CTD-2, CTD-3)	28 51.069	88 29.582	950
8. OC26 (MOC-1)	28 42.001	88 21.673	1625
9. MC252D (MUC-4)	28 44.481	88 20.734	1725
10. dive @ OC26 (#4687)	28 42.271	88 21.508	1611

Order of Operations.

Arrive on Station (ETA) 22:30

Operation	**Time**	**Date**
1. Deploy Pit Trap @ OC26	22:45-00:45	3/30/14
2. MUC @ Asphaltene HWY (MUC-1)	01:00-03:35	3/31/14
3. CTD @ OC26 (CTD-1)	04:00-06:00	3/31/14
4. CTD @ OC26 (CTD-2)	06:00-08:00	3/31/14

5. Transit to MC118 (~10 nm)	**~1 hr**	
6. Alvin Dive 4686	10:00-17:00	3/31/14
7. Multiple Core @ MC118 (MUC-2)	18:30-20:15	3/31/14
8. CTD @ MC118 (CTD-2, CTD-3)	21:00-00:30	3/31/14
9. Transit to OC26	**~1 hr**	
10. MOCNESS @ OC26 (MOC-1)	1:30-5:30	4/1/14
Multiple Core @ MC252D (MUC-3)	6:00-7:45	4/1/14
Alvin Dive 4687@ OC26	08:30-17:00	4/1/14

POD 2 - AT26-13 – Evening Ops 3/31/14; dive #4687 on 4/1/14

Stations:	**latitude**	**longitude**	**depth (m)**
1. MC118	28 51.137	88 29.523	890
2. OC26 Dive Site (#4687)	28 42.271	88 21.508	1630

Order of Operations (identical to those on POD-1, ops 6-10).

Operation	**Time**	**Date**
1. Multiple Core @ MC118 (MUC-2)	18:00-21:00	3/31/14
2. MOCNESS @ MC118 (MOC-1)	21:00-03:00	4/1/14
3. CTD @ MC118 (CTD-2)	3:00-6:30	4/1/14
4. Transit to OC26	**~1 hr**	
5. *Alvin Dive 4687 @ OC26*	08:00-17:00	4/1/14

(Mandy Joye and Antonia Juhasz are diving)

POD-3 - AT26-13 – Evening Ops 4/1/14; Dive 4688 on 4/2/14

Stations:	latitude	longitude	depth
1. PIT recovery	Joe will provide recovery location		1000
2. MC118	28 51.137	88 29.523	890
3. MC253	28.6340	-88.1700	1500

Order of Operations.

Operation	Time	Date
1. Transit	**~1 hr**	**4/1/14**
2. Recover PIT Trap	18:30-20:30	4/1/14
3. Transit to MC118	**~0.5 hr**	**4/1/14**
4. CTD @ MC118 (CTD-3) (in plume)	21:00-00:00	4/1/14
5. CTD @ MC118 (CTD-4) (out plume)	00:30-03:00	4/2/14
6. Additional tasks as need at MC118 (surface water collection)		
7. Transit to MC253	**~0.5 hr**	**4/1/14**
8. Alvin Dive 4688 @ MC253	08:00-17:00	4/2/14

(Ian MacDonald and Caroline Johansen are diving)

POD-4 - AT26-13 –Dive 4688 on 4/3/14; Evening Ops 4/3-4/14

Stations:	latitude	longitude	depth (m)
1. GC600	27 21.860	90 33.823	1250

Order of Operations @ GC600

Operations	Time	Date
1. Transit to GC600	**~12 hrs**	**4/2/14**
2. Alvin Dive 4689 @ GC600	08:00-17:00	4/3/14
3. Multibeam mapping	17:30-23:00	4/3/14
4. CTD @ GC600	23:30	4/3/14
5. CTD @ GC600	03:00	4/4/14

Note: The dive was aborted ca. 11:30 and all additional ops were cancelled because of an injury to a member of the ship's crew, which required us to motor to SW Pass to transfer him to a USGC rescue vessel. Other operations were delayed/rescheduled.

POD-5

AT26-13 –Dive 4690 on 4/4/14; Evening Ops 4/4-5/14

Stations:	latitude	longitude	depth
1. GC600	27 21.860	90 33.823	1250

Order of Operations at GC600

Event	Time	Date
1. Deploy PIT trap	10:00	4/4/14
2. Alvin Dive 4690 @ GC600	10:30-17:00	4/4/14
3. Multibeam mapping survey	17:30-23:30	4/4/14

5. CTD @ GC600 - in gas plume	23:30-02:00	4/4-5/14
6. CTD @ GC600 - out of plume	3:30-5:00	4/5/14

POD-6

AT26-13 –Dive 4691 on 4/5/14; Evening Ops 4/5-6/14

Stations:	**latitude**	**longitude**	**depth**
1. GC600	27 21.860	90 33.823	1250

Order of Operations at GC600

Operations	**Time**	**Date**
1. Alvin Dive 4691 @ GC600 *(Andreas Teske, PIT)*	08:00-17:00	4/5/14
2. CTD @ GC600 (CTD-7)-out of plume	18:00-20:30	4/5/14
3. CTD @ GC600 (CTD-8)-in plume	21:00-11:30	4/5/14
4. Mocness @ GC600 (MOC-2)	00:00-04:00	4/6/14

POD-7

AT26-13 –Dive 4692 on 4/6/14; Evening Ops 4/6 and 4/7/14

Stations:	**latitude**	**longitude**	**depth (m)**
1. GC600	27 21.860	-90 33.823	1250
2. GC246	27 42.198	-90 39.011	1000

Order of Operations at GC600

Operation	**Time**	**Date**
1. Alvin Dive 4691 @ GC600	08:00-17:00	4/6/14
(Mandy Joye, Matthew Saxton)		
2. Multiple Core @ GC600	18:30-20:30	4/6/14
3. CTD @ GC600 - out of plume	21:00-23:30	4/6/14
4. CTD @ GC600 - in gas plume	02:00-04:00	4/7/14

<<ABORTED TRANSIT TO GC246 BECAUSE OF ALVIN ISSUE>>

POD-8

AT26-13 –NO Dive – Resolving Scrubber problem

Station:	**latitude**	**longitude**	**depth**
1. GC600	**27 21.860**	**90 33.823**	**1250**

Order of Operations at 4/8/14 (no dive)

Operation	**Time**	**Date**
1. Multiple core @ GC600 (27.36757, -90.5661)	10:00	4/8/14
2. CTD @ GC600 East (between 27 25.6967, -90 26.2061 and 27 25.4164, -90 26.1388) exact location to be determined by the MBES **We're going to drop at least 4 CTDs	12:00	4/8/14
3. Control Multiple Core (27 23.7746, -90 30.09904)	T.B.D.	T.B.D.

POD-9

AT26-13 –Dive 4693 on 4/9/14; Evening Ops 4/9/14 to 4/10/14

Station:	**latitude**	**longitude**	**depth**
1. GC600-East	27 25.4326	-90 26.1388	1220
2. GC600-West	27 22.0161	-90 34.0146	1300

Order of Operations

Operation	**Time**	**Date**
1. Plume-1 CTD (trip bottles @ 6 depths on PLUME-1)	06:00	4/9/14
2. Re-position to Plume-2 (trip bottles @ 6 depths on PLUME-2)	8:30	4/9/14
3. Tow-Yo Southern Line (W to E) (trip bottles @ 6 depths on SW corner and 1 depth @ middle and SE corner)	11:00	4/9/14
4. Stay positioned @ NE corner (trip bottles @ 6 depths on NE corner)	13:30	4/9/14
5. Tow-Yo Middle Line (trip bottles @ 6 depths on MW corner and 1 depth @ middle and ME corner)	16:00	4/9/14
6. Stay positioned @ ME corner (trip bottles @ 6 depths on ME corner)	18:30	4/9/14
7. Tow-Yo Northern Line (trip bottles @ 6 depths on NW corner and 1 depth @ middle and NE corner)	21:00	4/9/14
8. Stay positioned @ NE corner (trip bottles @ 6 depths on NW corner)	23:30	4/9/14
9. Multicore @ GC600 (27º 22.0161, -90º 34.0146)	02:00	4/10/14
10. Transit to GC246		

POD-11

AT26-13 –Dive 4694 - 4/10/14 to 4/11/14

Station:	latitude	longitude	depth
1. GC246:	27° 42.128	-90° 38.892	867m
2. GC600, B-day can.	27° 21.871	-90° 33.775	1225m

Order of Operations

Operation	Time	Date
1. Alvin dive # 4694 @GC246	08:00	4/10/14
2. Multibeam @ GC246 (waypoints to be provided by Rich Viso)	18:00-12:30	4/10/14
3. CTD at gas plume targets or above the Brine lake	12:30	4/11/14
4. CTD at gas plume targets or above the Brine lake	02:30	4/11/14
5. Transit to GC600, Birthday Candles Target for Dive #4695	05:00	4/11/14

POD-12

AT26-13 –Dive 4694 - 4/11/14 to 4/12/14

Station:	latitude	longitude	depth
1. GC600, B-day candles	27° 21.860	-90° 33.791	1225m

Order of Operations

Operation		Time	Date
1.	Alvin dive # 4695 @GC600 Drop target: Hydrate (Cobra) Brine Pool	08:00	4/11/14
2.	Multicore @ GC600 (27 21.896, -90 33.792; this might require two attempts)	18:00-20:00	4/11/14
3.	CTD surface (3m) water (take home water, @ megaplume, 27 22.206, -90 34.254)	20:00	4/11/14
4.	CTD full profile (@ megaplume, 27 22.206, -90 34.254)	21:00	4/11/14
5.	Multicore @ GC600 (near oily brine: 27 21.896, -90 33.792; 2nd attempt, if necessary)	23:30-01:30	4/12/14
6.	CTD bottom water (5-10 m off) (take home water , @ megaplume 27 22.206, -90 34.254)	02:00	4/12/14
7.	Transit to GC246 for Dive #4696		

POD-13

AT26-13 –Dive 4694 - 4/12/14 to 4/13/14

Station:	latitude	longitude	depth
1. GC246:	27 42.128	-90 38.892	867m
1. GC234:	27 44.730	-91 13.330	660m

Order of Operations

Operation		Time	Date
1.	Alvin dive # 4696 @GC246 Drop target: old brine pool, new mud flow	08:00	4/12/14

2. CTD in gas plume (target from MBES data)	18:00	4/12/14
3. CTD in gas plume (if necessary; target from MBES data)	20:00	4/12/14
4. Transit to GC234 (ca. 30 nm, 27 44.730 -91 13.330)	20:00	4/13/14
5. Multibeam @ GC234 (Rich Viso will provide waypoints)	00:30-07:00	4/13/14

6. Dive #4697 @ GC234 (Described on tomorrow's POD)
<note, dive @ GC234 was ultimately scrubbed>

POD-14

AT26-13 –Dive 4694 - 4/13/14 evening 4/14/14 all day

Station:	**latitude**	**longitude**	**depth**
1. GC600:	27 22.206	-90 34.254	1225m
2. Orca Basin:	27 0.406,	-91 17.326	2385m

Order of Operations

Operation	**Time**	**Date**
1. Alvin dive # 4696 @GC600	08:00	4/13/14
2. Multicore @ GC600 (27 21.896, -90 33.792)	18:00-19:30	4/13/14
3. CTD surface (3m) water (take home water, @ megaplume, 27 22.206, -90 34.254)	19:40	4/13/14

4. CTD bottom water (5-10 m off) 20:30 4/13/14
(take home water , @ megaplume 27 22.206, -90 34.254)

5. CTD full profile 21:30 4/13/14
(@ megaplume, 27 22.206, -90 34.254)

6. CTD full profile 23:30 4/13/14
(@ megaplume, 27 22.206, -90 34.254)

Once CTD is on deck, transit to Orca Basin

7. Transit to Orca Basin for Dive #4697 01:30-05:30 4/14/14
(27 0.406, -91 17.326; 2385m, chemocline @ ca. 2200m)

8. Once on station at Orca, drop the CTD 05:30 4/13/14
for a deep profile – this is mainly to obtain
hydrographic data so we know where the
chemocline is and what the methane profile is

9. Alvin Dive # 4697 @Orca Basin North 08:00 4/14/14
Drop target: 27 0.406, -91 17.326; 2385m, chemocline @ ca. 2200m

10. Multibeam @Orca Basin North 17:00-00:00 4/14/14
Rich Viso will provide targets for the Northern Basin

11. Shallow CTD @ N Orca 00:00 4/14/14
27 0.406, -91 17.326; 2385m, chemocline @ ca. 2200m
(0-2200m)

12. Deep CTD @ N Orca 02:30 4/14/14
27 0.406, -91 17.326; 2385m, chemocline @ ca. 2200m
**fine tune depth selections from Frannatech data from first cast (Op 8)
(2180m – 2380m; 2180, 2200, 2220, 2240, 2245, 2250, 2275, 2325, 2375)

13. Deep CTD @ N Orca 02:30 4/14/14
27 0.568, -91 15.516; 2385m, chemocline @ ca. 2200m
**fine tune depth selections from Frannatech data from first cast (Op 8)
(2200m – 2380m; 2180, 2200, 2220, 2240, 2245, 2250, 2275, 2325, 2375)

13.	Multiple Core @ N Orca 27 0.406, -91 17.326; 2390m, chemocline @ ca. 2200m **fine tune depth selections from Frannatech data from first cast (Op 8) (2200m – 2380m; 2180, 2200, 2220, 2240, 2245, 2250, 2275, 2325, 2388)	05:00	4/14/14

POD-15

AT26-13 - 4/14/14 – NO DIVE (weather)

Station:	latitude	longitude	depth
1. S Orca Basin-CTD	26 54.988	-91 23.148	2370m
2. S Orca Basin-Alvin	26 54.958	-91 22.774	2377m
3. S Orca Basin-A:	26 54.968	-91 22.350	2379m
4. S Orca Basin-B:	26 54.144	-91 19.606	2363m

	Operation	Time	Date
1.	At South Orca, drop the CTD for a full hydro profile to find chemocline and the methane max 26 54.988, -91 23.148	05:00	4/14/14
2.	South Orca Basin, Dive #4698 26 54.958, -91 22.774	08:00	4/14/14
3.	Multiple Core @ S Orca 26 54.958, -91 22.774 (Alvin Dive Site)	18:00	4/14/14
4.	Deep CTD @ S Orca-A 26 54.968, -91 22.350	20:30	4/14/14
5.	Deep CTD @ S Orca B 26 54.144, -91 19.606	22:00	4/14/14

6. Multibeam @Orca Basin South 00:30-07:00 4/15/14
Rich Viso will provide targets for the Southern Basin

POD-16 ** NO Alvin Dive ** (weather)

AT26-13 - 4/15/14 all day

Station:	**latitude**	**longitude**	**depth**
1. S Orca Basin-MUC	26 54.990	-91 22.799	2377m
2. Multibeam	Viso to provide waypoints		
3. Mocness	Montoya will provide waypoints		
4. S Orca Basin-A-full:	26 54.725	-91 22.450	2379m
5. S Orca Basin-B-full:	26 54.275	-91 19.850	2363m

Operations	**Time**	**Date**
1. South Orca MUC attempt #3	07:00	4/15/14
2. Detailed CTD	09:00	4/15/14

*trip a bottle @ 1800, 2000 and then every 10 m between 1990 and 2310, another at 2350, and another 10m off bottom >150 m East of position 4A.

3. Mocness	13:00	4/15/14
4. Full CTD @ S Orca-A	18:00	4/15/14
5. Full CTD @ S Orca B	23:00	4/15/14
26 54.144, -91 19.606		
6. Repeat S MUC (#4) if needed	02:00	4/16/14

POD-17

AT26-13 - 4/16/14

Station:	**latitude**	**longitude**	**depth**
1. South Orca Basin, Dive #4698	26 55.0,	-91 22.7	2377m
2. Multiple core:	26 55.0,	-91 22.7	2377m
3. Multibeam	Viso to provide waypoints		
3. S Orca Basin-A-full:	26 54.725	-91 22.450	2379m
4. Mocness	Montoya will provide waypoints		

Operation	**Time**	**Date**
South Orca Basin, Dive #4698 26 55.0, -91 22.9	08:00	4/16/14
Multiple Core @ S Orca 26 55.0, -91 22.7 (Alvin Dive Site)	18:00	4/16/14
CTD @ S Orca-A (to 1800m) 26 54.968, -91 22.350	21:30—23:30	4/16/14
CTD @ S Orca-A (chemocline) 26 54.968, -91 22.350	00:30—02:30	4/17/14
Multibeam (end up at Orca Central, see POD18)	02:30-morning	4/17/14

POD-18

AT26-13 - 4/17/14

Station:	**latitude**	**longitude**	**depth**
1. Central Orca Basin, Dive #4699	26 56.2918,	-91 17.174	2198m
2. Multiple core-Orca Central	26 56.2035,	-91 18.713	2200m

3. CTD – Orca Central	26 56.336,	-91 17.131	2205m
4. Multiple Core-Orca North	26 0.092,	-91 17.486	2371m
5. Multibeam	Viso to provide waypoints		

Operation	**Time**	**Date**
1. Central Orca Basin, Dive #4699 26 55.0, -91 22.9	08:00	4/17/14
2. Multiple Core @ Central Orca 26 56.2035, -91 18.713	16:00	4/17/14
3. CTD @ Central Orca-A (full profile) 26 56.336, -91 17.1308	18:30-20:30	4/17/14
4. Multiple Core @ North Orca 26 0.092, -91 17.486	21:00-23:00	4/17/14
5. Mocness along the central axis end up at the Central Basin (dive target)	23:30-morning	4/17/14

POD-19 *no dive – repairs to basket junction boxes
AT26-13 - 4/18/14

Sites: Orca Central and Orca North

Event (locations above)	Time	Date
1. CTD @ Central Orca Basin 26 56.2256, -91 17.000	11:30	4/17/14
(high resolution over the bottom 100m, +10, +25, +50, +100, then up)		
2. CTD @ Central Orca-B (full profile) 26 55.337, -91 17.221	02:00	4/18/14

3. CTD @ North Orca - B (chemocline)	06:00	4/18/14
27 0.4261, -91 15.516 (detailed chemocline)		
4. CTD @ North Orca - A (full profile)	08:30	4/18/14
27 0.284, -91 17.302		
5. Multiple Core @ North Orca	11:00	4/18/14
27 0.0311, -91 17.627		
6. Mocness along the central axis	13:00-17:00	4/18/14
end up at the Central Basin (dive target)		
7. Multiple Core @ Central Orca (take home)	18:00	4/18/14
26 56.293, -91 17.087		

8. Possibly additional MUCs and/or multibeaming TBD tomorrow

POD-20

AT26-13 - 4/19/14

Sites: Orca Central and Orca North

Operation	**Time**	**Date**
1. CTD @ North Orca Basin	00:00	4/19/14
27 0.352, -91 17.578, shallow CTD		
2. MUC @ Central Orca	03:30	4/19/14
26 56.336, -91 17.099		
3. Multibeam until the Alvin Dive	targets from Rich	
4. Alvin Dive #4700 Orca Central	08:00	4/19/14
(same target as dive 4699)		
5. CTD @ Central Orca-C (chemocline)	16:00	4/19/14

6. CTD @ Southwest Orca-C (chemo) 19:00 4/19/14

7. Possibly additional MUCs and/or multibeaming TBD tomorrow

POD-21

AT26-13 - 4/20/14

Sites: Orca Central and Orca South; Transit to Hot Site

Operation	**Time**	**Date**

Evening of 4/19/14

1. MUC @ Central Orca 17:37 4/19/14
26 56.336, -91 17.099

2. CTD @ Central Orca-C (chemocline) 20:00 4/19/14
26 56.693, -91 19.663

3. When CTD is on deck, **transit** to next site (op #4): 26 55.192, -91 25.285 (5 nm; 30 min.)

4/20/14 ** ☺ Happy Easter ☺ **

4. **CTD** @ Southwest Orca-C (chemocline) 00:00 4/20/14
26 55.192, 91 25.285 (within 50-75m of the target location is fine)

5. **Transit** to the Hot Site: 02:30 4/20/14
27° 19.1376' N, 92° 6.4669' W (44 nm from #4-CTD site; ~3.5 hrs)

6. Upon arrival at the Hot Site: **Multibeam** until the sub goes into the water (Rich to provide waypoints)

7. **Alvin Dive #4701** 08:00 4/20/14
27° 19.1376' N, 92° 6.4669' W; depth: 1004m

8. CTD @ location TBD from dive obs.	18:00	4/20/14
9. MUC @ location TBD from dive obs.	19:30	4/20/14
10. CTD @ 27 20.6257, -91 5.8340	21:00	4/20/14

11. When MUC is on deck, **transit** to GC246: 23:00 4/20/14

27º 20.183, -91º 59.477 (81 nm; ~7 hrs; arrive on site at 06:00)

POD-22

AT26-13 - 4/21/14

Station:	**latitude**	**longitude**	**depth**
1. GC246:	27 42.128	-90 38.892	867m

Operation	**Time**	**Date**
1. **Alvin Dive #4702**	08:00	4/20/14
2. Transit to Gulfport		

Dive Plans

Cruise AT26-13

Date: 03/31/2014 Dive # 4686 Site: MC118

Pilot: Bruce Strickrott Port: Mandy Joye Starboard: Joe Montoya

Launch Target: 28º 51.07N, 88° 29.55' W; 1000m

24 Tube Cores	Ian's Camera	Mets SLURP line
Niskins	Laser CH4 sensor	2-METS sensors

Tasks:

1) High Def video: Sleeping Dragon; Leo's box (if possible: 28 51.51, 88.29.67 x 28 51.20, 88 29.48926); evaluate coverage of sedimented oil; survey area around Rudyville and Mandyville; lots of high def video; target areas for coring

2) Methane concentration field around hydrates: at sites around Sleeping Dragon, move the METS/laser intake around (above, various distances; beside; at depth) the hydrate to evaluate the methane field **DO NOT SUCK IN MUD—KEEP WELL ABOVE SEDIMENT***

Record and STATE (audio record) core #s, X,Y, depth, and times.

3) Mat coring transect (video during transects): collect 6 cores each at 3 sites across a microbial mat (middle of mat; edge of mat; outside of mat—draw a map):

Record and STATE (audio record) core #s, X,Y, depth, and times.

4) Collect water samples from venting gas/oil streams (as observed).

5) Collect 6 cores from a gas/oily seep area.

6) Time permitting more high def video of hydrate (and ice worms!!!).

END OF DIVE

Dive Plan – Cruise AT26-13

Date: 4/1/2014 Dive # 4687 Site: OC26

Pilot: Bob Waters Port: Mandy Joye Starboard: Antonia Juhasz

Launch Target: 28º 42.412N, 88° 21.653' W; 1621m

Equipment:

24 Tube Cores	Ian's Camera	Mets SLURP line
Niskins	Laser CH4 sensor	2-METS sensors

Tasks:

This is a re-survey of site that was heavily impacted by "oil snow" in 2010 and sampled on the AT18-2 cruise in December 2010.

1) At the landing target, take high def video before landing; then collect 6 push cores (first target)

2) Move along the same sampling grid sampled in 2010. Move along the 2 nm radial (~200' intervals) and stop; high def video and then collect 6 push cores. Survey the launch target in several directions and collect cores of interest:

* if you see microbial mat, collect 8 cores, otherwise 6 cores

Record core #s, X,Y, depth, and times for each set/type of cores

4) Collect HD video of sediments and animals on the bottom

5) Do surveys with Methane Wand and Close up shots with Ian's camera.

6) Collect gas tight sample if you spot gas/oil streams (as observed) – if no plumes are observed, simply collect two water samples at two of the coring sites (your choice).

END OF DIVE

Dive Plan – Cruise AT26-13

Date: 4/2/2014 Dive # 4688 Site: MC388

Pilot: Pat Hickey Port: Ian M Starboard: Caroline J

Launch Target: 28.718, -88.323 W; 1500m

Equipment:

24-30 Tube Cores	Ian's Camera	Mets SLURP line
Niskins	Laser CH4 sensor	2-METS sensors

Tasks:

general: state the time every 5-10 minutes loudly to time stamp the video

1) High Def video: Microbial mat, brine flows, carbonates, other features; evaluate presence/coverage of sedimented oil; survey area to target areas for coring

2) Methane concentration field around hydrates or gas plumes – don't put the probe into the bubble field! **Also DO NOT SUCK IN MUD—KEEP ABOVE SEDIMENT***

Record and STATE (audio record) core #s, X,Y, depth, and times.

Note that the tracking screen has Lat and Long so you can record L/L directly instead of X/Y

3) Mat coring transect (video during transects): collect 6 cores each at 3 sites across a microbial mat (middle of mat; edge of mat; outside of mat—draw a map):

Record and STATE (audio record) core #s, X,Y, depth, and times.

4) Collect water samples from venting gas/oil streams (as observed).

5) Collect 6 cores from a gas/oily seep area or a brine seep area (which ever looks the most active).

6) Time permitting more high def video of gas vents/chimenys/hyrate/brine, etc.

END OF DIVE

Dive Plan – Cruise AT26-13

Date: 4/3/2014 Dive # 4689 Site: GC600

Pilot: Bruce Strickrott Port: Mandy J Starboard: Kim T

Launch Target: 27° 21.860'N, 90° 33.823'W; 1400m

Oily Brine Target: 27º 21.887N, 90º 33.791W

Final Target: 27° 22.206'N, 90° 34.254'W

24 Tube Cores (more if possible)	Ian's Camera
Niskin Rack	2 brine trapper bottles w/ slurp

Tasks:

1) Do a survey taking images with the high def camera (record times, X, Y).

2) Fire niskin bottles during the survey in gas plumes, recording time and X,Y for each bottle.

3) Take pictures of microbial mats (note location!) and other features (hydrate, oil plumes carbonate, etc.)

4) Push Coring

-- Core microbial mats (transect; video during transects); collect 2 cores each at 3 sites across a microbial mat (middle of mat; edge of mat; outside of mat—draw a map):

--Core microbial mats for microelectrodes, rates, geochem – 7 cores

--Core oil seep for microelectrodes, rates, geochem – 7 cores

--Core "control", off seep site – 4 cores

Record and STATE (audio record) core #s, X,Y, depth, and times.

5) Bottom Water and Oil Trapping in Brine Trapper Bottles—collect oil from a seep into a brine trapper bottle; RECORD CORE #s, X,Y, Depth, Times carefully

6) Carbonate rocks: carefully collect carbonate rock slabs (HD video and Beast Cam before collecting) from various locations. Collect as many as you can.

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 4/4/2014 Dive # 4690 Site: GC600

Pilot: Bob W Port: Barbara M Starboard: Ian M

Launch (Birthday Candles) Target: 27° 21.860'N, 90° 33.823'W; 1400m

Oily Brine Target: 27º 21.887N, 90º 33.791W

Megaplume Target: 27° 22.206'N, 90° 34.254'W

24 Tube Cores (SBJ, AT, BM) Beast Cam (IRM) VTLC (IRM)

Niskin Rack (SBJ) 2 core injectors (IRM) Sm. Biobox (SBJ)

Tasks:

**** STATE (audio) time stamp and location for all activities ****

1) Do a survey taking images with the high def down-looking camera (record times, X, Y and lat/long (Port: LL; Stb: both).

2) Beast Cam Oily Hydrate with ice worms (27 21.853, 90 33.805)

3) Bottom Water Sampling - Fire niskin bottles during the survey in gas plumes, recording time and X,Y for each bottle.

4) Move to oily brine target – taking pictures and noting locations of microbial mats and other features (hydrate, oil plumes carbonate, etc.) along the way

5) Push Coring at oily brine site

--Core oily brine site for microelectrodes, rates, geochem – 10 cores

6) Collect Mussels <u>THAT ARE IN OIL</u> into biobox from oil pond (27 21.098; 90 33.791)

7) Move to megaplume target taking pictures and noting locations of microbial mats and other features (hydrate, oil plumes carbonate, etc.) along the way

8) Deploy Dye Chambers and Cameras

--Core microbial mats for microelectrodes, rates, geochem – 8 cores

9) Recover existing VTLC at Megaplume

10) Push Coring for microcable bacteria

--Core dark (sulfidic) vs orange (iron oxide) sediments (no obvious sfc mat!!) for microelectrodes, rates, geochem – 6 cores

11) Carbonate rocks: carefully collect carbonate rock slabs (HD video and Beast Cam before collecting) from various locations. Collect as many as you can.

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 4/5/2014 Dive # 4691 Site: GC600

Pilot: Pat H Port: Andreas Starboard: PIT

Megaplume: 27° 22.206'N, 90° 34.254'W; 1225m
Birthday Candles: 27° 21.860'N, 90° 33.823'W; 1225m
Oily Brine Sediment: 27º 21.887N, 90º 33.791W; 1225m

Equipment in the Basket

24 Tube Cores Beast Cam Large Mussel Net
Niskin Rack 2 core injectors Sm. Biobox Sm. Milk Crate for rocks

Tasks:

** STATE (audio) time stamp and location for all activities **

General Tasks:

a) Bottom Water Sampling. There are 5 niskins, as you motor around, please fire 3 bottles near gas plumes and 2 bottles away from gas plumes, recording time and Lat/Long and X/Y for each bottle.

b) Down-looking Camera: Run the down-looking camera all during the dive (take a pic every 10 seconds)

Specific Tasks:

1) Reposition the VTLC: Make sure lasers are pointing at target mat

2) Deploy Mat Dye Chambers

--Core nearby microbial mats nearby for microelectrodes, rates, geochem (transect from inside to outside mat) – 12 cores total

3) Micro-cable Bacteria cores

--Core 4 dark (sulfidic) and 4 orange (iron oxide) sediments (no obvious sfc mat!!) for microelectrodes, molecular, rates, geochem – 8 cores total

4) Carbonate rocks: carefully collect carbonate rock slabs (HD video and Beast Cam before collecting) from various locations. Collect 2-5 rocks (more if you have a chance).

5) Collect live mussels (large and medium sized) from any oil pond that you see – Ian says there were not many mussels near megaplume so you will need to head SE towards Birthday Candles. There should be numerous

6) Time permitting, move to oily brine target – taking pictures and noting locations of microbial mats and other features (hydrate, oil plumes carbonate, etc.) along the way

8) Push Coring at oily brine site

--Core oily brine site for microelectrodes, rates, geochem – 6 cores (these should be replicate cores from the oily-brine target)

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 4/6/2014 Dive # 4692 Site: GC600

Pilot: Bruce S Port: Mandy J Starboard: Matt S

Launch Target: Elevator

Elevator: 27.3701, -90.5699; X=2976, Y=2221; z=1225m

Megaplume: 27.3698, -90.3638; X=2852, Y=2196; z=1225m

Birthday Candles: 27.3643, -90.5637; X=3590; Y=1588; z=1215m

Oily Brine Sediment: 27.3648, -90.5632; X=3642, Y=1638; z=1225m

Equipment in the Basket

(1) 24 Tube Cores (2)Beast Cam (3) Large Mussel Net (4) pCO_2

(5) Niskin Rack (5) 2 brine bottles w/ slurp (6) Sm. Biobox (7) Sm. Milk Crate

Tasks:

** STATE (audio) time stamp and location for all activities **

General Tasks:

a) Bottom Water Sampling. There are 5 niskins, as you motor around, please fire 3 bottles near gas plumes and 2 bottles away from gas plumes, recording time and Lat/Long and X/Y for each bottle.

b) Down-looking Camera: Run the down-looking camera all during the dive (take a pic every 10 seconds)

Specific Tasks:

1) Reposition the Elevator: Pick up Elevator and move it to megaplume (look for white square markers with blue, red and yellow tape); get some HD video at Megaplume w/ elevator; drop target, note distance from MP & heading; position intake ~1' from plume

2) Recover Mat Dye Chambers and take 2 cores (1 inside, 1 outside) -- 4 cores

3) Transit towards Oily Brine/Birthday Candles – BeastCam and Collect oil chimneys (various types) and place into biobox; do panoram's (10^o intervals) w/ BC from 2-3 different mounds

4) Micro-cable Bacteria cores – collect during transit at an appropriate site

--Core 4 dark (sulfidic) and 4 orange (iron oxide) sediments (no obvious sfc mat!!) for microelectrodes, molecular, rates, geochem – 8 cores total

5) Carbonate rocks: carefully collect carbonate rock slabs (HD video and Beast Cam before collecting) from various locations. Collect 2-5 rocks (more if you have a chance).

6) Collect live mussels (large and medium sized) from any oil pond that you see – more abundant in the Birthday Candles region.

7) Push Coring at oily brine site --Core oily brine site for microelectrodes, rates, geochem – 12 cores (these should be replicate cores from the oily-brine target)

END OF DIVE.

Dive Plan – Cruise AT 26-13

Date: 4/9/2014 Dive # 4693 Site: GC600

Pilot: Bob W Port: Howard Starboard: PIT-Chris

Launch Target: Megaplume, 27° 22.206'N, 90° 34.254'W; 1225m

Equipment in the Basket

(1) 24 Tube Cores (2) Beast Cam (3) pCO_2 (4) Niskin Rack
(5) 2 brine bot. w/ slurp (6) Sm. Bio Box

Tasks:

** STATE (audio) time stamp and location for all activities **

Specific Tasks:

1) Recover Elevator.

2) Recover VTLC.

3) Push core at VTLC site and any other site possible near megaplume

This dive went in late (1:30PM) because of weather.

END OF DIVE.

Dive Plan – Cruise AT 26-13

Date: 4/10/2014 **Dive # 4694** **Site: GC246**

Pilot: Pat **Port: Andreas** **Starboard: Verena**

Launch Target: Dead Crab Lake

Lake Position: 27° 42.128 N, 90° 38.892' W; z=867m

Equipment in the Basket

(1) 24 Tube Cores (2)Beast Cam (3) pCO_2 (4) Niskin Rack

(5) 2 brine bot. w/ slurp (6) Sm. Bio Box (7) VTLC

Tasks:

** STATE (audio) time stamp and location for all activities **

General Tasks:

a) Bottom Water Sampling. There are 5 niskins, please fire 3 bottles near the brine source and 2 bottles over DCL, recording time and Lat/Long and X/Y for each bottle.

Specific Tasks:

1) Down-looking Camera Survey: Run a grid with the down-looking camera (set it to take a picture every 5 seconds); run at 1.5-2m above bottom. Survey the entire area – it is not large so basically run lines N-S until you've captured the entire seep area (this will be mosaic-ed)

2) Site Survey: Survey the area with the HD down-looking camera. Locate the two brine sources (there is one large one (I believe the larger brine seep is to the West) and one small one). When you locate the main brine vent, sample it by lowering the slurp nozzle into brine – flush the brine bottle for 7 min. and then close the bottle. Measure the temperature of the venting fluid with the Temp. Probe (allow to equilibrate~3-5 min.)

3) Deploy VTLC over the brine source, with the camera looking down the flow path of the brine.

4) Push core at brine origin --Core the area adjacent to the flow for microelectrodes, rates, geochem – 6 cores (these should be replicate cores from the oily-brine target).

5) Push Coring at a white mat site – Mat transect for microelectrodes, rates, geochem (4 per location) – 9 cores (3 within the mat; 3 at the edge; 3 ca. 2m away)

6) Micro-cable Bacteria cores – Core ~6 dark (sulfidic) and 6 orange (iron oxide) sediments (no obvious sfc mat!!) for microelectrodes, molecular, rates, geochem – 12 cores total

7) Carbonate rocks and Barite Chimneys: carefully collect carbonate and barite chimneys (HD video and Beast Cam before collecting) from various locations. Collect 2-3 of each (more if you have a chance).

END OF DIVE.

