Use of an EM3002 Multibeam Sonar in Underwater Archaeological Research

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Abstract
Multibeam sonar has recently been applied to underwater archaeological research, with surveys in 2011 in Italy, Albania and Montenegro. RPM Nautical Solutions utilizes an EM3002 multibeam sonar on board the R/V Hercules to scan large areas of mostly unexplored nearshore coastal regions within the Adriatic Sea. Raw data are actively fed through a suite of post-processing software, including CARIS HIPS & SIPS and Fledermaus. Once data are cleaned, the company’s archaeological team examines 3-d images of the data and, based on certain parameters such as object height and shape, determine targets or possible ancient ship wreck sites. An ROV is then deployed to examine these possible ship wreck sites. Ancient treasures such as amphora, battle rams and roman helmets have been retrieved by using either the manipulator hands of the ROV or by divers. These treasures belong to the countries in whose coastal waters they are found, and will be displayed in museums. Such archaeological finds enrich the general population that often knows little of the cultural treasures that lie beneath waters adjacent to their shoreline.

Background
RPM Nautical Foundation is a non-profit research organization dedicated to marine archaeology. The foundation performs both multibeam survey of specific archaeological sites and artifact retrieval using ROV and specialized dive teams. RPM has examined several sites around the Mediterranean since 2003 (fig. 1).

Methods
- Data collected using Simrad EM3002 multibeam.
- Data attained using program SIS (Spatial Information Program)
- Data processed for refraction during acquisition in CARIS HIPS and SIPS.
- Raw data processed and converted to Fledermaus pfm file format using Dmagic.
- Data cleaning performed in Fledermaus.
- Targets determined using parameters described below.
- ROV deployed on targets to make sure that they are "real" shipwrecks.
- Depending on depth, divers or ROV retrieve selected amphora or other archaeological materials.

Acknowledgements
The help of Dr. Leslie Sautter was irreplaceable in the creation of this poster. In addition, I’d like to thank the entire crew of the R/V Hercules whom I lived and worked with all summer. I’d also like to thank Josh Mode (CARIS USA) for his willingness to be on call for my programming issues as well as Dr. Scott Harris for the same reason. Finally I’d like to thank Graham Nickerson with Highland Geo. Solutions for giving me the amazing opportunity to be a part of this project.