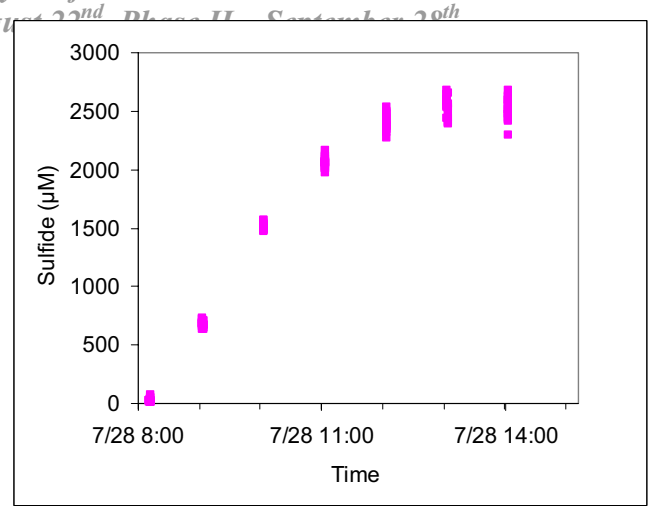
Sulfide Flux Sensor

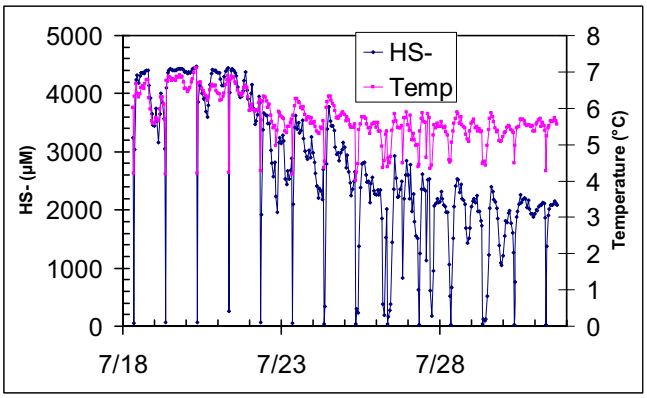
Status of project

This effort is aimed at using the ISUS to measure sulfide flux from cold seep sediments. The overarching goal is to demonstrate the ability of ISUS to measure dissolved sulfide in interesting environments. A benthic flux chamber that we constructed with an ISUS sensor was placed in a cold seep at Extravert Cliff in mid-July for a 2 week period.

Results to date

Measurements at Extravert Cliff were highly successful. The flux chamber is placed with its open end in the seep sediment. It is flushed with ambient bottom water once per day at 0800 GMT. As seep fluids flow upwards, the concentration of sulfide in the chamber increases. The concentration is sampled once per hour (Fig. 2A) until 0800 on the next day when the chamber is refilled and the process repeats. An opening on the top of the chamber eliminates back pressure and allows for unrestricted seep-fluid flow. A complete 14 day record was obtained (Fig. 2B) that shows a striking correlation of high sulfide with elevated temperatures in the fluid (Fig. 2C). Flow rates were as high as 25 cm/hr (2.2 km/y). This





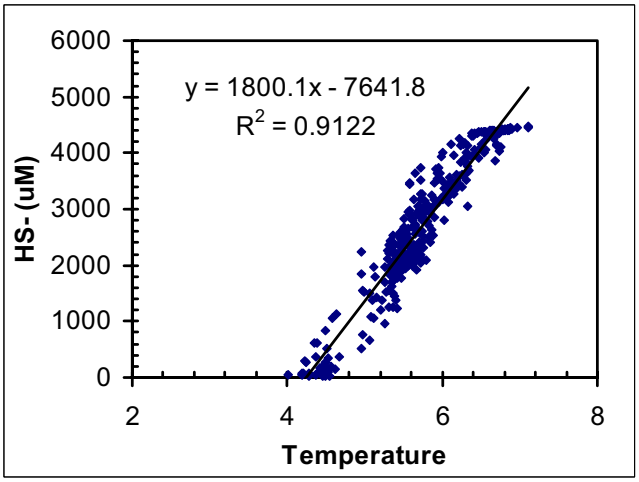


Fig. 2. A) Sulfide vs. time for the first 6 hours after chamber flushing on July 28 shows the concentration increase to a steady state where the chamber is filled 100% with seep fluid. B) The complete 14 day record of sulfide and temperature. C) Sulfide concentration versus temperature of the chamber water.

is the maximum that could have been detected with hourly sampling as the 25 cm tall chamber completely filled with seep fluid in less than 1 hour (Fig. 2B) on many of the days.

Publications (from the last 5 years)

We are preparing a paper describing these results and an additional deployment that we have requested this fall, which will extend over a full tidal month.

Plans for 2007

Engineering/technology development

No major technology development is needed for this project. Some software modifications may be implemented.

Field programs

In 2007, we will utilize additional ROV dives to deploy the sulfide flux chamber over sediment outside seep sites, as well as at other seep sites where fluid flow is not as pronounced. These results will be an interesting test of Charlie Paull's hypotheses concerning erosion versus fluid flow as the primary mechanism that supplies sulfide.

Data (availability outside project team, uniqueness)

Primary source of data will be publication and then distribution to any interested party.

Significant changes from previous project proposal (continuing projects only)

None

Trace Metal Sensors

Status of project

We have developed a set of detectors for the YSI 9600, in collaboration with Zanna Chase at OSU and with NSF support, that enable the determination of copper and zinc in seawater. This includes a chemiluminescence detector and a fluorescence detector. At MBARI, we are now exploring the potential of using the YSI 9600 with the chemiluminescence detector for the determination of dissolved iron in seawater. If successful, this would enable the autonomous determination of iron from moored platforms.

Results to date