Dive Plan – Cruise AT 26-13

Date: 4/11/2014 Dive # 4695 Site: GC600

Pilot: Bruce S Port: Mandy J Starboard: Mary Kate

Launch Target: Birthday Candles

Brine Pool: 27 21.871, -90 33.775, z=1215m

Oily Brine Sediment: 27.3648, -90.5632; X=3642, Y=1638; z=1225m

Birthday Candles: 27.3643, -90.5637; X=3590; Y=1588; z=1215m

Equipment in the Basket

(1) 27 Tube Cores (2)Beast Cam (3) Large Mussel Net (4) Niskin Rack

(5) 4 brine bottles w/ slurp (6) Sm. Biobox (7) VTLC

Tasks:

** STATE (audio) time stamp and location for all activities **

General Tasks:

a) Bottom Water Sampling. There are 5 niskins, please fire one in a boring location, 3 near brines, and one near B-day candles, recording time, Lat/Long and X/Y.

b) Down-looking Camera: Run the down-looking camera all during the dive (take a pic every **5** seconds)

Specific Tasks:

1) At Birthday Candles – BeastCam and Collect oil chimneys (various types, various locations) and place into biobox; do panorama's (10º intervals) w/ BC from 2-3 different mounds. Take high def video flying around different mounds STOP recording so there are individual files of each mound. Use UV cam to illuminate birthday candles and image the oil and hydrate. Collect oily cores if possible (6-8 cores)

2) During transit from B-day candles, prospect for micro-cable bacteria and mussels – collect if possible – NO FLUFF--Core 4 dark (sulfidic) and 4 orange (iron oxide) sediments (lacking sfc mat!!) for microelectrodes, molecular, rates, geochem – 8 cores total; collect as many mussels as possible.

3) Mosaic the brine pool and spend 30 minutes flying around the area searching for other similar features (down looking sci cam running all the time)

4) If additional brine pool(s) are discovered collect a brine trap sample of the source and core around the source (3 cores) and the terminus (3 cores). - 6 cores total

6) Time permitting – transit to hydrate cave region (3640/1601, 1208m) where more luxurious mats may be present; video oil – hydrate – carbonate caves and core mat if it is present (6 cores)

7) Retrieve VTLC

END OF DIVE.

Dive Plan – Cruise AT 26-13

Date: 4/12/2014 Dive # 4696 Site: GC600

Pilot: Bob W Port: Ian M Starboard: Mau S

Launch Target: Birthday Candles

Brine Pool: 27 21.871, -90 33.775, z=1215m

Oily Brine Sediment: 27.3648, -90.5632; X=3642, Y=1638; z=1225m

Birthday Candles: 27.3643, -90.5637; X=3590; Y=1588; z=1215m

Equipment in the Basket

(1) 27 Tube Cores (2)Beast Cam (3) Niskin Rack (4) Sm. Biobox

(5) VTLC (6) Oil Corers (7) Gas Trapper

Tasks:

** STATE (audio) time stamp and location for all activities **

General Tasks:

a) Bottom Water Sampling. There are 5 niskins, please fire one in a boring location, sample near hydrates, recording time, Lat/Long and X/Y.

b) Down-looking Camera: Run the down-looking camera all during the dive (take a pic every **5** seconds)

Specific Tasks:

1) At Birthday Candles – BeastCam and Collect oil chimneys (various types, various locations) and place into biobox; do panorama's (10º intervals) w/ BC from 2-3 different mounds. Take high def video flying around different mounds STOP recording so there are individual files of each mound. Use UV cam to illuminate birthday candles and image the oil and hydrate. Drop Markers. Leave VTLC at Big Birthday Candle.

2) During transit from B-day candles, prospect for micro-cable bacteria – collect if possible – NO FLUFF--Core 4 dark (sulfidic) and 4 orange (iron oxide) sediments (lacking sfc mat!!) for microelectrodes, molecular, rates, geochem – 8 cores total; collect as many mussels as possible.

3) Mosaic the brine pool (down looking sci cam running all the time). Drop Markers

4) Transit to hydrate cave/honeycomb region (3640/1601, 1208m) where more luxurious mats may be present; video oil – hydrate – carbonate caves and core mat if it is present (4 cores of white or yellow; 4 cores of orange; 4 cores of oily sediment).

5) Retrieve VTLC

END OF DIVE.

Dive Plan – Cruise AT 26-13

Date: 04/13/2014 Dive # 4697 Site: Orca North

Pilot: Pat Port: Mandy J Starboard: Sairah M

Launch Target: Orca Basin North

Orca North: 27 0.406, -91 17.326, z=2385m, chemocline @ 2200m

Equipment in the Basket

The Brine Trapper

Overview: This is a dive to the deep Northern Orca Basin. The AM CTD cast will inform our depth targets for sampling with the brine trapper.

Goal: The goal of this dive is to collect brine in a detailed profile along the chemocline. Optimally, we will obtain a detailed (2-5 intervals) profile between 2230 and 2250m.

Tasks:

1. Use the Science Cam to take images at 5 second intervals starting at 2000m

2. Starting at about 2000m, turn on the lights and start recording high def video so that you capture the various clines along the density gradient.

3. Brine Trapper: When you hit maximum depth, start brine trapping: lower to the target depth and flush the line. Then open a chamber; record chamber # and flush for 7 minutes. Close chamber; lower to next depth and flush chamber 7 min; record depth; repeat until profile is completed. Upon completion of profile turn off the pump. Record DEPTH and X,Y and Lat,Long at start/end of each flush cycle and when sampling is completed for each sample.

4. Exploration: When brine sampling is completed, explore and take high def video as time permits. Drop weights (possibly in small intervals – individual plates on the basket -- to go up slowly and get more high def video of particular clines in the water column. Take video of as many depths as possible.

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 04/16/2014 Dive # 4698 Site: Orca South

Pilot: Bruce Port: Joe M Starboard: Sarah W

Launch Target: Orca Basin South

Orca North: 26 55.0, -91 22.9, z=2385m, chemocline @ 2200m

Equipment in the Basket

The Brine Trapper

Overview: This is a dive to the deep Southern Orca Basin.

Goal: The goal of this dive is to collect brine in a detailed profile along the chemocline. Optimally, we will obtain a detailed (3 bottles @ 5 intervals) profile between 2230 and 2250m. The 16th bottle you can sample any interesting feature that you see.

Tasks:

1. Use the Science Cam to take images at 5 second intervals starting at 2000m

2. Starting at about 1900m, turn on the lights and start recording high def video so that you capture the various clines along the density gradient.

3. Brine Trapper: When you hit maximum depth, start brine trapping: lower to the target depth and flush the line. Then open a chamber; record chamber # and flush for 10 minutes. Close chamber; lower to next depth and flush chamber 10 min; record depth; repeat until profile is completed. Upon completion of profile turn off the pump. Record DEPTH and X,Y and Lat,Long at start/end of each flush cycle and when sampling is completed for each sample.

**Make sure Bruce refreshes the NAV after each bottle since there will be no Doppler seafloor lock (thus it will not auto update).

4. Exploration: When brine sampling is completed, explore and take high def video as time permits. Drop weights (possibly in small intervals – individual plates on the basket -- to go up slowly and get more high def video of particular clines in the water column. Take video of as many depths as possible.

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 04/17/2014 Dive # 4699 Site: Orca Central

Pilot: Bob Port: Mandy J Starboard: Ryan S

Launch Target: Orca Central Basin

26° 56.2918' N, 91° 17.174' W; depth range: 2198-2205m

*****same general target area as AT18-2 dive 4650*****

Equipment in the Basket

24 Tube Cores Sm Bio Box Scoop Niskin Rack Milk Crate

BeastCam 2 brine trapper bottles w/ slurp hose (long as possible)

Tasks:

1) Do a survey taking images with the down-looking camera (record times, X, Y). Look for areas of brine seepage

2) Fire 2 niskin bottles during the survey in the "brine fog", recording time and X,Y for each bottle.

3) Source brine sampling: At two locations where brine is seeping from the canyon wall, position the slurp nozzle into the brine flow and flush bottles 8 minutes; fill bottle 8 minutes; turn off the pump; then close the valve.

4) Sediment Coring—collect 12 replicate cores from 2 different sites. This is important—preferential targets ~ pink jello mats and Fe-mineral rich sediments-RECORD CORE #s, X,Y, Depth, Times carefully

i) collect 12 cores from site 1; drop marker

ii) collect 12 cores from site 2; drop marker

5) Sponge Documentation and Collection: scoop sponges into the Biobox; BeastCam sponges and associated area; BeastCam close-ups of sediment surface

6) Carbonate rocks: grab carbonate rock slabs—grab from various locations

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 04/19/2014 Dive # 4700 Site: Orca Central

Pilot: Pat Port: Rich V Starboard: PIT

Launch Target: Orca Central Basin

26° 56.2918' N, 91° 17.174' W; depth range: **2198-2205m**

*****same general target area as AT18-2 dive 4650*****

******* need to heavy in order to reach sponge garden target *******

Equipment in the Basket

24 Tube Cores Sm Bio Box Scoop Niskin Rack Milk Crate

BeastCam 1 brine trapper bottle w/ slurp hose (long as possible)

Tasks:

1) Target-1: Sponge Garden -- Do a survey taking images with the down-looking camera (record times, X, Y). Look for areas of brine seepage.

2) Sponge Garden – Beast Cam & Sediment Coring—once on site, collect TWO NISKINS (Record number of bottle fired, time, lat/long, X,Y); then collect 5 replicate cores around sponges -- RECORD CORE #s, X,Y, Depth, Times carefully (there should be markers here so easy to see previously sampled sites).

3) Sponge Documentation and Collection: scoop sponges into the Biobox; BeastCam sponges and associated area; BeastCam close-ups of sponge sediment surface

4) Move to brine source target (to the SE) – along the transit you will come across several diapirs that rise from the abyss (2200m) to about 2180m to ultimately 2170m). Along the sides, you will see "white-ish" flows coming down the sides (wide at the top, skinny at the bottom, with flow lines/fractures pointed downward). Collect 5 cores oriented PERPINDICULAR to the face (go straight in, not vertical) in the fracture (flow?) zones. Record time, X-Y, Lat-Long.

5) Move to main sampling mound from dive 4699. Collect high def video before sampling and fire 3 niskins. Then collect 5 cores in the white-ish mud and 5 in the pink mud from below the edge of the wall face (watch the video from yesterday's dive).

6) Source brine sampling: When done coring, you'll see brine seeping from the canyon wall where you cored, position the slurp nozzle into a hole created by coring and flush bottles 5 minutes; fill bottle 6 minutes; turn off the pump; then close the valve.

7) Go to the top of the mound and do a flyover taking pics of the sponges w/ the down-looking camera for a mosaic. Collect two cores from the top of the mound in the greenish mud around the sponges.

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 04/20/2014 Dive # 4701 Site: Hot Site

Pilot: Bruce Port: Mandy J Starboard: Lindsey F

Launch Target: Hot Site (AT 18-2 dive 4646; x/y based on dive 4646 origin)

27° 19.1376' N, 92° 6.4669' W; depth: 1004m

target:	X	Y	depth	notes
brine volcano-1	516	4121	1003m	primary brine vent
white mat	588	4168	1017m	VERY gassy
brine spout-1	523	4120	1001m	briney fog
brine volcano-2	529	4119	1000m	brine&mud flow
mussels	283	4279	1003m	mussel field
carbonates	272	4274	1004m	carbonate field

Equipment in the Basket

24 Tube Cores Lg Bio Box Scoop Niskin Rack Milk Crate

Howie Sensors 3 brine trapper bottles w/ slurp hose (long as possible)

Tasks:

1) Do a survey taking images with the down-looking camera (record times, X, Y). Go to areas of brine seepage (3 targets) and get high def video.

2) After the video survey, source brine sampling: At three locations where brine is seeping, fire 1 to 2 niskins and then collect a brine trap of the source brine. Position the slurp nozzle into the brine flow and flush bottles 5 minutes; fill bottle 5 minutes; turn off the pump; then close the valve.

3) After collecting the brine sample from brine volcano #1, dump dye into the source and then position the VTLC at the bottom of the source to track the flow of dye.

4) Sediment Coring—collect 7 replicate cores from 3 different sites. Preferential targets ~ white mats; orange mats; cable bacteria (flat sediment) - RECORD CORE #s, X,Y, lat/long, Depth, & Times carefully **note that previous sites are marked with floating markers**

5) Collect mussels: Identify mussel patches and fly over to get down looking camera shots; scoop as many mussels as possible into the Biobox.

7) Carbonate rocks: collect carbonate rock slabs from various locations (throughout dive)

END OF DIVE

Dive Plan – Cruise AT 26-13

Date: 04/20/2014 Dive # 4702 Site: GC246

Pilot: Bob Port: Rick Starboard: Joy

Launch Target: Dead Crab Lake -- 27° 42.128'N, 90° 38.892'W; 867m

target:	Lat	Long	depth	notes
bacteria staining	**in thick white mats TO THE EAST OF DCL**			
thermistor-1	27 42.100	90 38.908	833m	thermistor
thermistor-2	27 42.128	90 38.892	800m	thermistor
thermistor-3	27 42.094	90 38.908	836m	thermistor
Thioploca coring	27 42.117	90 38.893	831m	Thioploca
Mussel collection	27 42.067	90 38.888	832m	Mussels
Orange sediment	27 42.108	90 38.901	833m	oxidized sediment
Orange sediment-2	27 42.050	90 38.892	833m	orange oxid mud

Equipment in the Basket

24 Tube Cores Lg Bio Box Scoop Niskin Rack Milk Crate

Howie's Laser 2 brine trapper bottles w/ slurp hose (long as possible)

Tasks:

1) Down-looking Camera Survey: Run a grid with the down-looking camera (set it to take a picture every 5 seconds); run at 1.5-2m above bottom. Survey the entire area – it is not large so basically run lines N-S until you've captured the entire seep area (this will be mosaic-ed {maximum 20 minutes}

2) After the video survey, identify a luscious white mat site (to the E of DCL) and stain it: Leave the strainers in place (collect later; see #xxx) {20-30 minutes}

3) Collect mussels: SE side of DCL (position above); fly over to get down looking camera shots; carefully scoop as many mussels as possible into the Biobox (fill it up; both sides).

5) Recover VTLC (27 42.102; 90 38.898) after filling the biobox with mussels

6) Recover Thermisters (positions above)

6) Carbonate rocks: collect carbonate rock slabs from various locations (throughout dive); place into milk crate

7) Sediment Coring—collect 3 olive-gray Thioploca cores at 27 42.117, 90 38.893

8) Sediment Coring—collect 6 orange sediment cores at 27 42.108, 90 38.901

9) Sediment Coring—collect 6 orange sediment cores at 27 42.050, 90 38.892

10) Stained Sediment Recovery and Mat gradient coring: core area that was stained (2 cores); 2 cores middle of mat outside stained areas; collect 2 cores at the edge; 2 about 0.5 meter from the edge of the mat.

END OF DIVE

Dive Summaries

Dive #4686 Report – Joye

Date: 03/31/2014 Dive # 4686 Site: MC118

Pilot: Bruce Strickrott Port: Mandy Joye Starboard: Joe Montoya

Dive Origin: 28 50.0N, 88 30.5W

Launch Target: 28º 51.07N, 88° 29.55' W; 1000m

Observations & Samples:

MC118 is a natural seep located 14 nm NW of the Macondo site that is home to a long -term gas hydrate microbial observatory. Though it is a natural seep, this site received deposition of marine "oil snow" during the late summer and fall following the Macondo blowout. For dive 4686, we landed in the same area (S of the SW crater at MC118) where we landed in 2010 during dive 4687 to MC118. Qualitatively, there seems to be more and more diverse animal life (fish, eels, sea cucs, what appeared to be pogonophorans, etc.) in this area than there was in 2010. The "marine oil snow" layer is still there but it's quite different – it's got an olive color to it and is leathery, like a tar mat. Very, very strange. We visited Sleeping Dragon and sampled carbonate. Multiple gas streams were noted in the vicinity of Sleeping Dragon. We had a hard ground fault on the starboard battery so our bottom time was essentially cut in half. Despite this, we accomplished most of objectives laid out in the dive plan, collecting 10 oily push cores, 5 Niskins and 2 carbonate rocks. We were unable to find a decent mat to core. Note, all times below are ZULU.

1. **14:48:** Into the water

2. **15:33: 28 51.55568N, 88 29.65769W**

On the Bottom, landed to the South of the SW crater – crabs running away from the sub. There is an odd olive-colored layer here interspersed with what looks like the caramel oil snow. While getting neutral, the basket plunged into the sediment and it's clear that this olive layer is thick and leathery – is it a tar mat? Very interesting. Despite the apparent "tar mat", there are a lot of fish and other fauna on the bottom. Near this spot, numerous fish were lying along the bottom with their mouths positioned into the current.

3. **16:07: 28 51.61794N, 88 29.75731W**

We are going to transit towards the SW crater. Having NAV problems – can't get any headings and are driving a bit in circles. We are headed in the right direction but it took a while.

4. **16:19: 28 51.1584N, 88 29.5367W**

location of the beautiful “Orca” memorial marker for Vicky Bertis (near existing Marker #3).

5. 16:26: 28 51.65854N, 88 29.50829W

thin white microbial mat—very sparse and patchy

6. 16:32: 28 51.65150N, 88 29.5144W

marker #10 – carbonate, clams and pogos; nearby are corals that do not look very healthy. Moving to the mound and looking for Sleeping Dragon

7. 16:54: 28 51.64555N, 88 29.50890W

oil droplets and gas plumes (looks like clean bubbles) now visible, just have to get the sub into position to video the mound and bubble streams. Very difficult to position the sub within the narrow crater.

8. 17:06: 28 51.63743N, 88 29.51813W

finally positioned within Mandyville @ Sleeping Dragon hydrate mound – at least 7m long and 2m high with several underhangs that were covered by ice worms. Took extensive high def video of venting gas, ice worms, etc.

9. 17:47: 28 51.64068N, 88 29.45726W

Videoing a gassy plume with oil covered bubbles.

10. 17:56: 28 51.64284N, 88 29.51628W

Nice bubble stream with 2 discrete bubble sources. Positioned Howard’s sniffer 2 feet from the bubble stream, next to the mat about 6” off the bottom. Let it soak for 2.5 min. Next moved the wand to about 6” from the plume (2.5 min soak). Moved it about 2 feet up, still 6” away (2.5 min soak). Moved to 1’ foot away, still at same ht above bottom (2.5 min soak).

11. 17:56: 28 51.64284N, 88 29.51628W

Fired all 5 Niskin bottles here, ca. 2m from the bubble stream

12. 18:17: 28 51.64230N, 88 29.51567W

We are running low on battery so commenced **coring**: collected 10 cores – all looked very oily and gassy (in order: 15, 18, 8, 7, 11, 10, 14, 13, 16, and 17). Two of the 10 cores (#15 and #10) had oil bubbling from their retrieval holes. Cores were secured and tapped down into quivers (completed @ 1837)

13. 18:42: 28 51.64230N, 88 29.51567W

AWESOME video of gas bubble streams where round gas bubbles convert to flat hydrate discs on the way up (about 2m above the bottom)!

14. 18:45: 28 51.64176N, 88 29.51075W

Collected two carbonate rocks

END OF DIVE

Dive #4686 Report – Montoya

Date: 03/31/2014 Dive # 4686 Site: MC118

Pilot: Bruce Strickrott Port: Mandy Joye Starboard: Joe Montoya

Launch Target: 28º 51.07N, 88° 29.55' W; 1000m

Observations & Samples:

This was a successful, though short dive at MC118. We experienced high turbidity and a moderate bottom current throughout our time on the bottom, but saw numerous animals (fish, holothurians, clams, and pogonophorans), a variety of carbonate crusts and boulders, several massive hydrates, and several bubble streams. Our bottom time was limited by a ground fault in the starboard battery, but we were able to accomplish most of our core objectives at this site.

1. ~0951 local:
We observed high abundances of *Trichodesmium* at the surface and in the upper tens of meters of the water column. Large puffs and tufts, as well as smaller colonies were very abundant and easily visible to the naked eye.

2. ~ 1039 local:
high concentrations of particles as we approached the bottom, including numerous "comets" like those imaged by Vernon Asper's snowcam

3. ~1035 local:
on the bottom @ 904m. Soft bottom with lots of pockmarks

4. ~1115 local:
small hydrate mound with lots of shells

5. ~1130 local:
marker M-28 to starboard.

6. ~1210 local:
Mandyville (x1597, y2101; 28˚51.13743'N 088˚29.51820'W): overhang with sediment cover and wormholes, exposed hydrate on edges.

7. ~1252 local:
Mandyville (x1600, y2111; 28˚51.14284'N 088˚29.51636'W): vent with steady stream of oil and gas bubbles.

8. ~1303 local:
Mandyville (x1600, y2110; 28˚51.14284'N): wand sampler, held ca. 2' from bubble stream

9. ~1306 local:
Mandyville (x1600, y2111; 28˚51.14284'N 088˚29.51636'W): wand sampler, held ca. 6" from right plume

10. ~1307 local:
Mandyville (x1600, y2111; 28˚51.14284'N 088˚29.51636'W): wand sampler, held ca. 2' above right plume

11. ~1309 local:
Mandyville (x1600, y2111; 28˚51.14284'N 088˚29.51636'W): wand sampler, held ca. to right of plumes to sample nearfield water.

12. ~1314 local:
Mandyville (x1600, y2111; 28˚51.14284'N 088˚29.51636'W): Niskins: fire all 5

13. ~1315 local:
Mandyville (x1601, y2111; 28˚51.14284'N 088˚29.51575'W): push cores. In order, 16, 17, 3, 14, 10 in one row in the slope above the bubble plumes. Next, tubes 11, 17, 8, 18, 15 in a row above the first one. Coring operation filmed with stbd MZ camera.

14. ~1337 local:
Mandyville (x1601, y2111; 28˚51.14284'N 088˚29.51575'W): recover push cores. In order, 15, 18, 8, 11, 10, 14, 13, 17. Core recovery operation filmed with stbd MZ camera.

15. ~1346 local:
Mandyville (x1609, y2109; 28˚51.14176'N 088˚29.51083'W): carbonate chunks: collect two chunks and place on the basket.

16. ~1358 local:
Mandyville (x1601, y2111; 28˚51.14284'N 088˚29.51575'W): film "dragon anemone".

End of Dive

Dive #4687 Report – Joye

Date: 4/1/2014 Dive # 4687 Site: OC26

Pilot: Bob Waters Port: Mandy Joye Starboard: Antonia Juhasz

Dive Origin: 28 40.0N, 88 40.0W

Launch Target: 28º 42.412N, 88° 21.653' W; 1621m

Observations & Samples:

On this dive, we will re-sampled and re-surveyed areas that were sampled on dive 4689 on cruise AT_18-2 in December 2010. In 2010, this site was a barren desert. During a 7 hour dive, we saw one rather sad looking crab. **During launch, we lost two baskets of cores because they were not tied down to the milk crate.** *Swimmers recovered one basket and we tried (unsuccessfully) to find the other one during the dive.* During this dive we saw abundant deepwater critters, including eels, various fishes, infauna, a skate, large mounds generate by some bioturbating organism, a fair number of crabs and even two vampire squids. So qualitatively, there seems to be more and more diverse animal life (fish, eels, sea cucs, what appeared to be pogonophorans, etc.) in this area than there was in 2010 just as we observed at MC118. The "marine oil snow" layer is still there and appears the same (varies in depth from 1 to 2"). We surveyed a broad area traveling almost 2.5 km during the dive. We collected 4 sets of sediment cores and 5 Niskins; we did not see any mussels, clams or carbonate.

14:17: 28 42.42001N, 88 21.66020W

Into the water (sub is light; descent was long)

15:28: 28 42.42921N, 88 21.73631W
On the Bottom, landed in the middle of all the targets. Decide to stay at this spot and core. Collected **cores** 2,3,4,5 at this site. Cores look similar to 2010: generic oxidized (gray) sediment overlain by light chocolate brown layer of differing heights. Lots of burrows and mounds (not hydrate) in the area; many crabs in the landing pads of burrow mounds. Tripped **Niskin** #5 at this site. Now heading to the "basket target" to look for the basket that fell off during our first launch attempt.

16:05: 28 42.36100N, 88 21.33243W

Searching for the core basket – we did two circles and did not see it. Aborted this effort at 1632. Now heading towards target #2. Down-looking camera is on, taking pictures every 10 seconds during transit. Seafloor looks similar along the entire distance of this transit.

16:58: 28 42.3336N, 88 21.32936W

Target #2 – brown muddy layer clearly visible above generic deep sea clay-ey foram ooze. Collected a set of **cores** here: 20, 6, 21, 9, 8, 7. Fired Niskin #4 @ 17:22 (28 42.24297N, 88 21.66388W) we saw a vampire squid. We got the squid on HiDef video, with the handheld camera in the sub, and on the down-looking camera. During the

transit, not much changed, lots of mounds and a good number of animals. Moving towards target #7.

18:00: 28 42.23052N, 88 21.71360W

Coring at target #7– sediment looks very similar: collected cores 19, 25, & 26. Fired the middle **niskin** at this site.

18:13: changing position

Moving to Target #4 which is closer to the central OC26 site. The seafloor is hummocky and there are huge mounds and what looks like T-Rex footprints. We were moving W but I changed the direction to S and then SE.

19:44: 28 41.7362N, 88 22.22182W

Coring somewhere in the vicinity of Target #4, we are almost out of power. 4th set of cores: 27, 28, 29 & 30. These are very similar to what we saw elsewhere here (generic mud covered by "oil snow" layer). Fired Niskins #3&4.

END OF DIVE

Dive #4688 Report – MacDonald

Date: 03/31/2014 Dive # 4688 Site: MC253

Pilot: Pat Hickey Port: Ian Macdonald Starboard: Caro Johansen

Dive Origin: 28 34.358, -88 19.584

Launch Target: 28.718, -88.323 W; 1500m

Equipment on board:

24 Tube Cores	Beast Camera	Mets SLURP line
Niskins	Laser CH4 sensor	2-METS sensors

Observations & Samples

This site is located approximately 3 km from the Macondo well and is part a cluster of The dive site is on the NW edge of Biloxi Dome, a flat-topped salt dome at about 1500 m depth. It is located about 3 km the DWH wreck site. Numerous gas plumes have been detected along this portion of Biloxi dome during swath-mapper surveys conducted by FALKOR and Okeanus Explorer. Dive 4688 targeted the cluster of plumes closest to Macondo. However, during the initial two hours of the dive, we were unable to locate any indicators of active seepage despite repeated transects across the site. Eventually we were given a target for a specific plume at 28 43.236N x 88 19.644W. Arriving at this location we found white mats and carbonate rubble. We found a small area of larger carbonates with white mats (Theiomargarita??). In the center of this area, which was about 1.5x1m, 5-10 vents releasing small bubbles and drops of oil. The area around the vents was too rocky to core, but we were able to core mats alongside. All cores release oil and gas bubbles.All of our subsequent sampling was done at this location or at white mats less than 20 m from this location.

1. **13:30:** Alvin in water **[ALL TIMES IN GMT]**
2. **13:54:** Verify lights on Beast Cam.
3. **14:03: 28 43.375, -88 19.584 d=650**

Comunicated pos. with Atlantis. Lots of bioluminescence on the way down. Many particles and jelly fish on descent.

4. **14:38: 28 34.358, -88 19.562, d=1477/1484**

Bottom in sight/landing. Sat and waited for mud to clear a little, and spent some time trimming the sub. Many shrimp and crabs. Start heading due East to look for target. Giant isopod and skate spotted. Many shrimp burrows.

5. **15:05: 28 43.086, -88 19.304, d=1507**

Searching for cluster of seeps. Still heading East, found nothing. According to map we should be in the middle of a gas plume. Nothing visible. Decided to travel WSW.

6. **15:25: 28 43.708, -88 19.418, d=1490**

Climbing a slope, depth keeps descending. Still climbing, heading N. Bathymetry on map not matching what we see. New target from Atlantis. Travelling N to look for plumes.

7. 16:13: 28 43.320, -88 19.602, d=1467

Looks like more a seep site. Bacterial mats present. Carbonates. Tubeworms (bad shape) No muscles or clams.

8. 16:20: 28 43.329, -88 19.581, d=1468

Site #1: X-mas Tree

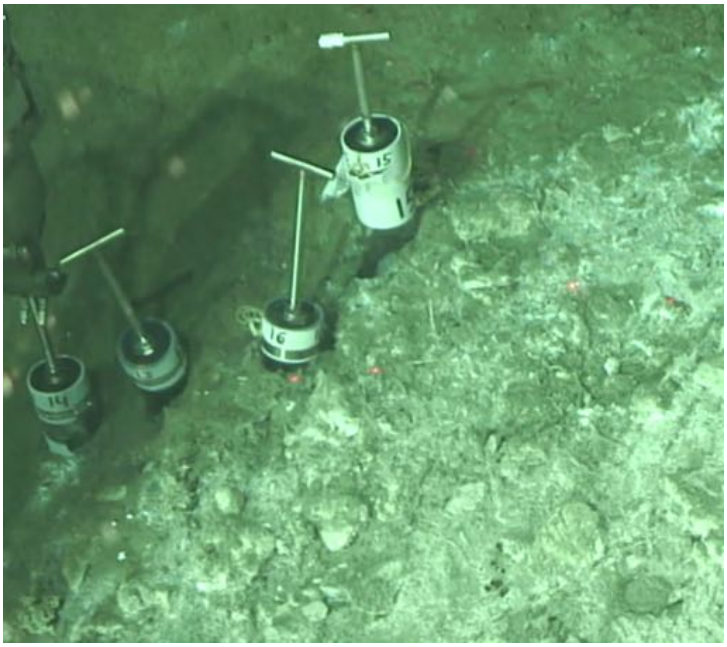
Settling to collect samples (cores, water, methane, beastcam). Nice bacterial mat, looks fluffy, in a crater. May be rocky. Carbonates present.

9. Methane Wand (16:31).

10. Coring (16:39): Attempted to core in center of mat, next to bubble stream. Substrate was too hard.

11. Beast Cam (16:52): Taking pics of bacterial mat, and little vent site. About 10 bubble tubes visible. Extremely slow bubble release. Pic of fish!

12. Collecting 10 geochem cores: Core#21 (in small mat), core#22 (next to 21 in small mat), core#23 (no mat), core#24 (no mat), core#17 (small mat that fits in core), core#18 (mat that fits in core), core#15 (mat with lots of oil!), core#16 (lots of oil! Bubbles flying out when removed), core#13 (oily core), core#19 (more on edge), core#20 (no mat)



17:59: 28 43.326, -88 19.586, d=1468

Site #2: Africa

Found a nice bacterial mat for dye and transect for Barbara. We call this site Africa (looks like the Northern part of Africa)

Niskin #1 (18:01) Outboard niskin fired. (Niskins fired from port side to Stbrd side)
Sniffer sucked mud (18:03) Looks like sniffer sucked in some mud because basket was close to ground
Injection Chamber (18:10) Injector chamber placed and pin pulled out. Rubber band got in the way, but the syrynge made it all the way down with help of manip. Left chamber for 5 min. Shifted sub pos. for better maneuvering for cores. Removed dye chamber, no green dye color visible.
Coring for bacterial mat (18:19) Core # 11 (Placed right in the center of where the injector chamber was. On bacterial mat), Core # 6 (Outside of mat for control), Core # 7 (Edge of mat, hard substrate at bottom), Core # 5 (Close to Core 11 where injection chamber was, in center area of mat), Core # 10 (lesser mat), Core # 9 (lesser mat)
9. 18:52: 28 43.324, -88 19.578, d=1468
Site #3: Rock Site
Rocky site. Decided only to do water sample and beast cam pics. Too rocky for cores
Beast Cam (18:53) Taking pics of rocks. Pushed another rock out of the way to get a good shot of the one behind it. Thinking of changing angle of lights on Beast Cam
Niskin #2 (19:06)
Beast Cam (19:08) More photos of rocks. Lip of lens protector hit bottom. Stirred up some mud at bottom

Rock collection (19:14) Picked up rock we took photo of, put on basket. Second rock also collected
10. 19:20: 28 43.330, -88 19.582, d=1467
Travel back to site #1 (X-mas tree) to collect water, since we forgot when we were there first
Niskin #3 (19:20)
11. 19:25: 28 43.332, -88 19.585, d=1467
Site #4: Moustache Mat
Fairly sparse mat, softer than other areas cored
Niskin#4 (19:25)
Coring mats along side Moustache Mat: Core #12 (Long core, on edge of mat), Core #8 (Long core, in mat), Core #4 (Long core, in sparse mat area, hit hard bottom), Core #3 (in sparse mat area), Core #2 (Edge of mat), Core #1 (Outside of mat. Thought this area would be a good transect for Barbara). Video file started at 19:45 shows all 6 cores in position.
12. 19:50: 28 43.326, -88 19.696, d=1467
Spent last half hour at bottom taking pictures of a crab and a shrimp.
ALVIN ascent (20:25)

Niskin #5 (20:28) last bottle fired on the way up.

13. 21:00: on deck.

Dive #4689 Report – Joye

Date: 4/3/2014 Dive # 4689 Site: GC600

Pilot: Bruce Strickrott Port: Mandy J Starboard: Kim T

Dive Origin: 28 21.0N, 90 36.0W

Launch Target (Birthday Candles): 27° 21.860'N, 90° 33.823'W; 1400m

Oily Brine Target: 27º 21.887N, 90º 33.791W

Final Target (Megaplume): 27° 22.206'N, 90° 34.254'W

Observations & Samples:

GC600 is a prolific natural seep that host oil vents, gas vents, as well as briney pore-fluids. It is unclear whether the brine derives from hydrate formation or from brine fluid seeping from the underlying salt dome. This was the first of 5 dives to the GC600 site. We landed just south of the "Birthday Candles" area, almost on top of a hydrate mound. This is an extremely active area characterized by abundant hydrate mounds, carbonate pavement, and chemosynthetis (large mussels (>25 cm long) and fairly large (~10 cm across) clams. The dive had to be aborted early (we were called to the surface around 11:30) because of an injury on board the ship that required immediate transport of the injured party to shore. Despite the short dive, we got exceptional video of hydrates, oil chimneys, and ice worms, collected 17 sediment cores from essentially a control site (no oil and no gas flux) and 5 brine trapper bottles. We also collected 4 very large mussels which were living in a pool of oil.

All times in GMT

15. 13:30: 27 21.0N, 90 36.0W

Launch

16. 14:43: 27 21.839N, 90 33.70; 1222m

On the Bottom, we landed in an area where there were thin microbial mats on top of hydrate; many clams, black reducing sediment, and a large fault running along N-S along the Port side of the sub.

17. 14:53: 27 21.839, 90 33.80; 1222m

High Def video of large hydrate mound with oil/hydrate/carbonate chimneys on its port side. The hydrate mound is covered with white specs that appear to be copepods upon further inspection. During the video effort, a large rat tail fish (@1509) swam up and sat down beside the oil chimneys and stayed there the entire time we were videoing.

18. 14:53: 27 21.839, 90 33.80; 1222m

Moving towards "Birthday Candles" target. As we moved off we took down-looking image mosaics of the hydrate mound and of some very large mussels. Numerous pockmarks along the seafloor and the craters are often filled with shell hash. Carbonate is abundant (@1524, 27 21.841, 90 33.797).

19. 15:28: 27 21.853N, 90 33.805; 1222m

Stopped to video at "Mr. Noodle Head" Hydrate mound. The hydrate mound is black, saturated with oil. Along it's bottom edges are oil/hydrate chimneys. On the S face, there are ice worms living in the oil, burrowed into the hydrate. Collected high def video for about 20 minutes (see video!!).

20. 15:36: 27 21.853N, 90 33.805; 1222m

Attempted to fire up Beast Cam but after numerous attempts gave up (it turned out that the Ethernet cable inside the sub coming from the camera was not plugged in).

21. 15:36: 27 21.853N, 90 33.805; 1222m

High Def video of Mr. Noodle Head hydrate mound. to fire up Beast Cam but after numerous attempts gave up (it turned out that the Ethernet cable inside the sub coming from the camera was not plugged in).

22. 16:12: 27 21.853N, 90 33.804; 1222m

Filled Brine Trapper (back bottle) by opening, purging for 5 minutes and then closing the bottle. The bottle was approximately 1m from the hydrate mound, perhaps 0.5m above the bottom.

23. 16:26: 27 21.853N, 90 33.804; 1222m

Mussel and Clam shell collection; one each into the core rack.

24. 16:35: 27 21.853N, 90 33.804; 1222m

Received call from the surface to immediately abort dive due to an injury to one of the ship's crew. However, because the A-frame had to be fired up, we asked and received permission to push core.

25. 16:47: 27 21.866N, 90 33.807; 1222m

Collected 8 push cores from the backside of a hydrate mound. Surprisingly, they were not oily or gassy or black (reducing). Cores: 21, 22, 23, 17, 18, 19, 13 & 14 (note #17 is very short, hit carbonate).

