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Purpose of the Dive

Dive 1 of EX1402 L3 succeeded in achieving the two primary geological objectives set forward by the nominating organization – the Bureau of Ocean Energy Management (BOEM): 1) ascertaining whether high acoustic backscatter (from multibeam bathymetry) and linked high seafloor reflectivity (from 3D seismic/industry data) correlate with hardgrounds, and 2) determining whether seafloor locations of presumed cold seeps as deduced from the origination of ~vertical bubble stream anomalies in the overlying water column (from multibeam bathymetry) are discrete sites of gas escape. Both turned out to be true.

Description of the Dive:

Geological Summary

During the dive, multiple (5) cold seep candidates were located and mapped visually. The first, a circular feature ~1-2 m high topped with hardground crusts, appeared to be an extinct mud volcano. All but one of the others correlated with rugose carbonate hardground outcrops of irregular dimension. These hardgrounds appeared to be exhumed, as gravity had caused collapse of some of the authigenic crusts presumably formed sub-seafloor. Around the rim of one of these hardground outcrops, seafloor evidence suggested the presence of a brine river at the seafloor.

Some or all of these hardgrounds, up to several meters high, were occupied with living bivalve colonies (i.e., buccinid mussels) and other biota (see biological summary). Many discrete locations of gas escape were encountered. At one outcrop, gas escape was accompanied by escaping oil droplets. At this same hardground, at one vent site, hydrate rinds formed around individual bubbles as they escaped.

Outcrops of hydrate under hardground ledges were encountered prominently in two locations. In both cases, proximal gas bubble streams were also encountered. At the last hardground/cold seep site visited, living mussels were literally being encased in hydrate forming from these bubbles.

There were two bubble streams where the temperature probe aboard D2 was used to sample the bottom (5.15 - 5.22 °C) there was not a significant difference from ambient temperature.

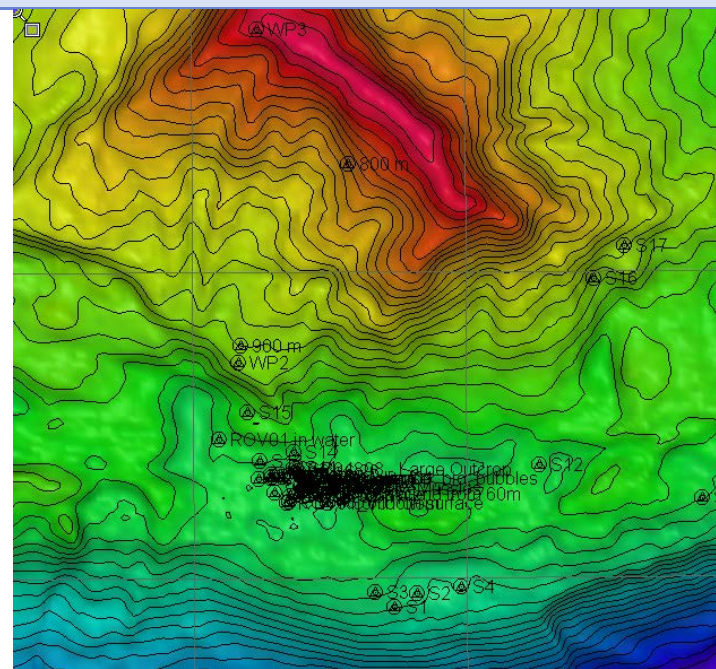
Biological Summary

With regards to the importance of identifying chemosynthetic communities in this area, Bob Carney stated during the dive that these dives are significant because it gives us more confidence in the mapping and ground-truthing. We are able to put a 2000 ft buffer to restrict the oil industry from drilling where it can adversely affect these communities.

