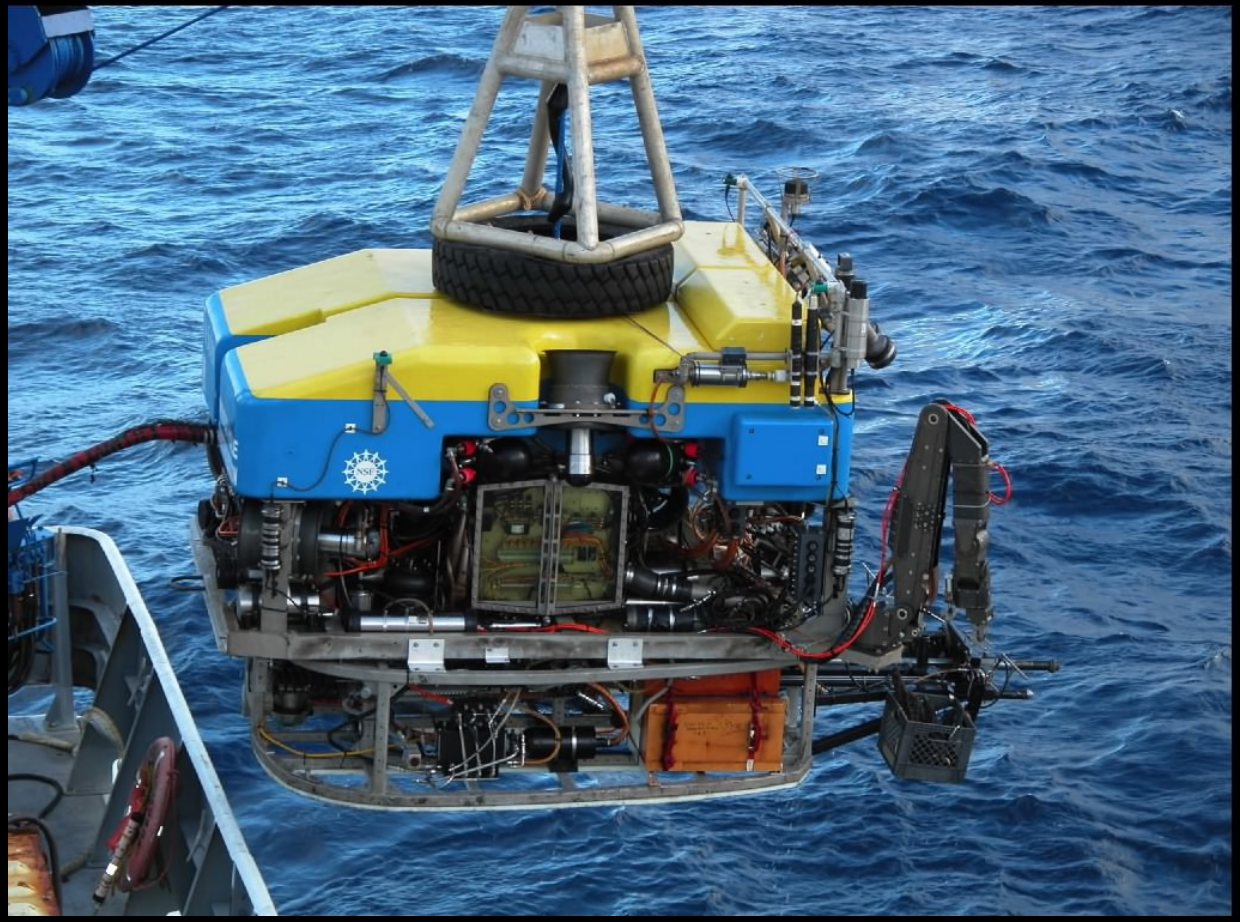
DESSC Meeting
December 2008



Jason Science User Reports

MAR '08 KNOX18RR
07/9-08/13
R/V Roger Revelle, ROV Jason II

Rainbow, Lucky Strike, Lost city, TAG

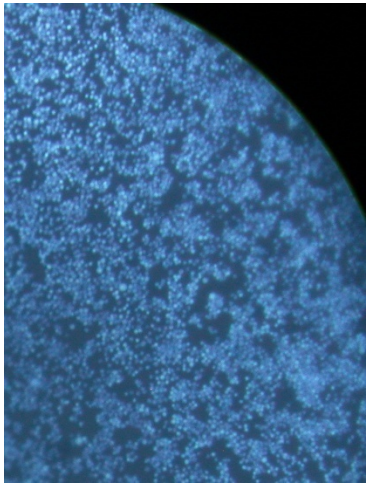
Reysenbach: Diversity and Distribution of Thermoacidophiles and Hydrogen Oxidizers at Deep-sea Hydrothermal Vents

