ID21- INTEGRATING DATA FROM VESSEL MONITORING SYSTEM AND FISH LANDINGS IN MEDITERRA NEAN SMALL FLEETS, USING A POSTGRESQL DATABASE WITH POSTGIS EXTENSION.

JOSE A. GARCIA[108], JOAN B. COMPANY[106], JACOPO AGUZZI[99], GIULIA GORELLI[105]

Abstract – Geospatial technologies represent an advance in knowledge of marine ecosystems, allowing approach the study of the potential effect of world fishing fleets and their dynamics. Nevertheless, their application to fisheries biology is very recent and its use is generalizing when the ICES (International Council for the Exploration of the Sea) proposed one methodology to study fisheries and their impact in Atlantic Ocean ecosystems in the 2008 year. This procedure is based on the use of position data from the "blue boxes" (VMS-Vessel Monitoring System), mandatory since 2006 due to a European regulation, and it's present in most fishing boats. The junction of the VMS, fishing logbooks and landings data enables us to obtain among others results, maps of fishing effort, behaviour of fishing fleet and precise location of fishing grounds at the European waters. However, its design is made for large trawlers and longliners, and extensive Atlantic areas. This fact makes impossible its application for the study of the fleet and fisheries in Mediterranean waters. Because, the boats are much smaller, have lower mobility and they work in small fishing areas. The aim of this work has been to develop and apply a methodology (ICES based) to study fishing effort on species of commercial interest in Catalan coast, using scripting PL/SQL procedures of PostgreSQL system database with PostGIS extension.

Keywords – Geospatial, PostgreSQL, PostGIS, Vessel Monitoring System, landings, fishing effort, Mediterranean Sea.

ID22- FIRST AUV AND ROV INVESTIGATION OF SEISMOGENIC FAULTS IN THE ALBORAN SEA (WESTERN MEDITERRANEAN)

EULÀLIA GRÀCIA[104], HECTOR PEREA[113], RAFAEL BARTOLOME[102], CLAUDIO LO IACONO[153], SERGIO COSTA[103], SUSANA DIEZ[217], XAVIER PLACAUD[60], CHRIS SMITH[82], PABLO RODRÍGUEZ[214], HÉCTOR SÁNCHEZ[216], OLIVIER QUEDEC[91], JUANJO DAÑOBEITIA[206] AND SHAKE CRUISE TEAM

Abstract – In May-June 2015 we carried out the SHAKE cruise on board the RV "Sarmiento de Gamboa" the first in situ investigation using state-of-the-art underwater vehicles, the AUVs "AsterX" and "IdefX" (IFREMER, France) and the ROV "Max Rover" (HCMR, Greece). Here we present how these vehicles helped us to achieve our main goals to survey active seismogenic faults and associated structures of the Eastern Alboran Sea (Western Mediterranean).

Keywords –micro-bathymetry, AUV sub-bottom profiles, ROV high-resolution video-imaging, ROV sampling.

I. INTRODUCTION

The SHAKE cruise consisted in a 30-day investigation using state-of-the-art underwater vehicles (AUV and ROV) to survey active seismogenic faults of the Eastern Alboran Sea. These fault systems have been well characterized during previous national and European projects. In the frame of the Spanish project SHAKE we had shiptime on the RV "Sarmiento de Gamboa" to carry out an ultra-high resolution marine geophysical investigation of active faults and associated processes.

The first part of the cruise (Leg 1: 23 April-13 May 2015) was devoted to acoustic seafloor investigation (i.e. micro-bathymetry, sub-bottom profiler) to search for surface ruptures and on-fault / near-fault co-seismic seafloor deformation using the AUVs "AsterX" and "IdefX" (IFREMER, France) (Fig. 1) obtained in the frame of an OFEG exchange. The second part of the cruise (Leg 2: 16 May to 22 May), was focused to a direct visual seafloor exploration and sampling of selected sites (i.e. scarps related to earthquake ruptures, fluid venting and associated habitats) using the ROV "Max Rover" (HCMR, Greece) (Fig. 2) in the frame of the IRIS project granted within EuroFleets-2.

II. OBJECTIVES

The main objective of the SHAKE project was the in situ characterization of the following fault systems: the Carboneras Fault, North-South Faults, Djibouti Fault, Al-Idrissi Fault and Yusuf Fault [1, 2]. Additional surveys were dedicated to specific studies on seamounts, such as Cabliers Bank [3], to investigate deep-sea habitats associated to the active structures. To achieve such a high-degree of resolution we used cutting-edge techniques that allow a cm-resolution in surface mapping and profiling, and high-resolution video imaging.

