Shallow Water MCM and ASW using Off-Board, Autonomous Sensor Networks and Multi-static, Time-Reversal Acoustics.

Henrik Schmidt
MIT

The MIT/MPL/SACLANTCEN SWAMSI partnership combines the results of two ONR sponsored SACLANTCEN Joint Research Projects (JRP), the GOATS (Generic Oceanographic Array Technology Sonar) multistatic MCM initiative led by MIT, and the FAF (Focused Acoustic Fields) time reversal initiative, led by MPL, into a new, environmentally adaptive, multistatic sonar concept for concurrent detection and classification of proud , buried and waterborne targets. It uses a fleet of autonomous vehicles to create a wide, combined physical and synthetic aperture for mapping the *spatial and temporal characteristics* of the scattered field produced by the targets in the mid-frequency regime which is rich in target-specific structural responses. The multistatic field characteristics, rather than classical sonar imaging, is then used as the the basis for *concurrent detection and classification (CDC).* For insonification the concept would be to use organic, mid-frequency sonar resources on a littoral surface platform in an *environmentally adaptive*, time-reversal mode, as well as conventional sources carried by the underwater vehicles. The research will develop a comprehensive System Modeling and Simulation framework which will be used for identifying and characterizing robust, bistatic target scattering characteristics which may be explored for CDC, and for developing adaptive sampling strategies, performance prediction and experiment planning. Concept demonstration will be performed through a FY04 (July 6 – 25, 2004) field experiment conducted jointly by the three Institutions, involving MPL and SACLANTCEN time-reversal acoustic arrays operated off R/V Alliance, and two MIT Odyssey III AUV's operated from R/V Leonardo, as bi-and multistatic, adaptive acoustic platforms.