Seewald,McCollom, German: Organic Geochemical Investigation of Mid-Atlantic Ridge Hydrothermal Systems

Ding and Seyfried: In-Situ Chemical Sensors for Monitoring the Chemistry of Hydrothermal Vent Fluids at Mid-Ocean Ridges: Instrument Development and Field Applications

Involved colleagues from Portugal, China, Netherlands and USA

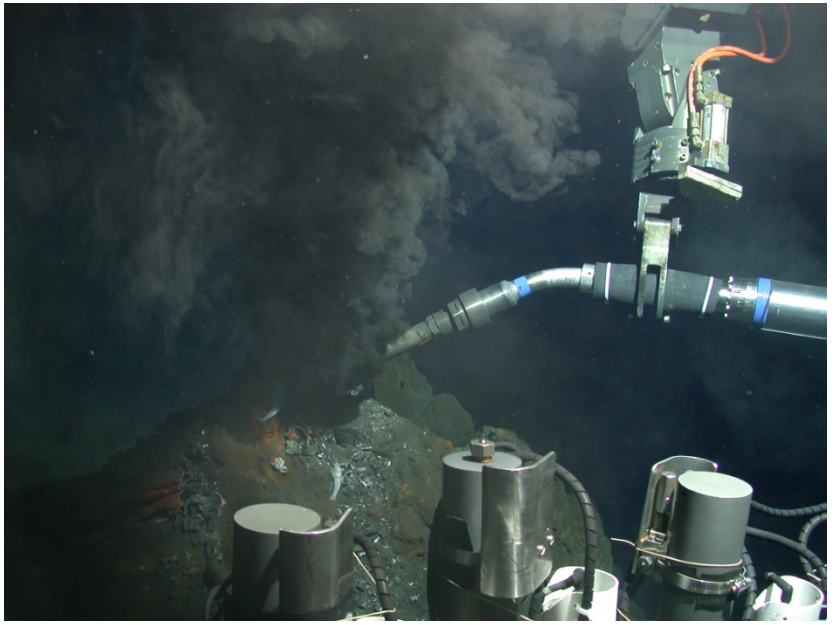
Microbiology

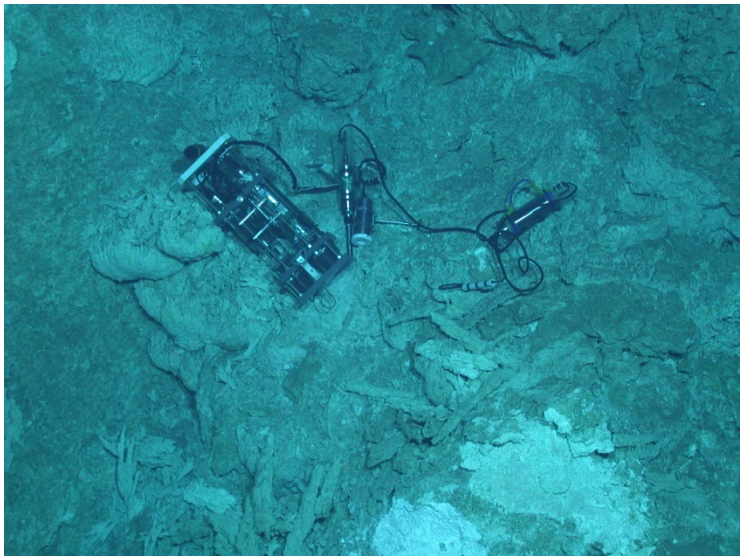


- ~70 sulfide deposits collected
- Enrichment culturing and DNA extractions
- Over 40 cultures- different growth conditions
- At sea, quantitative PCR (QPCR) of functional genes (interesting prelim results… methanogens prevalent at Rainbow, and not detected in samples from Lucky Strike)
- Were able to also monitor and ID cultures using QPCR
- New acidophiles, one already being sequenced by the Joint Genome Institute.

Geochemistry

- ~62 vent fluid IGT samples analyzed shipboard
- deployment of an in-situ pumping system that was designed for potentially concentrating small quantities of dissolved organics
- Multiple successful in situ pH and redox measurements
- Successful deployments of in situ pH data loggers





Numerous Ancillary projects: e.g.

- Lost City- Baross lab, Billy Brazelton
- Microbes of serpentinized rocks- Alexis Templeton lab, Lisa Mayhew
- engineering trial deployments of a rising plume particulate multi-sampler system developed by J. Breier
- Invertebrate collections
- Mapping of Rainbow (incomplete)
- Kadko- Radon measurements in fluids

Overall operations

- With the primary goals completed at Rainbow (Seewald et al, Reysenbach, Ding-Seyfried) and Lucky Strike (Reysenbach) vents, we anticipated that more time might be needed for deployment of the chemical sensors at Lost City (Ding-Seyfried). As these deployments went well, we were able to spend some time at TAG hydrothermal, before our scheduled transit to Snake Pit for the 3 final dive days.
- Winch failed at TAG, >48 hr to retrieve Jason II
- Reysenbach lost 3 dive days of her 10 dive program on the MAR.

