JASON
November 14-December 17
Maurice Tivey
JASON
April 5 - May 11
Meg Tivey
TUIM05MV – RV Melville/DSV Jason2
LAU Basin Vent Characterization Cruise
April 5-May 7, 2005
Tonga - Tonga

- P.I.s M.K. Tivey, J. Seewald (Woods Hole Oceanographic Institution), C.G. Wheat (University of Alaska), M. Mottl (University of Hawaii), A-L. Reysenbach (Portland State University), S. Kim (Moss Landing Marine Lab)
Vent Fields studied along the ELSC and VFR

How discovered:

🌟 *Nautilus* Dives from water column temperature anomaly data and dredged hydrothermal deposits. (Fouquet *et al.*, 1991)

🌟 Water column (MAPR, CTD), ABE and TowCam surveys. (Martinez *et al.* and Langmuir *et al.* cruises, 2004)


🌟 Multiple CTD Tow-Yo Casts using MAPR data. (Tivey *et al.* cruise, 2005)
Successfully characterized for each of 6 vent fields:

- Distributions of types of venting, types of vent structures and morphologies, and their relations to substrate and the range and distribution of megafauna (SM2000 and down-looking pixelfly)

- Fluid chemistry (Seewald gastight and major bottles)

- Vent deposit mineralogy/bulk geochemistry (grab samples/bioboxes)

- Molecular and physiological diversity of microbes associated with diffuse and high T fluids and active chimneys (subsamples of fluids/solids)

- Range, abundance, distribution, and reproductive status of dominant megafaunal organisms in vent fields and distribution of larvae/plankton in water column above vents (slurp/grab/bioboxes and MOCNESS)
Numbers of samples collected from vent fields on TUIM05MV.

<table>
<thead>
<tr>
<th></th>
<th>Kilo Moana</th>
<th>Tow Cam</th>
<th>ABE</th>
<th>Tui Malila</th>
<th>Mariner</th>
<th>Vai Lili</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High T fluid</strong></td>
<td>15 (7 vents)</td>
<td>12 (6 vents)</td>
<td>12 (5 vents)</td>
<td>11 (7 vents)</td>
<td>11 (5 vents)</td>
<td>6 (2 vents)</td>
<td>67</td>
</tr>
<tr>
<td><strong>Low T fluid</strong></td>
<td>1 (1 vent)</td>
<td>2 (1 vent)</td>
<td>4 (3 vents)</td>
<td>2 (1 vent)</td>
<td>3 (1 vent)</td>
<td>2 (1 vent)</td>
<td>15</td>
</tr>
<tr>
<td><strong>Active vent deposit</strong></td>
<td>10 (5 w/fluid)</td>
<td>9 (4 w/fluid)</td>
<td>8 (3 w/fluid)</td>
<td>10 (5 w/fluid)</td>
<td>6 (3 w/fluid)</td>
<td>2 (1 w/fluid)</td>
<td>45</td>
</tr>
<tr>
<td><strong>Inactive vent deposit</strong></td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>28</td>
</tr>
<tr>
<td><strong>Igneous substrate</strong></td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>11</td>
<td>2</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td><strong>Megafauna</strong></td>
<td>11</td>
<td>14</td>
<td>10</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>45</td>
</tr>
</tbody>
</table>
Cruise Assessment:
Melville, Jason2, systems, operations, process all very good.

SM2000 worked well BECAUSE WE BROUGHT AN EXTRA PERSON TO DEAL WITH SM2000 which allowed near real-time processing

But there were still some lessons learned.
SO, if we had it to do over again we would:

1) Lay our own transponders (takes less time than trying to figure out why ones left by earlier cruises are either not responding, or responding with a weak signal)

2) Ask for more contingency days if ship time is in cyclone season, even the tail end! We lost NINE days to weather – nine days when we could not put Jason2 in, or had to recover early. (Had 21 days of successful dives)

ON 10-YEAR TIME FRAME THERE SHOULD BE SOME PLAN FOR JASON2 TO BE ABLE TO LAUNCH IN HIGHER SEA STATES!
Characterization of Six Vent Fields Within the Lau Basin

High-Resolution Micro-Bathymetry Mapping in the Lau Basin: Examples From the Tui Malila and Mariner Vent Sites
* V Ferrini, A Sterling, F Martinez, M K Tivey, M Mottl, S Kim

