Tempo-Mini Inhabits the Hot Vents

Submitted by Rory Lattimer Wed, 2011-11-30 00:00

Located on mid-ocean ridges, hot vent ecosystems are characterized by extreme environments and unique organisms, which don't depend on sunlight - a rare feat! Photosynthesis is the way plants convert energy to food, but deep-sea hydrothermal vent communities are sustained by a special group of microorganisms, which carry out a process known as chemosynthesis. This allows the bacteria and archaea to produce organic matter for themselves and the animals using energy from chemical reactions that occur as hot vent fluids mix with seawater. Several studies have shown that the distribution of vent communities and their composition are strongly influenced by local geological, physical and chemical processes. We know very little about the day-to-day life of hydrothermal vent organisms or how these particular ecosystems evolve over time as a result of the various processes.
affecting them.

During the last few years, engineering and science teams at Ifremer [4], France’s national public institute for marine research have developed Tempo-Mini: a custom-designed instrument package for real-time monitoring of hydrothermal vent communities and their environment. Tempo-Mini integrates the following custom instrumentation:

- 2 megapixel streaming video camera with embedded event detection;
- 6 LED lights;
- Aanderaa oxygen optode [5] (used to measure oxygen concentrations as well as temperatures between 0 and 40°C);
- 10m-long, 10-sensor temperature probe [6] array;

To keep Tempo-Mini clean, an efficient and innovative anti-biofouling system protects the camera porthole, lights, and optical oxygen sensor. Tempo-Mini is remotely controlled by researchers in France via the Internet. Software at our Port Alberni shore station acquires the data and keeps all the measurements in order.

In 2008, Ifremer collaborated with NEPTUNE and VENUS networks to collect live data from the seafloor in Saanich Inlet near Sidney, BC. After this 5-month test in relatively shallow water (100m), Tempo-Mini was recovered in February 2009. In September 2011, an updated version (Auffret et al., 2010) was connected to the NEPTUNE observatory. Its principal objective is to gather the data needed to describe how physical, geological and chemical variations influence the structure and growth of hydrothermal communities at Endeavour vent field in the northeast Pacific Ocean.

Tempo-Mini was deployed to a tubeworm community (Ridgeia piscesae) near the base of Grotto vent edifice. Since 29 September 2011, Tempo-Mini has been sending real-time video
This time-lapse video compresses an hour of action in the tubeworm community into 2 minutes.

Preliminary results from Tempo-Mini observations suggest that the community is bathed every so often by small amounts of vent fluid. Oxygen values showed a significant decrease in October (from ~90µmol/L to 30-70µmol/L), which has been recovering since the beginning of November (see oxygen plot below). Curiously, this variability in oxygen concentration is not observed in the temperature data measured by the optode. The temperature is relatively low, varying between 2 and 3.5°C.
Tempo-mini’s array of 10 temperature probes, which snakes around on the active vent, is showing scientists how much temperatures vary in this environment at small spatial scales. At the base of the vent edifice, temperatures of 2°C were recorded (close to sea water temperature) while temperatures between 10 and 12°C in other locations indicate warming by hydrothermal fluid. In the longer term, multivariate statistics will be used to determine the role of environmental factors on different aspects of the lives of the vent animals (community structure, behaviour, reproduction, colonization, activity rhythms, etc.).
CHEMINI, the chemical analyzer, samples seawater daily, and then analyzes the iron concentration. Since the beginning of the deployment, the iron concentrations have remained low and quite stable, between 1 and 5µmol/L, and in concordance with the temperature variability.

Tags:

- tempo-mini
- endeavour
- CHEMINI
- data
- hydrothermal vents
- tubeworms
- IFREMER
- Collaboration

Categories:

- Data Highlights
- News Stories
- Science Highlights

Highlights

- Audio
Reading Room

- Active Research
- Backgrounders
- FAQs
- Glossary
- News Briefs
- News Stories
- Newsletters
- Publications

Cool Stuff

- Apps
- Digital Fishers
- iBooks & e-Pubs
- Live Video
- Maps
- Images
- State of the Ocean

Data & Tools

- Apps
- Data Plots
- Data Search
- Data Policy
- Data Help
- OPeNDAP Web Services

Opportunities
Sites & Instruments

- Arctic Sites
- Northeast Pacific Sites
- Salish Sea Sites
- Notice to Mariners

Follow Us

Sign up for our newsletter

Feedback

Send us your questions and comments *

How could we improve this page?

Your Name

Your Email *

Your Location

CAPTCHA
This question is for testing whether or not you are a human visitor and to prevent automated spam submissions.

What code is in the image? *