26. 16:47: 27 21.877N, 90 33.799; 1222m

Moved slightly to NW and **collected 9 push cores** from the backside of a hydrate mound. These also were not oily or gassy or black (reducing). I consider both of these sets of cores to be "controls" for GC600. Cores: 15, 9, 10, 5, 6, 7, 1, 2 (crooked) &3 (note #2 went in sideways so is crooked). Much of this mud can be used for experiments back home.

27. 16:59: 27 21.866N, 90 33.807; 1222m

Filled Brine Trapper (back bottle) by opening, purging for 5 minutes and then closing the bottle. The bottle was adjacent to the coring site so should reflect background in the area.

28. 16:59: 27 21.879N, 90 33.791; 1222m

Mussels living in oil Collected a clump of 4 mussels that were living in a pool of bubbling oil.

29. 17:02: 27 21.889N, 90 33.799; 1222m

Huge Hydrate mound

30. 17:04: 27 21.898N, 90 33.791; 1222m

Another clump of mussels living in a pond of oil!! Grab them tomorrow.

END OF DIVE

Dive #4690 Report – MacDonald

Date: 03/31/2014 Dive # 4690 Site: GC600

Pilot: Bob Waters Port: Barbara MacGregor Starboard: Ian MacDonald

Launch Target: Birthday Candles 27°21.860'N 90 °33.823;
Hydrate with ice worms 27 °21.853 90°33.805
Oily brine target 27°21.777N 90°33.791'
Mussels in oil 27°21.098 90°33.791'
Megaplume 27°22.206' 90°34.254'

The deeper site called Birthday Candles features hundreds of small and large mounds, interspersed with steep-sided craters. White mats of many descriptions are observed everywhere. Seafloor is strewn with carbonate debris, irregular, rarely forming continuous pavements. The walls of the most prominent of mound and crater features have exposed hydrate, black in color. Most notably, oil and gas bubbles are released from complexes of tiny chimneys, like spouts, that discharge occasional drops. Ice worms and crabs line the exposed hydrate crevices. A large, possibly new to science mussel is abundant in the northwestern end of the site, which spans at least A few "brine" channels were observed, but we did not see any pools.

1) Standby deck 13:18 08:18 CDT.

Hard electrical grounds. Sorting out issues.

2) Launch & dive 14:07

1199m is launch altitude
3) Landed 15:04 1226 27°21.829' 90°33.831' x3577 y1531

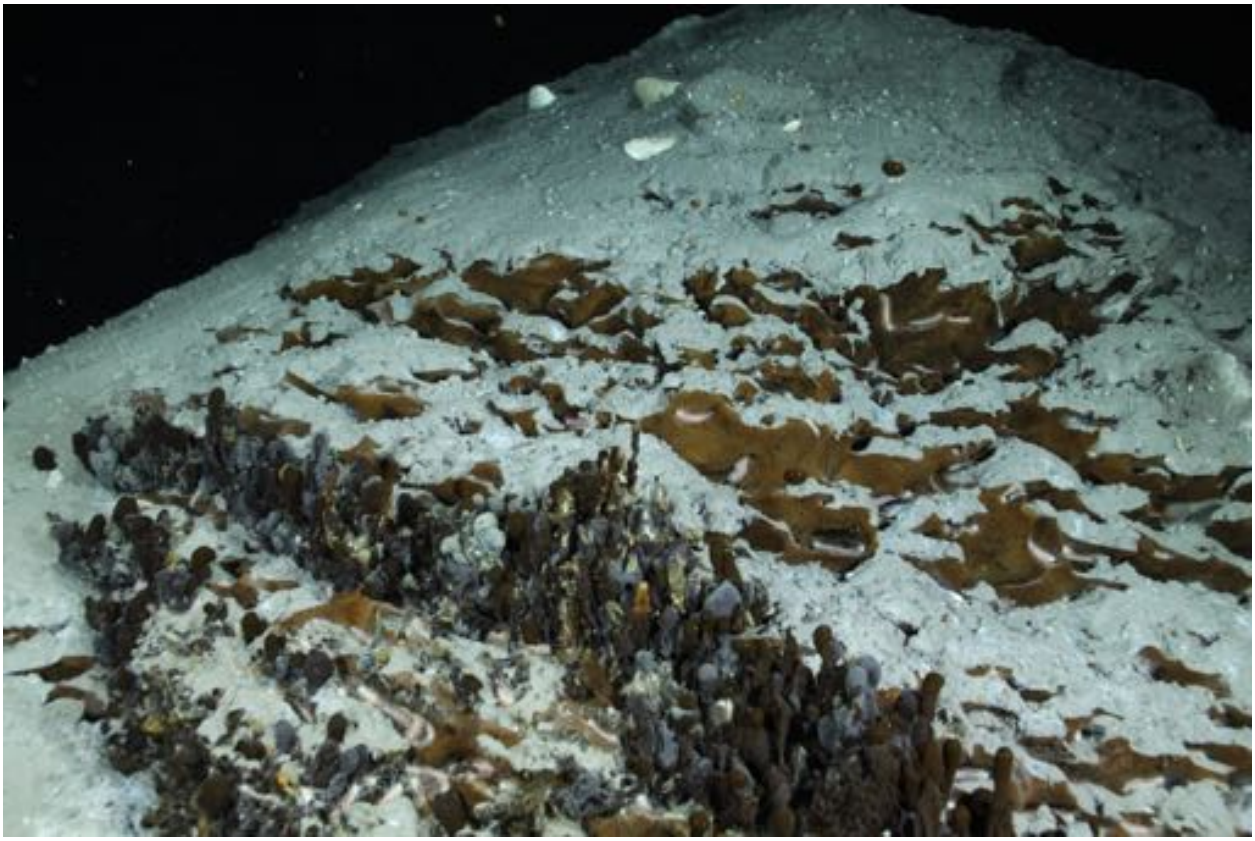
Bottom is strewn with carbonate rubble and Calyptogena shells. White mats present in small patches
4) Underway 15:21 1227

Heading toward launch target ~100m north of landing spot.
5) Searching 15:29 1208

Searching for oily hydrate target. We are recording the downlooking camera

6) Beast Cam 16:05 1220 27°21.84 90°33.804 X3621 Y1551 head 105°

At an oily hydrate mound with vigorous venting from one side. Extensive oil chimneys with iceworms & crevices.



7) Niskin 16:37 Same position as previous.

Completed ~ 30 Beast Cam pix of mound. Liifted off and took niskins #s 5, 4 in bubble stream. Note that #5 is outboard on port side, #4 is the next one inboard.

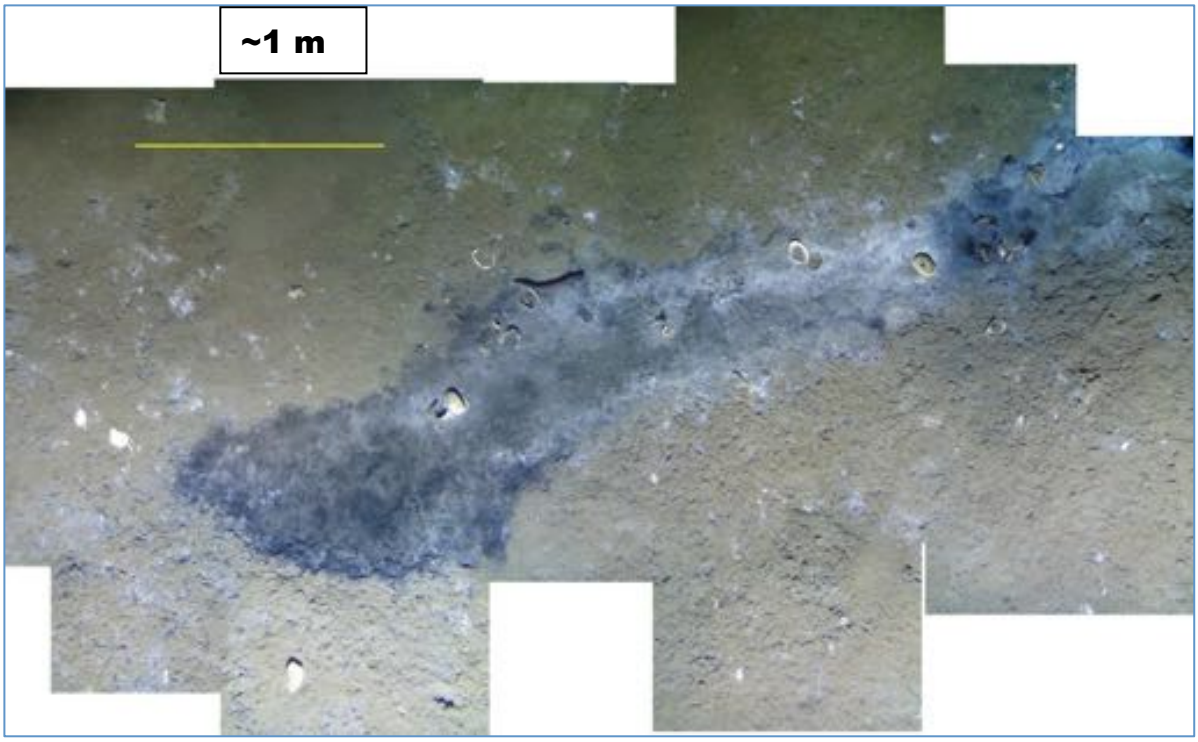
8) Underway 16:46 1220 Searching for oily brine pools

9) Photosurvey 16:52 1213 27°21.854 90°33.782 X3657 Y1576

possible brine pools, possible mussels. Doing photosurvey prior to sampling

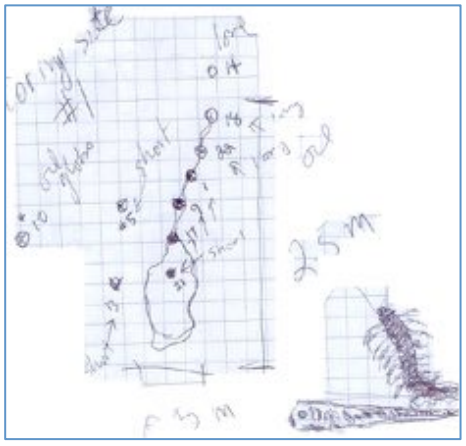
10) 17:00 Same position

Doing a photo-survey of site before sitting to sample



11) Coring 17:23 Same position

The brine is just under the interface. Shells are dead. Probably not the site seen yesterday.
Collecting cores along edges of pool & runoff channel:
See map. Core #s 21, 17, 9, 5, 13, 1, 22, 18, 14, 10: #s 21, 17, 9, and 1 were quite short—less than 6", the others were longer.



12) Niskin 17:36 Same position

Middle niskin above pool. This is the middle bottle, labeled #1

13) Searching 18:16 1209 27°21.87 90°33.806

Searching for mussel target from yesterday. Not seeing mussels. Collected rock from edge of crater. We are in the cloud. Moving on NW

14) Beast Cam 18:43 1209 27°21.817 90°33.864

15) Collection 19:16 1206 27°21.922 90°33.864 X3527 Y1703

As we moved northwest toward Megaplume target, encountered more mussels. Stopped here to collect from about 10 individuals in pit. Beast Cam pix of bed show mussels 1/2 to 2/3 buried in sediment. Releases copious oil, not visible when you sit down--ie no drops seeping out until disturbed. At least one mussel is crushed in collection. Try collecting rock with mussels hanging on.

16) Underway 318°19:30 1205

Numerous mussel beds, GH mounds, shells & bacterial mats (suspected).

17) Underway 318°19:46 1200 X355 Y3791
Still underway. Still seeing carbonate rubble & shells plus occassional white mats, but much less activity. No longer seeing gas hydrate or mussels

18) Underway 318° 19:52 1198 X3031 Y2090

patchy white mats with dark halos

19) Underway 318° 19:58 1193 X3003 Y2114 We are about 100 m from Megaplume target.

20) 20:03 1993 X2932 Y2179

Quiet bottom with shells & crabs. Suddenly some carbonate

21) Niskin 20:15 1182 X2850 Y2196

Found camera at Megaplume--vent is very active with oil drops & bubbles streaming out.
Took niskin labeled #6--this is fourth from port--in megaplume stream. Oil everywhere

22) Observation 20:24

Same position Lights of deployed VTLC came on and burned for ~10s

23) Difficulties 20:45 1181 27°22.196 90°34.267 X2857 Y2208

We have a problem. Deployed VTLC is in a fairly deep hole and ALVIN cannot approach. Motored completely around trying to find a way to approach, stirring up big cloud. Want to grab camera now while in position, but viz is very bad

24) Recovery 20:55 Same position

Managed to grab camera in port manip. Need to deploy new VTLC and recover old one. Not easy

25) Basket mess 21:17 1180 X2836 Y2222 heading 237°

Found large area of mats. Attempting to swap cameras here. Dropped old camera. New camera very tangled on basket. Running out of time. New camera deployed but lamp pointed up. Old camera on basket--also tangled. Will hold in manip. Leaving bottom

26) Niskin 21:25 1174 X2817 Y2238

Last niskin closed. This is labeled #3, most inboard bottle. Dropping all weights.

END OF DIVE

Dive #4690 Report – MacGregor

Date: 04/04/2014 Dive # 4690 Site: GC600

Pilot: Bob Waters Port: Barbara MacGregor Starboard: Ian MacDonald

Launch (Birthday Candles) Target: 27º 21.860′N, 90° 33.823′ W; 1400m

Observations & Samples:

Note: all times below are ZULU.

Collected 10 cores along a brine stream flowing into a small pool; all made it back with sediment inside, although the one from the stream source was plastered to the core liner walls. Collected 2 Niskins at ice-worm hydrate, 1 at brine pool where cores were taken, 1 in Megaplume, and one in Megaplume area just before starting up. Collected several mussels, including one group attached to a rock, and a couple pieces of carbonate rock. Beautiful photographs of dense ice worm population on hydrate taken with Beast Cam, with (?) bubble formation visible. Ran out of time for injection-chamber deployment, probably due to late start (electrical problems), long transit between sites, and awkward position of camera that had to be recovered.

Assorted: Pilots prefer xy to lat/long; overlay on cameras often gets stuck, time and location stay the same for several minutes at a time; Niskin bottles need sequential (or at least consistent) numbers. And, put things w/ ROVs where *Alvin* can't go!

14:07: Into the water

15:04: 27º 21.829′N, 90º 33.821′W (x3577, y1531), 1226 m
Landed about 100 m S of target. Bottom temperature 4˚C.

15:20: 27º 21.850′N, 90º 33.826′W (x3584, y1517), 1219 m
Continuing upslope, nearly at target.

15:22: 27º 21.860′N, 90º 33.823′W (x3592, y1584)

Reach launch target. See pit with dead mussels, no hydrate. General area has rubble, no seeps, white fuzzy [possible] mat.

15:32: 27º 21.867′N, 90º 33.825′W, 1208 m

Still searching for hydrate target.

15:35

See something like Mandy's "dinosaur footprint" to port – small dark bump with four small depressions in front of it. New target: x3635, y1545.

15:49: (x 3638, y 1576), 1212 m

Brine pool? Lots of patchy white mussel beds (live). Starboard MZ shows white sediment, small outcropping.

15:56: 27º 21.838′N, 90º 33.791′W (x3638, y1576), 1219 m

Target (we think). “Bubbling crude” – mound and ledge of hydrate. Bob – “stalactite farm”.

16:05: 27º 21.840′N, 90º 33.804′W

Heading 105. North side of gas hydrate mound, one side exposed. Steady oil stream – getting Beast Cam positioned. Port MZ on mound overview.

16:13

Port MZ shows ice worms, hydrate closeup. Beast Cam at work – beautiful ice worm pictures!

16:20

Port MZ crab study, then (back to) line of slower seeps extending away from hydrate.

16:37

Port PATZ has overview; photos of hydrates done, time for Niskins

16:45: 27º 21.840′N, 90º 33.804′W

Fired Niskin 5 (outboard), then Niskin 4. Heading back to try and find brine pools.

16:52: (x3657, y1576), 1213 m

At brine pool, surveyed with down-looking camera. ~30 cm wide, 2 sections, EW orientation.

17:10

Coring, mostly up along oil stream: 21 (hit rock, collect ~4”), 17 (shallow, gas), 13 (shallow), 9 (shallow), 5 (outside stream, level with 9 – shallow), 1 (further upstream, bit deeper – 7”; oil came out)

17:22

Continued coring – Port MZ shows #1 hole. 22 (bit longer, hit rock), 18 (“source” - got through crust; very oily, white crust on black crackles – like ginger snaps; cloudy black liquid escaped), 14 (~full core, further up), 10 (sediment falling out bottom; oily goo hanging down).

17:36 (x3650, y1583), 1213 m

Middle Niskin (#1 on lid) collected at brine pool

17:52

Off to new target – oily mussels – looking for lots of little clams that should be in the area

18:04

At possible mat, but had to wait too long for mud to clear

18:08

Headed for Bruce's suggested mussel target (x3650, y 1611) – should be about 40 m at heading 309

18:15: 27º 21.870′N, 90º 33.806′W (x3619, y1608), 1209 m

Collecting rocks – crunchy and crumbly

18:30: 27º 21.873′N, 90º 33.793′W, heading 315 (x3641, y 1611), 1209 m

Starting for Megaplume, looking for mussels along the way

18:32: 27º 21.882′N, 90º 33.792′W (x3641, y1629), 1209 m

Coming to exposed black hydrate, Beast Cam brought into action

18:49: (x3618, y1623), 1208 m

Trying to capture mussels – oil bubbles rising – near big mound covered with white crust? mat?

19:04: 27º 21.922′N, 90º 33.862′W (x3527, y1703), 1205 m

Ian spotted bunch of mussels in a pit between Birthday Candles and Megaplume. Beast Cam, then mussel collection. Waiting on cloud… Oil came out when mussels pulled up collected several, including one live with rocks, and one dead.

19:46: (x3223, y1901), 1185 m, heading 318

Still cruising to Megaplume. Seafloor less seep-affected – fewer mussels, flatter.

19:55:

Glimpse another "dinosaur footprint"

19:57: (x3031, y2090), 1194 m, heading 318

Patchy white mats, some with dark halos

20:03: (x2932, y2179), 1193 m, heading 318

Quiet bottom – shells, crabs – then suddenly a little carbonate

20:06: (x2890, y2226), 1180 m

Deep pit, about Alvin-sized

20:11: 27º 22.201′N, 90º 34.280′W (x2862, y2193), 1180m

Megaplume site

20:14: (x2850, y2196), 1181 m

Niskin #6 fired in Megaplume

20:24

Camera lights coming on

20:29:

Camera is in a hole, trying to get at it raised a cloud

20:55

Camera grabbed, heading out of pit

21:01: (x2836, y2223), 1181 m, heading 287

Mat found for (possible future) staining and coring

21:17: (x2837, 72222), 1180 m

Old camera on, new camera off, Beast Cam on bungee. Positioning of camera will have to wait until next dive.

21:25: (x2817, y2238), 1174 m

Niskin #3 (inboard) fired; headed for surface

END OF DIVE

Dive #4691 Report – Teske

Date: 4/5/2014 Dive # 4691 Site: GC600

Pilot: Pat H Port: Andreas Starboard: PIT

Megaplume: 27° 22.206'N, 90° 34.254'W; 1225m

Birthday Candles: 27° 21.860'N, 90° 33.823'W; 1225m

Oily Brine Sediment: 27º 21.887N, 90º 33.791W; 1225m

Tasks:

** STATE (audio) time stamp and location for all activities **

Specific Tasks:

1) Reposition the VTLC:

GMT 14.15 and x/y 2835/2330 (**27°N22.262; 90°W34.281)**: at bottom

GMT 14.26 and x/y 2833/2235 (**27°N22.210; 90°W34.282)**: arrived at Ian's camera; the light beam is pointing upwards into the dark ocean. We are trying to point it to a nearby microbial mat, but the sloping site is too steep, and repositioning a few meters away to a more accessible microbial mat becomes necessary (finally done **15:15 GMT, x/y 2834/2217; 27°N22.200; 90°W34.281**). Lasers and lights are pointing at the mat (has a grey dusting after all the commotion).

2) Core nearby microbial mats nearby for microelectrodes, rates, geochem (transect from inside to outside mat) – 12 cores total

GMT 15.23 and x/y 2842/2188 (27°N22.185; 90°W34.277): after some cruising around looking in vain for Megaplume (but seeing some of its markers – duh!) we find a suitable large mat for coring. This mat, like all others that we see today, has a whispy and sugar-dust-like surface appearance, unlike the fluffy mat pillows of Guaymas-type *Beggiatoa* mats.

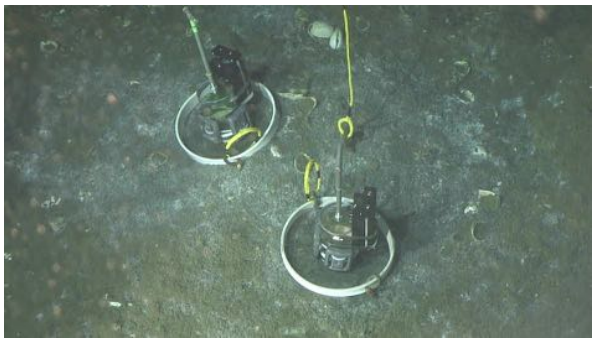
Cores 13, 17, 21 and 22 are obtained from the white central area (screengrab above); carbonate pavement in the sediment prevents deep cores (ca. 10 cm). Done 15:59.

Cores 9, 16, 18, 23 and 24 (long) are obtained from the edge of the mat, ca. 50 cm distant from the other core group. The long core 24 is most distant from the mat edge on sediment. These cores are much deeper and do

not hit carbonate pavement. Core 9 is cored first, and triggers a small oil bubble stream. The screengrab left shows the reducing sediment under the mat immediately after coring No. 9. Cores 9 and 23 overcore a nice fluffy small white mat. Done 16:41.

Finally, Cores 11, 15, 19 and 20 (long) are taken at the bare sediment area ca. 30 cm distant from the mat, left of the edge core group. Done 16:57 (a few minutes earlier)

Niskin bottles 1 and 2 are fired at the mat sampling site (x/y 2842/2188)

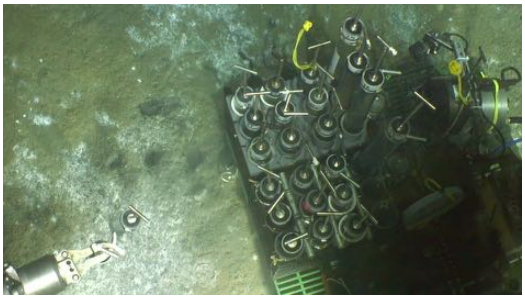


3) Deploy Mat Dye Chambers

GMT 17:00; x/y 2842/2169. **(27°N22.174; 90°W34.277)**: We find another small mat for dyestainer deploy-ment; again, this mat has the whispy appearance unlike Guaymas-Type *Beggiatoa* mats. Both stainers are positioned into white plastic rings on the mat surface, and are fired and incubated for at least 5 minutes before the staining chambers are lifted off the sediment and mat. No visible staining was apparent.

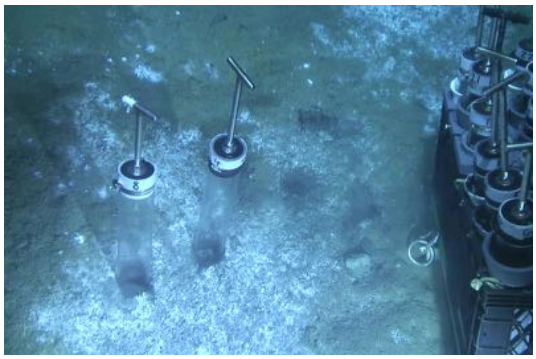
GMT 17:43: dye chambers are taken off, and a disk marker labeled **4691A** is set out.

4) Micro-cable Bacteria cores



[--Core 4 dark (sulfidic) and 4 orange (iron oxide) sediments (no obvious surface mat!!) for microelectrodes, molecular, rates, geoch**]**

GMT 18:03, x/y 2822/2169 (27°N22.174; 90°W34.289): A white-powder covered mat and its olive-grey boundary regions here in



the Megaplume area are the best way to fill this request. The first cores (1, 2, 5, 6, all small cores) are taken at the upper edge of the mat (see coring holes in screengrab above). Then, cores 4 (long), 8 (normal), 10 (long), and 12 (long) are taken in the central white mat area (screengrab left, with cores 4 and 8 in). Both core groups are done at GMT18:42. Finally, cores 16 (long), 7 (short) and 3 (short) were taken ca. 2 m upfield of the mat area from olive-grey colored oxidized sediment without any traces of white mat.

GMT 19:01, x/y 2823/2170 (27°N22.175; 90°W34.288): Battery check. We have enough energy to attempt cruising over to the Birthday Candles area to collect mussels (no more sediments, as the cores are all full).

5) Collect live mussels (large and medium sized) from any oil pond that you see – Ian says there were not many mussels near megaplume so you will need to head SE towards Birthday Candles. There should be numerous.

GMT19:42; x/y 3377/1785 (27°N21.966; 90°W33.952): Found clams, but not mussels; scoop samples into biobox. Fired Niskin bottles 3, 4 and 5 at the clam scooping site.

GMT 20:09, x/y 3378/1764 (27°N21.955; 90°W33.952): return to surface.

END OF DIVE

Coring map for dive 4691

Core description examples (top layer only)
Core 18: Mat 1: Edge
Still bubbling. <1 mm patchy gray microbial mat with tube sticking out; 0-2 cm brown; dark brown boundary...
Core 9: Mat 1: Edge – Fluffy
– 2 mm black surface. 0-15 cm brown with numerous fluorescent orange UV(+) pockets...
Core 14: Mat 1: Edge

Dive #4692 Report – Joye

Date: 4/6/2014 Dive # 4692 Site: GC600

Pilot: Bruce S Port: Mandy J Starboard: Matt S

Elevator: 27.3701, -90.5699; X=2976, Y=2221; z=1225m

Megaplume: 27.3698, -90.3638; X=2852, Y=2196; z=1225m

Birthday Candles: 27.3643, -90.5637; X=3590; Y=1588; z=1215m

Oily Brine Sediment: 27.3648, -90.5632; X=3642, Y=1638; z=1225m

Observations & Samples:

We moved the elevator to a position perfectly in front of the oil vent known as Megaplume. The intake hose was less than 1m from the vent. At the elevator we collected a gas tight brine bottle and fired all the Niskins. We collected two cores – in and out – from the dye chamber experiment. We looked for micro-cable bacteria sites but did not see any. We collected mussels and carbonate rocks. We found an extensive brine flow near the oily-briney site and sampled the brine fluid as well as sediments around the brine pool (3 locations with increasing distance from the brine). We had a scrubber issue that caused to leave the bottom a bit early and lost the next dive because this issue had to be remedied.

All times Zulu

13:15: Launch

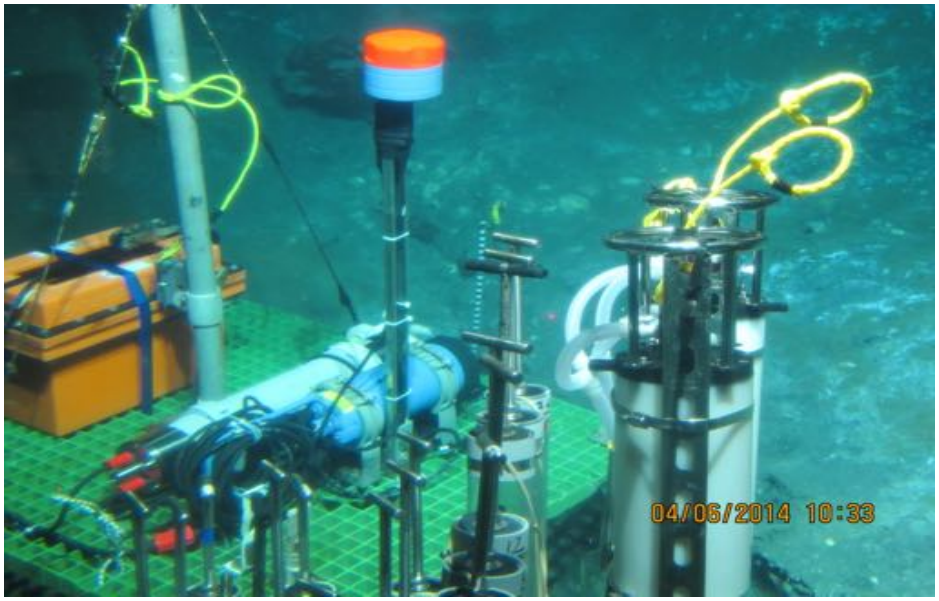
14:21: 27 22.252, -90 34.126, 1191m; On the bottom about 100 m from the elevator. The light on Ian's camera is not flashing. Lots of carbonate and small corals here.

14:34: 27 22.251, -90 34.143, 1192m: moving to the elevator and picking it up to position it. Took off the drop weights and picked it up.

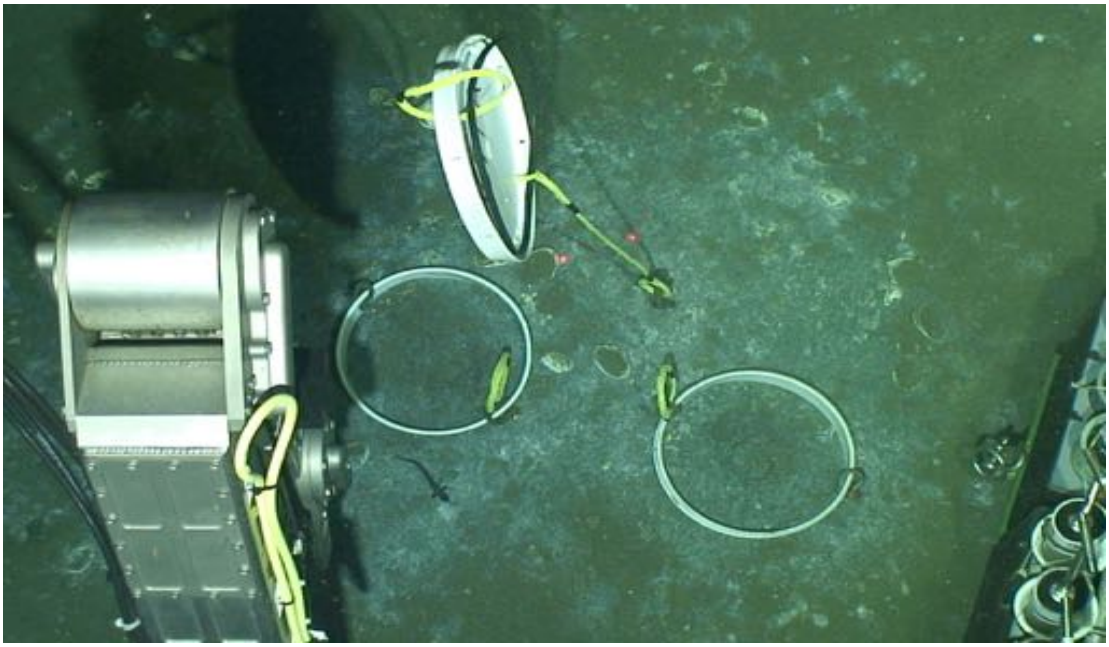
14:51: Moving towards megaplume

15:37: Elevator is positioned perfectly, heading 004 (almost due North)

27 22.191, -90 34.275. Fired a brine bottle (FRONT) [flushed for 5 minutes]; fired all the niskins; then moved to core mats. Took a lot of high def video of the elevator in place.

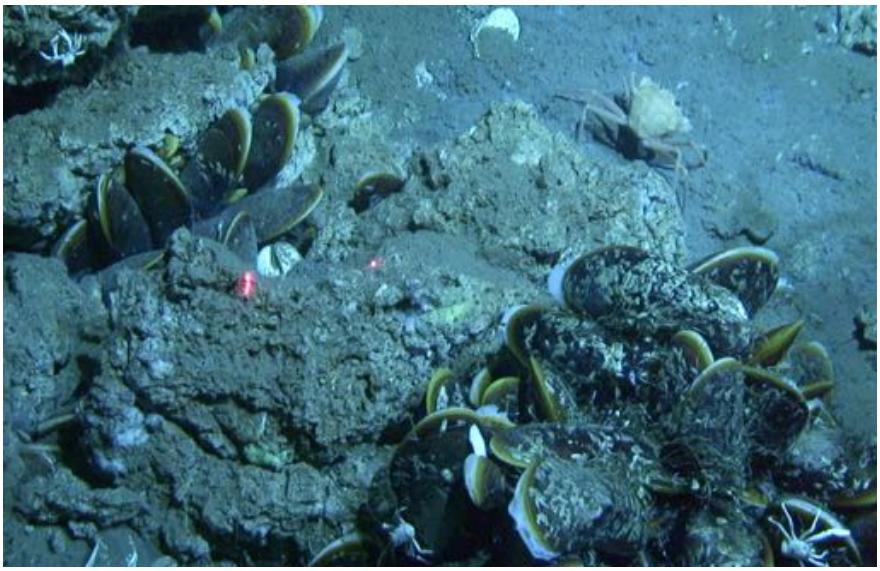


15:58: 27 22.186, -90 34.242. Sampling the dye experimental plots. Port site: Core 21, in the dye hole; core 22 outside; Starboard site: core 23 inside (gas bubbles), core 17 outside. There was carbonate at shallow depths between the sites. Afterwards we recovered the floats and markers.



16:35: Moving towards oily brine target

16:55: 27 21.965, -90 33.870: Spotted a large clump of mussels atop a carbonate mound. These look like B, brooksi but there may be two species mixture (B. childressi too)? Took high def video of the site before samples. Lots of associates living within the mussels, e.g. fish, crabs, etc. This is a very healthy colony.



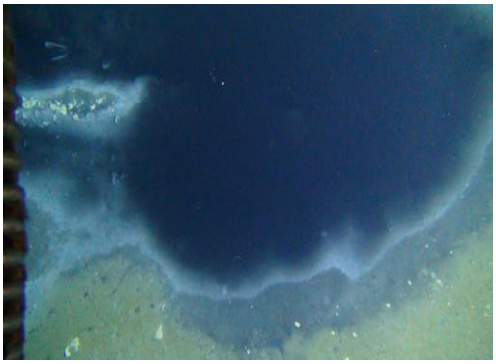
18:02: Headed back to oily brine

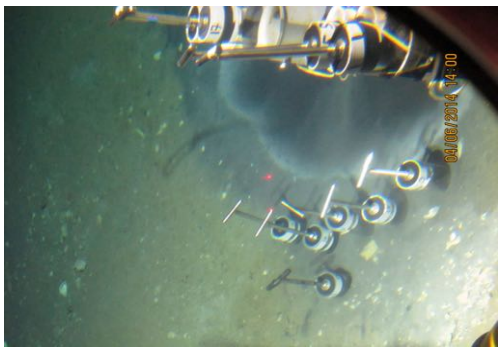
18:14: 27 21.921, -90 33.793: lots of mussels, carbonates and oil

18:32: 27 21.871, -90 33.775: found a brine pool!! Flew up the brine flow and took down looking photos. Amazing!!

Brine trap the brine: purge at 18:38-18:45 (clear flow through the tube into the bottle visible on video). The fluid is particle rich and extremely viscous.

Collected three sets of cores from the edge of the brine flow terminus, a small (2m long x 1.5m wide) pool. One set was in the black/dk gray mud at the edge (within 10 cm) of the pool, one set in the brown mud about 50cm from the pool edge, and one set was from brown mud 2m out from the pool edge.





Back rim mud: cores 18, 19, 13, 14, 15, 9

Brown mud (middle): cores 10, 24, 20, 12, 16, 5

Brown mud (away): cores 1, 2, 3, 6, 4, 8

Completed coring at 19:27; shortly before this scrubber breaker tripped. We had to wrap up and surface.

END OF DIVE.