FeMO

- An Iron Microbial Observatory at the Loihi Seamount

- PIs:

- Katrina Edwards, USC
- David Emerson, Bigelow
- Craig Moyer, WWU
- Hubert Staudigel, Scripps
- Brad Tebo, OHSU

- Collaborators:

FeMO 2008

- Third of four sea-going research expeditions
- September 22- October 10
- R/V Thompson
- ROV Jason

Research Objectives

- Understand the diversity, form, function of the neutraphilic iron-oxidizing bacteria
- Elucidate thier role in iron deposition in the modern environment -> rock record
- Elucidate thier role in rock alteration -> biogeochemical cycles
- Why Loihi? We know they are there and are abundant - figure them out where they occur naturally “concentrated”

What we do

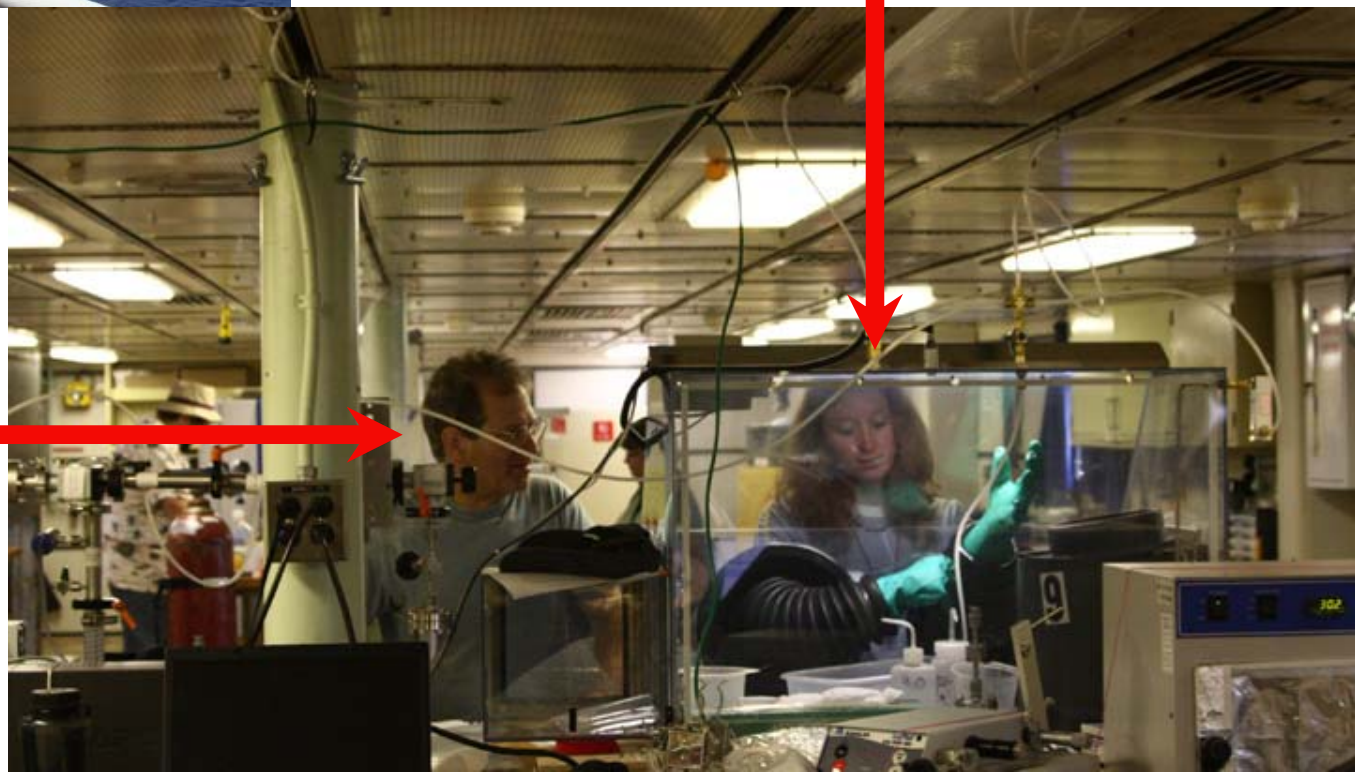
- Collect: Rocks, Mat samples, fluids -> ROV Jason + elevator runs; water column samples (plumes) -> CTDs
- Make Measurements: in-situ voltametry -> Brian Glazers “sniffer”; in-situ temperature loggers; microprofiling
- Map and image: SM2000 data and photomosaicing

