

Collaborative proposal: Test of new instrumentation for integrated physical, chemical and microbiological sampling at R2K sites

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We are working hard to meet the 15 February submission deadline. This is a collaboration between OSU and UW. We have also been working with MBARI to make sure the instrumentation we seek to test has met all the engineering requirements, through MBARI's Science Use Case Scenario process, for integration into any future cabled observatory that may emerge at Endeavour or other sites of interest to R2K.

The proposal seeks modest levels of support to carry out the first full field deployments of the new "isosampler" system. Isosampler is a modular instrumentation system that is designed simultaneously to monitor and sample fluids emitted from vent sites for physical, chemical and microbiological analysis. It includes a modular set of large-volume (1 liter), high-pressure flow-through Titanium sample bottles that also serve as microbial incubation chambers. Optionally, any bottle can be equipped with a dynamic pressure compensation module that will maintain the pressure state of the sample through the storage and incubation cycle. The system also includes manifold pumps, a network of individually addressable high pressure titanium/PEEK valves that allow one to channel sample fluids into any combination of sample bottles, and an ROV/HOV removable, compact Ti sensor head that has a very sensitive flow and temperature sensor integrated into the fluid inlet port - giving one good controls on the physical state of the fluids that are being sampled, and also providing constraints on advective heat flux of great use to geochemical interpretation.

Isosampler is a next-generation system that follows on ten years of successful development and deployment of Medusa hydrothermal monitoring systems around the world, by our own lab, and also by other groups for whom we have built Medusa and other systems (e.g. Geological Survey of Japan, Univ. Tokyo, IFREMER, etc). Isosampler was developed entirely from non-NSF funding, with a roughly equal split between US (mainly NASA) and European funding sources. The total investment by our lab in isosampler development over the past five years has exceeded \$1M. We are now ready to carry out the first field deployments, having thus far tested only individual components of isosampler. There has not yet been a full, integrated system deployment on the seafloor.

We propose that isosampler would be of considerable use to integrated studies of the interaction between physio-chemical changes in hydrothermal systems, and microbiological response. We would like to make isosampler available as a resource to the R2K community, and are in the fortunate situation of having

already been able to build three isosampler systems, comprising a total of five sensor heads, three titanium gear pumps, 16 high pressure 1-liter flow-through sample bottles and three pumps. There is therefore very substantial leveraging of non-NSF, non-R2K investment, that could be applied to R2K goals. We do not seek in this proposal any significant capital investment in isosampler by R2K. Rather we seek support for salary (primarily engineering salary) and for supplemental ROV time, to test the system under actual field conditions. We propose first to do so in Monterey Bay, purely as an engineering test, and then to carry out deployments at the Main Endeavour vent field, where we can obtain initial scientific results including the first diffuse flow, large volume microbial characterization data. The experience gained through this would then position the isosampler facility for wide use within R2K SSI and other R2K targeted activities.