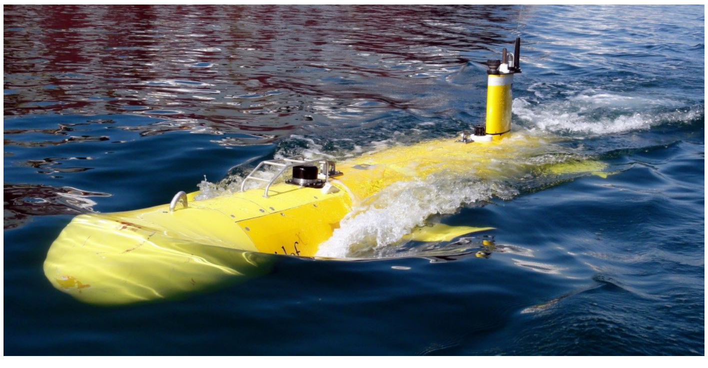

Fig 1. AUV IdefX (IFREMER, France) navigating at sea surface.

The specific objectives were threefold: 1) Obtaining fault offsets using the AUVs AsterX and IdefX. The goal is to carry out a fault-scarp profiling and surface mapping of co-seismic scarps and seafloor ruptures associated to recent earthquakes; 2) Identification and dating of earthquake seafloor ruptures using the ROV Max Rover. The aim is to identify recent earthquake ruptures associated to the active faults, and to obtain single event co-seismic slip; and 3) Evaluation of fluid circulation and characterization of associated benthic habitats. Using the AUV and ROV we also investigated the occurrence of fluid flow escape processes and associated habitats.

III. METHODS

The following methodologies were used during the SHAKE cruise:

a) Autonomous underwater vehicles (AUVs) survey: The AsterX and IdefX (Fig. 1) AUVs missions were devoted to study the seabed and water column with multiple objectives through various payloads: Multibeam echosounder (2 EM2040 Kongsberg Maritime), Sediment Sub-bottom profiler (Echoes 10000 Ixea), CTD (Seabird SBE49) and current profiler (ADCP300k and 1200k). The payload capacity of the AUVs is characterized by a weight in water of 100 kg and a maximum power consumption of 500 W for 8 hours. The vehicle needs a minimum speed to manoeuvre (1 to 4 knots). The system has on board control and navigation system and includes means for mission implementation composed by the Caliste deployment and recovery cage, rigging, battery chargers, transport and maintenance support and on board equipment installation.

b) Remote operated vehicle (ROV) survey: Max-Rover is an underwater, remote-controlled system to perform high-quality optical imaging, with a maximum operating depth of 2000 m (Fig. 2). It has 6 electric motors x 2.0 hp for a resulting underwater speed of approximately 2.5 knots. Average transect speed on the seabed would be approximately 800 m/hour. The ROV has several cameras, with a main HDTV full frame colour camera with zoom lens. Lights are 2 x 100 W HID and 4 x 150 W Quartz. The manipulators are 2 Hydrolek electro-hydraulic 5 function manipulators. Main sensors are pressure depth-meter, altimeter and digital compass. The positioning system is a Linkquest Tracklink USBL, georeferenced through Max-Sea software.

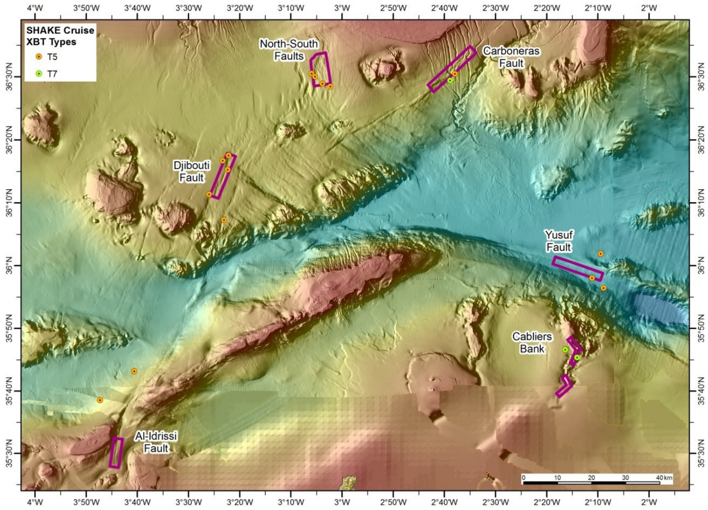

Fig 3. Map of the Alboran Sea with the location of the AUV dives and XBT probes.