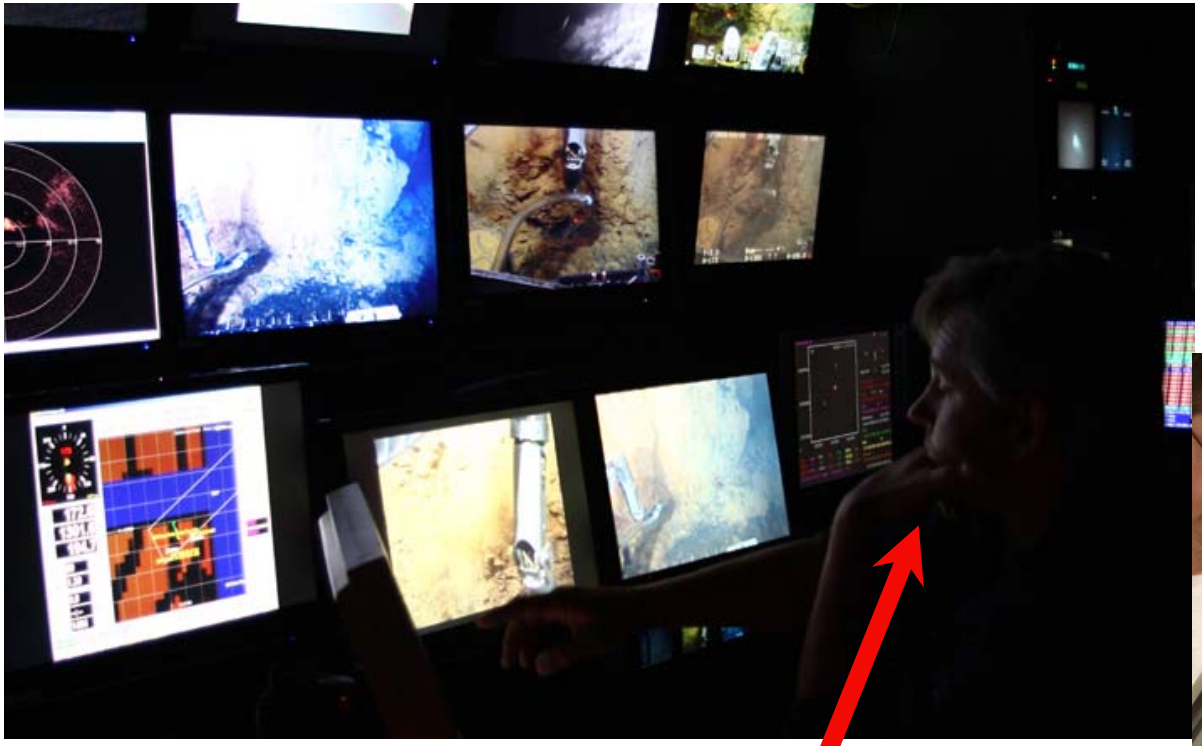
This year

- FeMO - our usual gig with some new twists and turns to keep things interesting, including a mid-point transfer of personnel
- Mark Kurz - a rock-sampling petrology program
- Science party: 5 PIs (1F), 4 assistant-level faculty collaborators (1F), 1 high school teacher, 1 NSF observer, 4 postdocs (3F), 1 international guest, 3 technicians (2F), 7 graduate students (5 F), 4 undergrads (1F)

