

MODUS - A Heavy Load ROV for Deployment and Recovery of Deepwater Laboratories

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Abstract

One major task of 'ocean engineering' is the exploration and exploitation of the deep seas, which is essentially supported by Unmanned Underwater Vehicles (UUVs) encompassing both Autonomous Underwater Vehicles (AUVs) and Remotely Operated Vehicles (ROVs). Each vehicle category utilizes its specific set of tools and sensors for surveying, measuring and sampling. A new umbilical tethered system for deepwater interventions and long-term observations was developed, built and successfully tested within the European GEOSTAR project:

Concept outline and validation

The GEOSTAR (GEophysical and Oceanographic STation for Abyssal Research) concept comprises

- the deep-sea benthic observatory for geophysical and oceanographic purposes with its unique Data Acquisition and Control System (DACs),
- the innovative underwater communication system as near real time interface, and
- the deployment and recovery vehicle **MODUS** (MOBILE DOCKER for Underwater Sciences) for precise operations with heavy payloads.

The first module is a contribution of the Italian project partners, the second lies in the responsibility of French partners, while MODUS itself has been developed under cooperation of TFH Berlin and TU Berlin.

Aim of the preceding project GEOSTAR 1 (1995-1998) was the affirmation of the overall intervention concept in shallow waters (40 m w.d.), successfully completed in late 1998. GEOSTAR 2 (1999-2001) deals with the improvement of the MODUS prototype for deployment and recovery of autonomous benthic seafloor stations with **weights up to three tons down to 4000 m water depth**.

An iterative process with 3d CAD application, FEM structural analysis and numerical flow field simulations (CFD) characterizes the design phase of the deepwater MODUS. In addition, simulations of the linear and non-linear dynamics of the complete submerged system have been carried out: The RAOs of the research vessel in prevailing seas and the resulting response of the deepwater system give indication of the most favorable weather windows of operation

for MODUS and BS. Thus, dangerous slack cable situations with corresponding snap loads at the cable are identified. Experimental investigations with a model and the prototype in the large circulating water tunnel of TUB validate the numerical simulations.

Operations in the Tyrrhenian Sea with the complete system have proved the reliable performance of the GEOSTAR components during a seven-month scientific mission (09/2000-03/2001).

GEOSTAR is carried out under EU-DGXII contracts:

- GEOSTAR 1: MAST-CT91-0075
- GEOSTAR 2: MAST-CT98-0183

GEOSTAR 2 partnership includes: Istituto Nazionale di Geofisica (I), Tecnomare (I), Technische Fachhochschule Berlin (D), Technische Universität Berlin (D), Ifremer (F), Orca Instrumentation (F), CNRS-Laboratoire d'Océanographie et de Biogéochimie (F), Institut de Physique du Globe de Paris (F).

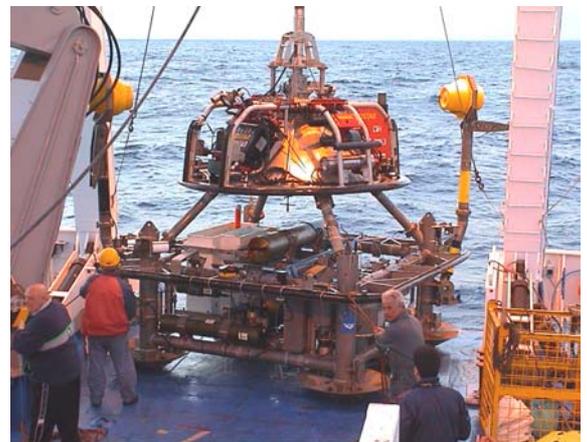


Fig. 1:
MODUS
(top) after
successful
recovery of
the
GEOSTAR
Bottom
Station