Dive #4692 Report – Saxton

Date: 4/6/2014 Dive # 4692 Site: GC600

Pilot: Bruce S Port: Mandy J Starboard: Matt S

Launch Target: Elevator

Elevator: 27.3701, -90.5699; X=2976, Y=2221; z=1225m

Megaplume: 27.3698, -90.3638; X=2852, Y=2196; z=1225m

Birthday Candles: 27.3643, -90.5637; X=3590; Y=1588; z=1215m

Oily Brine Sediment: 27.3648, -90.5632; X=3642, Y=1638; z=1225m

Observations and Samples:

Significant natural seeps and hydrates are present at GC600. These were observed in the form of megaplume, the oil and gas seep that has been an important sampling target thus far in this cruise. We also observed hydrate mounds and craters created by hydrate mound release. The inside of these craters was frequently observed to be colonized by large mussels and clams. Some mussel clusters were of substantial size. The areas where hydrate mounds and craters were present were also rich in calcite. Overall, these hydrate rich areas were active biologically with mussels, clams, crabs, and the most dense bacterial mats observed on this dive. It should be noted that these mats were mostly small wispy white mats. We also visited a brine pool near the birthday candles site. Rivulets of brine flow were observed to be flowing into the larger pool. The brine fluid and sediments appeared black and a grey/black beach surrounded the pool. The sediment around the pool transitioned to a brown color, returning to the color of non-brine sediments away from the pool. The dive ended with a brief failure of the CO_2 scrubber that necessitated a return to the surface. At the time of the scrubber failure most sampling objectives had been achieved.

Sample summary: 21 sediment cores were collected, mostly in the vicinity of the brine pool. 5 Niskins and 2 brine bottle were used to collect water. Mussels and carbonate rocks were also collected. All times below are in ZULU.

1. **1435: 27 22.65805N, 90 34.66596W (2200, 3062)** On the bottom and heavy carbonate observed.

2. **1440: 27 22.21024N, 90 34.18753 (2989, 2235)** The elevator was located in the vicinity of sandy bottom sediment and a few wispy bacterial mats.

3. **1517: 27 22.18912N, 90 34.27424W (2846, 2196)** Black and white stick marker denoting the megaplume observed.

4. **1532: 27 22.19129N, 90 34.27484W (2845, 2200)** The elevator was placed ~1m (likely less) away from the plume.

5. **1551: 27 22.19291N, 90 34.27181W (2850, 2203)** One brine bottle sampler was used to sample megaplume, at the time of sampling the bottle intake tube positioned just outside the plume.

6. **1559: 27 22.18695N, 90 2428212W (2833, 2192)** The site of the previously performed experiment to stain bacterial mats with dye located and 4 cores were taken. 1 inside each of the sampling rings and 1 outside each ring. The sampling rings and marker were collected.

7. **1631: 27 22.20861N, 90 34.89032W (1830, 2232)** We visited the site of the VTLC which was easily observable due to its flashing light. We confirmed the placement of the instrument on a bacterial mat.

8. **1752: 27 21.96765N, 90 33.87463W (3505, 1787)** A large mussel bed was observed. Hi-def video and pictures were taken and a large cluster of mussels were collected into biobox attached to carbonate.

9. **1812: 27 21.90917N, 90 33.79580W (3635, 1679)** Many large hydrate craters were observed many with oily deposits on inside and nearly all with clams and mussels living inside.

10. **1824: 27 21.87235N, 90 33.77882W (3663, 1611)** A black oily brine pool was found. Brine fluid was collected using a brine trapper bottle. Sediments outside the brine pool were collected. 6 cores were collected in the grey/black beach surrounding the pool, 6 were collected just outside the grey/black area and. Oil was observed to bubble up from coring sites at each distance, though oil did not bubble from all sites. All 5 niskins were fired at this site to collect seawater adjacent to brine pool. The pool and the rivulets feeding the pool were documented using the downlooking camera and via video.

11. **1940: 27 21.86856N, 90 33.78186W (3658 1604)** 6 more cores were collected in this area where sediments returned to a non-brine impacted color.

END OF DIVE

Dive #4693 Report – Mendlovtiz

Date: 04/09/2014 Dive # 4693 Site: GC600

Pilot: Bob Port: H. Mendlovitz Starboard: Chris (PIT)

Dive Origin: 27 21.0 N 90 36.0 W

Megaplume: 27.3698, -90.3638; X=2852, Y=2196; z=1225m

Observations & Samples:

Dive 4693 turned into a short afternoon dive due to weather. We had less the two-hour to complete our work. We completed our major tasks of retrieving both the lander and VTLC. We also collect water around both. Cores were taken in front of the VTLC and across the rim of the Mega Plume crater.

Summary

18:30 Alvin in water

18:31 Alvin free

18:35 Launch altitude 1189m

18:36 Dive, Dive Dive

19:22 On bottom 2997,2148 (27 22.193129N 90 34.182675W)

19:28 Headed to Mega plume 1194m 2977,2178 (27 22.179373N 90 34.194802W)

Temp 5C, bare sediment

19:36 Lots of half shells 1192m 2900, 2187 (27 22.184247N 90 34.241494W)

19:39 Spotty Mat and many more shells some live 2859, 2178

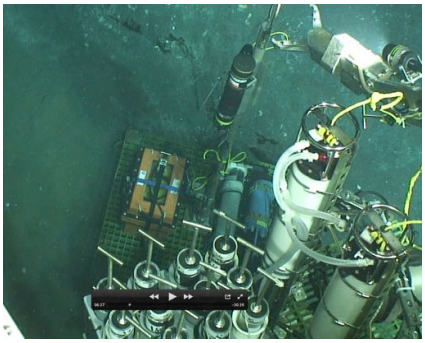
(27 22.179373N 90 34.266355W)

19:47 At lander1182m 2857, 2214

(27 22.198867N 90 34.267568W)

20:00 Sampling water with brine trap #1, 1182m

Half way over lander to the south, plumb ~ 1 meter away



Flush for 7 min ended at 20:07

20:13 Repositioning sub, plume coming through basket

20:15 Picking up lander and moving 2861,2200 1179m

(27 22.191286N 90 34.265143W)

20:18 Placing lander down

20:30 Releasing elevator (drop weight) 2881, 2230

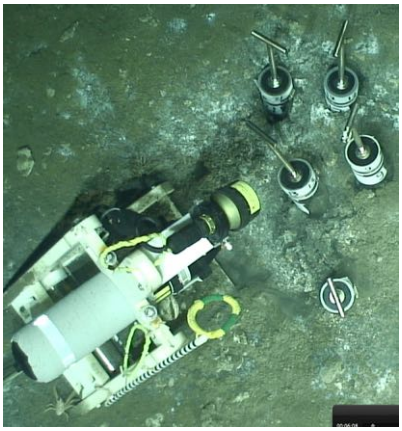
(27 22.207531N 90 34.253015W)

20:34 Bubble stream out of front port

20:47 At VTLC 2840,2225 1180 (no flash see whole time)

(27 22.204824N 90 34.277877W)

20:50 Coring in front of VTLC (six pack)



All six in all six out #1, 5, 9, 13, 17, 21 -- done 20:58

21:00 sample niskins in front of VTLC 1,2,3

21:05 Retrieved VTLC

21:06 Fish made home under camera with a clam

21:18 Headed back to Mega Plume

21:23 Red maker on sediment 2864, 2203

(27 22.192911N 90 34.263323W)

21:30 Going to core a transect of rim of mega plume 2860

Mega Plume just off starport window, stills and hand held video

21:30 Coring of port at 11 oclock, 2860, 2211 (27 22.197243N 90 34.265749W)

Below the rim core #22, white mat, 21:30

Rim #18 little white mat, 21:33

Above Rim #14 no white mat, 21:34

21:38 Trip niskins 4, 5 on rim

21:40 Drop weights

Core 22, 18, 21 venting within the last 30m to surface

END OF DIVE

Dive #4694 Report – Teske

Date: 4/10/2014 Dive # 4694 Site: GC246

Pilot: Pat Port: Andreas Starboard: Verena

Official Lake Position: 27° 42.128'N, 90° 38.892'W; 867m

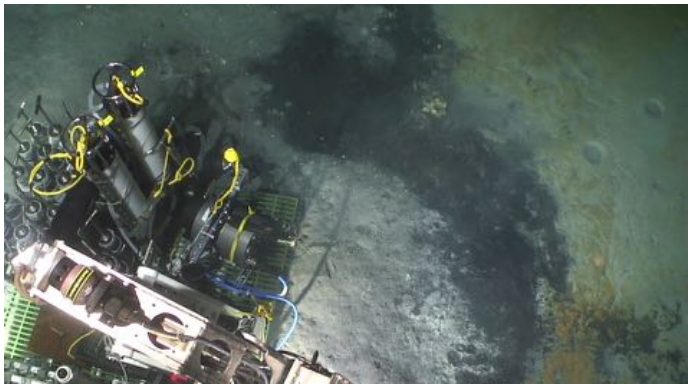
Summary

1) 14:02 at bottom (**27°N42.164; 90°W38.906**). 837m depth

2) 14:21 at Dead Crab Lake **(27°N42.104; 90°W38.898**) SHOCK!!! It's filled with cement-colored gray mud!!!

3) 14:22 at Marker O from 2010 expedition at the NW corner of DCL a few meters backed up from DCL; the marker string is nicely overgrown with some sort of alga-lookalike colonial fluff. Color-coded white and dark sediments around. We try to start the downlooking HD cam for the next twenty minutes (with instructions from top lab) but the thing does not start. Then, short reconnaissance tour.

4) 14.45: turning SW, S, then back east to DCL and flyover DCL to its eastern shore; limpets and mussels are found east of DCL (27°N42.101/90°W38.858), but no conspicuous black sediments or mats. Back to Marker O, with a look into the extensive black sediments [in part encrusted or dusted with white] and mussel colonies, just a little west and south of marker O (27°N42.108/90°W38.908).



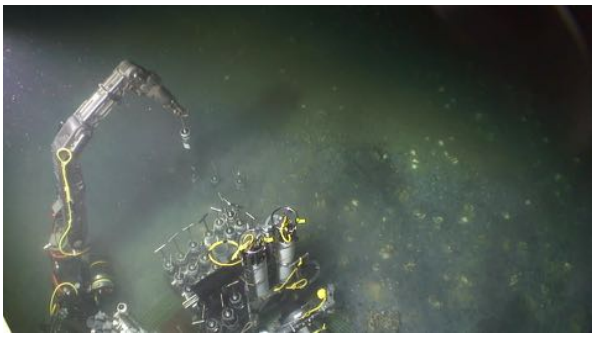
5) 15:00 back at marker O, place VTLC camera looking into what appears to be a little black brine pool with a mussel island at the north edge of DCL (h=103, Port MZ). DCL mud is on the right with bubble holes, terra firma on the left.

6) 15:20 start coring in the black sediment overlaid with brine flow (suspended fine white silt) behind the VTLC.

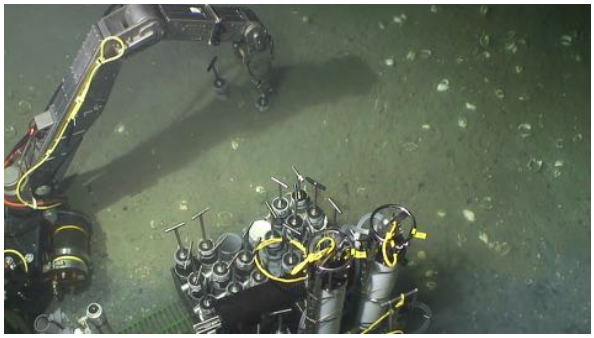
DCL is on the right in the east-facing pictures. Black sediment, we worry that it might be very gassy. Pat sees gas bubbles. Six cores (17, 18, 21, 22, 23, 24). Note that these cores represent brine sediment right on the DCL shore. Done coring at 15:39.

7) 15:48 Explore SE of DCL and see essentially reducing sediments w. rusty stains (**27°N42.050; 90°W38.892**). In a moment of existential doubt (can this mud hole be DCL?) we check old coordinates of DCL (**27°N42.134; 90°W38.884**); nothing there. The grey mud hole is indeed DCL, after massive mud influx.

8) 16:17 While heading back from NE, encounter mud cloud moving NEward from the lake; waiting for cloud to clear and sit down (**27°N42.117; 90°W38.893**) NE of DCL. Sediments have lots of limpets and mussels; right here we have a spot of reducing sediments and normal (olive-grey) sediments next to each other. Core for cable bacteria in this area.



9) 16:26 at same spot start coring the darker, more reducing sediment area (screengrab left, cores 14, 15, 16, 19, 20)



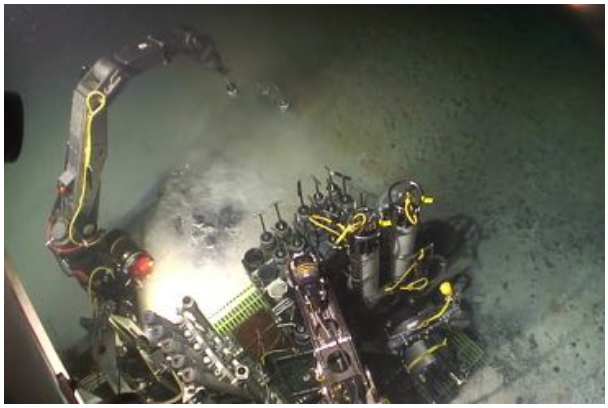
10) 16:40 move the sub 2 meters south (**27°N42.117; 90°W38.891)** to more oxidized, less dark sediment for coring (screengrab left, cores 8, 9, 10, 11, 13). These sediments look reducing at the bottom, but appear to have a suboxic zone (at least as seen from portholes). We notice the laser and lights of the VTLC just a few meters ahead. Works nicely! 834 m.

11) 16:57 Take Niskins 1, 2 and 3 over the VTLC (**27°N42.108; 90°W38.898**). 831 m

12) 17:00 Take Niskins 4 and 5 over DCL nearby (**27°N42.104; 90°W38.901**). 831 m

13) 17:11 Back near marker O. Here, parked to core grey, orange and black sediment (**27°N42.108; 90°W38.901**). 833 m. Stump of one of the chimneys harvested in 2010 is seen nearby. A total of nine cores are collected here. First three light grey cores (5, 6, 7) from grey sediment area; the Alvin footage shows that this is de facto soft lake sediment encroaching on the shore near Marker O.

14) 17:30 Then, three light grey cores from grey sediment with some orange crust on top (1, 2, 3); these are very soupy and only core 1 is really good.



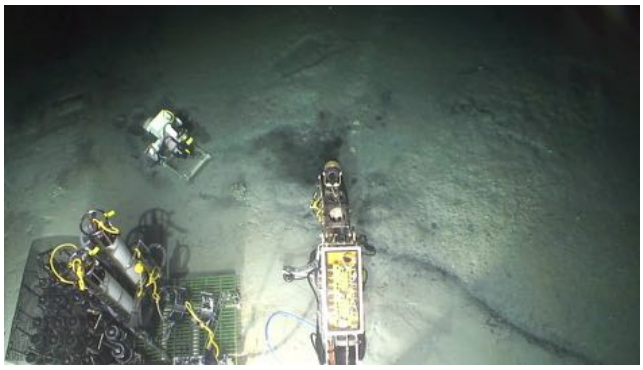
Based on various Alvin footage screen grabs with parking scars in the lake mud, the lake surface is light grey and turns dark and reducing quickly; the mud should be (mostly) corable if more is needed.

15) 17:38 a few meters over (**27°N42.104; 90°W38.902**) three cores from black-covered sediment near a mussel colony (4, 12, 26). The black color turns out to be mere surface dusting; the cored holes look light grey immediately under the surface, just like the other cores in this group. The suspended light grey particles stay in the hole and bob gently up and down (good Portside MZ footage); they do not rise into the water column at all. Strong suspicion of brine.

16) 17:55 collect clump of mussels at the same place; includes small ones. After mussel sampling, the site is dusted with grey sediment, now physically resuspended.

17) 18:12 drive around and look for beastcam things. Find CC marker (**27°N42.101; 90°W38.907**), a small white square with letters CC on a string anchored in sediment with orange-hued surface; candidate site for orange cores later.

18) 18:27 find the new dead crab of DCL at the NE steep bank (**27°N42.102; 90°W38.893**) and beastcam it. 833 m.



19) 18:38. Back to the VTLC; its location and "brine streamlet" are covered with light grey dust - from all the Alvin driving or a mud burp? (**27°N42.102; 90°W38.898**). The light-grey sediment is extremely fine-grained and easily resuspended (unless weighted down by a brine). We hope that the reducing geochemistry will recover as the VTLC watches, and beastcam the scene. On the screen grab, the lower left corner is the lake mud, the upper right corner is terra firma, with the black brine line separating the two. 833 m.

20) 18:52 Back at marker O; we beastcam the reddish-ochre stump of a barite chimney (harvested in 2010 and not much regrown since) and notice little chards of orange chimney material lying around the stump (**27°N42.105; 90°W38.902**). This material should be scooped up carefully with a small tool. At the same spot, we beastcam a mussel cluster with a little fish (eelpout?) hiding in a cleft of the mussels, and then a second mussel cluster. Beastcam works well!

21) 19:10 approx. drive towards SE of DCL; find very extensive mussel beds and the best orange-hued sediments of the entire dive (**27°N42.067; 90°W38.888**). Next time!

22) 19:17 batteries down to 5 minutes; begin ascent to surface (**27°N42.062; 90°W38.888**). Watching cores on portside lower camera, but very little bubbling. OK at 250m, OK at 150m, OK at 75m, a little more bubbling at 30 mbsf; core 14 looses a lot of bubbles and some sediment, but this modest damage is in no way comparable to the wild & out-of-control bubbles of the GC600 cores after dive 4691. Brine inhibition of methanogenesis near DCL?

END OF DIVE

23) 20:00 back at surface

Dive #4695 Report – Joye

Date: 4/11/2014 Dive # 4695 Site: GC600

Pilot: Bruce S Port: Mandy J Starboard: Mary Kate

Launch Target: Birthday Candles

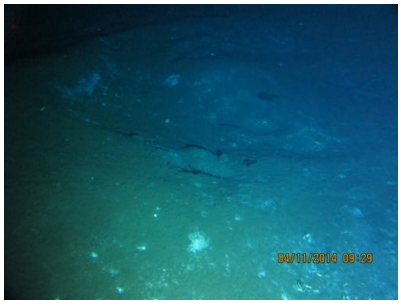
Brine Pool: 27 21.871, -90 33.775, z=1215m

Oily Brine Sediment: 27.3648, -90.5632; X=3642, Y=1638; z=1225m

Birthday Candles: 27.3643, -90.5637; X=3590; Y=1588; z=1215m

Observations and Samples:

We landed at 1203m and it was 8.5-C on the bottom. The main goals of this dive were to drop the VTLC on top of mega-birthday candle chimneys; BeastCam the chimneys and then sample them (targeting the different colored candles to see if there is chemical distinction between them); none of those objectives were achieved. We did collect mussels, brine, bottom water and sediment cores. The dive was significantly impacted by (bad) navigation. We spent a lot of time chasing targets. Following the dive, I plotted the X/Y for the same features obtained from different dives and noted that positions were off by 30-100m; hence our inability to locate targets. Ultimately we stopped chasing our tail and dropped the VTLC at a small chimney site that was discharging mainly oil, but a little gas. These chimneys were small (<1") and similar in color (all brown), a stark contrast from the mega birthday candles site where chimneys of at least five varieties were observed. We tried sampling chimneys at another mound (the same small brown ones) and the chimneys disintegrated when the tube touched them. We located the Cobra brine (took two brine traps) and flew a mosaic over the area. We collected mussels, push cores, and bottom water (at the brine site). Many sparse mats were observed during the dive but we could not core them because we hit hard ground. We found the missing arm of the MUC and dropped a target. When we went back to the target to get it, it was there. The Nav bit us one last time. While the main dive objectives were not accomplished but we did collect 21 cores, 5 Niskins, 2 brine bottles and a bunch of mussels. Final note, Bruce forgot to record my camera. Note to divers: make sure the red frame is on around your camera screen. If the red screen is not on, then the camera is not actually recording (the pilot, not the co-pilot or observer, controls whether or the camera is recording).



Dive Summary

1. 13:10: Launch: 27 21.0N, 90 36.0W d=1203m

2. 14:08: 27 21.930N, 90 33.758W d=1205m, T=8.5°

Landed adjacent to large pockmark

3. 14:25: 27 21.884N, 90 33.781W d=1215m

Mosaic down the Cobra brine pool

4. 14:34: 27 21.880N, 90 33.754W d= 1215m

Found lost multiple corer arm! (X=1434x1210)

5. 14:34: Looking for Birthday Candles

Nav is off and we cannot find it; we waste an hour flying around

6. 15:30: Still looking and now have lost coms

7. 15:54 - 16:04: 27 21.856 N, 90 33.33.832W d= 1214m

Came upon a small mound with two oil chimneys. Decided to deploy the VTLC here. Don't think we will find B-day candles mound.

8. 16:31: 27 21.842N, 90 33.803W d=1222m

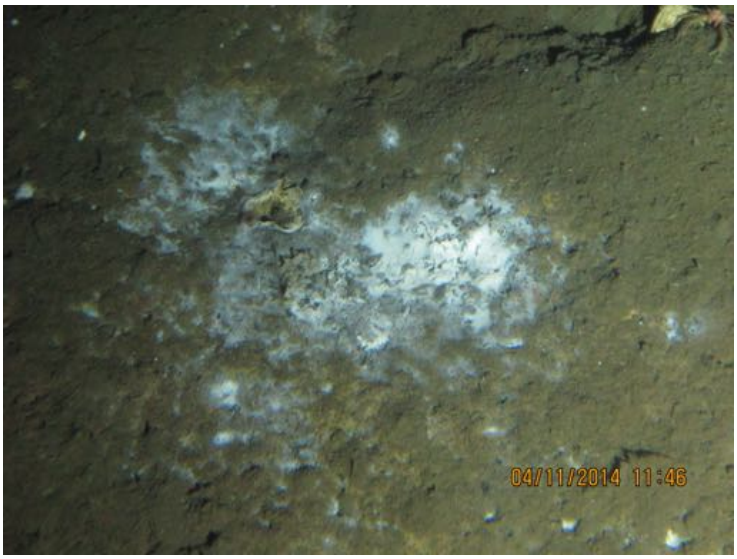
Found another mound with small brown chimneys and are going to try and collect them. The pressure wake of the core tube coming towards them causes some to disintegrate. The rest is scooped into the core tube but is coming out the top. This is core 21….not optimistic that it's going to stay in there.

9. 16:53: 27 21.88534N, 90 33.80429W d= 1222m

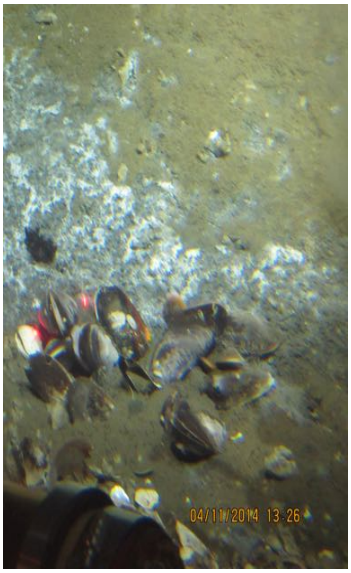
Coring (22, 23, 17, 18, 19, 13) around the hydrate mound – oily and gassy

10. 17:18: 27 21.880N, 90 33.803W d= 1222m

Saw a nice bed of white mat but it could be elemental sulfur? Tried coring it but hit hydrate or carbonate at about 2" down so aborted this effort.



11. 17:35: 27 21.883N, 90 33.803W d=1222m



Lots of mussels here so collected them. Oil bubbles from sediments as the mussels are removed; they are buried about halfway down into the oily mud. There are also clams here so collected a few of them as well. Fired the two most outside niskins

12. 17:35: 27 21.883N, 90 33.803W d=1222m

Mat cores collected up hill from the mussels (14, 9, 10, 11, 15, 16)

13. 18:20: 27 21.885N, 90 33.804W d=1222m

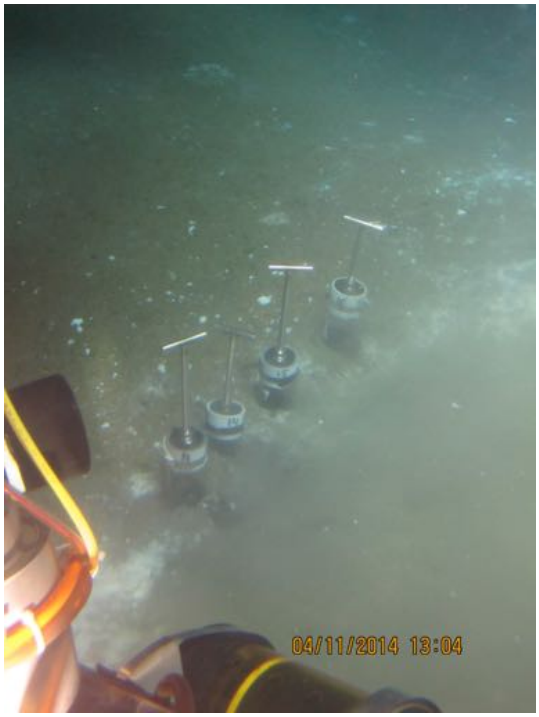
More mussel collections

14. 18:26: 27 21.885N, 90 33.804W d=1222m

Looking for oil chimneys again but found more oily mussels and snagged them

15. 19:15: 27 21.864N, 90 33.786W d= 1210m

Found the Cobra brine river again; brine trap from upper pool (not cobra head) and collected both bottles



16. 19:30: 27 21.864N, 90 33.786W d= 1211m

Cored at this pool – 5,6,7,8,1,2,3,4

17. 19:45: 27 21.864N, 90 33.786W d= 1211m

Flew mosaic at brine pool – cobra head @ 19:52, x=3603, y=1592

18. 20:04: Retrieve VTLC

Fire remaining Niskins (see map below)

mussels **VTLC site**

Niskin Rack looking at if from the front of sub (L to Right)

END OF DIVE.

Dive #4695 Report – Rogener

Date: 4/11/2014 Dive # 4695 Site: GC600

Pilot: Bruce S Port: Mandy J Starboard: Mary Kate

Launch Target: Birthday Candles

Brine Pool: 27 21.871, -90 33.775, z=1215m

Oily Brine Sediment: 27.3648, -90.5632; X=3642, Y=1638; z=1225m

Birthday Candles: 27.3643, -90.5637; X=3590; Y=1588; z=1215m

Obervations and Samples:

For dive 4695 were landed with the objective of dropping the VTLC. We dropped the VTLC over an oily bubbling mound were there was active oil bubbles forming little chimneys, which disintegrated even with motion near by. At GC600 there was a large amount of macrofauna, including rat tail fish, clams, mussels, a giant isopod, shrimp, and crabs. We located and explored briny rivers that formed lobes with tons of mussels inhabiting them. We collected mussels, cored, collected bottom water and brine for geochemistry and rates. We saw mat like features, which were also cored for further analyses. We accomplished most of the objectives laid out by the dive plan, collecting 21 cores, 5 Niskins, 2 brine bottles and mussels. All times ZULU.

1. 14:20: 27 21.92920N, 90 33.73213W d=1220m

Hit the bottom. Topography is sloped with a fluffy gray/tan layer on top of dark gray sediment. There are many rat like fish swimming and clams scattered throughout the bottom.

2. 14:37: 27 21.88426N, 90 33.76124W d=1211m

Driving around surveying for oil bubble locations and we locate a piece of the multiple corer.

3. 16:04: 27 21.86098N, 90 33.82976W d=1215m

Deployed the VTLC on a nice patch of oil bubbles coming out of the sea floor. We will retrieve it before departure.

4. 16:32: 27 21.84148N, 90 33.80247W d= 1220m

Took an oil chimney sample using core number 21. The oil chimneys seem to disintegrate by the movement of the core near the chimney. We collect some but they wash out of the top of the core tube. Possible residue left in core tube.

5. 16:42: 27 21.84094N, 90 33.80247W d= 1220m

Took cores (22, 23, 17, 18, 19, 13) just above the chimney location.

6. 17:19: 27 21.87993N, 90 33.80308W d= 1209m

Located and followed a Briney river.

7. 17:21: 27 21.87993N, 90 33.80308W d= 1208m

Located a patch of area that appears to be microbial mat in the briney river. This mat was too hard to core. 2in down in sediment the core hit carbonate rock.

8. 17:35: 27 21.88263N, 90 33.80369W d=1208m

Located and collected mussels. Once mussels were pulled from sediment there were many oil bubbles coming out from where the mussels were seated.

9. 17:58: 27 21.88534N, 90 33.80429W d= 1207m

Cored (14, 15, 9, 10, 11, 16) an area that appeared to have white wispy microbial mat on top. The white mat like feature could also be elemental sulfur.

10. 18:14: 27 21.88534N, 90 33.80429W d= 1207m

Collected mussels. One of the mussels was crushed during collection and a crab came in response to the mussel juice.

11. 18:26: 27 21.89726N, 90 33.82491W d=1203m

Located an oily brine location. There were clams and mussels living in the oily brine.

12. 18:30: 27 21.89888N, 90 33.82612W d=1205m

Collected mussels from oily brine location. Oil bubbled once mussels were removed.

13. 18:40: 27 21.89888N, 90 33.82612W d=1205m

Fired two Niskins (1,2) from over oily brine location.

14. 18:50: 27 21.89455N, 90 33.81096W d=1204m

Located a brine river off of the starboard side. Followed the brine river.

15. 19:06: 27 21.86368N, 90 33.78549W d= 1210m

While following brine river we located a bunch of smaller lobe brine pools off of it.

16. 19:19: 27 21.87126N, 90 33.78246W d= 1211m

Slurped brine into front brine bottle

17. 19:25: 27 21.87126N, 90 33.78246W d= 1211m

Slurped brine into second brine bottle

18. 19:36: 27 21.87126N, 90 33.78246W d= 1211m

Collected cores (5,6,7,1,2,3,8,4) near the brine pool location.

19. 19:58: 27 21.85718N, 90 33.82491W d=1212m

Retrieved the VTLC

20. 20:04: 27 21.85827N, 90 33.83461W d= 1215m

Fire remaining Niskins (3,4,5)

21. 20:35: 27 21.89780N, 90 33.78368W d=1205m

END OF DIVE

Dive #4696 Report - MacDonald

Date: 04/12/2014 Dive # 4696 Site: GC600 Birthday Candles

Pilot: Bob Waters Port: Mauricio Silva Starboard: Ian MacDonald

Launch Target: Birthday Candles

Brine Pool:	27 21.871; 90 33.775 1215m
Oily Brine Sediment	27.3648; -905632 X=3642, Y=1638; z=1225m
Birthday Candles:	27.3643; -905637; X3590, Y=1588; z=1215m

Observations & Samples

We are returning to the large hydrate mound seen on dives 4689 and 4690. Objective is to collect gas and oil chimney samples as well as Beast Cam pictures and deployment of VTLC to monitor gas/oil seepage rates. From there we will survey the lake and search for coring sites including dark mats, sulfidic mats, and orange mats. Mussel collection and collection of carbonate as occasion arises.

1) 13:19

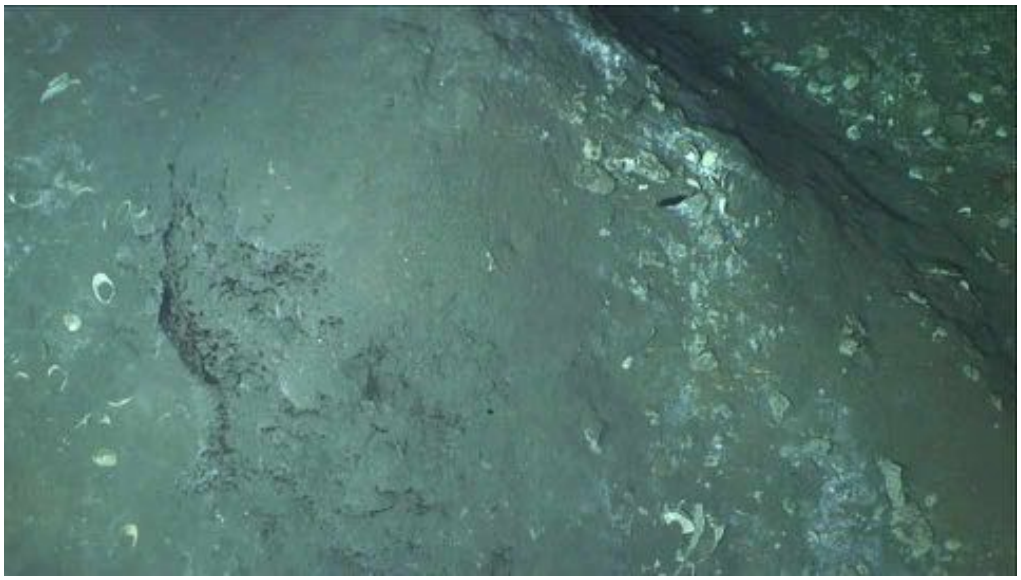
Diving

2) 13:43 27°22.853 88°33.736 1212 X3689 Y1575 °

On bottom. Level with extensive Calyptogena shells (live & dead), carbonates outcrops & white mats. We think we are about 100m NE of target

3) 14:47 27°22.841 88°33.796 1220 X3635 Y1553

This is the Cigar Mound. Can see rows of hydrate chimneys around north base of mound. Very heavy dust clound is making it impossible to work. Waiting for it to clear.



4) 15:36 27°22.838 88°33.803 1221 X3623 Y1547

Moved away slightly to escape dust. At small crevice with hydrate, ice worms, & possible carbonate. Beast cam.

5) 15:57 same position

Same position. Completed Beast Cam--poor quality due to dust cloud

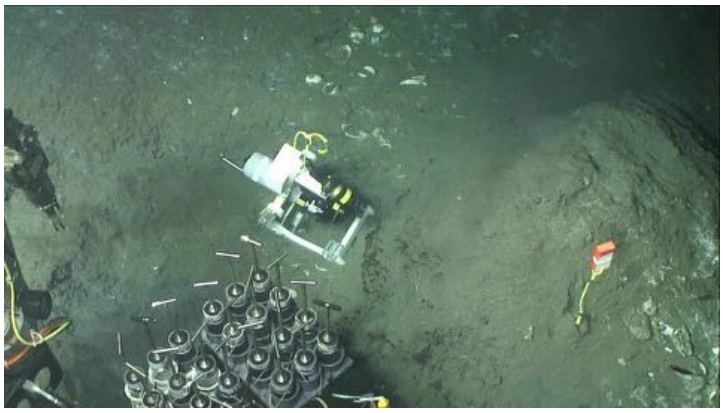
6) 16:10 27°22.853 88°33.736 1212 X3689 Y1575

Back at Cigar Mound. Deployed Marker #10--orange near top of mound.

7) 16:16 16:37 same position

Took gas and oil sample from main portion of vent. Video shows oil in funnel with tennis ball sized lump of hydrate pellets.

8) 16:42 same position



Deployed VTLC at Cigar Mound facing west at base of mound aimed at oil chimneys from dives 4689 and 4690

9) 16:49 Moving

Underway looking for brine lake, mats to core and mussels.

10) 16:55 27°22.874 88°33.771 1207 X3671 Y1610

At multicore tube.

11) 17:05 27°22.859 88°33.773 1212 X3673 Y1586

Deploying orange marker #11 at southern end of brine lake

12) 17:15 same position

Collecting Core #s 6, 19, 2, 3 in a small dark mat near carbonate pavement

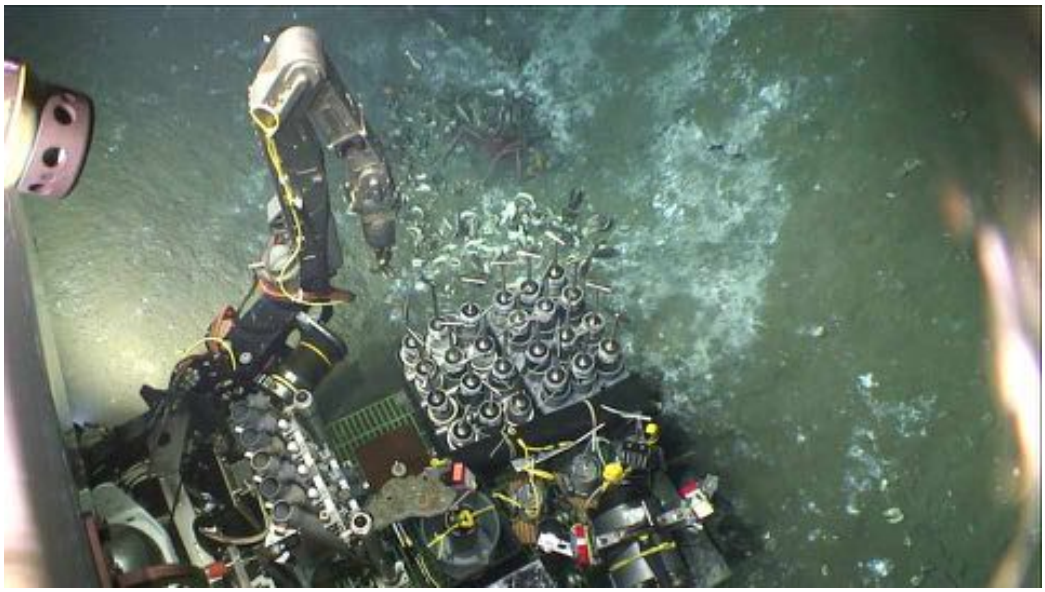
13) 17:15 same position

Collecting large, flat carbonate rock

14) 17:21 Moving

15) 17:41 27°22.866 88°33.77 1212 X3677 Y1599

Collecting mussels from pit beneath outcropping hydrates. White mats. Living & dead mussels.