Aqueous Volatiles in Lau Basin Hydrothermal Fluids
*J Seewald, T McCollom, G Proskurowski, E Reeves, M Mottl, J Sharkey, C G Wheat, M Tivey

Vent Fluid Chemistry From Six Hydrothermal Fields Along the Eastern Lau Spreading Center From 20deg03'S to 22deg13'S.
*J Sharkey, C G Wheat, M J Mottl, J Seewald

Bacterial and Archaeal Diversity From the Eastern Lau Spreading Center
*A Reysenbach, A Banta, S Kelly, J Kirshstein, M Voytek

Overview of the Ridge 2000 Integrated Studies Sites
*C Fisher, a Ridge 2000 Steering Committee
JASON
May 15 - June 3
Robert Vrijenhoek
Cindy Vandover
JASON
June 9- June 29
Childress
Fiji-Lau Jason II expedition: 15 May-3 June 2005

Investigators:
- R Vrijenhoek: 12 NSF-funded dives
- CL Van Dover: 2 NSF-funded dives

Goals:
- Sample biology at Lau sites identified by RIDGE program
- Sample biology at N. Fiji sites
Collaborators

Todd Bliss
Pacific Grove High School
biology teacher

Anders Warén
Sweden

Victoria Orphan
CalTech-microbiology

Fred Pleijel
Sweden

Greg Rouse
Australia

http://www.mbari.org/expeditions/fijilau/
Motivation: vent habitats are discontinuous

On what timescales do chemosynthetic taxa disperse across ocean basins?
Bathymodiolus mitochondrial phylogeny

ND4 sequences
Courtesy: J. Jones
2.8 meter long *L. columna*
An emergent fungal disease in Fiji Basin mussels

CL Van Dover, R Carnegie, ME Ward, JL Scott
The College of William & Mary and VIMS

Brown-Spot Stage  Black-Body Stage

- affects connective tissue
- identified as a “black yeast”
- prevalence > 58% and pervasive tissue necrosis in infected individuals
- US deep-submergence operators notified of the potential role vehicles and gear may serve in transport of pathogen
- proposal pending to study progress of disease:
  - effects on mussel community structure
  - viability of fungus (or spores) on vehicles and collecting gear
Fiji-Lau expedition: SUMMARY

Accomplishments:

• 14 successful *Jason* dive days
• 0 dives lost to weather
• *Jason* digital video: excellent
• *Virtual Van*: excellent annotation capability
• *Jason* payload: excellent
• *Jason* pilots: excellent

What went wrong:

• No weather days scheduled
• Vacuum sampling very poor
• Recommend rotary suction sampler like harbor Branch design
• Launch crane is dangerous even at mild sea-states
JASON
September 11-September 17
Debbie Kelley
John Delaney
Debbie Kelley, John Delaney VISIONS05

Examining extreme conditions under which life thrives, survives expires

Development of microbial incubators
4 chambers, 36 temperature probes, H2, time-series sampling
3 instruments 1 mo, 2 instruments deployed for 1 year, 2 colonization 1 year, scheduled to be on Neptune Canada 2007
Tough conditions- drilling while flying

Completed all objectives with successful holes in Roane, Giraffe, Hulk, Gremlin; 3 incubators deployed, 3 colonization experiments
Tough to drill and fly
Should consider system without Medea
Need a dedicated ship for J2-launch mid ship
JASON
September 18-October 4
John Delaney
Debbie Kelley
First HD Transmission from the seafloor-across US, Canada, Australia, Tokyo REVEL Program 5 middle-high school teachers, 1 mentor Completion of KECK-funded proto-Neptune Observatory: Installation of 20 in situ Seismic instruments, chemical, thermal, and biological sensors 3rd year
3rd year of Keck Observatory Efforts

CO-REGISTERED IN SITU EXPERIMENTS 05-06

*Keck-Funded
Survey tracklines ABE dives 157-165
ABE operations, VISIONS05

• Mapped the cable route approaching axial valley
• Mapped the axial valley from 47° 56’ to 48° 01’N
• ABE operated simultaneously with Jason2:
  • Launch before or during Jason2 dive
  • ABE “sleeps” until Jason dive completed
  • Battery recharge, transponder ops conducted during Jason2
  • Shared acoustic net in rudimentary fashion.