



R/V Hercules

# 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).

## Ancient Shipwreck- Albania

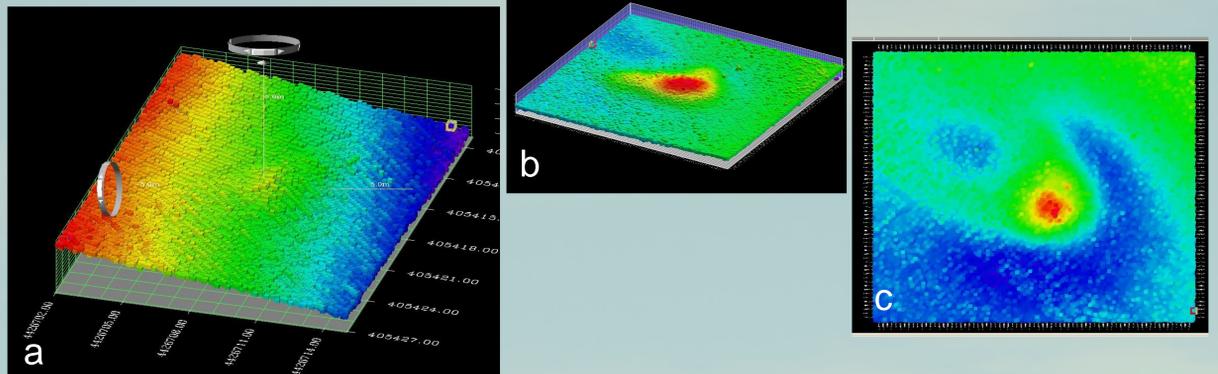


Figure 5 an ancient shipwreck seen at 1m resolution. Figures 5a and 5b show the low profile of an ancient shipwreck which is usually approximately 1-2 m high. Figure 5c shows another parameter for determining if a feature is real or not. It has material built up behind it indicating that ocean currents have deposited material behind it as they hit the feature and water velocity decreases.



Figure 6 The product of finding ancient shipwrecks is seen above. Figure 6a displays the underwater view of a 1m high ancient shipwreck. Figure 6b shows ROV retrieval of amphora in waters too deep for divers to dive in. Figure 6c shows a cleaned amphora pulled from the same shipwreck site. The amphora found on this particular wreck site in Albania is of the type Lamboglia as determined by archaeologist Dr. Jeff Royal.

## Modern Shipwreck- Albania

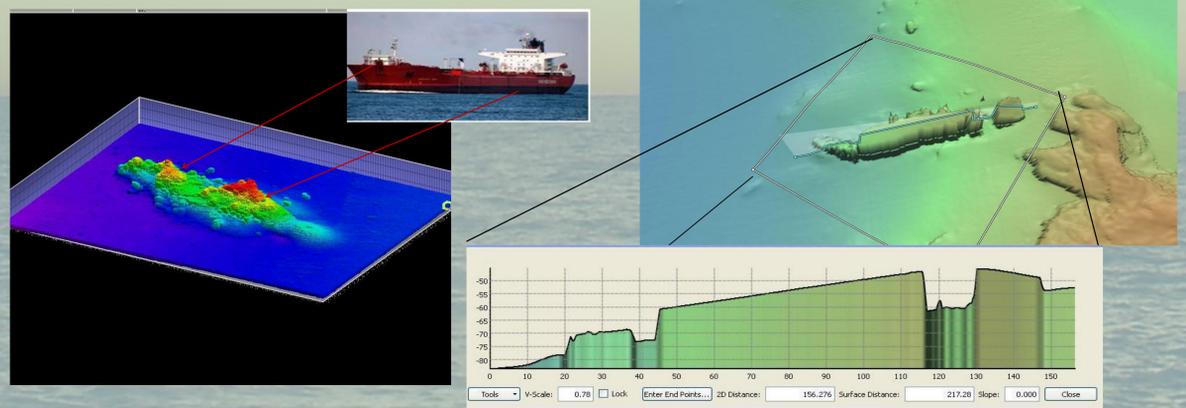


Figure 3 Modern shipwrecks have a specific shape with a boat house and foredeck area (see red arrows). Above image at 1m resolution.

Figure 4 displays profile mode in Fledermaus. This shipwreck is also too tall (~30m) to be an ancient shipwreck.



Figure 1 shows the locations of RPM sites explored since 2003. The red dot indicates the Albania location explored this (2011) season.



Figure 2 displays a CARIS HIPS image of the survey area completed in Albania during the 2011 field season. All data were collected no deeper than 100m.

## 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.
- After acquisition data 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.

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