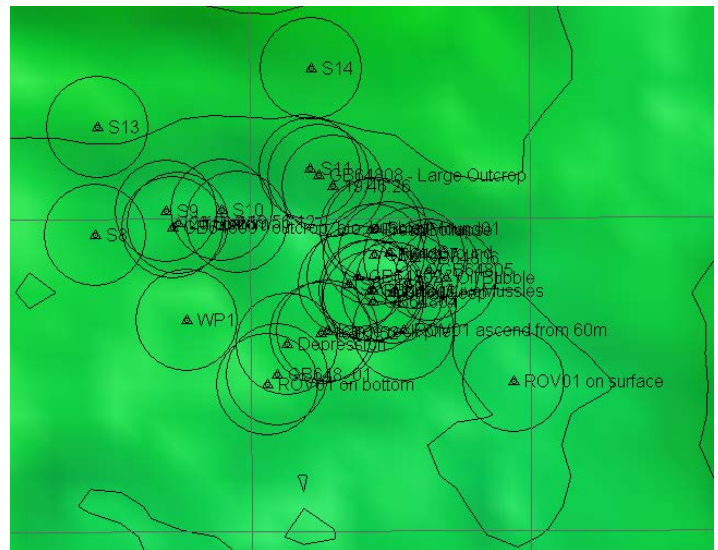
The most abundant species were living buccinid mussels as well as shell halves and hash surrounding the base of outcrops, some of which was composed of clams, however none were seen living. Small white heterotrophic gastropods: *Cantrainea* sp. were found very close to active seep sites, likely feeding on the chemosynthetic bacteria. Arthropods- *Chaceon quinquedens* (red crabs) were common, including 2 mating pairs and a molt these were fairly even distributed throughout the dive with at least one associated with each methane ice/seep location as well as one spider crab, *Paralithodes* (a type of king crab). Corals were rare and low in diversity with only 3 antipatharians (*Tanacetipathes?* sp. - black corals) as well as two *Chrysogorgia* sp. (octocoral) throughout the entire dive. Echinoderms consisted of Asteroids- Brisingidae starfish usually occurring in multiples and Goniasteridae- batstars, usually closely associated with the seep communities. There was one holothurian- *Mesothuria lactea* in the sediment. Many bacterial mats were seen coming in a range of colors (white, orange and black- namely in the brine pool area) and always associated with seeps. There were two types of polychaetes seen including iceworms on the methane ice and - *Methanoaricia dendrobranchiata* (snotworms) living between the buccinid muscles. Armored shrimp in the family- Glyphocrangon were common and one *Alvinocaris* sp. (ice shrimp) was seen. There were also *Lamellibrachia* sp. tube worms with their respiratory organs exposed. There were several species of fish

including a bat fish, some rat tails and cutthroat eels.

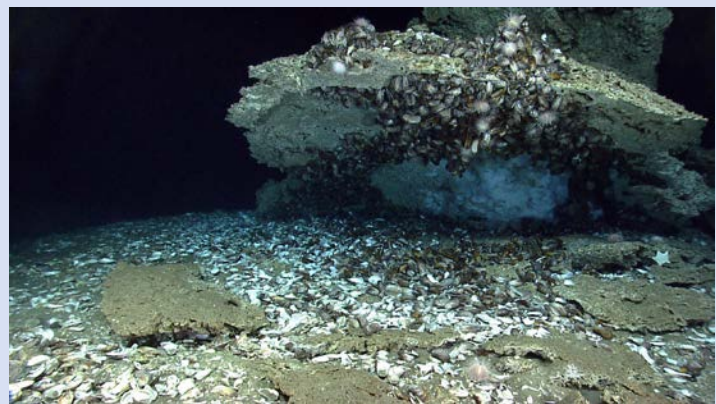
Overall Map of ROV Dive Area



Close-up Map of Main Dive Site



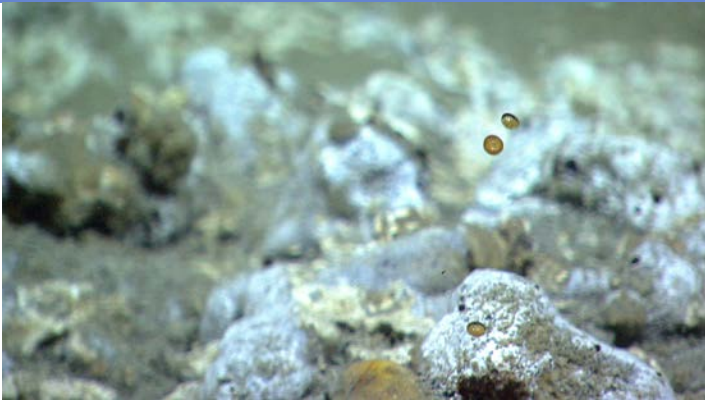
Representative Photos of the Dive



An overhang with buccinid mussels, white urchins and methane ice accumulating underneath.



Methane ice engulfing the holdfasts of buccinid mussels.



Methane seep

Chaceon crab next to a bacterial mat

Please direct inquiries to:

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