**Cruise Plan for AT 18-10 (PIs: Levin, Orphan, Rathburn, Rouse)**

**Science Party: 24 people**

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Cruise Plan

The primary objectives of this research are to (a) characterize the biotic diversity of authigenic, methane-derived carbonates at Hydrate Ridge from microbes to metazoans, (b) identify the ecosystem-scale interactions among these groups including habitat alteration, colonization, and trophic transfer, (c) assess how proximity to methane seepage influences (a) and (b), define successional dynamics of carbonate ecosystems, (d) determine the evolutionary affinities of carbonate faunas and (e) refine our understanding of one of the most important paleoceanographic indicators, *C. wuellerstorfi*. Community components to be studied include associated megafauna, attached epifauna, endofauna (i.e. cryptofauna), and endolithofauna, as well as the biogeochemistry of carbonate environments experienced by these organisms. Primary activities include collection of experiments deployed in August 2010 at active and inactive seep sites on Hydrate Ridge North, OR (590 m; 44 O 40.5’N, 125 O 6.0’W), and Hydrate Ridge South Pinnacle and Sediments (770 m, 44 34.22 N 125 8.9 W).

**Research synopsis:** We will conduct the research in exposed carbonate ecosystems on Hydrate Ridge North (587-618 m) and Hydrate Ridge South (774-810 m) to test hypotheses about the influence of active seepage on carbonate rock animal communities and their successional phases, on microbial activity including anaerobic methane oxidation and sulfide oxidation, on carbon isotopic composition of shelled organisms, and on phylogenetic affinities of animals. To test hypotheses we will recover experiments deployed in 2010 at active and inactive seep sites. These consist of carbonate, rock, wood, bone, rock chip substrates, transplanted rocks, caged rocks, microbial colonization stakes and foraminiferal cages deployed on hard and soft substrates. There are 105 experimental units on the seabed; each will require careful handling and recovery in a separate compartment. We will also sample existing authigenic carbonates, sediments, and water at the experimental sites to generate the background information necessary to interpret the experiments. Natural wood fall material will be sampled via manipulator as available. We anticipate collecting tube cores (8-12/elevator deployment) from a variety of sedimentary habitats including microbial mats, clam beds and carbonate cobble. We will attempt to manage experiment and core recovery using sequential deployment of gear elevators with insulated, compartmentalized bio boxes. Additionally we will require water samples (via Niskin Bottle) collected on and off active seep areas, and sediment scoops and slurp samples as feasible. CTD casts will be made from the ship when Jason is on board. A multicorer is requested as backup instrumentation in case of bad weather. Note that we cannot conduct primary research activities with the multicorer.

On board ship we will need a walk in refrigerator room (4-5oC), a refrigerator in each of the 3 main labs, and access to two -80oC freezers, as well as running seawater, milli Q water and racks for gas tanks in the hydro lab.

August 31. Transit to Hydrate Ridge North (587 m) 44 O 40.172’N, 125 O 5.887’W

(x=5447 y=13283).

Standard Dive activities:

 Locate gear elevator , move position as needed.

Recover designated experimental substrates (8 units) and station markers

Take tube cores of clam, mat or cobble sediments (8-10),

 If space is available, recover background wood, rock

Faunal collections via scoop, slurp and manipulator

Release gear elevator

Sept. 1-3 AM Hydrate Ridge North, 590 m 44 O 40.17’N, 125 O 5.89’W (587-610 m)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Station** | **x** | **y** | **Lat** | **Long** |
| HR-3 | 5447 | 13283 | 44 40.17212 N | 125 5.88719 W |
| HR-4 | 5402 | 13348 | 44 40.20721N | 125 5.92117 W |
| HR5 | 4985 | 13286 | 44 40.17374 N | 125 6.23603 W |
| HR 6 | 4613 | 13206 | 44 40.13054 N | 125 6.51691 W |
| HR7 | 5298 | 13014 | 44 40.02687 N | 125 5.99969 W |
| HR8 | 5233 | 13075 | 44 40.05981 N | 125 6.04877 W |

Sept. 3 PM- Sept. 6 Hydrate Ridge South 44 34.1 N 125 9.1 W (774-810 m)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Station** | **x** | **y** | **Lat** | **Long** |
| HR-1 | 1114 | 2057 | 44 34.11067 N | 125 9.15886 W |
| HR-2 | 1198 | 2254 | 44 34.21704 N | 125 9.09544 W |
| HR9 | 1100 | 2052 | 44 34.10797 N | 125 9.16943 W |
| HR10 | 1083 | 2017 | 44 34.08907 N | 125 9.18227 W |
| HR11 | 1064 | 1975 | 44 34.06640 N | 125 9.19662 W |
| HR12 | 1085 | 2005 | 45 34.08259 W | 126 9.18076 W |
| HRF22 | 1512 | 2216 | 44 34.1965 N | 125 8.8583 W |
| HRF23 | 1512 | 2216 | 44 34.1965 N | 125 8.8583 W |
| HRF24 | 1514 | 2189 | 44 34.1819 N | 125 8.8568 W |
| HRF25 | 1493 | 2128 | 44 34.1490 N | 125 8.8727 W |
| HRF26 | 1493 | 2128 | 44 34.1490 N | 125 8.8727 W |
| HRF27 | 1579 | 2191 | 44 34.1830 N | 125 8.8078 W |
| HR-V2 | 1584 | 2275 | 44 34.2284 N | 125 8.8040 W |
| HR-V1 | 1556 | 2277 | 44 34.2295 N | 125 8.8251 W |

Sept. 7. Transit to San Francisco