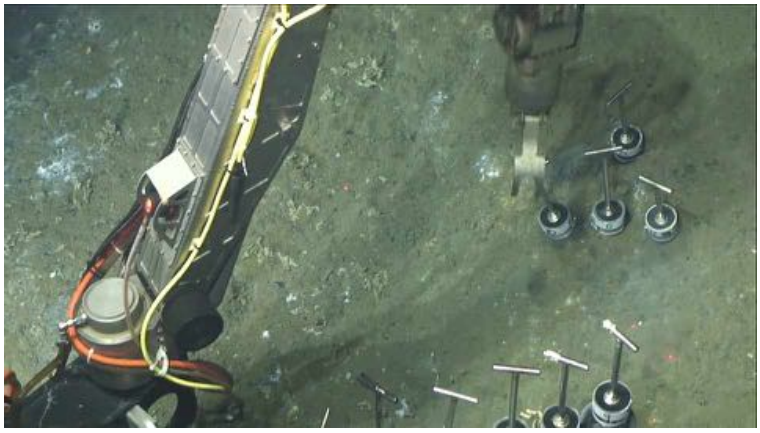


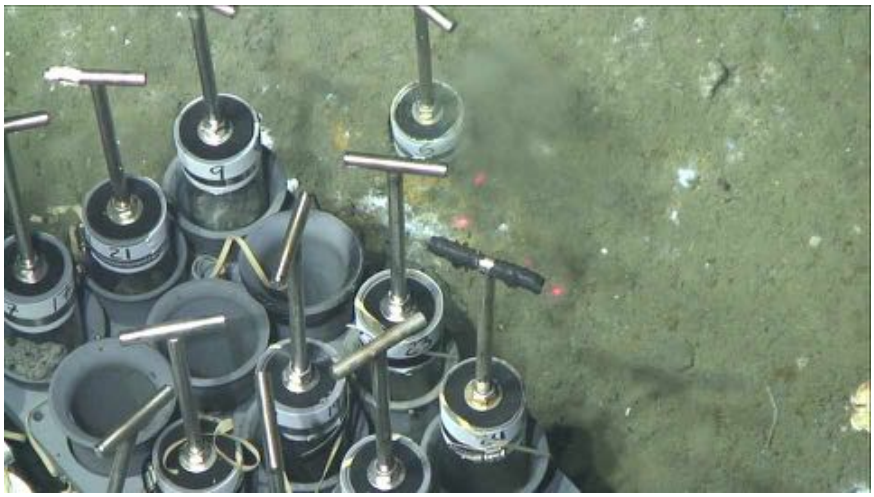
16) 17:48

Collecting Niskin bottle #1 (port side) over brine lake.

17) 18:01 27°22.866 88°33.77 1212 X3677 Y1599

On east side of lake ~ 5 m from brine: Core #s 22 10, 18, 14 in faint orange mat. Very near mussel collection site. Core #s 6, 19, 3, 23 in orange mat with white center.





18) 18:24 same position

Deployed dye chamber. Plunger did not compress--jammed with mud?

19) 17:25 1213 X3642 Y1561

Collecting core #s 15, 11, 7 -- no visible mat, but lots of oil released

20) 18:40 same position

Batterys exhausted unexpectedly must leave bottom soon

21) 18:50 Cigar mound

Recovered VTLC

22) 18:58 Cigar mound

Collecting Niskin bottles 2-5. Leaving bottom

END OF DIVE

Dive #4697 Report – Joye

Date: 04/13/2014 Dive # 4697 Site: Orca North

Pilot: Pat Port: Mandy J Starboard: Sairah M

Launch Target: Orca Basin North

Orca North: 27 0.406, -91 17.326, z=2385m, chemocline @ 2200m

The Orca Basin.

The Orca Basin is a deep intraslope basin in the northern Gulf of Mexico, located 345 km SW of New Orleans on the outer continental slope. It straddles the Green Canyon and Walker Ridge lease blocks on the Outer Continental Shelf at depths between 1650 and 2470 m. Orca Basin is an area of numerous sub-basins, salt ridges, salt canopies, breaching salt diapirs, brine lakes, brine flows, and anoxic sediments. The basin occupies ~400 km^2 of seafloor and contains a large, dual-lobed, J-shaped, 220 m deep anoxic brine lake (~260‰). The basin is partially separated into two distinct sub-basins (North and South) by a small, submerged, central ridge. The Orca Basin brines are sourced from a sediment breaching salt sill of Jurassic-aged, Louann salt deposits above the eastern basin flank, rather than from below the sediment-brine interface like many other seafloor brine accumulations. The donated salts are likely comprised at least partially of gypsum, as evidenced by higher sulfate concentrations in the brine as compared to the overlying seawater.

Flowing brine enters the basin from above at a depth of ~2200 m, and mixes with the seawater to produce a chemocline characterized by a ~50 m meter gradient in salt, oxygen, methane, nutrients, metals, and dissolved organic carbon concentrations. The large density differences at the chemocline effectively suppress vertical transport of solutes into and out of the basin, and act as a particle trap. Oxidation of sulfide, ferrous iron, and reduction of manganese oxides, ferric oxides, and sulfate all occur along the Orca chemocline. Discrete laminations of particulate organic carbon and elevated microbial biomass within the chemocline suggest a trove of complex heterotrophic and chemosynthetic communities that have yet to be identified. High concentrations of biogenic methane at salinities > 200 PSU (>600 μM) suggest viable microbial activity at salinities > 260 PSU.

The sediments in Orca show signs of highly reducing conditions; jet black, pyrite and organic-rich sediments, brilliant red, hematite and cinnabar rich sediments, and pink sediments have all been documented at Orca Basin. Evidence from XRD analysis of red-colored cores retrieved from Orca Basin suggests both periodic and continuous deposition of allochthonous hematite, lending the distinct red hue to the sediments. Levels of iron in the anoxic portions of the brine are nearly 1000 times higher than that of the overriding seawater. There are no detectable levels of sulfide in the anoxic portions of the brine, so hematite

and pyrite formation is likely controlled by the availability of sulfide, or the rate of sulfate reduction.

Few studies have focused on the microbial biology in the Orca Basin. The work of Van Cappellen et al. suggests manganese-reducing bacteria within the chemocline, and the presence of biogenic methane hints at methanogenic microbial communities in the deep anoxic brine. Numerous glass sponge gardens, crabs, and shrimp have been observed on past Alvin dives.

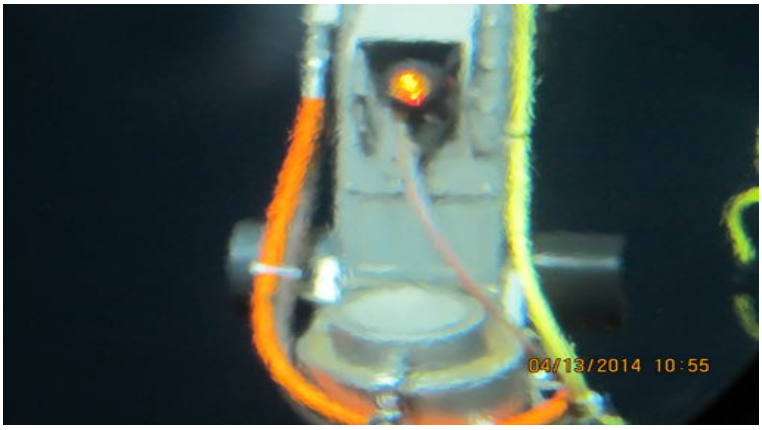
Observations and Samples:

Again, we had a terrible problem descending. It took at least 25 minutes to actually start the descent. Once under, Atlantis did not have NAV lock on us so we were going down blind. Another problem, we did not know the water weight of the trapper so Bruce guessed 250 lbs. He was about a factor of two off (actually more like 125; thank you Lewis. Seriously. Thank you.). So we were REALLY light, descending at only 25 m/min. The descent took the better part of 2 hours, and we landed at 2180m, 35m above where we landed in 2010 (2215). Major bummer. We're at about 40 PSU according to the CTD trace from this mornings drop – but the brine was clearly shimmering. On the way down (at 15:48, 2027m) we saw a fascinating layer of shrimp in the water column. From 2100 to 2150, there are a lot of animals – shrimp, amphipods, copepods, gel. Zoops, salps and larvaceans. We stopped at 2180, did the brine trapper down to 2201, bracketing the oxycline from 2 mg/L to 0 mg/L. We drifted 700 to 1000m SE during the brine trap; did not ever reach the launch target though because they dropped us about 1.2 km to the N of it (?).

1. 13:59: Launch: 26 53.5N, 91 21.0W d=2385m

2. 1600: 27 0.607N, 91 17.179W d=2180m, T=4°

LANDED at 2180m; brine shimmering visible on the manip. Lots of arrow worms, copepods and other zoops in the water. We started sampling here – purged bottle #1 for 20 minutes to clean all the lines. Takes about 4-5 min to purge the bottles. Best to purge bottles for 10 minutes after the lines are clean. Afterwards, moved down 5 m.



3. 16:15: 27 0.6073, 91 17.17842 d=2181m

Switched to bottle#2; purged for 10 minutes.

4. 16:25: 27 0.59187N, 91 17.16272W d= 2181m

Switched to bottle#3; purged for 10 minutes.

5. 16:35: 27 0.59187N, 91 17.16272W d= 2181m

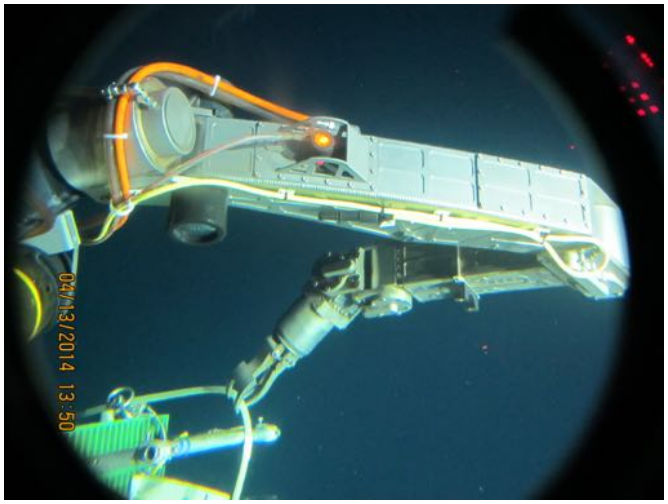
Switched to bottle#4; purged for 10 minutes. Afterwards, moved down 5m.

6. 16:46: 27 0.59079N, 91 17.13373 d= 2186m

Switched to bottle#5; purged for 10 minutes.

7. 17:01: 27 0.55505N, 91 17.12286 d= 2186m

Switched to bottle#6; purged for 10 minutes.



8. 17:16: 27 0.54205N, 91 17.11260 d= 2186m

Switched to bottle#7; purged for 10 minutes. Afterwards, moved down 5m.

9. 17:31: 27 0.54205N, 91 17.11260 d= 2191m

Switched to bottle#8; purged for 10 minutes;

10. 17:47: 27 0.51497N, 91 17.09237 d= 2191m

Switched to bottle#9; purged for 10 minutes;

11. 17:57: 27 0.48302, 91 17.08663 d=2191m

Switched to bottle#10; purged for 10 minutes; Afterwards, moved down 5m.

12. 18:10: 27 0.450N, 91 17.082W d=2196m

Switched to bottle#11; purged for 10 minutes;

13. 18:24: 27 0.450N, 91 17.082W d=2196m

Switched to bottle#12; purged for 10 minutes;

14. 18:36: 27 0.437N, 91 17.082W d=2196m

Switched to bottle#13; purged for 10 minutes; Afterwards, moved down 5m.

**big ciliates and copepods here

15. 18:48: 27 0.426N, 91 17.082W d=2201m

Switched to bottle#14; purged for 10 minutes;

16. 18:58: 27 0.423N, 91 17.087W d=2201m

Switched to bottle#15; purged for 10 minutes;

17. 19:08: 27 0.431N, 91 17.093W d=2201m

Switched to bottle#15; purged for 10 minutes; END OF BRINE TRAPPING

18. 1925: Tried to drive down into brine with thrusters; only got to 2186

small white fast swimmers (copepods?), small red and orange hydromedusa; numerous chaetognaths

19. Slowly ascending by blowing out VB – 200 lbs moved us about 2 feet have to drive up; zoops observed noted in the audio tape.

END OF DIVE

Dive #4698 Report – Montoya

Date: 04/16/2014 Dive # 4698 Site: Orca South

Pilot: Bruce Strickrott Port: Joe Montoya Starboard: Sarah Weber

Dive Origin: 28˚ 53.5'N, 91˚ 21.0'W

Launch Target: 28º 55.0'N, 91° 22.9'W; chemocline at 2200 m

Equipment on Board

Brine trapper (NB: brine chamber 1 was at the distal right end of the basket. We numbered chambers sequentially toward the sub, so chambers 1-6 were in the rightmost column, 7-10 were in the middle column, and 11-16 were in the leftmost column. Chambers 1, 7, and 11 were farthest from the sub, while chambers 6, 10, and 16 were nearest the sub.)

Observations & Samples:

This was a dive to the chemocline of the Southern Orca Basin with the goal of collecting a profile of samples through the upper layer of brine. During the descent, we saw a great deal of marine snow and numerous mucilaginous flocs, particularly below 1000 m depth. We used the UGA brine trapper to collect triplicate samples at five depths starting at the greatest depth the sub could reach (2195 m). After filling 15 sample chambers, we ascended to ca. 2186m to try to collect zooplankton using the 16th brine trapper chamber. The weight at the end of the brine trapper hose made it difficult to use in collecting zooplankton, but we laid the probe on the basket and attempted to collect both zooplankton and marine snow. We began our ascent at 1359. Times in the report are LOCAL times.

08:17: Into the water. Lots of *Trichodesmium* in the water, including very large tufts.

08:58 – 09:24: 28˚55.07919'N, 91˚22.73402'W (-2819x, 2917y)
2080 m depth: large flocs in the water column, some cm-sized.
2170 m depth: hydromedusae
2190 m depth: amphipods

09:28: 28˚55.07919'N, 91˚22.73402'W (-2819x, 2917y)
Entering brine, descent slows noticeably.

09:44: 28˚55.09650'N, 91˚22.71495'W (-2788x, 2949y)
2194 m sub depth: Extend brine trapper hose beyond left side of basket
Fill brine chamber #1. Pump for at least 10 min total with a restart after ~ 3 min. pumping b/c the bottle was briefly closed when the manipulator arm lost its grip.

09:56: 28˚55.09163'N, 91˚22.68419'W (-2738x, 2940y)
2194 m sub depth: Fill brine chamber #2, pumping for 10 min.

10:08: 28˚55.09380'N, 91˚22.67435'W (-2722x, 2944y)
2194 m sub depth: Fill brine chamber #3, pumping for 10 min.

~10:25: 28˚55.09650'N, 91˚22.66082'W (-2700x, 2949y)
2194 m sub depth: Extend brine trapper hose 5m. The fairlead at the edge of the basket interfered with the hose and Bruce had to use the left manipulator arm to pull the hose through.

10:35: 28˚55.09650'N, 91˚22.66082'W (-2700x, 2949y)
2194 m sub depth
2199 m hose depth: Fill brine chamber #4, pumping 10 min.

10:50: 28˚55.10029'N, 91˚22.60361'W (-2607x, 2956y)
2194 m sub depth
2199 m hose depth: Fill brine chamber #5, pumping 10 min.

11:01: 28˚55.09488'N, 91˚22.60177'W (-2604x, 2946y)
2194 m sub depth
2199 m hose depth: Fill brine chamber #6, pumping 10 min.

~11:15: 28˚55.09488'N, 91˚22.60177'W (-2604x, 2946y)
2194 m sub depth: Extend brine trapper hose 5m.

11:17: 28˚55.09488'N, 91˚22.60177'W (-2604x, 2946y)
2194 m sub depth
2204 m hose depth: Fill brine chamber #7, pumping 10 min.

11:29: 28˚55.07918'N, 91˚22.58085'W (-2570x, 2917y)
2194 m sub depth
2204 m hose depth: Fill brine chamber #8, pumping 10 min.

11:42: 28˚55.06781'N, 91˚22.57101'W (-2554x, 2896y)
2194 m sub depth
2204 m hose depth: Fill brine chamber #9, pumping 10 min.

~11:55: 28˚55.06781'N, 91˚22. 57101'W (-2529x, 2896y)
2194 m sub depth: Extend brine trapper hose 5m.

11:58: 28˚55.05861'N, 91˚22.55010'W (-2520x, 2879y)
2194 m sub depth
2209 m hose depth: Fill brine chamber #10, pumping 10 min

12:10: 28˚55.04074'N, 91˚22.53472'W (-2495x, 2846y)
2194 m sub depth
2209 m hose depth: Fill brine chamber #11, pumping 10 min

12:23: 28˚55.03316'N, 91˚22.52734'W (-2483x, 2832y)
2194 m sub depth
2209 m hose depth: Fill brine chamber #12, pumping 10 min

~12:36 28˚55.02125'N, 91˚22.51319'W (-2460x, 2810y)
2194 m sub depth: Extend brine trapper hose 3.5m, leaving only part of a single wrap on the drum. Hose end now at 2212.5m.

12:41: 28˚55.02125'N, 91˚22.51319'W (-2460x, 2810y)
2194 m sub depth
2212.5 m hose depth: Fill brine chamber #13, pumping 10 min.

12:52: 28˚55.00663'N, 91˚22.49597'W (-2432x, 2783y)
2195 m sub depth
2213.5 m hose depth: Fill brine chamber #14, pumping 10 min.

13:04: 28˚54.99310'N, 91˚22.48797'W (-2419x, 2758y)
2195 m sub depth
2213.5 m hose depth: Fill brine chamber #15, pumping 10 min.

~13:15: 28˚54.97740'N, 91˚22.48059'W (-2407x, 2729y)
2194 m sub depth
Reel in brine trapper hose. Several of the markers have slipped: 16 is near 15, 13 & 14 are together, 9 – 11 are together, as are 6 and 7.

~13:22: 28˚54.97740'N, 91˚22.48059'W (-2407x, 2729y)
Drop basket weights and start exploring. Depth display stops updating even though we're clearly ascending.

13:42: 28˚54.96387'N, 91˚22.48490'W (-2414x, 2704y)
sub depth ~ 2188 m.
Position pump head so that it projects just to the front of the basket, then try to slurp plankton and marine snow into chamber #16. Pump for ca. 10 min in all while maneuvering to try to capture interesting objects. This wasn't very successful, and some sort of easily manipulated wand would really be needed to sample plankton with the brine trapper.

13:59: prepare to come to surface

END OF DIVE

Dive #4699 – Joye

Date: 04/17/2014 Dive # 4699 Site: Orca Central

Pilot: Bob Port: Mandy J Starboard: Ryan S

Launch Target: Orca Central Basin

Dive target: 26° 56.2918' N, 91° 17.174' W; depth range: 2198-2205m

Origin: 26º 53.5, -91º 21.0

Observations and Samples.

Again, we had a tough time getting under. It took ~30 minutes to start the descent. Once under, our descent rate was slow (25 m/min) and I suspected we would not reach the target depth, which we didn't. At a depth of 2163m, we noted shimmering indicating we were entering the brine. We ended at 2188m and could barely see the sponge garden beneath us. No way to sample here so we headed SE towards the brine diapir target. Observed a lot of siphonophores (very log, 1.5m and bright orange/red), a few small larvaceans and salps, and one sucker fish (!) on the way to the target. We found a small diapir and did some sampling and then found the target – a very large diapir with what appeared to be flow features on the surface. About the time we started sampling, we got a call from Top Lab that the weather had gone bad and were instructed to scale back ops. Shortly thereafter, we were told to stop sampling and hunker down. This meant we accomplished only half of the tasks on the 'to do list'. Despite that, we collected a half of the cores we had targeted, brine samples and niskins and a few sponges. We sat on the bottom for about 4 hours waiting for a break in the weather. The recovery in heavy seas and high winds was exciting to say the least. The basket was sheared off but thankfully the safeties held; we lost about half the cores we collected ☹ But no one was hurt. Thankfully. But the other samples (sponges, brine trappers, etc. were OK). Thankfully the BeastCam was taken off at the last minute, as it would have been gone when the basket came off.

Dive Summary.

1) 13:24: Dive launch @ **26 53.5, -91 21.0**: took a while to get under

2) 14:46: @ 2163m, shimmering brine apparent on the Alvin arm

3) 14:47: @2188m. **not enough weight on the sub**. We are neutral at 2188m, 15m above where we need to be to sample sponge garden. There are a lot of (red) siphonophores in the water an a few salps. Also saw some fish

4) 15:21: **heading SE** towards, I hope, the land of salt diapirs (saw a fish during transit and more siphonophores

5) 16:02 @ 2185m, **26 26.225, -91 17.028**: **steep slope to starboard**, sponges evident atop what appears to be a diapir, though this one is deeper than I expected the big one to be (we are not at the target). Collected cores among the sponges:

brown/green sediment on top with pink jello underneath. Cores number: 21, 17, 13, 9, 5 & 1. **Note**: 17 is likely overtopped; finished coring at 16:21.

a. @ 16:33 – pulled two niskins (two outmost on port side);

b. @ 16:36 – grabbed a glass sponge;

6) 16:40 @ 2185m: **moving towards SE** in search of the big diapir

7) 17:00 @ 2175m, X=6655-6673, Y=5025-5043: found another knoll, more shallow; there exposed to be exposed salt here. Amazing sight. There are pink (gypsum/rhodosocite) and white (halite) flow features and rivulets that look like regions where brine have been flowing.

8) 17:32 @ 2169m, X=6560, Y=5029: coring white fissures

a. 17:32 - Perpendicular to the cliff face (not vertical): white cores 22, 18, 14, 24; pink cores: 10, 6, 2, 19

b. 17:57: Vertical into the cliff face, white cores: 24, 16, 20; pink cores: 4, 12, 8

c.finished @ 18:10

10) 17:35: call to the surface to talk to Sophie's class!!

11) 17:45: instructed to power down and sit tight due to weather on the surface.

12) 21:45 @ 2169m, X=6560, Y=5029: fired remaining niskins and filled the brine bottle (21:53)

13) We are surfacing now…exciting recovery (OMG).

END OF DIVE…

Dive #4699 Report – Sibert

Date: 4/17/2014 Dive # 4699 Site: Orca Basin

Pilot: Bob Port: Mandy J Starboard: Ryan Sibert

Launch Target: Orca Central Basin

26˚ 56.2918' N, 91˚ 17.174' W; depth range: 2198 - 2205m

Overview.

The goals of this dive were to identify and sample one of the breaching salt blocks feeding brine into the Orca Basin, sample the elusive glass sponges native to the area, and obtain cores of source brines and mud. We wanted to reach a depth of >2198 m (deeper than the previous dive), as most of our bottom-sampling features were slightly deeper than this. Despite carrying more weight than that of the previous dive, we fell short of our goal and instead coming to rest in the upper portion of the chemocline at 2188 m. Much lamenting ensued. We eventually decided to drive SE to the central shoreline to see if we could find the much fabled sponge garden and perhaps identify a salt ridge. It didn't take long to find what appears to be a major salt escarpment (really, we almost ran smack into the thing). This steeply dipping escarpment contains visible flow features marked by dendridic micro-valley cuts, stained either pink or white (in contrast to the surrounding khaki-colored mud matrix), and supports a sparse (but diverse) community of glass sponges. We collected 18 cores at and around the top of the escarpment, collected a number of glass sponges (3 or 4), tripped 2 niskin bottles (first 2 on port side), and the outside brine trapper bottle at the escarpment salt source.

Summary

1. 14:50: 26˚ 56.37877 N, 91˚ 17.15185 W d=2188m

Touchdown in the chemocline. Not deep enough to see bottom. The bottom is perhaps 10-20 m below our current altitude. Begin driving to the SE shore of Orca Central.

2. 16:11: 26 56.22335 N, 91˚ 17.03831W d= 2184m

Contact. Found a sediment draped salt rise with sparse sponges. Core taken here in pinkish sediments (# 1, 21, 17, 9, 5).

3. 16:25: 26˚ 56.22335 N, 91˚ 17.03771 W d=2183m

Glass sponge torture. One glass sponge collected and stored in the bio box.

4. 16:30: 26˚ 56.22281 N, 91˚ 17.03711W d= 2183m

Tripped the two port side niskins (#1 and 2) for bottom water before purging the VB to start our assent upslope.

5. 17:13: 26˚ 56.23093 N, 91˚ 16.97068W d= 2171m

Found a salt cliff inhabited by numerous and diverse glass sponge community at the ridge line. The cliff face shows signs of fluid erosion. Potential salt sill. Sediment is tan with pink and white streaking that closely follows fluid erosional features.

6. 17:32: 26° 56.22931 N, 91° 16.97490 W d= 2169m

Got word from the surface that a storm has kicked up. We are instructed to wrap up ops, conserve power, and stay put until further notice. White flow feature cores (23, 14, 18, 22, 24, 16, 20) and pink flow feature (19, 10, 6, 2, 12, 8, 4) cores taken here.

7. 22:00: 26° 56.22931 N, 91° 16.97490 W d= 2169m

Got word from the surface that we are to head back.

END OF DIVE.

Dive #4700 Report - Viso

Date: 04/19/2014 Dive # 4700 Site: Orca Basin (central)

Pilot: Pat Hickey PIT: Jefferson Grau Starboard: Rich Viso

Dive Origin: 26° 53.5' N, 91° 21.0' W

Launch Target: 26° 56.2918' N, 88° 17.174' W; 2916-2175m

Observations & Samples:

Orca Basin is a large brine basin centered at ~26° 56' N, 91° 18' W. The basin is surrounded by large salt domes and is divided into three sub-basins: north, central, and south. This dive has similar targets to dive 4699, aiming to sample the central basin salt exposure/brine seepage origin environment. The dive penetrated upper brine layers, evidenced by shimmering water at the end of the descent, though the maximum salinity/turbidity layer (and O2 minimum) as defined by the CTD ca. 2230m was not reached. Once maximum depth was achieved (2196m) we transited towards a steep seepage face. The first bottom visible was a gently sloping brown sediment with blocky pink mineral exposures. As the bottom slope increased, we found an escarpment with pink and white mineral exposures. The top of the escarpment was covered in several centimeters of brown sediment with a crusty white layer about 1-2 cm thick. Beneath were pink and white mineral exposures. We selected this escarpment for our first coring site and had a mechanical failure on the port side manipulator, with hydraulic oil leaking from near the wrist. This limited coring activity and four cores, three niskins, and a brine trapper sample were taken at the escarpment. We then transited to the sponge garden and collected 4 sponges, two more niskins, and one core. Following sponge collection, we cored a very steep seepage face. We were able to target horizontal cores of pink and white/light tan mineral exposure. In general, cores were very loosely consolidated at both sites and multiple efforts were required on several of the coring attempts. The beast cam was limited by network connection issues. Note, all times below are ZULU.

Summary.

13:30: Into the water

15:09: 26 56.45025 N, 91 17.17842 W
Maximum depth reached (2196m) no longer able to sink.

15:28 26 56.27696 N, 91 17.17057 W

Heading = 270. Looking for targets from dive plan.

15:51: 26 56.26234 N, 91 17.08965 W

Heading = 161. First sight of bottom. Gently sloping brown sediment with occasional small, blocky pink outcrops.

16:15 26 54.68920 N, 91 17.01537 W

Small seepage face. Gently sloping sediments disrupted by escarpment of 1-2m height. The escarpment revealed a 3cm layer of brown sediments on the seafloor with a thin (1-2cm) bright white layer beneath. This was atop Pink, tan, and white patches are exposed on the seepage face. Depth = 2196m, heading = 211

16:24: 54.68920 N, 91 17.01537 W

Basket of Alvin is nudged into the lower seepage face and work begins. Three niskins were fired. Beast cam photo of pink and white exposures was attempted. Science computer crashed. Port manipulator sprung a leak.

16:54: 26 56.24447 N, 88 29.50890W

Depth = 2196, heading 210. It was determined that coring activity would be limited by capabilities of the starboard manipulator due to the damage to the port side arm. First core was #16. Could not go in horizontally to the seepage face. Lost the core and tried again. Core #16 successfully recovered pink material.

Core #15 successfully recovered pink material on second attempt.

Core #19 was taken through the overlying sediments. Beneath a few cm of brownish seafloor sediments, a thin white layer gave resistance to core penetration, but we eventually broke through. When core tube was removed we had from top to bottom: 3 cm brown seds, 1cm white layer, several cm of interbedded pink and dark layers.

Core #22 was attempted to be a replicate of #19. Core recovered on 3rd attempt. Less dramatic stratigraphy.

Dive plan indicated to slurp brine in core holes. This was impossible without 2 manipulators, so we filled the brine trapper by opening the valve as close to the core site as possible.

17:24: 26 56.24447 N, 88 29.50890W

Leave sampling area #1 and do brief recon for sponges. Downward looking Alvin cam is working. Heading = 174.

17:56: 26 56.22010 N, 91 16.98215 W

Possible sub tracks from previous day's dive. Sponges on gentle slope. Having trouble rising over knoll, making dust clouds.

18:45: 56.22010 N, 91 16.98215 W

Depth = 2180, heading = 102. After waiting 30+ minutes for dust to clear, pitch plates were dropped to achieve buoyancy. We began to rise just a bit and continued upslope traverse.

19:03: 26 56.21794 N, 91 16.97430 W

Depth = 2176, heading = 034. Pursuing a good spot for sponge collection.

19:07: 26 56.21740 N, 91 16.97068 W

Depth = 2176, heading = 002. Fire last two niskins. Collect 4 sponges.

19:50: 26 56.21740 N, 91 16.97068 W

Depth = 2176, heading = 024.

Core #11 was taken in sediments among sponges.

20:08: 26 56.21740 N, 91 16.97068 W

Reposition to heading 056 and commence coring a very steep, large seepage face. Pink and white sediments have the appearance of weathered minerals streaking down a cliff.

Core #10 was taken horizontally into a white patch on the seepage face.

Core #21 was taken horizontally into a blocky pink patch slightly upslope (<1m) from core #10.

20:28: 26 56.21740 N, 91 16.97068 W

No further cores can be reached on basket. Attempts were made at all objectives with partial completion of all but beast cam.

End of dive

Dive #4701 Report – Joye

Date: 04/19/2014 Dive # 4701 Site: Hot Site

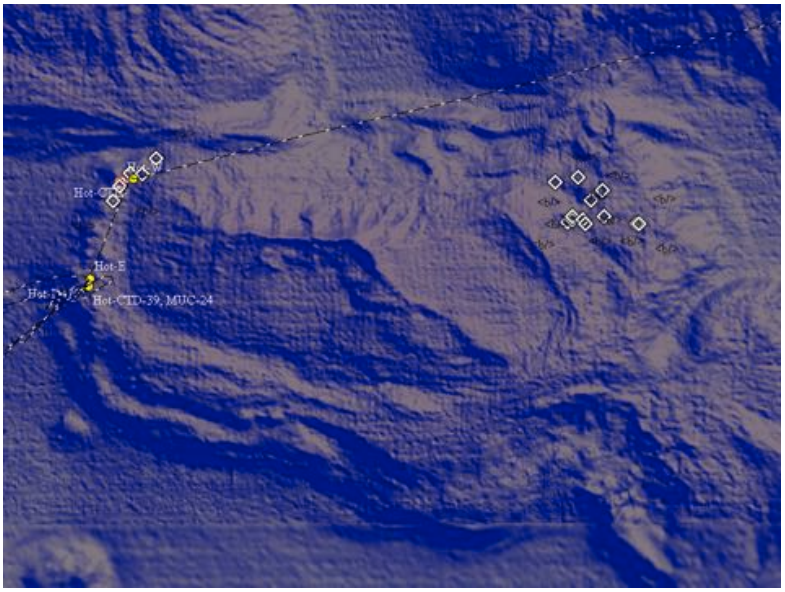
Pilot: Bruce Port: Mandy J Starboard: Lindsey F

Launch Target: Hot Site

27° 19.1376' N, 92° 6.4669' W; depth: 1010m

Sample Site Description:

The Hot Site lies in the Garden Banks 697 (GB697) lease block. This area is characterized by active salt tectonics and gas, fludized mud, and oil discharges along the flanks of salt diapirs. An extensive large mud expulsion feature is present around a central topographic high (salt diaper) and gas fluxes abound all around the flanks of the structure. The diamonds are sites of water column plumes identified by the Okeanos Explorer in early April 2014. Yellow circles are our sampling sites on this visit. MBES line run at this site showed numerous additional plumes along the lower (S) edge of the feature and up the SW edge, which the OE did not image. The seafloor is characterized by numerous topographic highs and mud volcanoes that overlie shallow salt. The Hot Site is home to a small, highly active vent that discharges copious gas and fluidized mud. The fluid salinity was approximately 210‰ and the temperature was 4.97 ºC. This active fluidized mud/brine flow is thought to be geologically young; it lies atop a strong positive amplitude anomaly. There are multiple gas/mud and brine vents emanating from flank of salt along the edge of the mound and basin below. The site was characterized more by gas flow than mud flow in 2010 but in this dive, we observed copious amounts of mud discharge as well as gas. Microbial mats, clams, crabs and amazing flow features characterize this site.



Observations and Samples.

We were late getting in the water today. We landed on a flat muddy bottom with little topography NW of the brine avalanche target. We found the main vent quickly, it's putting out a lot of fine white fluidized mud. There is quite a current and we're getting pushed around a lot. The mud flow is phenomenal, more impressive than the GB425 MV when it was flowing like mad. While sitting at the site, the tide shifted (I assume) because suddenly gas started screaming from the vent. We collected brine samples and niskins here as well as 6 sediment cores along the rim of the crater. From there we moved positioned Ian's camera at the bottom of the brine flow and went back up top to drop the green dye into the source. It was hard to tell how much dye went down with the brine vs. got washed away with the current. Next, we moved to the White mat target where we obtained 6 nice cores within the white mat. After sampling the mat, we wanted to go look for the brine lake but Bruce advised that we should to retrieve the camera even though it had only been out for 1.5 hrs. That was a good call b/c we would not have made it back there. After recovering the camera, we went looking for mussels but did not find mussels or carbonates (until it was too late to collect the latter). We stopped at an interesting mixed white/brown mat and collected cores in the brown and the white/brown areas. This is clearly a brine influenced site but not a brine collection area. We collected a full compliment of cores, brine samples, and fired all the niskins. We failed to collect mussels or carbonates ☹

Dive Summary.

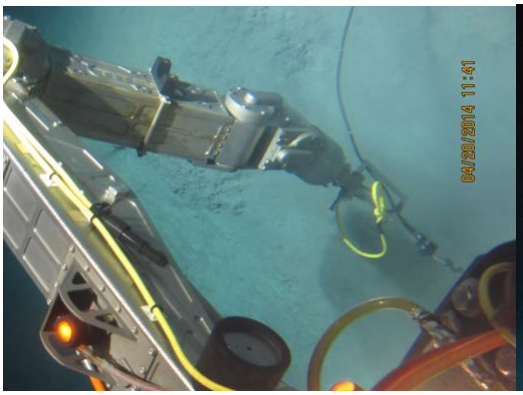
13:45: Dive launch @ **27 16.902, -92 6.798**: descended pretty quickly (diving @ 13:53)

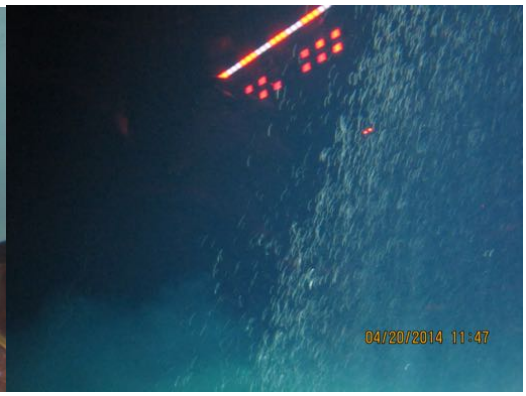
14:44: @ 1010m, **27 19.137, -92.483, on bottom.** Flat mud; NW of primary target

15:53: @1000m. **27 19.128, -92 6.474**. Briney mud volcano!! Main vent is extremely impressive, the flow rate is substantial (muddy brine is billowing from the crater, which is about 1.5-2m in diameter. Crabs were grazing all along the crater edge

a) 16:04: We collected six sediment cores at the crater edge: 1, 2, 3, 4, 5, & 6; the mud was very, very slippery and had to be turned side-ways to keep the mud from falling out of the tubes. The brine fog coming from the crater is clearly evident in the picture below.