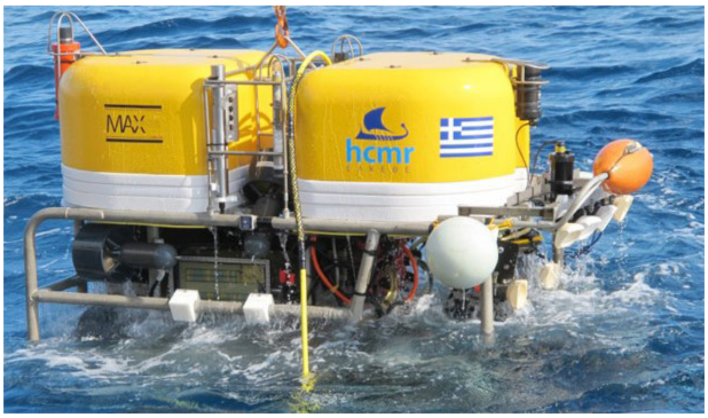

Fig 2. Recovering the ROV Max Rover (HCMR, Greece).

c) High-resolution Sparker seismic survey: We used Geo-Spark 16 kJ (Geo-Marine Survey Systems) pulse power supply that allows survey from 2 to 2500 m depth, with a vertical penetration < 750 m and vertical resolution < 30 cm. The streamer was a Geo-Sense 250 m long, 48 channels separated 3.125 m. Seismic signals were recorded by the Geo-Suite software.

d) Underway geophysical survey: During transits and simultaneously to seismics, we used the ATLAS Hydrosweep DS multibeam echosounder (14.5 to 16 kHz) and the Parasound P35 narrowbeam parametric sub-bottom profiler. It uses a primary frequency of 18-39 kHz, and a secondary frequency of 0.5 to 6 kHz, yielding a theoretical maximum bottom penetration of > 150 m.

e) Sediment sampling: A 3 m and 5 m long gravity corer was used to collect sediment samples in selected sites.

IV. RESULTS

During the SHAKE cruise a total of 26 AUV dives and 10 ROV dives were done, and 34 high-resolution MCS Sparker profiles, 23 gravity cores, swath-bathymetry and sub-bottom profiler data were acquired (Fig. 3)

In Leg 1, a total of 26 AUV dives were acquired along and across the main faults and prominent structures and basins of the Alboran Sea. The new high-resolution bathymetry covers 222 km2 and the high-resolution sub-bottom profiles totalize 77.5 km of new data acquired across different active faults as well as the Cabliers Bank.

During Leg 2 (“IRIS”), despite serious problems with the ROV positioning and navigation at the start of the leg, we have been able to perform direct visual seafloor exploration and sampling of selected sites. A total of 10 ROV dives were done and 34 high-resolution MCS Sparker profiles (274 km of new seismic data), bathymetry, parametric echosounder and ADCP data, and gravity cores were acquired along and across the main faults and prominent structures and basins of the Alboran Sea. Outstanding results were obtained at the shallowest sites of the Cabliers Bank.

V. CONCLUSIONS

In conclusion, we have obtained ultra-high resolution mapping and profiling of the main active strike-slip and normal faults of the Alboran Sea (Carboneras, N-S, Djibouti, Al-Idrissi and Yusuf) and Cabliers Bank (Fig. 3). We have also explored numerous circular seafloor depressions related to gas escapes, referred to as “pockmarks”, and discovered, imaged and sampled a deep sea coral site with great detail. With no doubt, we can affirm that SHAKE has been a marine paleoseismology expedition with no precedents.

REFERENCES

[1] Gràcia, E., et al. “Active faulting offshore SE Spain (Alboran Sea): Implications for earthquake hazard assessment in Southern Iberian Margin”, Earth Planet. Sci. Lett., vol. 241 (3-4), pp. 734-749, 2006.

[2] Martínez-García, P., et al. “Strike-slip tectonics and basin inversion in the Western Mediterranean: the Post-Messinian evolution of the Alboran Sea”, Basin Res., vol. 25, pp. 1-27, 2013.

[3] Lo Iacono et al. “The West Melilla cold water coral Mounds, Eastern Alboran Sea: Morphological characterization and environmental context”, Deep-Sea Res. II, vol. 99, pp. 316-326, 2014.