Jessica Deemer, Grad Student

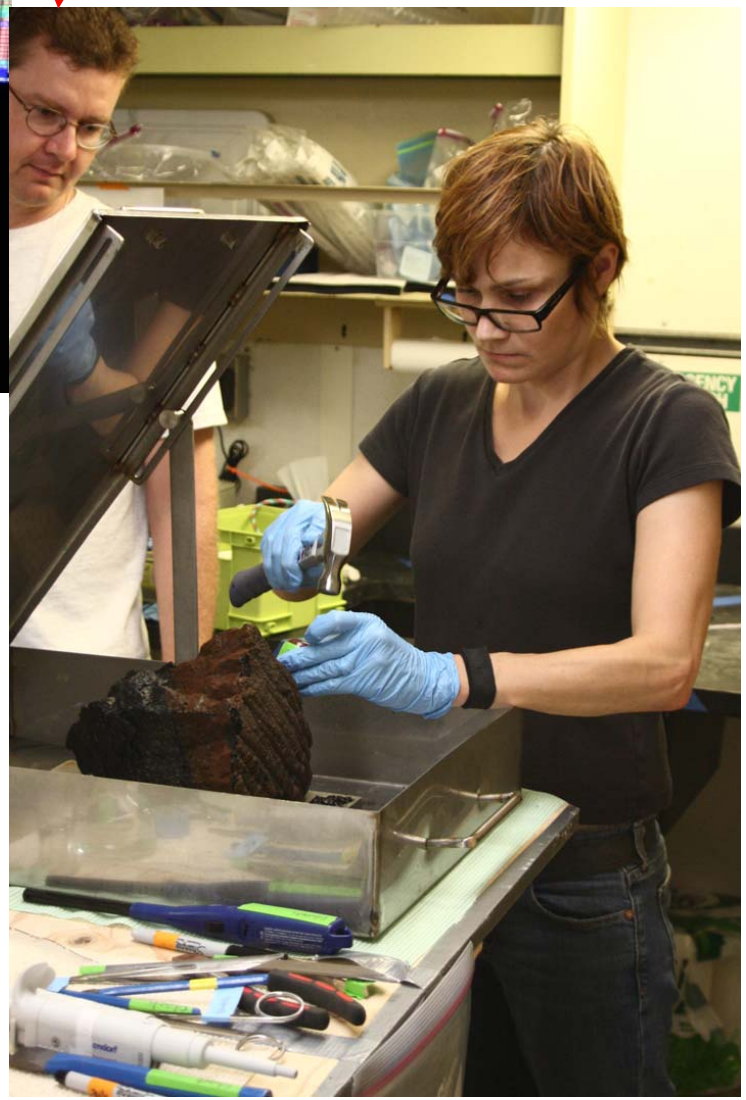
Mark Kurz, WHOI





Expedition leader in training! went great

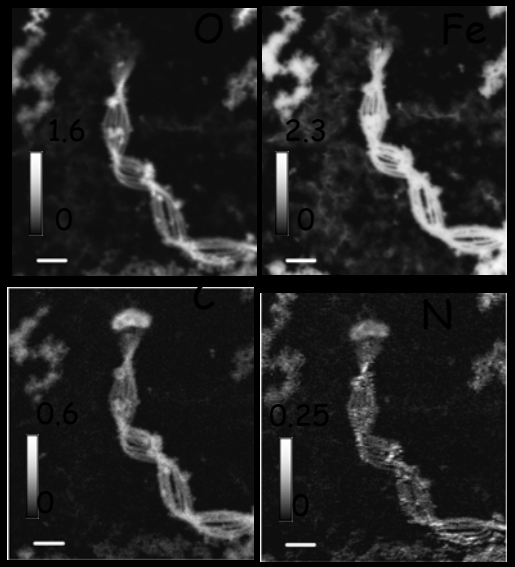
NSF observer, don't screw up!



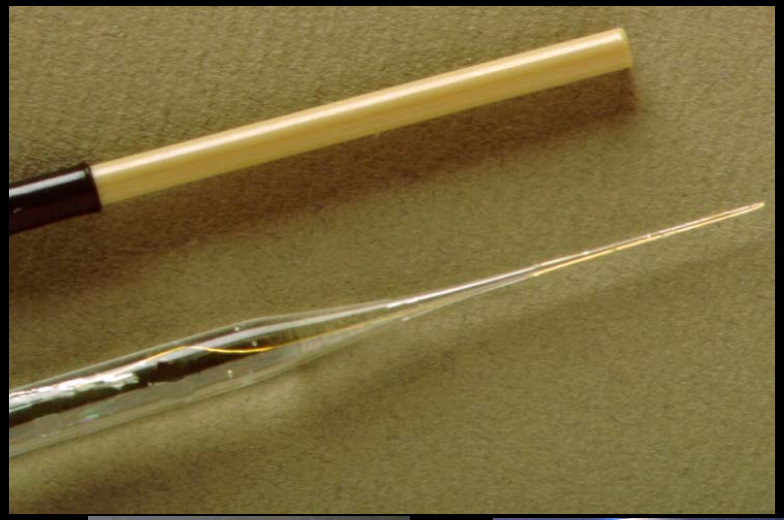

The Bio-
Inorganic
CHemistS

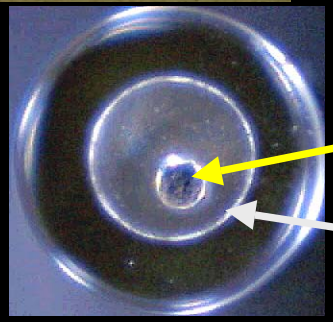
In situ redox chemistry

Brian T. Glazer
University of Hawaii
Department of Oceanography
glazer@hawaii.edu
http://www.soest.hawaii.edu/oceanography/glazer/



