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MISO Facility: Acoustic Transponders

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Recent advances in underwater vehicle navigation and mapping technology now permit the precise tracking of vehicle position and the creation of accurate sub-meter resolution bathymetric maps. For instance, this information is critical for an integrated understanding of complex hydrothermal systems and is important to the evolving research initiatives of the Ridge 2000 (R2K) community. Not only does improved navigational accuracy benefit individual research programs with specific mapping objectives, but coupled with the placement of markers on the seafloor precise navigation benefits a broad spectrum of the R2K community by permitting detailed temporal investigations of changes within these complex biogeochemical systems. As the scientific community continues to utilize shared digital databases, and as we move more tangibly toward ocean observatories, the quality of vehicle navigation data within individual field programs and spanning field efforts over multiple years will become increasingly important.

The recent increase in high-resolution seafloor bathymetry and imagery has been made possible by both improvements in acoustic sensors and new approaches to vehicle navigation that includes Doppler Velocity Log (DVL) navigation for extremely accurate point to point, relative position information, in addition to traditional long-baseline (LBL) bottom moored transponder navigation for accurate geodetic positioning. In addition, vehicle attitude data provided by a new generation of north-seeking fiber optic gyros and pitch/roll data permits accurate processing of near-bottom multibeam and scanning altimeter 'pings' to make sub-meter bathymetric maps having relevance to biological scales. These data facilitate correlation between geological, biological and chemical processes related to hydrothermal vents and endemic volcanic and tectonic features of the mid-ocean ridge crest.

Optimally, DVL and LBL data collected simultaneously provide the best navigation solutions for deep submergence vehicle based programs. Providing the LBL infrastructure at R2K ISSs and data processing capability to the wide range of science users involved in R2K science would help optimize the efficiency of vehicle operations and science productivity during field programs, and ensure that the best navigation and associated data sets are provided to the R2K Data Office and the National Deep Submergence Facility (NDSF) Archives. DVL navigation is now routinely provided for all NDSF vehicles with commonality across the spectrum of *Alvin*, ROV *Jason2* and *DSL-120* sidescan sonar vehicle systems. LBL transponders are routinely provided by NDSF for field programs but they are not normally left on site for long periods of time. Users may require additional transponders either because of the greater seafloor area they intend to cover or because of logistical constraints involved in their field programs.

The MISO Facility transponders are available to users requiring seafloor navigation in addition to what may be provided by the NDSF, or other programs that require on-bottom acoustic navigation. In 2005, NSF provided funding to WHOI-MISO to purchase 4-new Benthos TR6001 acoustic transponders and to refurbish 2 other units so that a total of six (6) TR6001 transponders would be available through the MISO Facility for use by the broad oceanographic community.

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As part of the ongoing MISO Facility work, upkeep and maintenance of the 6 transponders is carried out to provide users requiring additional navigation infrastructure for their experiments access to additional transponders. A similar facility for acoustic transponders is available from UNC-Charlotte (Prof. John Bender), and I have coordinated the MISO transponder capabilities with the UNCC pool of 6 transponders both in terms of monthly lease costs and available frequencies and release codes.

Access to the MISO transponders will be to the broad ocean science community of federally funded researchers and will be done via an on line request form and tracking systems similar to what is currently done for the other MISO equipment such as the WHOI *TowCam* (towed deep sea camera systems).

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