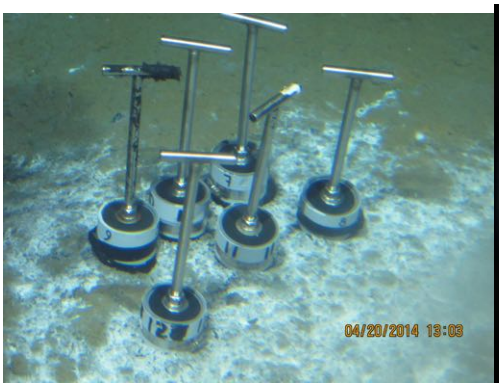
b) 16:23: We collected two niskins (_ X X _ _) slightly up current and then repositioned (16:32) to collect a brine trap sample in the muddy gas stream. At this time there was a tremendous amount of gas flowing from the vent (see images below) and appeared to be discharging in pulses.

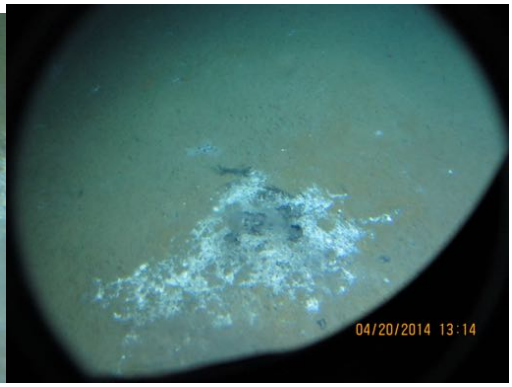




16:56: **moving towards the bottom of the flow feature** to position Ian's camera. The brine avalanche (1002m, **27 19.129, -92 6.484**). Set up camera here at the base of the flow then moved back up to main crater to drop in the dye. Dye release was tricky b/c of the strong current but some clearly went into the muddy brine. The marker was in the middle of the crater (@17:19).

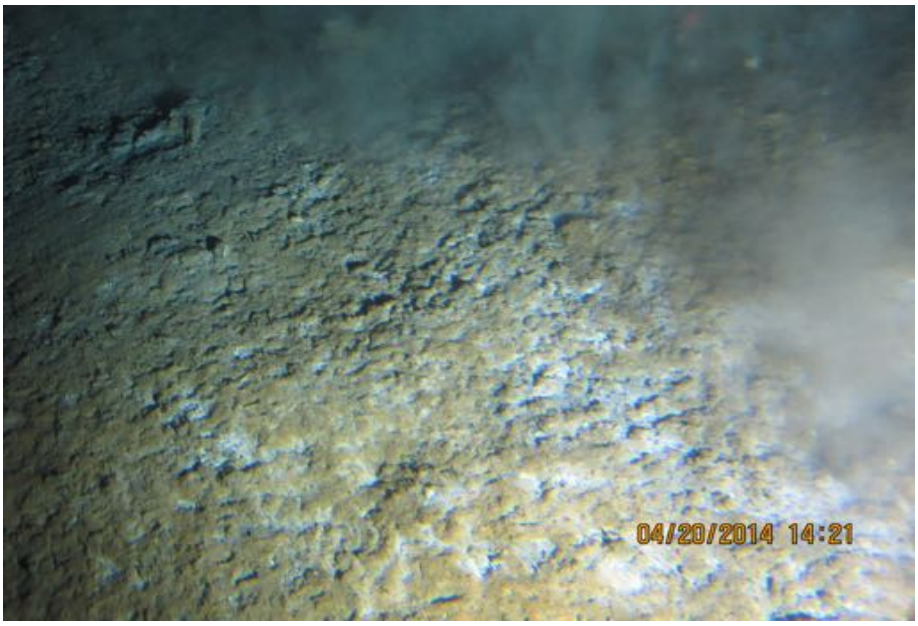
17:57 @ 1017m, **27 19.163, -92 6.542**: **brine influenced depression with white mats**. Sat down here to core. The sediment appears reducing and quite gassy. Possibly contain both Beggiatoa and Thioploca. Cores number: 7, 8, 9, 10, 11, & 12. Note: Gas was escaping as cores were pulled out; holes filled with cloudy brine (pics below). Concerned that these will degas extensively upon retrieval (and they did but not as bad as I expected).





@ 18:42 – retrieved the camera;

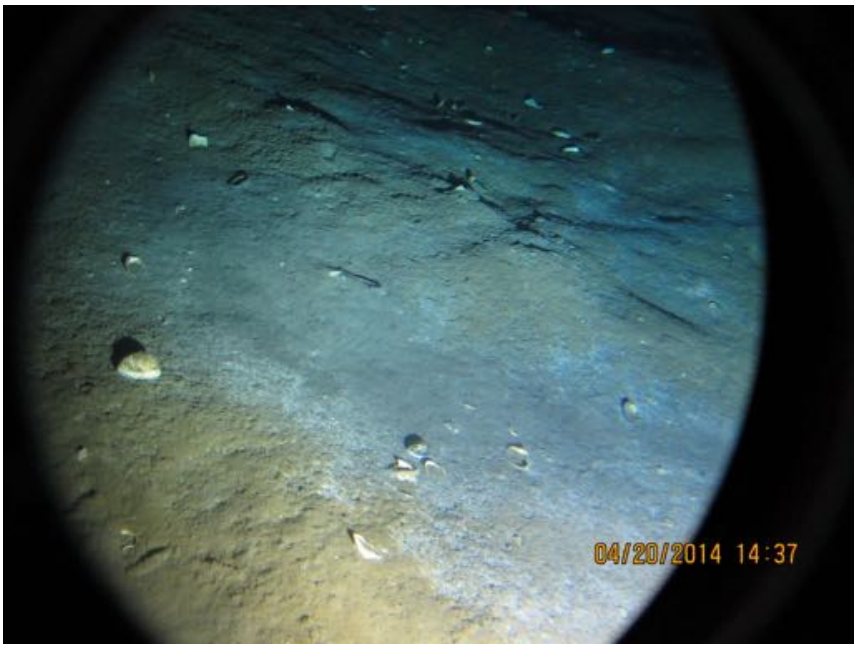
@ 19:19 – **1011m; 27 19.211, -92 6.542**: This was an area with a hummocky mat, white and brown on one side and brown on the other. Obviously sulfidic sediments underneath but not so gassy. Looked brine influenced but no obvious brine flows.

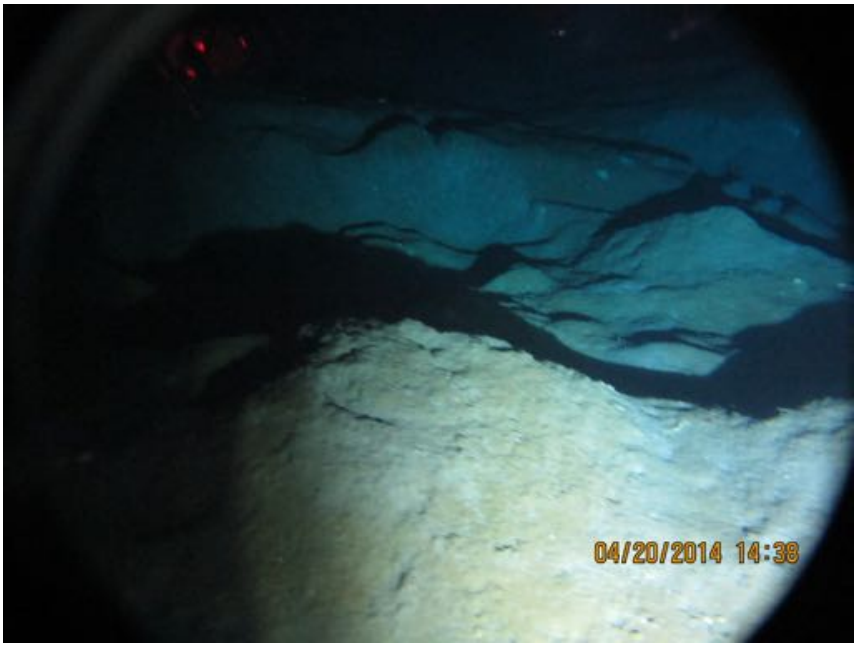


Collected 5 brown cores: 13, 14, 15, 21, 22

Collected 6 white/brown cores: 16, 17, 18, 19, 20, 13 (note two cores were labeled 13 but it should be obvious which is which based on the color difference).

This area was really interesting. A lot of brine-influenced sediment and mud mounds.





We spent a lot of time cruising around this area looking for mussels and carbonates. Finally found carbonate but Bruce could not grab it. We were very low on power (again) and had to surface early. Another 1.5 hrs of bottom time would

have been nice. Getting the battery charges equalized before the cruise would have made a big difference for us. It resulted in less time for exploration and rushed sampling because the dive plans were front loaded.

END OF DIVE.

Dive #4701 Report – Fields

Date: 04/19/2014 Dive # 4701 Site: Hot Site

Pilot: Bruce Port: Mandy J Starboard: Lindsey F

Dive Origin: 26 16.9'N, 92 6.80'W

Launch Target: Hot Site (AT 18-2 dive 4646; x/y based on dive 4646 origin)

27° 19.1376' N, 92° 6.4669' W; depth: 1004m

target:	X	Y	depth	notes
brine volcano-1	516	4121	1003m	primary brine vent
white mat	588	4168	1017m	VERY gassy
brine spout-1	523	4120	1001m	briney fog
brine volcano-2	529	4119	1000m	brine&mud flow
mussels	283	4279	1003m	mussel field
carbonates	272	4274	1004m	carbonate field

Observations and Samples:

We accomplished most of the objectives set forth by the dive plan. We recorded video of brine seepage and expulsion from the mud volcano, though the down-looking camera had some difficulty focusing. The brine flow was sampled using 2 Niskins (near flow) and a brine trapper bottle (in flow), and a nearby bubble stream was sampled, also using 2 Niskins and a brine trapper bottle. The VTLC camera was successfully deployed and retrieved, and dye was dumped into the brine source for recording. We collected 22 push cores from 3 different areas (1 site near the brine volcano, and 2 different mat sites). We were unable to locate and collect mussels, and could not collect a carbonate sample due to difficulties with maneuvering and time constraints. Note, all times below are ZULU.

1. 14:48: 26 19.13509'N, 92 6.49724'W

(x)504, (y)4127 depth=1010m

On the bottom. Landed fairly close to brine volcano, as is evidenced by the cloudy water and "brine fog". Sediment is qualitatively muddy, and stirred up easily upon landing. While waiting for the resuspended sediment to settle, we noticed that much of the cloudiness in the water was mud expulsion and brine from the nearby volcano. There was a noticeably strong southward current.

2. 14:52: 26 19.13509'N, 92 6.49663'W

(x)505, (y)4127 depth=1009m

We notice brine fog rising from the bottom, coming from the brine volcano. Temperature sensor indicates 5 deg C.

3. 15:00: 26 19.12913'N, 92 6.49123'W

(x)514, (y)4116 depth=1000m

Arrive at volcano. It was first visible on the port side, but we flew directly over and around it doing work for the next 1.5 hours. The volcano looks like a "brine avalanche;" thick, white, swirling clouds of brine and mud expulsion hover next to an abrupt drop-off. The abrupt drop-off of the sediment and surrounding clouds look like the top of a waterfall. Adjacent sediment is very light tan in color, and is quite muddy. Once the clouds clear a bit, the brine flow is visible. We notice several crabs and eels moving into and out of the brine flow. There is a noticeably strong southward current in this area. We begin to reposition and set down for sampling.

4. 15:17: 26 19.12642'N, 92 6.48402'W

(x)526, (y)4111 depth=999m

Park in trough next to brine flow to prepare for sampling.

5. 15:24: 26 19.12696'N, 92 6.48282'W

(x)528, (y)4112 depth=999m

Brine is directly in front of the science basket. We fire 2 Niskins (the 2 closest to the starboard side).

6. 15:32: 26 19.12859'N, 92 6.47921'W

(x)534, (y)4115 depth=999m

We are located at the top of the volcano. The brine trapper hose is positioned directly into the brine flow (as far as we could see from the video; it was very cloudy), aiming for the source. We pumped for a total of 12 minutes (15:33-15:45), allowing for time to purge and fill the bottle. Temperature sensor indicates that the temperature in the brine is 4.97 deg C (same as surrounding water temperature).

7. 15:56: 26 19.12859'N, 92 6.4678'W

(x)553, (y)4115 depth=999m

We reposition, heading up current to turn around, sit on ledge, and film from the opposite direction.

8. 16:06: 26 19.12642'N, 92 6.47921'W

(x)534, (y)4111 depth=998m

We are parked on the ledge, and begin collecting sediment cores on the inside of the crater. First, 6 cores are inserted into sediment (cores 1,2,3,4,5,6 in order) (Fig. 1). We notice a crab sitting nearby, very close to where we are coring. At 16:12, the

final core is pushed into the sediment, and bubbles begin streaming out of the sediment in front of us. We think this was caused by a shift in direction of the current. Sediment cores are pulled out of the sediment in reverse order (6,5,4,3,2, then 1) from 16:13-16:22. When the first core is pulled out, sediment immediately falls out of the bottom (it's too muddy). This core (#6) is re-inserted into the sediment, and all of the cores are carefully removed at a bit of an angle to prevent any mud loss during retrieval. Using this approach, all cores were successfully collected.

9. 16:24: 26 19.12696'N, 92 6.47861'W

(x)535, (y)4112 depth=998m

Since we are up out of the "avalanche," we trip 2 more Niskins (the next 2 closest to the starboard side; so the last remaining unfired Niskin is the one closest to the port side). A steady stream of bubbles is still coming out of the sediment.

10. 16:33: 26 19.1275'N, 92 6.47921'W

(x)534, (y)4113 depth=998m

Position brine trapper hose into bubble stream, and begin pumping. Pumped for a total of 10 minutes (16:34-16:44), to allow adequate time for purging and filling. The bubbles are now smaller, but still a steady stream. There are lots of small bubbles, with the source below the brine clouds beneath us.

11. 16:53: 26 19.13292'N, 92 6.48162'W

(x)530, (y)4123 depth=997m

We fly over the bubble stream source in an attempt to take some pictures of the source with the down-looking camera. We take some photos, but the camera has trouble focusing because of the bubbles.

12. 17:08: 26 19.1275'N, 92 6.48883'W

(x)518, (y)4113 depth=1002m

Deployed the VTLC camera at the base of the volcano, parked at the start of the brine flow. We expect this will provide great footage of brine flow.

13. 17:34: 26 19.1275'N, 92 6.47921'W

(x)534, (y)4113 depth=998m

Dispensed green dye in front of the VTLC camera for footage of dye dispersion. Dye is definitely coming out of the container, but quickly dissipates due to the magnitude of the brine flow. We will now transit to a site with microbial mat to collect sediment cores.

14. 17:43: 26 19.15079N, 92 6.44858W

(x)585, (y)4156 depth=1014m

We first spot white bacterial mat. From Mandy's previous visit, she anticipates that mat will get thicker as we continue on, so we continue a few meters deeper in search of thick mat to core. As we move, we notice some additional brine.

15. 17:49: 26 19.16541N, 92 6.45338W

(x)577, (y)4183 depth=1015m

We find a larger white bacterial mat to core. First, we fly over to take some pictures before coring.

16. 17:58: 26 19.16108N, 92 6.45639W

(x)572, (y)4175 depth=1017m

Start collection of sediment cores in white microbial mat. Six cores are inserted inside the mat (in the following order: core 9,10,7,8,11, and 12) (Fig. 2). We notice some brief gas flow from the sediment when we inserted core #12. Sediment cores are pulled out of the sediment at 18:05-18:09. We plan to spend the next portion of time looking for a brine pool or feature.

17. 18:42: 26 19.12642N, 92 6.49063W

(x)515, (y)4111 depth=1002m

We have been unable to locate a brine feature, and now have limited power remaining, so we pick up the VTLC camera.

18. 18:50: 26 19.12317N, 92 6.47861W

(x)535, (y)4105 depth=996m

We turn around to take some pictures of the volcano with the down-looking camera. However, the brine fog was too thick and pictures are likely blurry. Next we are headed to the previous location of a brine pool, where we plan to either collect cores or fill a brine trapper bottle (limited power will likely not allow time for both).

19. 19:07: 26 19.21037N, 92 6.61678W

(x)305, (y)4266 depth=1014m

We can see the bottom at the brine pool target location. We see lots of small hills/mounds and cracks in the sediment surface. There are many dead mussel shells. Off the starboard side, we see 2 pale purple corals (*Callogorgia* spp.) growing from the side of a small mound.

20. 19:13: 26 19.21361N, 92 6.6336W

(x)277, (y)4272 depth=1011m

We climb a hill towards the target location of the brine pool (seen on previous cruise). Though no brine features are visible, we do notice some white and brown bacterial mat and decide to collect sediment cores here. We also observe a very large crab near the mat.

21. 19:18: 26 19.20928N, 92 6.64441W

(x)259, (y)4264 depth=1011m

We are on top of a mound with some dark brown and white bacterial mats. There is a spot where the brown mat has white patches mixed in, and an adjacent spot that has white mat only. We collect sediment cores in both spots (Fig. 3). Due to time constraints (limited power), we did not place all sediment cores prior to pulling them out. Instead, we collected them one at a time (in the following order: 13,14,15,16,17,18,19,20,21,22). Core #s 13,14,15,20,21, and 22 were in the brown/white mat mixture, and core #s 16,17,18, and 19 were in the white mat. We finished core collection at 19:34.

22. 19:39: 26 19.21849N, 92 6.64621W

(x)256, (y)4281 depth=1012m

We notice a black brine feature on the port side. Not a flow.

23. 19:41: 26 19.2082N, 92 6.65282W

(x)245, (y)4262 depth=1014m

We find a very large carbonate mound, surrounded by lots of empty shells. A crab is perched on top of the mound. We attempted to collect a piece of carbonate from the side of the mound, but had difficulty positioning ourselves from an appropriate angle, and ran out of power. We were unable to collect any carbonate.

24. 19:47: 26 19.22553N, 92 6.68646W

(x)189, (y)4294 depth=1017m

Begin ascent.

END OF DIVE

Fig. 1 Cores – site 1 (inside/edge of crater near brine volcano).

Order of insertion: 1,2,3,4,5,6

Order of removal: 6,5,4,3,2,1

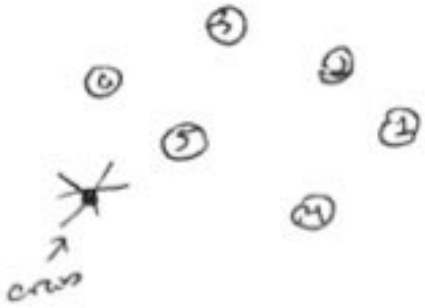


Fig. 2 Cores – site 2 (white bacterial mat).

Order of insertion: 9,10,7,8,11,12

Order of removal: 12,11,8,7,10,9

Fig. 3 Cores – site 3 (on top of mound in brown/white bacterial mat and white bacterial mat). To the left is the area with only white mat, and to the right is the brown mat with white patches.

Order of collection: 13,14,15 (brown/white mat mixture)

16,17,18,19 (white mat)

20,21,22 (brown/white mat mixture)


These locations are approximate
didn't place all cards in prior
to posing as Did one @ a
time

Dive #4702 Report – Peterson

Date: 04/21/2014 Dive # 4702 Site: GC246

Pilot: Bob Port: Rick Peterson Starboard: Joy Battles

Launch Target: 27º 42.128'N, 90° 38.892' W; 867m

Observations & Samples:

GC246 is a site where a brine lake existed during our 2010 visit along a rise where multibeam mapping identified a number of water column returns from this trip (see Viso). The dive target was the brine lake ('Dead Crab Lake'; DCL), located in the middle of sediments containing mineral crusts and microbial mats. The brine lake has essentially disappeared this year, turning into a mud lake with active sediment burping. A small amount of brine could be seen along the very northern edge of the lake, up against a ~0.5 m scarp that contains the lake (see 'Treasure map' provided by Andreas in the hand-written notes). We accomplished most of objectives laid out in the dive plan, collecting 22 push cores (including a dyed sediment transect through an orange mat, lake sediments, and various other colored mineral crusts), a photo-mosaic survey of the site, 5 Niskins, 1 brine trapper bottle, mussel collection, and recovery of the VTLC and a thermister mooring. Note, all times below are ZULU.

Summary.

13:01: Into the water

13:50: 27 42.117N, 90 38.846W (X: 1284; Y: 2047) 839 m
On the Bottom, landed to the north of Dead Crab Lake. Clam and mussel shell debris field as we transited to DCL. Saw a number of small mud volcanoes, some actively venting and others not. Transited across a brine stream and a few linear trenches and mounds, the latter appearing to be a buried pipeline. There was a cable (27 42.1268N, 90 38.8912W) exposed and sitting ~20 cm above the bottom in places along the mound. Observed a number of eels and fish in the area.

14:16: 27 42.1057N, 90 38.8979W (X: 990; Y: 2042)

Located DCL by spotting the VTLC. Approached from the ENE, taking note of suspected microbial mats in the area. Observed on orange mat near the edge of the lake. Continued to the W of the lake observing the surroundings, and noted 2 markers ['O' (27 42.1073N, 90 38.9143W) and 'CC' (27 42.0992N, 90 38.9155W)].

14:27: 27 42.0949N, 90 38.9173W (X: 958; Y: 2022)

Begin photo-mosaic survey on the west side of DCL. Survey began at marker 'CC', though I thought we were starting over marker 'O' which was closer to DCL. Lots of mussels and black mineral crusts intermixed with white crusts along the edges. Photo-mosaic survey was run at 10m line lengths along N-S lines. 1 m line spacing working farther E toward DCL. 5 second shots on the downward looking camera. Adjusting sub speed to maximize coverage while still maintaining ~50%

overlap between pictures. Final speed settled at 0.12 m/s. Height set above bottom at 1.5 m.

15:15: 27 42.1019N, 90 38.9100W (X: 970; Y: 2035)

Breaking off photo-mosaic survey atop VTLC. Ran 11 lines (for a total surveyed coverage of 11 m wide x 10 m long). Ended up covering western half of DCL, but I'm nervous about bottom time and reaching other objectives. Battery situation still looks good. We set way point (Target 11) in the event that we can return and continue the survey after accomplishing other objectives. During the last line, we observed a cloudy layer (maybe 20-30 cm think) moving N underneath us from DCL. Did we all of a sudden stir up a dust cloud, or did DCL burp? Can't tell, but suspect the lake burped because we hadn't done anything different than rest of survey.

15:29: 27 42.099N, 90 38.904W (X: 980; Y: 2030)

Transited to the E side of DCL in search of microbial mat to stain/core. Found a decent looking orange mat/crust (?) on E edge of DCL. Set down to stain/core and stirred up a ton of sediment. Very soft mud here. Can't see. Not going to work here, not enough current to dissipate sediment. We did observe and video DCL burping gas/sediment before we set down. Also observed a fish swim down into sediment to feed and immediately become stunned. Is he dead? Only tail sticking out of mud. Tried to nudge it with the port manipulator and see if it was stunned or dead. He didn't swim off – must be dead.

15:47: 27 42.109N, 90 38.923W (X: 949; Y: 2049) 834 m

Transited to west side of DCL to collect mussels. Found some nice clumps here. Discovered scoop did not make it onto basket. Got 3-4 good sized clumps of mussels with manipulator. Hopefully they are not all crunched. Threw out 2 pitch plates here.

16:06: 27 42.101N, 90 38.913W (X: 964; Y: 2029) 833 m

Set down on orange mat/crust to complete staining/coring operations to west side of DCL. Black crusts on western edge of orange mat. Dye injected (16:09) in middle of mat. Leaving dye injector here. Collected 2 cores outside mat injector for Barbara (Cores #2 and #5). Collected 6 cores in orange crust to north side of dye injector for Mandy (Cores #6, 10, 4, 9, 8, and 12). Fired 2 niskins (2 farthest to port) at 16:28 at this location.

16:32: 27 42.097N, 90 38.909W (X: 971; Y: 2026) 833 m

More mussel collection to S side of DCL. Several more good-sized clumps of mussels.

16:55 27 42.113N, 90 38.911W (X: 969; Y: 2056) 833m

Landed at VTLC. Small pocket of brine at base of camera is about the only observable brine in the area. Way too little brine to purge bottle with and fill.

Purged forward brine trapper bottle with bottom water (17:15 – 17:24), then filled from 17:24-17:30. I suspect this was mostly bottom water. Not much brine, and couldn't tell how close to the bottom the pump intake was located due to basket location. Fired remaining 3 niskins (3 to starboard side) at 17:35. Collected 2 cores from 'lake' (core #1 at 17:36 and core #3 at 17:37). Recovered VTLC (sit on top of bio box) at 17:38. Throwing out 2 pitch plates.

17:50: 27 42.106N, 90 38.901W (X: 985; Y: 2043)

Back to the dye-injector. Removed injector (17:52) and pushed 2 cores into the stained area (core #7 at 17:55 and core #11 at 17:56). Also collected 2 sediment cores from mat edge for Barbara (core #19 at 18:02 and core #22 at 18:06). Awesome squid squirt caught on video at 18:13!

18:18: 27 42.099N, 90 38.903W (X: 981; Y:2030) 833 m

We slid forward to reach black sediments outside of mat for Barbara. Core #13 at 18:18 and core #16 at 18:20.

18:45: 27 42.104N, 90 38.913W (X: 963; Y: 2040)

Finally found marker 'O' after much searching. Went to recover it and found no thermister array attached. Dropped it back down to this location after consulting top-side for instructions. Collected a core here (core #14 at 18:48) to provide different sediment types for Mandy (27 42.1041N, 90 38.9125W; X: 966; Y: 2039).

18:59: 27 42.102N, 90 38.919W (X: 950; Y: 2037) 833m

Found marker 'CC' to recover thermister array. Got it, with thermister attached.

19:10: 27 42.115N, 90 38.896W (X: 992; Y: 2059) 833m

Transited to north side of DCL to collect green sediments for thioploca. Collected 4 cores: core #17 at 19:13; core #21 at 19:17; core #20 at 19:19; and core #15 at 19:24. Out of battery and bottom time. Headed for surface at 19:28. On surface at 20:00.

END OF DIVE

Event Log

Cruise AT26-13

Created 3/30/14
Latest Update 7-Oct-14
Keeper: SBJ
FINAL

Ship: R/V Atlantis **Dates:** 3/30/2014-4/23/14
Cruise: AT-26-13

Op #	Stn	Evt	Date (L)	Time (L)	Time (Z)	Lat (N) deg	Lat (N) dec min	Lon (W) degrees	Lon (W) dec min	Lat (N) decimal	Lon (W) decimal	Lease Block	LocationNotes	Operation
Depart Gulfport	-	--	03/30/14	0915	03/30/14 15:15	29	13.502	087	41.612	29.2250	-87.6935	--		
Transit to MC252 (16 hrs)														
001.01	001	01	03/30/14	2308	03/31/14 05:08	28	42.239	088	21.698	28.7040	-88.3616	OC26	1600m	Deploy trap
Transit to OC (1 hrs)														
002.01	002	01	03/30/14	2300	03/31/14 05:00	28	43.460	088	21.870	28.7243	-88.3645	Asph-HWY	1594m	MUC-1
Transit to OC26 (20 min)														
001.02	001	02	03/31/14	0530	03/31/14 11:30	28	42.001	088	21.669	28.7000	-88.3612	OC26	1600m	CTD-1
Transit to MC118 (20 min)														
003.01	003	01	03/31/14	1000	03/31/14 16:00	28	50.000	088	30.500	28.8333	-88.5083	MC118	890m	Dive 4686
	DIVE ORIGIN					**28**	**50.000**	**088**	**30.500**	**28.8333**	**-88.5083**	MC118		dive origin
003.02	003	02	03/31/14	1800	04/01/14 00:00	28	51.137	088	29.523	28.8523	-88.4921	MC118	890m	MUC-2
003.03	003	03	03/31/14	2100	04/01/14 03:00	28	51.137	088	29.523	28.8523	-88.4921	MC118	890m	MOC-1
003.04	003	04	04/01/14	0310	04/01/14 09:10	28	51.137	088	29.523	28.8523	-88.4921	MC118	890m	CTD-2
Transit to OC26 (20 min)														
001.03	001	03	04/01/14	0800	04/01/14 14:00	28	42.412	088	21.653	28.7069	-88.3609	OC26	1600m	Dive 4687
	DIVE ORIGIN					**28**	**40.000**	**088**	**24.000**	**28.6667**	**-88.4000**	OC26		dive origin
001.04	001	04	04/01/14	1845	04/02/14 00:45	28	56.275	088	27.266	28.9379	-88.4544	OC26	890m	Recover Trap
ansit to MC118 (1 hr)														
003.05	003	05	04/01/14	2127	04/02/14 03:27	28	51.138	088	29.524	28.8523	-88.4921	MC118	890m	CTD-3
003.06	003	06	04/02/14	0059	04/02/14 06:59	28	51.096	088	29.471	28.8516	-88.4912	MC118	890m	CTD-4
Transit to OC26 (1 hr)														
001.05	001	05	04/02/14	1730	04/02/14 23:30	28	56.275	088	27.266	28.9379	-88.4544	OC26	890m	MB-1
Transit to MC253 (1.5 hrs)														
004.01	004	01	04/02/14	0100	07/11/14 07:00	28	38.040	088	10.200	28.6340	-88.1700	MC253	1500m	Dive 4688
	DIVE ORIGIN					**28**	**40.000**	**088**	**35.000**	**28.6667**	**-88.5833**			

Transit to GC600 (14 hrs)														
005.01	005	01	04/03/14	0800	04/03/14 14:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Dive 4689
	DIVE ORIGIN					**27**	**21.000**	**090**	**36.000**	**27.3500**	**-90.6000**			dive origin
005.02	005	02	04/04/14	0700	04/04/14 13:00	27	22.184	090	33.333	27.3697	-90.5556	GC600	1225m	Deploy PIT trap
005.03	005	03	04/04/14	0800	04/04/14 14:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Dive 4690
005.04	005	04	04/04/14	1800	04/05/14 00:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Deploy Elevator
005.05	005	05	04/04/14	1845	04/05/14 00:45	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	MB-2
005.06	005	06	04/04/14	0105	04/04/14 07:05	27	22.249	090	34.278	27.3708	-90.5713	GC600	1225m	CTD-5
005.07	005	07	04/05/14	0105	04/05/14 07:05	27	22.197	090	34.264	27.3700	-90.5711	GC600	1225m	CTD-6
005.08	005	08	04/05/14	0800	04/05/14 14:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Dive 4691
005.09	005	09	04/05/14	1828	04/06/14 00:28	27	22.204	090	34.266	27.3701	-90.5711	GC600	1225m	CTD-7
005.10	005	10	04/05/14	2140	04/06/14 03:40	27	22.199	090	34.264	27.3700	-90.5711	GC600	1225m	CTD-8
005.11	005	11	04/06/14	0112	04/06/14 07:12	27	22.456	090	35.355	27.3743	-90.5893	GC600	1225m	MOC-2
005.12	005	12	04/06/14	0800	04/06/14 14:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Dive 4692
005.13	005	13	04/06/14	1637	04/06/14 22:37	27	22.177	090	33.147	27.3696	-90.5525	GC600	1225m	Mocness
005.14	005	14	04/06/14	2015	04/07/14 02:15	27	21.872	090	33.781	27.3645	-90.5630	GC600	1225m	MUC-3
005.15	005	15	04/07/14	0010	04/07/14 06:10	27	40.328	090	45.830	27.6721	-90.7638	GC600	1225m	PIT recovery
005.16	005	16	04/07/14	1012	04/07/14 16:12	27	21.840	090	33.798	27.3640	-90.5633	GC600	1225m	CTD-9
*****LOST DIVE*** 4/7/14***ALVIN DIVE CANCELLED DUE TO SCRUBBER PROBLEM**														
005.17	005	17	04/07/14	1336	04/07/14 19:36	27	21.837	090	33.802	27.3640	-90.5634	GC600	1225m	CTD-10
005.18	005	18	04/07/14	1558	04/07/14 21:58	27	22.248	090	34.364	27.3708	-90.5727	GC600	1225m	MOC-3
005.19	005	19	04/07/14	1915	04/08/14 01:15	27	21.887	090	33.792	27.3648	-90.5632	GC600	1225m	MUC-4
005.20	005	20	04/07/14	2100	04/08/14 03:00	27	21.903	090	33.372	27.3650	-90.5562	GC600	1225m	MUC-5
005.21	005	21	04/07/14	2309	04/08/14 05:09	27	22.227	090	34.361	27.3705	-90.5727	GC600	1225m	MOC-4
*****LOST DIVE*** 4/8/14***ALVIN DIVE CANCELLED DUE TO WEATHER**														
005.22	005	22	04/08/14	1055	04/08/14 16:55	27	22.052	090	33.964	27.3676	-90.5611	GC600	1250m	MUC-6
005.23	005	23	04/08/14	1100	04/08/14 17:00	27	22.052	090	33.964	27.3676	-90.5611	GC600	1250m	MB-3
005.24	005	24	04/08/14	1611	04/08/14 22:11	27	25.644	090	26.092	27.3676	-90.5611	GC600E	1250m	MUC-7
005.25	005	25	04/08/14	2005	04/09/14 02:05	27	24.157	090	30.289	27.3676	-90.5611	GC600E	1380m	MUC-8
*****Limited Night Ops*** 4/8/14***DUE TO WEATHER (>30 knot winds and >10' seas)**														
005.26	005	26	04/09/14	0624	04/09/14 12:24	27	25.693	090	26.129	27.4282	-90.4355	GC600E	1250m	CTD-11
005.27	005	27	04/09/14	0925	04/09/14 15:25	27	25.640	090	26.101	27.4273	-90.4350	GC600E	1250m	CTD-12
005.28	005	28	04/09/14	1300	04/09/14 19:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Dive 4693
005.29	005	29	04/09/14	1844	04/10/14 00:44	27	25.297	090	25.785	27.4216	-90.4298	GC600E	1225m	CTD-13
005.30	005	30	04/09/14	2239	04/10/14 04:39	27	25.260	090	26.384	27.4210	-90.4397	GC600E	1225m	CTD-14
005.31	005	31	04/10/14	0105	04/10/14 07:05	27	25.907	090	26.370	27.4318	-90.4395	GC600E	1225m	CTD-15
005.32	005	32	04/10/14	0407	04/10/14 10:07	27	25.941	090	25.826	27.4324	-90.4304	GC600E	1225m	CTD-16
Transit to GC246 (1 hr from control site)														
006.01	006	01	04/10/14	0800	04/10/14 14:00	27	42.128	090	38.892	27.7021	-90.6482	GC246	867m	Dive 4694
DIVE ORIGIN (origin from dive 4610, AT 18-2, Nov. 2010)						**27**	**41.000**	**090**	**39.500**	**27.6833**	**-90.6583**	GC246	867m	dive origin