Voltammetry 101





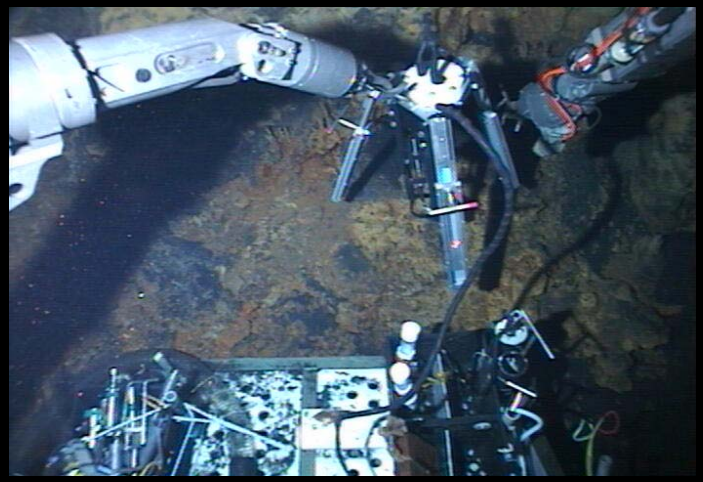
100 µm gold wire sealed in PEEK or glass using marine epoxy, plated with mercury

O_2, Fe^{2+}, Mn^{2+}, H_2S, H_2O_2, I^-, S_x^{2-}, $S_2O_3^{2-}$, FeS_{aq}, Fe^{3+} are all measurable in one scan, if present

Au wire
100µm diameter

Polished
epoxy surface

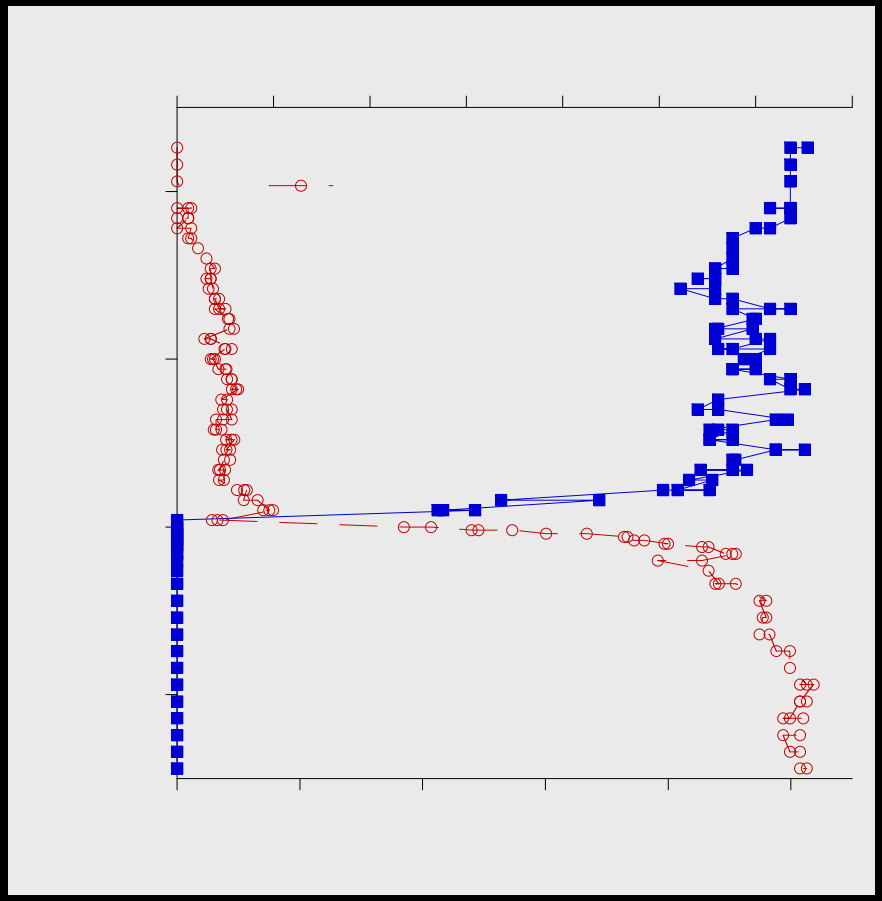
Seafloor microprofiling Fe-oxidizing mats



