VentsProgram
Hydrothermal Plume Studies

MAPR: Mi nature Autonomous Plume Recorder

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The PMEL **MAPR:** **M**iniature **A**utonomous **P**lume **R**ecorder

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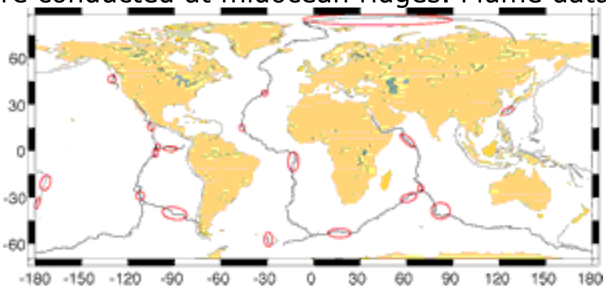
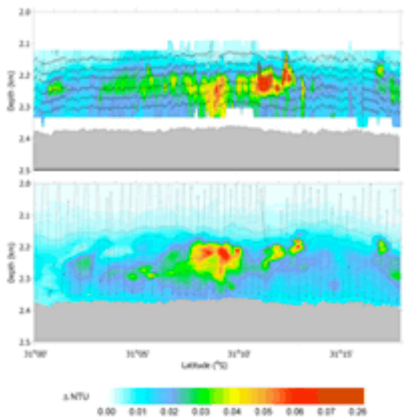
Goal:
To increase opportunities for collecting hydrothermal plume data by having a simple, rugged, and inexpensive instrument that can be deployed in conjunction with a variety of operations in the exploration of midocean ridge and volcanic arc systems.

Description of the PMEL MAPR:

The PMEL MAPR was designed to be an inexpensive, lightweight yet rugged, simple to use self-contained instrument for recording temperature, pressure, and optical data during a wide variety of seagoing operations. There are many cruises where geological or geophysical explorations and experiments are conducted at midocean ridges. Plume data are not normally collected during operations such as rock cores, dredges, or deep-towed geophysical and bottom imaging. We recognized that to take advantage of these operations we needed an instrument that was accurate enough to detect hydrothermal optical anomalies yet simple enough for untrained researchers to use as an ancillary program without detracting from the time or efforts of the main sampling programs. With such an instrument, our opportunities to collect hydrothermal plume data through collaborations with other researchers, and without the need for additional dedicated technicians, could be expanded worldwide.



The adaptable design of MAPRs allow them to be easily attached to many types of wires or towed instrument packages. Their small size makes them easy to handle and less likely to interfere with other instruments or wire configurations. Supporting software has been developed to provides a point-and-click user interface for instrument configuration and data recovery that assures MAPRs are reliable and simple to use. Since their introduction in 1996 [Baker and Milburn, 1997; Scheirer et al., 1998], PMEL MAPRs have been successfully deployed by PMEL and non-PMEL researchers at many locations not previously sampled for hydrothermal plumes. Specifications for constructing the MAPR pressure case and internal hardware, and schematic drawings for the

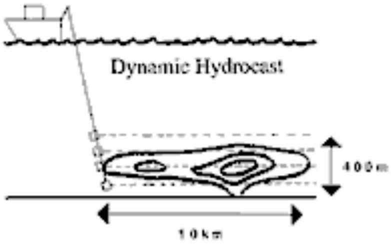


Results from plume mapping along the superfast-spreading southern East Pacific Rise. The upper panel shows plumes mapped using the optical sensor (light-backscattering in terms of Nephelometric Turbidity Units , (NTU) on an array of MAPRs attached to the tow wire of the DSL 120A sidescan vehicle. Black lines show the individual MAPR paths above the seafloor (gray solid). Lower panel shows

MAPR circuit board and sensor board, are available in the accompanying engineering drawings. (pdf files)

plumes mapped using the same optical sensor on a CTD tow-yo (thin black sawtooth path). Both transects, which were acquired about 1 day apart, show similar plume structure suggesting a seafloor source near 31°9'S.

The map (above-left) shows the path of the midocean ridge system through Earth's ocean basins. Red ellipses indicate locations where MAPRs have been used by a variety of investigators to study the distribution of hydrothermal plumes. As of 2006, MAPRs have been used in every ocean on more than 40 cruises on research vessels from the USA, New Zealand, UK, Germany, France, Japan, and China. A selection of papers describing results from MAPR work is listed below. For example, Walker et al. [2004] show that mapping hydrothermal plumes by attaching an array of MAPRs along the tow wire of a deep-tow vehicle (see the cartoon left), such as the DSL 120A side scan sonar, gives comparable results to the standard plume-mapping technique of a CTD tow-yo transect (see image above-right).



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