006.02	006	02	04/10/14	1600	04/10/14 22:00	27	42.128	090	38.892	27.7021	-90.6482	GC246	867m	MB-4
006.03	006	03	04/10/14	2105	04/11/14 03:05	27	42.427	090	39.049	27.7071	-90.6508	GC246	867m	CTD-17
006.04	006	04	04/11/14	0119	04/11/14 07:19	27	42.456	090	39.051	27.7076	-90.6509	GC246	867m	CTD-18
Transit to GC600 (2 hr from GC246)														
005.33	005	33	04/11/14	0500	04/11/14 11:00	27	21.896	090	33.254	27.3649	-90.5542	GC600	1225m	MUC-9
005.34	005	34	04/11/14	0800	04/11/14 14:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Dive 4695
005.35	005	35	04/11/14	0800	04/11/14 14:00	27	21.860	090	33.823	27.3643	-90.5637	GC600	1225m	Sfc Oil Coll.
005.36	005	36	04/11/14	2015	04/12/14 02:15	27	21.896	090	33.254	27.3649	-90.5542	GC600	1210m	MUC-10
005.37	005	37	04/11/14	2222	04/12/14 04:22	27	22.208	090	34.524	27.3701	-90.5754	GC600	1225m	CTD-19
005.38	005	38	04/11/14	0122	04/11/14 07:22	27	22.229	090	34.442	27.3705	-90.5740	GC600	1225m	CTD-20
005.39	005	39	04/12/14	0431	04/12/14 10:31	27	22.232	090	34.707	27.3705	-90.5785	GC600	1225m	CTD-21
005.40	005	41	04/12/14	0800	04/12/14 14:00	27	43.439	091	16.771	27.7240	-91.2795	GC600	1225m	Dive 4696
005.41	005	41	04/12/14	1725	04/12/14 23:25	27	21.896	090	33.763	27.3649	-90.5627	GC600	1210m	MUC-11
005.42	005	42	04/12/14	1832	04/13/14 00:32	27	22.207	090	34.255	27.3701	-90.5709	GC600	1225m	CTD-22
005.43	005	43	04/12/14	2000	04/13/14 02:00	27	22.525	090	34.068	27.3754	-90.5678	GC600	1225m	buckets
005.44	005	44	04/12/14	2043	04/13/14 02:43	27	22.208	090	34.254	27.3701	-90.5709	GC600	1225m	CTD-23
005.45	005	45	04/12/14	2317	04/13/14 05:17	27	22.231	090	34.441	27.3705	-90.5740	GC600	1225m	CTD-24
Transit to Orca Basin (4 hr from GC600)														
007.01	007	01	04/13/14	0558	04/13/14 11:58	27	01.260	091	16.850	27.0210	-91.2808	Orca-N	2385m	PIT-3
007.02	007	02	04/13/14	0633	04/13/14 12:33	27	00.356	091	17.266	27.0059	-91.2878	Orca-N	2385m	CTD-25
007.03	007	03	04/13/14	0800	04/13/14 14:00	27	00.406	091	17.326	27.0068	-91.2888	Orca-N	2385m	Dives 4697
	DIVE ORIGIN					**26**	**53.500**	**091**	**21.000**	**26.8917**	**-91.3500**	GC246	867m	dive origin
007.04	007	04	04/13/14	1700	04/13/14 23:00	27	59.384	091	16.954	27.9897	-91.2826	Orca-N	2385m	MB-5
007.05	007	05	04/13/14	2239	04/14/14 04:39	27	00.413	091	17.255	27.0069	-91.2876	Orca-N	2385m	CTD-26
007.06	007	06	04/14/14	0209	04/14/14 08:09	27	00.569	091	15.528	27.0095	-91.2588	Orca-N	2385m	CTD-27
*****LOST DIVE*** 4/14/14***ALVIN DIVE CANCELLED DUE TO WEATHER**														
007.07	007	07	04/14/14	1242	04/14/14 18:42	27	27.392	091	12.131	27.4565	-91.2022	Orca-N	2385m	PIT-3
move to Orca South														
007.08	007	08	04/14/14	1700	04/14/14 23:00	26	54.960	091	22.773	26.9160	-91.3796	Orca-S	2385m	MUC-12
007.09	007	09	04/14/14	1915	04/15/14 01:15	26	54.960	091	22.773	26.9160	-91.3796	Orca-S	2385m	MUC-13
007.10	007	10	04/14/14	2200	04/15/14 04:00	27	59.384	091	16.954	27.9897	-91.2826	Orca-S	2385m	CTD-28
***** LOST SOME NIGHT OPS DUE TO WEATHER *****														
*****LOST DIVE*** 4/15/14***ALVIN DIVE CANCELLED DUE TO WEATHER**														
007.11	007	11	04/15/14	0720	04/15/14 13:20	26	54.988	091	22.772	26.9165	-91.3795	Orca-Central	2209m	MUC-14
move to Orca Central														
007.12	007	12	04/15/14	1500	04/15/14 21:00	27	26.260	091	17.100	27.4377	-91.2850	Orca-Central	2209m	MUC-15
007.13	007	13	04/15/14	1700	04/15/14 23:00	26	56.252	091	17.102	26.9375	-91.2850	Orca-Central	2209m	MUC-16
move to Orca South														
007.14	007	14	04/15/14	1952	04/16/14 01:52	26	54.737	091	22.421	26.9123	-91.3737	Orca-Sa	2385m	CTD-29

007.15	007	15	04/16/14	0450	04/16/14 10:50	26	54.143	091	19.608	26.9024	-91.3268	Orca-Sb	2385m	CTD-30
007.16	007	16	04/16/14	0500	04/16/14 11:00	26	54.143	091	19.608	26.9024	-91.3268	Orca-Sb	2385m	MB-6
007.17	007	17	04/16/14	0800	04/16/14 14:00	26	54.938	091	22.350	26.9156	-91.3725	Orca S dive	2385m	Dive 4698
007.18	007	18	04/16/14	1740	04/16/14 23:40	26	55.001	091	22.776	26.9167	-91.3796	Orca-Sb	2385m	MUC-17
007.19	007	19	04/16/14	2000	04/17/14 02:00	26	55.000	091	22.702	26.9167	-91.3784	Orca-Sb	2385m	MUC-18
007.20	007	20	04/16/14	2126	04/17/14 03:26	26	59.969	091	22.350	26.9995	-91.3725	Orca-Sb	2385m	CTD-31
007.21	007	21	04/17/14	0051	04/17/14 06:51	26	54.969	091	22.351	26.9162	-91.3725	Orca-Sb	2385m	CTD-32
007.22	007	22	04/17/14	0051	04/17/14 06:51	27	59.384	091	16.954	27.9897	-91.2826	Orca-S	2385m	MB-7
move to Orca Central														
007.23	007	23	04/17/14	0800	04/17/14 14:00	26	26.227	091	17.000	26.4371	-91.2833	Orca Central	2200	Dive 4699
007.24	007	24	04/17/14	2350	04/18/14 05:50	26	26.227	091	17.000	26.4371	-91.2833	Orca Central-A	2155	CTD-33
*****LOST DIVE*** 4/18/14***ALVIN DIVE CANCELLED DUE TO BASKET REPAIRS (Weather turned out to be fine; maintenance was the issue)**														
007.25	007	25	04/18/14	0303	04/18/14 09:03	26	55.384	091	17.235	26.9231	-91.2873	Orca Central-B	2159m	CTD-34
move to Orca North														
007.26	007	26	04/18/14	0610	04/18/14 12:10	27	00.461	091	15.533	27.0077	-91.2589	Orca-North-B	2384m	CTD-35
007.27	007	27	04/18/14	1055	04/18/14 16:55	27	00.030	091	17.628	27.0005	-91.2938	Orca-North-A	2299m	MUC-19
007.28	007	28	04/18/14	1325	04/18/14 19:25	27	00.030	091	17.628	27.0005	-91.2938	Orca-North-A	2287m	MUC-20
007.29	007	29	04/18/14	1525	04/18/14 21:25	26	56.534	091	17.880	26.9422	-91.2980	Orca S to N	2287m	MOC-5
007.30	007	30	04/18/14	1900	04/19/14 01:00	27	00.239	091	17.966	27.0040	-91.2994	Orca-North	2299m	MUC-21
move to Orca Central (WR13, WR56, GC981)														
007.31	007	31	04/18/14	2130	04/19/14 03:30	26	56.319	091	17.092	26.9386	-91.2849	Orca North	2299m	MUC-22
007.32	007	32	04/19/14	0050	04/19/14 06:50	27	00.352	091	17.576	27.0059	-91.2929	Orca North	2357m	CTD-36
007.33	007	33	04/19/14	0400	04/19/14 10:00	26	56.319	091	17.092	26.9386	-91.2849	Orca Central	2299m	MB-8
007.34	007	34	04/19/14	0800	04/19/14 14:00	26	26.227	091	17.000	26.4371	-91.2833	Orca Central	2200m	Dive 4700
007.35	007	35	04/19/14	1737	04/19/14 23:37	26	56.336	091	17.099	26.9389	-91.2850	Orca Central	2208m	MUC-23
007.36	007	36	04/19/14	2009	04/20/14 02:09	26	56.689	091	19.663	26.9448	-91.3277	Orca S Central	2317m	CTD-37
007.37	007	37	04/19/14	2340	04/20/14 05:40	26	55.192	091	25.287	26.9199	-91.4215	Orca Southwest	2336m	CTD-38
Transit to Hot Site (44 nm) GB697						27	19.220	092	06.641					
008.01	008	01	04/20/14	0515	04/20/14 11:15	27	20.626	092	06.240	27.3438	-92.1040	Hot Site A	1014m	MB-9
008.02	008	02	04/20/14	0800	04/20/14 14:00	27	19.138	092	06.467	27.3190	-92.1078	Hot Site A	1014m	Dive 4701
	DIVE ORIGIN					**26**	**16.900**	**092**	**06.800**	**26.2817**	**-92.1133**	GC246	867m	dive origin
008.03	008	03	04/20/14	1732	04/20/14 23:32	27	19.078	092	06.490	27.3180	-92.1082	Hot Site A	1014m	CTD-39
008.04	008	04	04/20/14	1930	04/21/14 01:30	27	19.078	092	06.490	27.3180	-92.1082	Hot Site A	1014m	MUC-24
008.03	008	03	04/20/14	2108	04/21/14 03:08	27	20.627	092	05.836	27.3438	-92.0973	Hot Site A	1014m	CTD-40
Transit to GC246 (81 nm)						27	42.128	090	38.892					
006.05	006	05	04/21/14	0800	04/21/14 14:00	27	24.128	090	38.892	27.4021	-90.6482	GC246	867m	Dive 4702
END OF CRUISE OPS														
Transit to Gulfport			04/21/14	1500	04/21/14 21:00									

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
MC 118	**4686**		31 March 2014	18:17

Site Description(s)

Numbers here match numbers on white electrical tape – ignore numbers on gray tape if different
General sulfidic smell, probably from all cores
Two cores checked with UV light, plenty of green fluorescence

Core	Length (cm)	Description	Super-natant	Used for:
16	~18	Hydrate mound (x1601, y2110) Void closed during description; began ~18 cm 0-8 cm dark brown shading to gray, 8-bottom gray	turbid	Joye lab: Porewater chemistry; methane oxidation and sulfate reduction rates over a methane concentration gradient
17	~10	Hydrate mound (x1601, y2110) ~10 cm of sediment floating up by cap ~5 cm ov water over rest, with several mm oil floating on top Lower layer had some debris on surface, rest dark grey	turbid	Joye lab (same)
10	~28	Hydrate mound (x1601, y2110) Still bubbling. Void from 18-22 cm. ~1 cm black layer, 1-4 cm mixed tan and black, 4-bottom gray	orange-ish, oily	Joye lab (same) Chanton: subsamples collected by Caroline for carbon isotopes (1 cm intervals to 5 cm, 2 cm to 10, then 3 cm to bottom)
11	~26	Hydrate mound (x1601, y2110) Void from 10 to 13 cm 0-6 cm mixed dark brown and tan 6-10 cm black streaks in gray Gray to bottom	turbid	Joye lab (same)

7	~20	Hydrate mound (x1601, y2110) Several mm dark brown fluffy surface 0-8 cm streaky black-gray 8 cm – bottom gray	turbid and oily	Joye lab (same)
8	~24 (slanted)	Hydrate mound (x1601, y2110) Some oil and gas released during core collection Still bubbling during sectioning ~10 mm fluffy layer at top, rest gray Void between 11 and 14 cm	turbid	Joye lab (same)
18	~23 (slanted)	Hydrate mound (x1601, y2110) Thin fluffy brown layer on surface Shading dark to light gray from top to bottom Cracks ~15 cm to bottom	somewhat turbid	Joye lab (same)

13	~28 (soupy at top)	Hydrate mound (x1601, y2110) Orange oil floating on surface 0-2 cm dark brown 2-16 cm gray and black mixed Gray to bottom	cloudy (if any)	Joye lab: Porewater chemistry; methane oxidation and sulfate reduction rates over a methane concentration gradient
15	~20	Hydrate mound (x1601, y2110) Void between 14 and 16 cm Top section fluffy brown shading to dark grey Bottom section medium grey	clear	Joye lab: Porewater chemistry; methane oxidation and sulfate reduction rates over a methane concentration gradient
14		(Blew out on the way up)		

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
OC26	**4687**			

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
W	**1**	28	Site 1: x3694, y4487; 15:40. Dive notes: brown oily layer on top of white layer (drilling mud?). Slightly slanted surface. ~0-1 cm disturbed fluffy black layer. 1-7 cm brown layer, separated by crack from tan layer 7 cm – bottom.	Slightly turbid	
W	**2**	25	Site 1: x3694, y4487; 15:40. Dive notes: brown oily layer on top of white layer (drilling mud?). Slanted surface. ~2mm dark brown fluff on top. 0-5 cm fluffy brown. 5-10 cm brown streaked with dark brown, a few cracks. 10 cm – bottom gray.	Clear	
W	**3**	27	Site 1: x3694, y4487; 15:40. Dive notes: brown oily layer on top of white layer (drilling mud?). Surface very slightly slanted, a couple of worm tubes. 0-2 cm fluffy brown layer with a crack just below it. 2-5 cm lighter brown. 5-20 cm tan with darker brown streaks. 20 cm-bottom gray.	Clear	Microsensor
W	**4**	23	Site 1: x3694, y4487; 15:40. Dive notes: brown oily layer on top of white layer (drilling mud?). Surface slightly slanted. Worm tube. ~1 cm fluffy dark brown. 0-6 cm slightly lighter brown, with a crack at ~ 4 cm. 6 cm-bottom gray.	Slightly turbid	

W	**5**	27	Site 1: x3694, y4487; 15:40. Dive notes: brown oily layer on top of white layer (drilling mud?). Surface level, worm tubes. ~2 mm dark brown fluff on surface. 0-3 cm brown with a couple of pinhead-sized white inclusions; a few cracks and a crack at the bottom of the layer. 3-6 cm brown mixed with gray. 6 cm-bottom gray.	Clear	
W	**6**	26	Site 2: x 4351, y 4365; 17:20. Dive notes: deep white layer. Top slanted, several worm tubes. ~0-4 cm fluffy brown, with a sharp boundary at the bottom. 4 cm – bottom tan.	Turbid	
L	**20**	39	Site 2: x 4351, y 4365; 17:20. Dive notes: deep white layer. Slanted top, worm tube. 0-0.5 cm light tan layer. 0.5-2.5 cm fluffy brown. 2.5-8.5 cm tan, 8.5 cm – bottom gray.	Slightly turbid	Leigha (sp?) -
W	**7**	28	Site 2: x 4351, y 4365; 17:20. Dive notes: deep white layer. 0-0.5 cm fluffy brown. ~0.5-9.5 cm brown streaked with tan. 9.5 cm – bottom gray. UV negative.	Nearly clear	Microsensor
W	**8**	25	Site 2: x 4351, y 4365; 17:20. Dive notes: deep white layer. 0-2 cm fluffy brown with some cracks. 2-7 cm tan with darker brown streaks. 7 cm – bottom gray with a couple of dark brown streaks.	Slightly turbid	
W	**9**	27	Site 2: x 4351, y 4365; 17:20. Dive notes: deep white layer. Several mm fluffy brown material on surface. 0-10 cm brown sediment shading to gray. A few air pockets at 4 cm.	Reddish brown, turbid	
L	**21**	42	Site 2: x 4351, y 4365; 17:20. Dive notes: deep white layer. Surface slanted. Worm tubes. 0-0.5 cm light tan layer on surface. Thin dark brown band directly below. 0.5-5.5 cm fluffy brown with cracks. 5.5-13.5 cm tan. 13.5 cm – bottom gray.	Slightly turbid	Joye
L	**25**	30	Site 3: x 3725, y 4120. 18:00. Dive notes: White layer. ~0-8 cm reddish/brown, 8-13 cm tan streaked with reddish brown and brown; 13-23 cm tan; 23 cm -bottom gray.	None	DNA (Yang)

L	**26**	28	Site 3: x 3725, y 4120. 18:00. Dive notes: White layer. Slightly slanted surface. 0-4 cm fluffy brown with a crack or two at the bottom. 4-6 cm brown mixed with tan, 6-26 cm tan shading to gray, 26 cm – bottom gray.	Clear	
L	**19**	39	Site 3: x 3725, y 4120. 18:00. Dive notes: White layer. Top slightly slanted. 0-3 cm fluffy brown with cracks, 3-4 cm more consolidated brown, 4-22 cm tan with brown inclusions (at ~6, 12, and 18 cm). 22 cm-bottom gray.	Slightly turbid	
	27	27	Site 4: 28 41.747, 88 22.116. 0-4 cm reddish brown, 4-4.5 cm dark brown, 4.5-11.5 gray streaked with dark brown, 11.5 cm-bottom gray.	Slightly turbid	
	28	23	Site 4: 28 41.747, 88 22.116. Slightly sloped surface. 1 worm tube. 0-2 cm fluffy dark brown, 2-4 cm dark brown, 4-10 cm brown mixed with tan, 10 cm – bottom tan shading to gray.	Clear	
	29	26	Site 4: 28 41.747, 88 22.116. 0-5 cm fluffy reddish brown, 5-14 cm tan shading to gray, 14 cm – bottom gray.	Clear	
	30	22	Site 4: 28 41.747, 88 22.116. Slanted surface, worm tubes. 0-4 cm fluffy brown, 4-10 cm brown, sharp transition to gray. 10 cm – bottom gray.	clear	

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
MC253	**4688**		2 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	2	26	Moustache, 28 43.332, -88 19.585, 19:25, 1467 m. A few worms at the surface. 0-3 cm fluffy brown material with thin dark band just below. 3-6 cm brown with black streaks. 6-16 cm tan. 16-bottom gray. A few cracks in the top 8 cm.	Clear	Porewater geochemistry
	3	24	Moustache, 28 43.332, -88 19.585, 19:25, 1467 m. Possibly a large worm (dead?) on the surface – covered with sediment; a couple of small, more lively-looking ones. 0-2 cm fluffy brown, with an intermittent narrow black band just below. 2-6 cm brown; black streaks extending from 3 to 6 cm. 6-22 cm tan. 22-24 cm gray.	Clear	Rates
L	**4**	31	Moustache, 28 43.332, -88 19.585, 19:25, 1467 m. Small moving worms on top. 0-1 cm thin fluffy but somewhat fibrous-looking brown layer on surface with intermittent black band below. 1-6 cm mottled brown and tan. 6 cm-bottom tan. U-shaped burrows down to ~ 7cm.	Slightly turbid	
L	**8**	48	Moustache, 28 43.332, -88 19.585, 19:25, 1467 m. Worms at surface. 0-0.5 cm fluffy brown layer, 0.5-1.5 cm dark tan, 1.5-16.5 brown, 16.5-bottom tan shading to gray.	Clear	

L	**12**	47	Moustache, 28 43.332, -88 19.585, 19:25, 1467 m. Oil patches throughout, UV (+). Slightly slanted surface, worms, 0-1 cm disturbed, cohesive-looking layer – mat? 1-11 cm brown, 11-26 cm tan, 26 cm – bottom gray.	Slightly turbid	
	5	20	Africa, 28 43.326, -88 19.586, 18:23, 1467 m. Slightly slanted surface. 0-4 cm fluffy brown surface with numerous small white particles (mat?). 4-8 cm dark brown mixed with lighter brown. 8 cm-bottom brown shading to tan. A few dark streaks between 2 and 12 cm.	Clear	Porewater geochemistry
	11	26	Africa, 28 43.326, -88 19.586, 18:23, 1467 m. 0-3 cm fluffy dark brown, with possible white worms about 0.5 cm long. Fairly sharp boundary, 3 cm – bottom brown shading to tan.	Clear	RNA
	6	23	Africa, 28 43.326, -88 19.586, 18:23, 1467 m. Couple of small worms on the surface. 0-2 cm fluffy dark brown with a thin dark layer just below. 2-8 cm dark brown. 8 cm – bottom tan.	Clear	RNA/microsensor
	7	23	Africa, 28 43.326, -88 19.586, 18:23, 1467 m. Small white worms on surface. 0-3 cm fluffy tan material, possibly mat (appears cohesive); a couple white patches. 3-3.5 cm black layer. 3.5 – 14.5 cm dark brown shading to tan.	Clear	Porewater geochemistry
	9	25	Africa, 28 43.326, -88 19.586, 18:23, 1467 m. 0-0.5 cm possible disturbed mat, with uneven dark band just below. 0.5-4.5 cm brown, cohesive-looking sediment. 1 worm sticking out. 4.5-8.5 cm dark brown. 8.5 cm – bottom tan.	Clear	Porewater geochemistry
	10	21	Africa, 28 43.326, -88 19.586, 18:23, 1467 m. Crumbly-looking tan surface – mat? Worms sticking out. 0-2 cm brown, 2 cm – bottom mixed brown and tan.	Clear	RNA/microsensor

	19	23	Christmas tree, 28 43.329, -88 19.581, 17:36, 1468 m. 0-0.5 cm brown, 0.5-1 cm tan, thin dark band just below. Thin white worms on the surface. ~1.5-14 cm dark brown with many oil pockets. Very bottom is grey, also with pockets of oil. Cracks throughout.	Turbid	Rates and hydrocarbons
	20	24	Christmas tree, 28 43.329, -88 19.581, 17:36, 1468 m. Couple of worm tubes at surface. 0-0.5 cm tan, with intermittent dark band just below. 0.5-8.5 cm brown, shading below that to slightly lighter brown. Small void at 14 cm. Possible oil pockets near bottom.	Clear	Take home
	13	15	Christmas tree, 28 43.329, -88 19.581, 17:36, 1468 m. Strong sulfidic smell. Oil floating on top of overlying water. 0-1 cm fluffy dark brown material, 1-6 cm dark brown sediment, 6 cm – bottom brown. Pockets throughout.	Turbid, with oil on top	
	14	25	Christmas tree, 28 43.329, -88 19.581, 17:36, 1468 m. Few mm black layer at surface. 0-1 cm dark brown. 1-13 cm brown with numerous oily pockets. 13 cm – bottom grey with oily pockets.	Turbid, with ~0.5 cm of floating oil	Rates and geochemistry
	15	13	Christmas tree, 28 43.329, -88 19.581, 17:36, 1468 m. Oil likely on surface, streaks of oil down the side. 0-4 cm disturbed-looking dark brown sediment with pockets. 4 cm-bottom brown sediment with many pockets.	Turbid	Chanton/Joye
	16	13	Christmas tree, 28 43.329, -88 19.581, 17:36, 1468 m. Core bubbling. Worm tubes sticking out of surface. 0-5 cm disturbed-looking dark brown sediments with several worms. Two ~5 cm long, one in possible U-shaped burrow. Sharp interface, 5 cm-bottom brown.	Turbid, orange layer of oil floating on top	Rates and geochemistry
	21	15	Small mats, 28 43.329, -88 19.581, 17:17, 1468 m Slightly slanted surface. Long skinny white worms on surface.	Somewhat turbid	

			White patch (possibly worm?) on surface. 0-4 cm disturbed-looking brown fluff mixed with brown sediment. 4 cm – bottom brown.		
	22	23	Small mats, 28 43.329, -88 19.581, 17:17, 1468 m Very slanted surface. 0-5 cm fluffy brown. 5 cm – bottom brown. No animals obvious on surface.	Slightly turbid	
	17	~23	Small mats, 28 43.329, -88 19.581, 17:17, 1468 m. One bright white patch ~ 0.5 cm across (mat?). Cohesive-looking surface, possibly held together by white filaments. 0 – 3 cm fluffy brown, 3-12 cm brown with a crack just below, 12 cm – bottom tan	Clear	
	18	28	Small mats, 28 43.329, -88 19.581, 17:17, 1468 m. Couple of worm tubes and a small white patch? animal? on surface. 0-3 cm fluffy brown, 3-5 cm more cohesive dark brown, 5-14 cm brown with a crack just below. 14 cm – bottom gray.	Clear	
	23	22	Small mats (no mat), 28 43.329, -88 19.581, 17:17, 1468 m Slightly slanted surface. 0-0.5 cm fluffy brown layer. 0.5-2.5 cm reddish brown. 2.5-21.5 cm brown. 21.5 cm-bottom tan. A few black streaks beginning at ~8 cm depth.	Clear	
	24	24	Small mats (no mat), 28 43.329, -88 19.581, 17:17, 1468 m Worm tubes on surface. ~0.5 cm tan layer covers part of surface. 0.5-8.5 cm brown, shading to tan below.	Clear	

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC600	**4689**		3 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)
Landed at 1222 m depth, not sure yet for each site

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	21	20	Near hydrate mound: 27 21.866, 90 33.807, 16:47, depth? Slightly slanted surface. Couple of worms on surface. 0-3 cm fluffy light reddish-brown, 3-9 cm light brown, 9 cm – bottom tan with a few dark and reddish-brown streaks.	clear	
	22	23	Near hydrate mound: 27 21.866, 90 33.807, 16:47, depth? Slightly slanted surface. Worm on top. 0-0.5 cm fluffy brown with a crack at its base, 0.5-1 cm dark brown band, 1-5 cm brown, 5 cm – bottom tan.	clear	
	23	27	Near hydrate mound: 27 21.866, 90 33.807, 16:47, depth? Worms on surface. 0-0.5 cm dark brown fluff, 0.5-4.5 cm brown, 4.5-11.5 cm somewhat lighter brown, 11.5 cm – bottom tan with brown streaks. Some darker streaks from 15 cm to bottom.	clear	
	17	10	Near hydrate mound: 27 21.866, 90 33.807, 16:47, depth? Surface slanted. Small worms sticking out. 0-1 cm reddish-tan fluff with dark band below, 1-5 cm reddish-tan sediment, 5 cm – bottom gray.	clear	
	18	24	Near hydrate mound: 27 21.866, 90 33.807, 16:47, depth? Worms sticking out. 0-1 cm red-brown fluff, 1-12 cm brown, 12-16 cm tan, 16 cm – bottom gray.	clear	

	19	20	Near hydrate mound: 27 21.866, 90 33.807, 16:47, depth? 0-7 cm fluffy brown, with scattered skinny filaments (worms?); thin black band; 7 cm – bottom brown, with a couple of scattered dark patches.	clear	
	13	27	Near hydrate mound: 27 21.866, 90 33.807, 16:47, depth? Slightly slanted surface. Worms. 0-1 cm reddish brown fluff, 1 -5 cm reddish brown sediment, 5-11 cm brown, 11 cm – bottom tan with a couple of dark patches.	Slightly cloudy	
	15	25	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Slanted surface. 0-2 cm fluffy brown, thin dark band just below, 2-17 cm brown sediment with orange fluorescing patches (UV+), sharp transition to tan, 17 cm – bottom tan.	Cloudy	
	9	23	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? 0-4 cm disturbed-looking dark brown; 4-6 cm dark band; 6-17 cm brown sediment with cracks and a couple of dark, orange-fluorescing patches; sharp transition, then 17 cm – bottom tan.	Cloudy	
	10	20	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Skinny red worms on surface, and a couple sticking out; 0-1 cm fluffy brown; 1-5 cm black and dark brown streaks; 5 cm – bottom brown.	Clear	
	6	24	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Slanted surface. Worms. 0-4 cm fluffy brown, 4-6 cm streaky black band, 6-16 cm brown with a few dark spots, 16 cm – bottom tan.	Almost clear	

	7	25	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Some worms. 0-3 cm fluffy brown; thin dark band; 3-7 cm dark brown with cracks; 7-12 cm brown with a couple of small cracks; 12 cm – bottom tan streaked with brown.	clear	
	1	30	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Slanted surface. Cluster of sticklike fragments on surface (coral?). 0-2 cm fluffy brown (deeper on one side); 2-13 cm brown sediment with black streaks and a few scattered dark patches; 13 cm-bottom tan. Orange-fluorescing patch (UV+) and a few cracks at 45 cm depth.	cloudy	
	2	24	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Surface slanted. 0-2 cm disturbed brown fluff, thin black band, 2-12 cm dark brown with a streaky transition to gray, 12 cm-bottom gray with dark streaks.	cloudy	
	3	15	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Shell fragment on surface (several cm). A few worms visible. 0-5 cm fluffy reddish brown, 5-5.5 cm black band, 5.5-10.5 cm dark brown, 10.5 cm – bottom lighter brown.	Slightly cloudy	
	5	27	Edge of mat that was on top of hydrate: 27 21.877, 90 33.799, 16:59, depth? Noticeably sulfidic. Slanted surface. 0-1 cm fluffy reddish brown, 1-5 cm mottled brown and black, 5-11 cm brown shading to gray with a few dark patches, 11 cm – bottom gray.	Slightly cloudy	

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC600	**4690**		4 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	21	8	Spermatazoan/Teardrop brine pool	Very turbid	Joye
	17	16	Spermatazoan/Teardrop brine pool	Turbid, oil on surface	Leigha
	13	9	Spermatazoan/Teardrop brine pool	Turbid, bubbly, some surface oil	
	9	14	Spermatazoan/Teardrop brine pool	Turbid, bubbly	Chanton/Demopoulos
	5	10	Spermatazoan/Teardrop brine pool	Turbid with oil floating on surface	Andreas
	1	20	Spermatazoan/Teardrop brine pool	Turbid with oil floating on surface	Joye
	22	19	Spermatazoan/Teardrop brine pool	Turbid with oil floating on surface	Joye

	18	15	Spermatazoan/Teardrop brine pool	none	Joye
	14	16	Spermatazoan/Teardrop brine pool	Core drained – just 0.5 cm left on top	Joye
	10	30	Spermatazoan/Teardrop brine pool	Virtually none	Ryan

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC600 (Megaplume area)	**4691**		2 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	17	10	Mat 1: Mat Fluffy black surface, somewhat disturbed-looking, hints of white mat. ~2 mm black surface layer, 0-5 cm dark brown sediment, streaky lower boundary; 5 cm – bottom tan streaked with brown. Fluorescent orange UV(+) pockets.	Slightly turbid	
	22	12	Mat 1: Mat 0-1 cm fluffy black, 1-9 cm tan mixed with brown, many pockets; 9 cm – bottom tan with many pockets. Small clam (?) at ~0.5 cm depth, possible siphon sticking out.	Turbid/bubbling	Joye: Geochem
	21	17	Mat 1: Mat Hint of possibly tan mat on surface (<1 mm thick). 0 – 1.5 cm fluffy brown; 1.5 cm – bottom brown shading to tan with numerous fluorescent orange UV(+) pockets. ~0.5 cm wide band of oil at 7 cm, with possible worm.	Slightly turbid with oil floating on surface	Verena: microscopy
	13	Top 7 cm, bottom 2 cm, 6 cm gap	Mat 1: Mat Upper part: Fluffy dark brown surface, a few worms, possibly ~1 mm microbial mat underlying this. 0-0.5 cm v. dark brown; 0.5-3.5 cm dark brown with a streaky lower boundary; 3.5 – 6.5 cm gray sediment with intermittent black band at 6 cm. Lower part: Tan with oil at the surface (fluorescent orange UV(+).	Clear	Verena: microsensor/ Barbara: RNA

	9	24	Mat 1: Edge – Fluffy ~ 2 mm black surface. 0-15 cm brown with numerous fluorescent orange UV(+) pockets. 15 cm – bottom tan with continued pockets.	Cloudy, dark oil floating on surface	Joye: Geochem
	23	22	Mat 1: Edge – Fluffy. Oily and stinky! 0-1 cm brown sediment, with white layer below – could be mat or crust. 1-12 cm brown sediment with large cracks. 12 cm – bottom tan with continued cracks and fluorescent orange UV(+) inclusions.	Cloudy, oil floating on surface	Verena: microscopy
L	**24**	32	Mat 1: Edge Surface fluffy brown, with possibly a couple of worms. 0-1.5 cm fluffy brown, ~2 mm black band, 1.5 – 6 cm reddish brown, faint 1-2 mm black band, 6-11 cm dark brown, 11-24 cm tan shading to gray with fluorescent orange UV(+) cracks, 24 cm – bottom gray.	Very cloudy	Barbara: RNA
	18	15	Mat 1: Edge Still bubbling. <1 mm patchy gray microbial mat with tube sticking out; 0-2 cm brown; dark brown boundary; 2-6 cm dark brown sediment with oil pockets and ~0.5 cm wide fluorescent orange UV(+) region at base; 6 cm – bottom brown sediment with oil pockets.	Slightly turbid, some floating oil	
	14	23	Mat 1: Edge Still bubbling. Surface mixture of fluffy brown material and sediment, with possible white haze; 0-2 cm fluffy black mixed with tan; ~1 mm black band; 2-9 cm dark brown with a couple of large dark patches (likely oil); 9 cm – bottom tan with oil pockets.	cloudy	Peterson: Radon

	15	23	Mat 1: Outside Surface fluffy brown with skinny tubes sticking out. 0-2 cm reddish brown, 2-8 cm brown streaked with tan, 8-25 cm tan with streaky, uneven lower boundary; 25 cm – bottom gray.	clear	Sairah: Microsensor; Barbara RNA
	19	20	Mat 1: Outside 0-1.5 cm fluffy brown with a couple of tubes sticking out, possibly clam at base; 1.5-4.5 cm dark brown; 4.5-12.5 brown; 12.5 – bottom tan. No visible UV fluorescence.	clear	Joye: Geochem
L	**20**	28	Mat 1: Outside Surface fluffy tan with many tubes sticking out. 0-0.5 cm fluffy tan, 0.5-9.5 cm brown; 9.5-16.5 cm brown; 16.5 cm – bottom tan. Dark streaks and patches at ~ 10 cm depth, UV(-).	clear	Peterson: Radon
	11	16	Mat 1: Outside ~0-1 cm surface thin layer fluffy brown with small worms; 1 mm black band just below; 1-4 cm reddish brown; 4-10 cm brown streaked with black; 10 cm – bottom tan streaked with black.	clear	Sairah: Microsensor
	10	Top 10 cm, bottom 18 cm, 6 cm gap	Mat 2: Mat Top: 0-5 cm very dark brown, 5 cm – bottom brown streaked with very dark brown. Bottom: Tan shading to gray with numerous dark pockets (fluorescent orange UV(+)) and cracks throughout.	None	Verena: microscopy
	1	18	Mat 2: reducing sediment. 1 worm. Slightly slanted surface. 0-1 cm fluffy cohesive-looking grayish mat and patches of possible white mat; 1-2 cm dark brown; ? cm brown; rest tan fading to gray. No obvious oil.	Slightly turbid	Verena: microsensor

	2	16	Mat 2: reducing sediment Piece of tan material on surface (probably mat) a few mm thick. A few tubes sticking out. 0-4 cm dark brown, 4-8 cm tan, 8 cm – bottom gray.	clear	
	5	24	Mat 2: reducing sediment Mud stuck to bottom of stopper and on sides. Surface black and tan, very disturbed. 0-3 cm dark brown, 3-12 cm brown with a streaky lower boundary, 12 cm – bottom tan with fluorescent orange UV(+) patches (no oil apparent above tan layer).	none	
	6	Top: 18 cm, bottom: 2 cm, 5 cm gap	Mat 2: reducing sediment Still slightly bubbling. 0-3 cm reddish brown and fluffy with worms, broken clam shells; 3-5 cm very dark brown; 5-14 cm brown with dark streaks and sharp but uneven lower boundary; 14 cm – bottom gray.	clear	
	16	30	Mat 2: Oxidizing sediment Reddish tan surface with small tubes. 0-0.5 cm reddish tan, 0.5-8.5 cm tan with dark streaks, 8.5 – 20.5 cm brown with streaky lower boundary (ranges from 15 to 20 cm); 20.5 cm – bottom gray.	clear	
	3	24	Mat 2: Oxidizing sediment Fluffy brown surface with small worms. 0-6 cm reddish tan, 6-9 cm tan with light brown streaks, 9-18 cm tan with uneven lower boundary, 18 cm – bottom gray. Dark UV(-) pocket between 12 and 20 cm on one side.	clear	
	7	24	Mat 2: Oxidizing sediment Surface fluffy reddish tan with tubes sticking out. 0-2 cm reddish tan, 2-8 cm tan, 8-21 cm tan with many black streaks, 21 cm – bottom gray.	clear	

L	**12**	34	Mat 2: Brilliant white patch Surface disturbed dark brown. ~ 1 mm black. 0-9 cm dark brown with numerous UV(-) dark pockets, 9 cm – bottom tan with dark patches and streaks and small UV(+) specks.	turbid	
L	**4**	28	Mat 2: Brilliant white patch One big work sticking out. Surface brown and uneven. 0-0.5 cm very dark brown, 3-3.5 cm brown, 3.5 cm – bottom tan with many small pockets.	cloudy	Verena – microscopy; Andreas – future grazing expt.