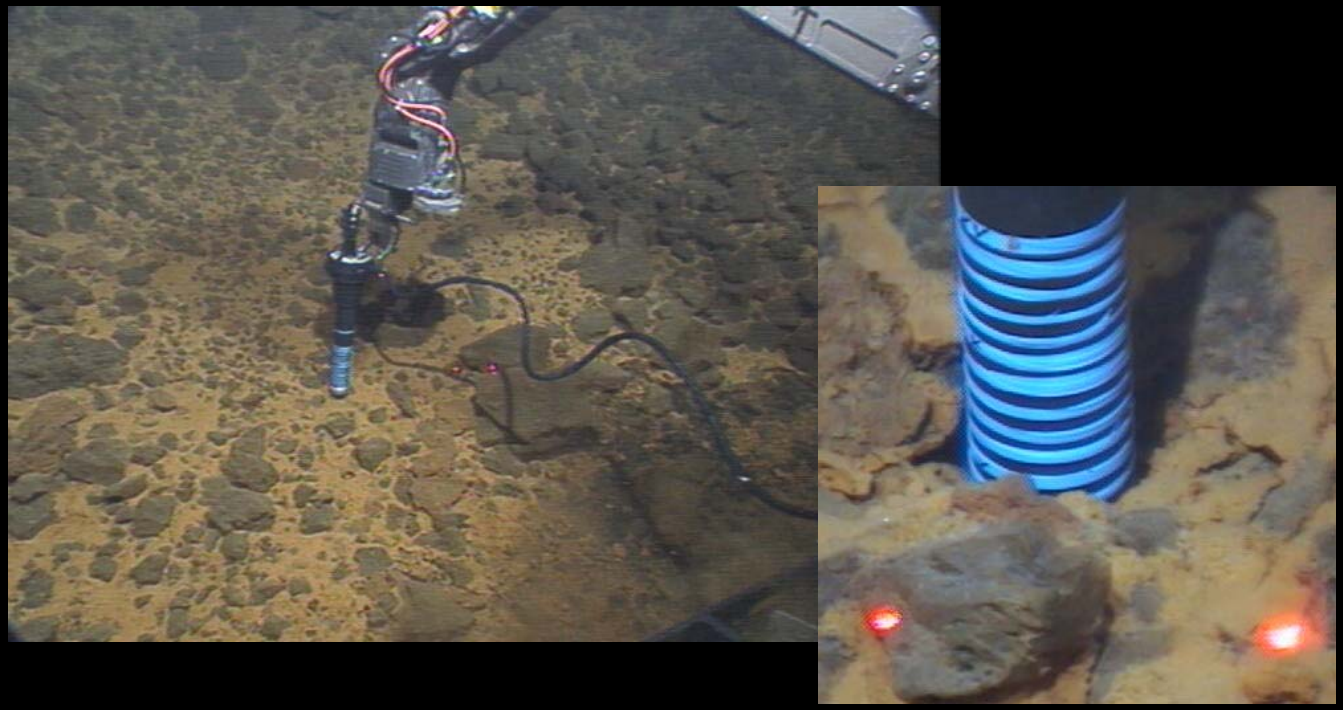
Tripod was designed with adjustable leg lengths and angles for deployment from Jason-II,

Micromanipulator capable of 0.05 mm steps

Seafloor microprofile of Fe-oxidizing hydrothermal mats



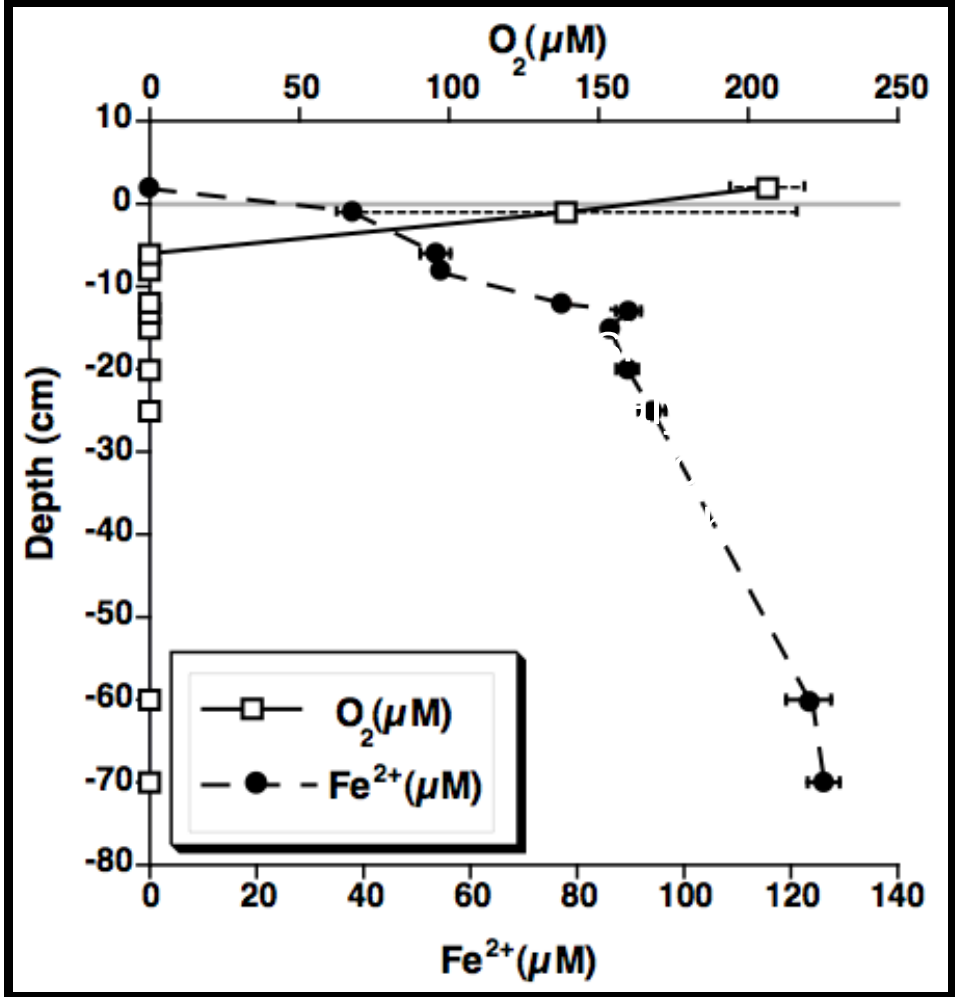
Seafloor "macro" profiles of vents and Fe-oxidizing mats at summit

