A High-Speed Self-Contained Video Camera System for Optical Plume Velocimetry: OTIC Project Report

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Abstract

Hydrothermal flow within mid-ocean ridges strongly affects the transfer of heat and mass between the crust and the overlying ocean. Despite its importance, there are no long-term measurements of flow through high-temperature hydrothermal vents primarily because invasive-type flow measurements do not work in these environments. In this project we are developing a high-speed seafloor camera system for measuring flows in black smoker vents using image analysis. The development of this system and subsequent deployment in stand-alone configuration or as part of a cabled seafloor observatory will provide important new insights into the functioning of seafloor hydrothermal systems.

Present Status

During the first phase of this project engineer David Gassier and PI Timothy Crone completed the initial design and specification of the camera system in preparation for the construction phase. We were then offered a chance to deploy the instrument on a cruise led by Scott Nooner, but such a deployment would require additional funding. Using our progress to date and OTIC funding as leverage, we wrote an NSF proposal that was funded at $97,386. This proposal is attached to this document.

David was called off the project to concentrate on his duties in the OBS facility, and because we were unable to find the appropriate expertise at Lamont, we began working with engineer Carl Robinson of the BAS to complete the construction of the instrument. This work is now complete and we are currently at sea on the R/V Atlantis with DSV Alvin making the final preparations for a deployment in two day's time. Pictures of the completed instrument and the mounting tripod are below.

Benefits Realized

This OTIC project has been an enormous success. Even before the project was finished we were able to leverage NSF funding to expand the scope of work and build a better and more capable instrument. We have increased the visibility of LDEO as an instrument building institution, increased our capacity to build instruments, and obtained outside funding to supplement our efforts. I would highly recommend the continuation and expansion of this project.

Close up view of the OPV system light and camera bar sitting in the main lab of the R/V Atlantis on its way to the EPR for its maiden deployment.

OPV system and seafloor mounting tripod with the LED light illuminated. A light calibration target can be seen in the background.