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC600	**4692**		6 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	21	18	Port: in dye chamber hole 0-0.5 cm fine-grain gray on surface; 0.5 – 10.5 cm light brown with numerous oil pockets; 10.5 cm – bottom gray with fewer, smaller oil pockets	Extremely turbid with thick layer of floating oil	Dye (green)
	23	10	Starboard: in dye chamber hole (gassy) Surface dark brown with one tube sticking out. 0-8 cm dark brown with numerous UV(+) oil pockets, 8 cm – bottom dark brown with numerous oil pockets. One worm visible along the side (photographed)	Somewhat cloudy, can't tell if oil or not	Dye (red)
	18	24	Brine pool: Black sediment Slightly slanted top. 0-2.5 cm dark brown fluff with a couple of dark streaks extending down; 2.5 – 21.5 cm brown sediment with numerous UV(+) orange fluorescing pockets; 21.5 cm – bottom tan with somewhat fewer oil pockets.	Turbid, oil floating	Malkin: Microprofile and take home
	19	20	Brine pool: Black sediment 3 mm black fluff on surface. 0-0.5 cm dark brown, 0.5 – 5.5 cm brown streaked with black, 5.5 – 15.5 cm tan with many large UV(+) orange fluorescing pockets, 15.5 cm – bottom tan with smaller oil pockets.	Cloudy, oil floating on top	Joye: Microprofile, rates and geochem

	13	Top 5 cm, void 2 cm, bottom 10 cm	Brine pool: Black sediment Top slanted. Surface fluff at 45˚ angle on one side, dark brown, average depth 0.5 cm. Top section tan with many oil pockets (UV(+), orange fluorescing) and dark band (oil pocket?) at bottom. Bottom section tan with fewer, smaller oil pockets, decreasing with depth.	Cloudy, oil floating	Joye – take home
	14		Brine pool: Black sediment. Core liner blew off in basket; came up lying sideways on top of it. Still some sediment inside, not described.	N/A	Leigha
	15	19	Brine pool: Black sediment Surface slanted ~30˚. 0-3 cm fluffy brown, 3-16 cm brown with numerous oil pockets (UV(+) orange), 16 cm – bottom tan with fewer oil pockets.	Cloudy with oil floating	Joye: Rates and geochem
	9	18	Brine pool: Black sediment Fine-grained black surface. 0-3 cm very dark brown with streaky lower boundary; 3-7 cm tan with large oil pocket below (UV(+) orange); 7 cm – bottom tan with small oil pockets.	Cloudy, no floating oil (not completely filled)	
	7	19	Brine pool: Brown sediment Fluffy dark brown surface, possible hints of mat. 0-3 cm brown with streaky lower boundary; 3-14 cm tan with oil pockets (UV(+) orange); 14 cm – bottom gray.	Cloudy, no floating oil	Joye: Microprofiling, rates and geochem
	5	14	Brine pool: Brown sediment ~1.5 cm fluffy tan with an uneven dark band below; 1.5 – 3.5 cm tan with black streaks; 3.5 – 8.5 cm tan with oil pockets (UV(+) orange); 8.5 – bottom gray. Core overall lighter than others.	Slightly turbid, too full to tell if oil floating	Joye: Microprofiling, rates and geochem
L	**20**	40	Brine pool: Brown sediment Possible animal on surface. 0-3 cm dark brown, 3-22 cm tan with many oil pockets (UV(+) orange), 22 cm – bottom	Cloudy, oil floating	Chanton/Demopoulos

			gray with fewer oil pockets		
L	**16**	28	Brine pool: Brown sediment 0-2 mm dark brown at surface. 0-18 cm tan with many oil pockets (UV(+) orange); 18 cm – bottom gray with fewer oil pockets.	Turbid; cloud of black sediment particles floating	Joye – take home
	1	21	Brine pool: 2m outside 0-0.5 cm disturbed dark brown fluff, ~2mm dark brown band, 0.5-1 cm uneven layer of reddish brown with ~1 mm dark band below; 1-3 cm mottled brown and black, 3 cm – bottom brown with occasional small oil pockets (UV(+) orange).	Slightly cloudy, can't tell if overlying oil	
	2	22	Brine pool: 2m outside Surface somewhat slanted. 0-3 cm fluffy dark brown mat; 3-3.5 cm dark band; 3.5 cm – bottom brown with small scattered pockets (UV(+) orange).	Cloudy, no floating oil	Microprofile
	3	22	Brine pool: 2m outside 0-2 cm dark brown fluff, 2 cm – bottom brown with scattered oil pockets. One large oil pocket at ~4 cm depth.	Cloudy, thick layer of oil floating on top (UV(+) orange)	Joye – rates and geochem
	6	25	Brine pool: 2m outside Still bubbling. Surface had thin layer of black fluff, remainder of core dark brown with numerous oil pockets (UV(+) orange), decreasing in size and number with depth.	Cloudy with thick (~2 cm) oil layer on surface	Joye – rates and geochem
L	**4**	18	Brine pool: 2m outside 2 mm dark brown layer on surface, streaking downward. 0-8 cm brown with oil pockets and streaks (UV(+) orange), shading to tan with diminishing oil.	Turbid, oil floating on surface – LOTS of water	

	8	44	Brine pool: 2m outside Somewhat slanted surface. ~1 mm disturbed dark brown fluff at surface. 0-9 cm dark brown, 9-32 cm brown with numerous (UV(+) orange) oil pockets, 32 cm – bottom tan.	Turbid overlying water, no oil	Joye – Microprofile, take home

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC600 (Megaplume area)	**4693**		9 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	1	20	In row in front of camera 0-0.5 cm brown fluff; 0.5-3.5 cm brown; **animal?** at 2.5 cm depth; 3.5 – 16.5 cm tan sediment with oil pockets; 16.5 cm – bottom with smaller oil pockets.	Turbid	
	5	26	In row in front of camera 0-1 cm fluffy dark brown on surface; 1-9 cm brown sediment; 9 cm – bottom tan mottled with gray. Numerous small pockets, UV(+) orange.	Turbid	
	9	20	In row in front of camera Thin layer dark brown fluff with **patches of white mat** below. 0-5 cm brown shading to tan with some oil pockets in tan, UV(+) orange. ~4 cm void at bottom.	Slightly turbid	Verena
	21	20	In row in front of camera **Unidentified animal** on surface, ~ 1 cm long (took picture). 0-0.5 cm dark brown fluff, 0.4 – 2 cm brown, 2-11 cm tan with oil pockets, 11 cm – bottom gray with continued oil pockets. UV(+) orange.	Turbid	
	22	10	Crater bottom Still bubbling, streaks of oil down inside of core liner. 0-10 cm tan with numerous UV(+) orange pockets.	Turbid, oil floating, many small bubbles	Andreas

	18	23	Crater mid-depth Still bubbling big bubbles, strong petroleum smell. Slightly slanted surface. ~2 mm dark brown fluff on surface. 0-10 cm brown with oil pockets, 10 cm – bottom tan with continued oil pockets. UV(+) orange.	Turbid, oil floating	
	14	22	Crater ridgetop 1 tube poking out at top. Surface fluffy brown. 0-20 cm brown sediment with scattered black streaks. Streaky lower boundary, then tan to bottom.	Clear	

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC246 (Dead Crab Lake)	**4694**		10 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	21	10	Black site near VTDC Fine-grained black sediment with possible sediment-covered worms (?), 0-0.25 cm black, 0.25-3.25 cm dark brown with a small crack at the bottom, brown to the bottom with some dark streaks	Nearly clear	
	22	18	Black site near VTDC 0-0.25 cm fine-grained black with a few tubes sticking up, 0.25-4.25 cm dark brown with cracks, 4.25 cm – bottom brown with a few small non-oily pockets.	Slightly cloudy, yellowish	
	23	25	Black site near VTDC Gray crust on surface ~2 mm thick, thin black layer, 0.8-2.8 cm dark brown, 2.8 cm-bottom tan with a few small, non-oily cracks	Slightly cloudy	
	24	6/gap (5 cm)/23	Black site near VTDC 0-1 cm black, rest of top part dark brown. Bottom section brown shading to tan. No visible oil or pockets.	None visible	
	17	11/gap (3 cm)/18	Black site near VTDC 0-1 cm very dark brown, 1 cm – bottom brown. One small dark pocket at 4 cm depth.	None; top of core stuck to stopper	
	18	28	Black site near VTDC A couple of tubes visible on surface. 0-0.25 cm dark brown, 0.25-0.75 dark brown, 0.75-3.75 tan, 3.75-bottom tan.	Cloudy	

	14	6/gap (2 cm)/23	"Cable" – 10 m NE of Dead Crab Lake (limpets, a few mussels in area; darker sediment with white dust) Top part largely dark brown; bottom part largely tan with dark streaks. Crack in bottom part at ~7 cm depth.	None; sediment to top	
	15	26	"Cable" – 10 m NE of Dead Crab Lake (limpets, a few mussels in area; darker sediment with white dust) Gray crust (can only see edge b/c turbid). 0-6 cm dark brown, 6-21 cm tan streaked with black, 21 cm – bottom tan. No visible pockets or oil.	Turbid	
	16	24	"Cable" – 10 m NE of Dead Crab Lake (limpets, a few mussels in area; darker sediment with white dust) 0-1 cm very dark brown, 1-7 cm brown with crack at ~5.5 cm depth, 7 cm – bottom tan streaked with black.	Turbid; sediment (?) floating on top	
	19	32	"Cable" – 10 m NE of Dead Crab Lake (limpets, a few mussels in area; darker sediment with white dust) 0-15 cm dark brown, 15 cm-bottom brown. Many small non-oily voids between sediment and core liner.	None; sediment to top	
	20	30	"Cable" – 10 m NE of Dead Crab Lake (limpets, a few mussels in area; darker sediment with white dust) 0-10 cm dark brown, 10 cm – bottom tan with a few dark streaks. No visible oil.	None; sediment to top	
	9	28	2 m S of "Cable" – lighter, olive gray "suboxic" sediment Surface fluffy reddish tan with a couple of tubes sticking out. 0-1 cm fluffy reddish brown with one ~2 cm wide dark pocket, 1-12 cm tan streaked with black, some steraks extending to bottom; 12 cm – bottom tan. Some small, non-oily pockets.	clear	
	10	25	2 m S of "Cable" – lighter, olive gray "suboxic" sediment ~2 cm long animal on surface **(snail?). Hint of white mat?** 0-2 cm reddish brown, 2-9 cm brown with darker streaks, 9 cm – bottom tan streaked with brown.	clear	

	11	28	2 m S of "Cable" – lighter, olive gray "suboxic" sediment **Snail** on top, a few small tubes sticking up. 0-3 cm reddish brown, 3-3.5 cm dark brown, 3.5 cm – bottom brown streaked with dark brown.	clear	
	13	20	2 m S of "Cable" – lighter, olive gray "suboxic" sediment Fluffy surface with a few tubes. 0-3 cm reddish brown fluff, 3 cm – bottom black streaked with tan. **Possible burrow** on one side at 2-5 cm depth (photographed).	Slightly cloudy	
	8	24	2 m S of "Cable" – lighter, olive gray "suboxic" sediment 0-3 cm reddish brown, 3-12 cm brown, 12 cm – bottom streaky transition to tan with brown streaks. Possible tube sticking out.	Nearly clear	
	5	30	Near "source" – very soft gray sediment, near Marker O Sulfidic. 0-1.5 cm brown, 1.5 – 1.75 cm black band, 1.75-5.75 brown, **5.75-9.75 black band most of the way around**, 9.75-bottom brown.	Turbid (just a thin layer)	
	7	16	Near "source" – very soft gray sediment, near Marker O Fine-grained, soupy surface. Layers somewhat uneven. 0-1.5 cm tan, 1.5-3 cm streaky brown band, 3-4 cm tan, 4-6 cm dark brown band, 6 cm – bottom tan. On other side, **lower dark band** is at ~8 cm depth.	Cloudy	
	1	27	Near "source" – gray with red dusting, very liquid, near Marker O Small **worm** on surface. 0-0.5 cm tan layer with a bit of orange partially exposed on surface, rest covered with brown fluff; 0-0.5 cm dark brown, 0.5-1.5 cm mottled brown and tan, 1.5-13.5 cm brown with dark streaks and a few dark patches, 13.5 cm – bottom brown with small non-oily pockets.	Cloudy	
	2	14	Near "source" – gray with red dusting, very liquid, near Marker O **Snail (?) on surface.** 0-0.5 cm dark brown, 0.5-2.5 cm mottled brown, 2.5 cm – bottom brown with dark streaks and some small non-oily pockets.	Cloudy	

	4	30	Black crust on gray, next to mussels, near Marker O **Small active white worm on surface**. 0-6 cm black, 6 cm – bottom tan with some black streaks. Crack at ~10 cm depth. No visible oil or pockets.	Clear	
	26	30	Black crust on gray, next to mussels; near Marker O 0-1.5 cm black, 1.5 cm – bottom brown with a few streaks and very small non-oily pockets.	None	

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC600	**4695**		11 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	22	18	Oily hydrate site **White mat** and possible worms on surface, partially covered by brown fluff. 0-1 cm surface fluff/mat, 1-1.5 cm dark band, 1.5 – 4.5 cm dark brown, 4.5 cm – bottom shading to lighter brown.	Clear	Verena
	23	23	Oily hydrate site 0-1 cm dark brown, ~1-2 cm uneven light brown, 2-3 cm dark band, 3 cm – bottom brown fading to tan. Increasing number and size of oily pockets 6 cm-bottom, large oily pockets throughout.	Turbid, oil floating on top	
	17	23	Oily hydrate site 0-2 cm fluffy brown, 2-8 cm dark brown, 8 cm – bottom shading to brown. Large oil pockets beginning at 10 cm depth, UV(+) orange.	Turbid, can't tell if oil or not	
	18	24	Oily hydrate site Possible worms on surface. 0-0.5 cm fluffy brown, thin black band just below, 0.5-10.5 cm dark brown, 10.5 cm – bottom shading to brown. UV(+) orange cracks at bottom, large UV(+) orange pocket at 10 cm depth.	cloudy	
	19	15 cm/(1 cm void)/4 cm	Oily hydrate site Disturbed-looking brown fluff with possible worms at surface. 0-1 cm brown fluff, 1-6 cm dark brown, 6-15 cm brown, 1 cm void. Bottom section tan . Some UV(+) orange streaks and pockets, especially towards bottom.	Clear	

	13	21	Oily hydrate site **White mat** on surface, mostly covered with brown fluff, tubes of various sizes sticking out. 0-2 cm brown fluff, 2-3 cm black, 3-12 cm dark brown shading to brown, 12 cm – bottom brown. Few scattered UV(+) orange pockets in middle third of core.	Clear	
	14	7/(3 cm gap)/11	Mat site Top section: 0-3 cm dark brown, 3-9 cm brown with apparent remains of oily layer below, UV(+) orange pockets throughout. Bottom section: Tan with continued UV(+) orange pockets. Oil on sides of core all the way to the top.	Thin layer of overlying water with a lot of oil	
	9	11	Mat site A few mm dark brown fluff on surface. 0 cm – bottom dark brown with numerous UV(+) orange pockets. Oil streaked down inside of core liner.	Turbid, numerous small bubbles, still bubbling, oil floating	
	10	22	Mat site Fluffy brown surface with **hints of white mat**. 0-1 cm black, 1-8 cm brown, 8 cm – bottom tan. UV(+) orange pockets throughout.	Turbid, can't tell if oil	Verena
	11	18	Mat site Couple mm black fluff on surface. 0-3 cm dark brown, 3-13 cm brown, 13 cm – bottom tan with numerous pockets, some UV(+) orange.	Turbid with oil floating on top	
	15	16	Mat site 0-3 cm disturbed-looking light brown and brown sediment with oil pockets, 3 cm – bottom tan with UV(+) orange oil pockets.	Turbid with many small bubbles; oil and sediment floating on top	
	5	17	Brine site Slightly slanted surface. 0-3 cm fluffy light brown with at least one white filament of some sort, 3-13 cm brown with large oil pockets, 13 cm – bottom tan with cracks and oil pockets. Large oil pocket between ~6 and 10 cm on one side.	Still bubbling (possibly just compression); slightly cloudy	

	6	20	Brine site Fluffy light brown surface with a few tubes sticking out. 0-2.5 cm fluffy brown, 2.5-3 cm dark brown, 3- 16 cm brown, 16 cm – bottom tan. Small cracks near brown/tan boundary, no obvious oil.	clear	Joye
	7	14	Brine site Fluffy light brown surface, possible animal in burrow at ~2 cm depth. 0-1 cm brown fluff with a hint of a dark band below; 1 cm – bottom dark brown shading to brown.	Clear	Demopoulos
	8	15	Brine site Fluffy brown surface with a few tubes sticking out. 0-0.5 cm brown fluff, 0.5-2.5 cm brown streaked with black, 2.5 cm – bottom brown shading to tan. No obvious oil.	Slightly cloudy	Joye
	1	17	Brine site Still bubbling, but possibly due to compression. Fluffy brown surface with a few **hints of filamentous white.** 0-1 cm fluffy brown with partial thin black band below, 1-5 cm dark brown with a streaky lower boundary to brown, 5 cm – bottom brown shading to tan. A few UV(+) orange streaks beginning at 5 cm depth. A few cracks throughout.	Nearly clear	Joye (let Verena and Sairah look first)
	2	10/(15 cm void)/4	Brine site Top: dark brown sediment stuck to stopper. Bottom: dark brown. Looks oily, especially the lower part.	No water, mud stuck to stopper at top	
	3	10	Brine site Few mm fluffy dark brown at surface – **possibly mat**. 0-1 cm fluid-lookinf black, 1-2 cm dark brown, 2 cm – bottom brown. UV(+) orange pockets below 4 cm depth.	Slightly cloudy	

	4	21	Brine site Fluffy brown surface with a few possible tubes sticking out, one small white worm. 0-2 cm fluffy brown, 2-3 cm mottled brown/black band, 3-13 cm brown, 13 cm – bottom tan with cracks. No obvious oil.	Clear	Joye

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC600	**4696**		12 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	22	27	Faint orange mat site 0-1.5 cm red-brown fluff with thin dark band below, 1.5 cm – bottom tan with dark streaks. A few scattered oily pockets below 10 cm (UV(+) orange).	Clear	Microsensor/RNA
	10	26	Faint orange mat site Surface reddish brown with possible hints of white mat. 0-1.5 cm reddish brown with intermittent dark band below, 1.5-6.5 cm dark brown, 6.5 cm – bottom brown. No obvious oil.	Clear	Microsensor/RNA
	18	27	Faint orange mat site Fluffy reddish brown surface with skinny tubes sticking up. Small patch of possible white mat buried under fluff. A few mm reddish brown fluff with thin dark band just below, 0-3 cm brown with black streaks, 3 cm –bottom brown shading to tan. UV(+) orange pockets and streaks especially ~20 cm depth.	Clear	Joye - geochem
	14	24	Faint orange mat site Fluffy brown surface, a few skinny tubes sticking up. 0-2 cm fluffy dark brown with a thin black band below, 2-5 cm dark brown, 5 cm – bottom brown. A few oily UV(+) orange streaks, especially in brown lower part.	Clear	

	21	22	Small dark patch near carbonate Fluffy dark brown surface. 0-0.5 cm dark brown, 0.5 – 12.5 cm brown with UV(+) orange oily pockets, 12.5 cm – bottom tan with continued oil pockets.	Cloudy, still bubbling	Joye
	17	23	Small dark patch near carbonate Possibly still bubbling. Samll tubes sticking out at surface. 0-4 cm dark brown, 4 cm – bottom brown shading to tan. Numerous small oil pockets throughout, with larger ones at ~6 cm depth.	Cloudy, some oil floating	Joye
	13	25	Small dark patch near carbonate 0-2 cm dark brown, 2-14 cm brown with numerous UV(+) orange oil pockets, 14 cm – bottom brown with fewer oil pockets.	Turbid, oil floating	Chanton
	9	25	Small dark patch (?) near carbonate ~2 mm black fluff on surface. 0 cm – bottom brown shading to tan with numerous UV(+) orange oil pockets. Oil streaking side of core liner.	Turbid, oil floating	RNA
	6	27	Orange mat with white 0-2 cm dark reddish brown fluff with a few tubes sticking up, 2-15 cm dark brown fading to brown, 15 cm – bottom tan streaked with brown and numerous UV(+) orange oily pockets.	Turbid	Microsensor/RNA
	2	25	Orange mat with white Crumbly looking tan surface, probably mat, small tubes sticking out. 0-3 cm black/brown/reddish mixed, 3-3.5 cm dark brown band, 3.5 – 6.5 cm brown, 6.5 cm – bottom tan with UV(+) orange oil pockets and streaks.	Clear	Joye - geochem

	23	23	Orange mat with white Fluffy tan surface, possibly mat, one possible patch white mat, large tube sticking out. ~ 0.5 cm fluid-looking black just below mat. 0.5 – 6.5 cm brown with large oil pocket at the bottom, 6.5 cm – bottom tan with large oil pockets and streaks.	Slightly cloudy	
	19	32	Orange mat with white: a little outside 0-5 cm dark brown, 5-18 cm brown, 18 cm – bottom tan with large UV(+) orange oil pockets and streaks.	Full to the top, very little overlying water	
	15	11 cm/(6 cm void)/12 cm	Orange mat with white: Oily nearby sediment Top part dark brown with oily pockets (stuck to stopper), bottom part brown with oily pockets, especially near the break point.	Blown up	Andreas
	11	20	Orange mat with white: Oily nearby sediment 0-0.5 cm mottled brown/black, 0.5-1.5 cm dark brown, 1.5 – 9.5 cm brown, 9.5 cm – bottom tan. Some UV(+) orange pockets and streaks, particularly at brown/tan boundary.	Drained, only a little water left on top	
	7	16	Orange mat with white: Oily nearby sediment Possible mat (or other layer) on surface covered by fluff. 0-1 cm fluffy black with brown pocket underneath at one spot, thin dark band, 1-9 cm brown with UV(+) orange oily patches and streaks, 9 cm – bottom tan with continue oily pockets.	Cloudy	

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
Orca Central	**4699**		17 April 2014	

Basket came loose and was dangling from sub during recovery – cores probably all well shaken.

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	9	25	Site: 16:04, x6560, y5029, z2184 m – pink but overlying brown. Tan mixed with red throughout, especially red from 7 cm – bottom. Numerous cracks.	Turbid	
	5	24	Site: 16:04, x6560, y5029, z2184 m – pink but overlying brown. Tan mixed with lots of red, numerous cracks.	Turbid	
	1	25	Site: 16:04, x6560, y5029, z2184 m – pink but overlying brown. 0-6 cm reddish brown, 6-23 cm red mixed with brown, 23 cm – bottom tan mixed with brown.	Turbid	
	18	18	Site: 17:32, x6560, y5029, z2169. White fissure – core taken perpendicular to cliff face. 0-6 cm reddish tan, 6-13 cm lighter reddish tan, 13 cm – bottom tan with a few cracks. (labeled 15 in Mandy's notes, but that was an error)	Turbid	
	14	18	Site: 17:32, x6560, y5029, z2169. White fissure – core taken perpendicular to cliff face. 0-4 cm reddish tan, 4 cm – bottom tan with faint black streaks.	None	
	2	20	Site: 17:32, x6560, y5029, z2169. Pink area adjacent to #14 – core taken perpendicular to cliff face. 0-11 cm brown mixed with red, cracks; 11 cm – bottom tan.	Turbid	

	16	18	Site: 17:57, x6663, y5039. Vertical white area. 0-3 cm soupy red-tan; 3 cm – bottom tan faintly streaked with black.	Turbid	
	4	19	Site: (done by 18:10), x6667, y5039. Pink vertical area. 0-8 cm tan mixed with red, 8 cm – bottom tan with faint gray streaks.	Turbid	
	8	25	Site: (done by 18:10), x6667, y5039. Pink vertical area. 0-11 cm tan with red patches and streaks, 11 cm -	Cloudy	

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
Orca Central	**4700**		19 April 2014 (Patriot's Day)	

For 19 and 22, see photos1

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	16	26	Vertical: pink material (took 2 tries). Slanted surface. 0-15 cm brown with many red streaks, 15 cm-bottom less red. Numerous cracks in top 7 cm, fewer below that.	Cloudy	Microsensor, geochem, DNA
	15	34	Vertical: pink material (took 2 tries). Solid red/brown layer slopes from surface on one side to ~5 cm depth on the other. Disturbed-looking brown sediment above that. Below, 20 cm brown mixed with red, then tan with very little red to the bottom. A few small cracks.	None, filled to top	
	19	22	Vertical: sediment on top of scarp: had to punch through surface. Slanted surface. ~2 mm brown fluff on surface. Top 5 cm laminated layers – describing shorter side here. 0-2 cm red/brown; narrow tan band; 2-3 cm brown mixed with red; 3-5.5 cm finely laminated tan alternating with red, ~5 layers of each; 5.5 cm – bottom brown mixed with red, large cracks. Longer side: similar structure, but generally more brown than red.	Cloudy	

	22	26	Vertical: sediment on top of scarp: had to punch through surface (took 3 tries). ~0.25 cm tan layer slopes from surface on one side to 3.5 cm on the other. Above slanted tan layer, where it is deepest: ~0.25 cm brown layer on surface. 0.25-1.25 cm red/tan/brown mixed; 1.25-1.5 cm brown; 1.5-2 cm finely laminated brown and tan, each layer ~1 mm. Below slanted tan layer: 5 cm finely laminated tan and red, each layer ~0.25 cm; then tan mixed with red to the bottom, with numerous cracks. Back side, below slanted tan layer: ~8 cm dark brown with tan inclusions, then tan mixed with red to the bottom.	Slightly cloudy	
	11	25	Sponge garden. Slanted surface. Hint of darker brown layer on surface. Top to bottom brown mixed with red, large cracks.	cloudy	Microsensor, geochem, DNA
	10	26	Horizontal: White area. Slightly slanted surface. Thin layer of reddish brown fluff. 0-0.5 cm red, 0.5 cm – bottom tan streaked and mixed with red.	Cloudy	5 cm sections
	21	24	Horizontal: Pink area, a bit upslope of Core #10. Generally tan mixed with red, cracks throughout. 0-3 cm hints of tan and brown laminations; 0-6 cm slightly darker brown than the rest.	cloudy	5 cm sections

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
Hot site/GB697	**4701**		20 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	1	32 (~2 cm voids at 8 and 13 cm depth)	Site: 16:04, 27 19.128N, 92 6.474W, 998 m, Brine, crater edge. 0-8 cm brown sediment, 2 cm void, 3 cm brown, 2 cm void, brown to bottom with a few small pockets.	None – full to top	Joye - geochem
	2	18	Site: 16:04, 27 19.128N, 92 6.474W, 998 m, Brine, crater edge. Surface has a hazy white appearance. 0-4 cm gray, intermittent narrow black band, tan to bottom with a few black streaks and patches of light gray.	cloudy	
	3	24	Site: 16:04, 27 19.128N, 92 6.474W, 998 m, Brine, crater edge. 0-2.5 cm brown, 2.5-3 cm dark brown band, 3-8 cm brown, 8 cm-bottom tan with many small holes.	Mostly drained, ~1 cm turbid water on surface	Joye - rates
	4	26	Site: 16:04, 27 19.128N, 92 6.474W, 998 m, Brine, crater edge. Surface slightly slanted. Possible tubes sticking out. ~1 mm dark brown on surface. 0-2 cm mixed tan and brown, 2-2.5 cm dark brown band, 2.5-7.5 cm dark brown sediment with streaky lower boundary, 7.5 cm – bottom light brown fading to tan.	turbid	Joye - geochem
	5	30	Site: 16:04, 27 19.128N, 92 6.474W, 998 m, Brine, crater edge. Surface layer of brown fluff ~1 mm deep on one side, 2.5 cm on the other, with ~0.5 cm black band just below. 6 cm layer of dark brown, then lighter brown fading to tan at the bottom. Crack at ~15 cm depth, many small pockets in sediment below that.	Almost full, a little cloudy supernatant	

	6	32 (2 cm void at 15 cm depth)	Site: 16:04, 27 19.128N, 92 6.474W, 998 m, Brine, crater edge. 0-11 cm dark brown, 11-15 cm tan, 2 cm void, tan to bottom.	None – full to top	
	7	20	Site: 17:59, 27 19.163N, 92 6.542W, 1017m, White mat, gassy. 0-0.25 cm dark with white inclusions (mat?), thin dark band, 0.25-4.25 cm dark brown, 4.25 cm-bottom brown fading to tan with dark streaks and pockets.	Partially drained, cloudy supernatant	Verena or Sairah?
	8	30	Site: 17:59, 27 19.163N, 92 6.542W, 1017m, White mat, gassy. 0-5 cm dark brown, 5-8 cm brown, 8 cm –nearly bottom tan with cracks at ~13 cm depth, very bottom ~ 2 cm slightly darker tan.	None – full to top	
	9	26	Site: 17:59, 27 19.163N, 92 6.542W, 1017m, White mat, gassy. 0-7 cm brown, 7 cm – near bottom tan with cracks and pockets, very bottom ~ 2 cm slightly darker tan.	None – appears to have hit stopper on top and subsided	
	10	32	Site: 17:59, 27 19.163N, 92 6.542W, 1017m, White mat, gassy. 0-17 cm dark brown, 17-19 cm tan, 19-20 cm dark tan, 20 cm – bottom brown. Pockets and cracks throughout.	None – full to top	Chanton?
	11	30	Site: 17:59, 27 19.163N, 92 6.542W, 1017m, White mat, gassy. Cracks throughout. 0-5 cm dark brown, 5-11 cm brown, 11-21 cm tan with small cracks, very bottom ~ 2 cm slightly darker tan.	Extremely turbid	Verena or Sairah?
	12	32	Site: 17:59, 27 19.163N, 92 6.542W, 1017m, White mat, gassy. 0-12 cm dark brown shading to brown, 12-22 cm tan with numerous pockets and cracks, very bottom ~ 2 cm slightly darker tan.	None – full to top	
	13	28	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Brown mat. Thin tubes sticking up, fluffy brown surface, possibly mat. 0-2 cm fluffy reddish brown, 2-4 cm black mixed with tan, 4-8 cm tan, 8 cm-bottom slightly darker tan with some cracks.	Clear	Verena – take home

	14	24	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Brown mat. Slanted surface with many worms sticking out. 0-0.5 cm fluffy reddish brown, possibly mat; 0.5-2.5 cm dark tan with ~2 mm dark band below, 2.5 cm – bottom tan with a few large cracks at ~15 cm depth.	Clear	
	15	27	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Brown mat. 0-2 m reddish brown fluff, 2-5 cm tan streaked with black, 5 cm – bottom tan fading to light tan with a few cracks.	Cloudy	
	21	15	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Brown mat. 0-0.5 cm fluffy brown. Below this, on one side, 2.5 cm disturbed black and white crust or mat. Other side, looks like disk of reddish brown with about half streaked down the side – possibly mat. Below all this, 4 cm brown, then tan to the bottom. Possibly some worms near the surface?	Clear	
	22	23	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Brown mat. Fluffy tan surface with skinny tubes sticking out. 0-2.5 cm slightly slanted layer of reddish brown with a couple of dark patches and streaks, thin dark band below. 2.5 cm – bottom, brown fading to tan. Possible dark-walled burrow, 2-8 cm depth.	Clear	Sairah
	16	20	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Mixed white/brown mat. Slanted surface. 0-1 cm fluffy light brown, 1-5 cm brown with tan patches, 5 cm-bottom tan with a few possibly oily pockets.	Cloudy	Joye
	17	22	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Mixed white/brown mat. 0-0.5 cm dark fluffy material, 0.5 – 5.5 cm brown with numerous black streaks, 5.5-12.5 cm tan with continued black streaks and cracks, 12.5 cm – bottom tan with a few small cracks.	Turbid	Joye

	18	22	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Mixed white/brown mat. 0-1 cm brown with a streaky lower boundary, 1 cm – bottom tan with numerous pockets.	Turbid	Joye
	19	28	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Mixed white/brown mat. Brown fading to tan, with cracks and pores throughout.	None – appears to have hit stopper on top and subsided	
	20	23	Site: 19:19, 27 19.211N, 92 6.641W, 1011m, Mixed white/brown mat. 0-4 cm light brown, 4 cm – bottom brown fading to tan, with cracks in the lower part.	Turbid	Joye

SAMPLING INFORMATION				
Site	**Dive #**	**Lat/Long**	**Date**	**Time**
GC246	**4702**		21 April 2014	

Site Description(s)

Core types: WHOI (W), MPI, long (L), big/wide (B)

Core type	Core number	Length (cm)	Description	Supernatant	Used for:
	2	28	Mat: center. 0-8 cm tan; 8-11 cm irregular streaky black layer; 11 cm – bottom brown streaked with black	None – looks like it hit the stopper and subsided	Demopoulos
	19	26	Mat: edge. Still bubbling. 0-0.5 cm black, 0.5-5.5 cm brown mixed with black, 5.5 cm – bottom brown fading to tan with black streaks and small pockets.	Turbid	RNA
	22	32	Mat: edge. 0-6 cm tan, 6-9 cm irregular black band mixed with brown, 9 cm – bottom brown with dark streaks.	None	Joye - geochem
	16	30	Mat: outside. 0-1 cm black, 1 cm – bottom brown. Large dark streak on one side extending to ~12 cm depth.	None – looks like it hit the stopper and subsided	Joye - geochem
	13	27	Mat: outside. Fluffy black surface. 0-7 cm black mixed with gray, 7 cm – bottom gray with black streaks.	Slightly cloudy	RNA
	8	24	Orange crust. 0-7 cm brown, thin irregular black band, 7 cm – bottom brown streaked with black.	~0.5 cm turbid overlying water	Joye – sampled for crust

	9	28	Orange crust. Hints of orange at surface. 0-8 cm brown with small pockets, 8-9 cm irregular black band, 9 cm – bottom brown mixed with black.	Turbid	Joye – sampled for crust
	6	34	Orange crust. 0-6 cm tan mixed with brown, 6-7.5 cm irregular black band, 7.5 cm – bottom brown with black streaks and patches.	None	
	12	28	Orange crust. Hints of orange smeared on sides at top. 0-8 cm tan with black streaks and patches; 8-11 cm streaky, irregular black layer; 11 cm – bottom brown with small pockets.	~0.5 cm cloudy overlying water	Joye – sampled for crust
	1	8 cm/(1 cm void)/23 cm	Lake. 0-2 cm black mixed with tan, 2-8 cm tan, 1 cm void, bottom part tan with small pockets.	None	Joye – take home
	3	32	Lake. Gray throughout; lots of pockets at 15-30 cm depth.	None	Joye – take home
	14	32	Black mud. 0-0.5 cm black, 0.5 – 7.5 cm brown streaked with black, 7.5 cm – bottom brown with some pockets.	None	Joye – take home
	18	31	Black mud. 0-1 cm black, 1-7 cm brown streaked with black, 7 cm – bottom brown with small pockets.	None, filled nearly to top	Joye – take home
	15	29	Green mud. Slanted surface. 0-4 cm reddish brown, 4-5 cm irregular black band, 5-11 cm brown streaked with black, 11 cm – bottom brown.	Slightly cloudy	Verena
	17	28	Green mud. 0-3 cm fluffy reddish brown, ~2 mm black layer, 3-10 cm brown streaked with black, 10 cm – bottom tan with black streaks.	Clear	Verena

	21	25	Green mud. 0-3.5 cm fluffy reddish brown, 3.5-12.5 cm tan with black streaks, 12.5 cm – bottom tan.	Nearly clear	Verena