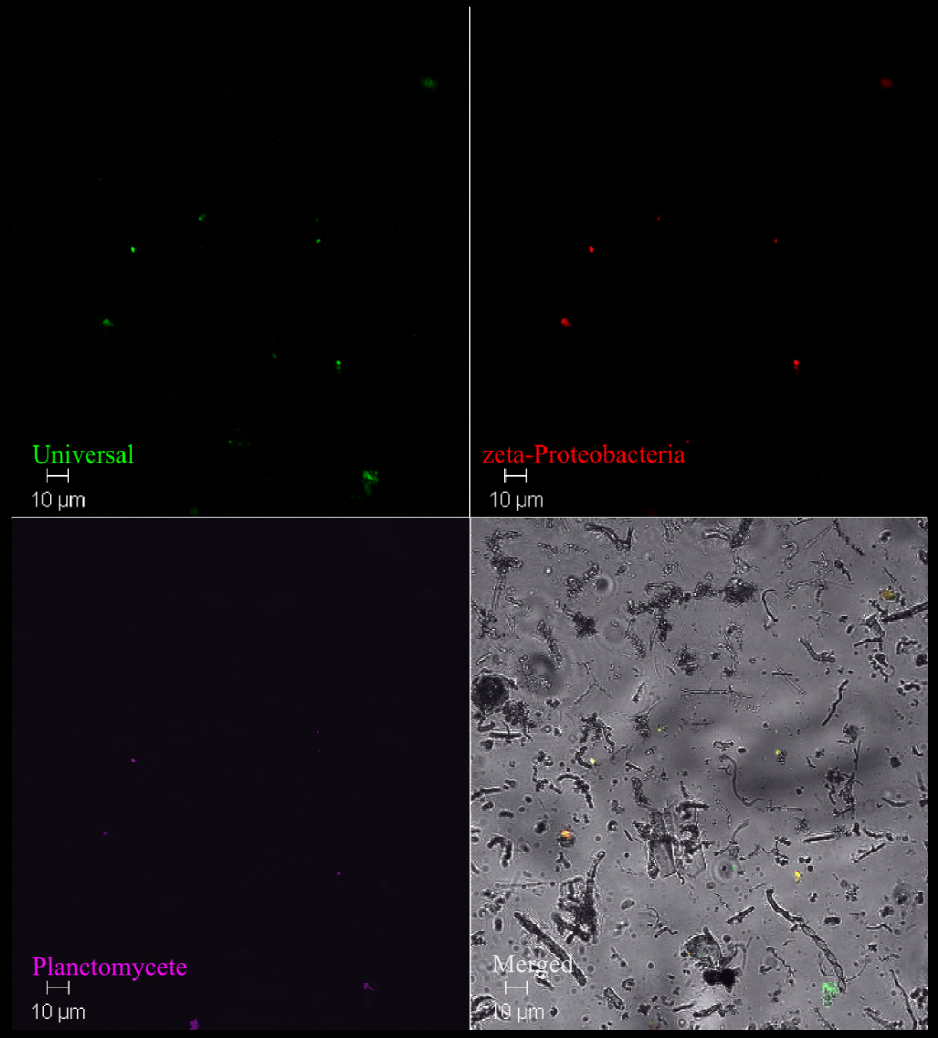


$T = 20 - 50^{o}C$

O_2 ~ 130μM, rarely any HS^-, Fe^{2+} ~200μM

FeMO Deep Site - 5000m





FeMO 2009

- Our last year! Stay tuned....