

# ABSTRACTS

## Introduction

### REVIEW OF THE PRINCIPAL RESULTS OF THE TTR-12 CRUISE

M. Ivanov<sup>1</sup>, N. Kenyon<sup>2</sup>, T. Neilson<sup>3</sup>, L. Pinheiro<sup>4</sup>, M. Comas<sup>5</sup>, M. Marani<sup>6</sup>, J. Monteiro<sup>4</sup>,  
P. Van Rensbergen<sup>7</sup>, T. Furey<sup>8</sup>, J.-P. Henriët<sup>7</sup>, and Shipboard Scientific Party

<sup>1</sup> UNESCO-MSU Centre for Marine Geology and Geophysics, Faculty of Geology, Moscow State University, Vorobjevy Gory, Moscow 119899, Russia, fu@geol.msu.ru

<sup>2</sup> Southampton Oceanography Centre, Empress Dock, Southampton, SO14 3ZH, United Kingdom, n.kenyon@soc.soton.ac.uk

<sup>3</sup> Geological Survey of Denmark and Greenland, Thoravej 8, DK2400, Copenhagen NV, Denmark, tni@geus.dk

<sup>4</sup> Departamento de Geologia Marinha, Instituto Geológico e Mineiro, Estrada da Portela – Zambujal, Apartado 7586, 2720 Alfragide, Portugal, luis.pinheiro@igm.pt, hipolito.monteiro@igm.pt

<sup>5</sup> Instituto Andaluz de Ciencias de la Tierra, C.S.I.C. and University of Granada, Campus Fuentenueva, 18002 Granada, Spain, mcomas@goliat.ugr.es

<sup>6</sup> Istituto di Geologia Marina, via Gobetti 101, 40129 Bologna, Italia, michael@igm.bo.cnr.it

<sup>7</sup> Renard Center of Marine Geology, Ghent University, Krijgslaan 281, S8, B-9000 Ghent, Belgium, jeanpierre.henriet@rug.ac.be

<sup>8</sup> Geological Survey of Ireland, Haddington Road, Dublin 4, Ireland, thomasfurey@eircom.net

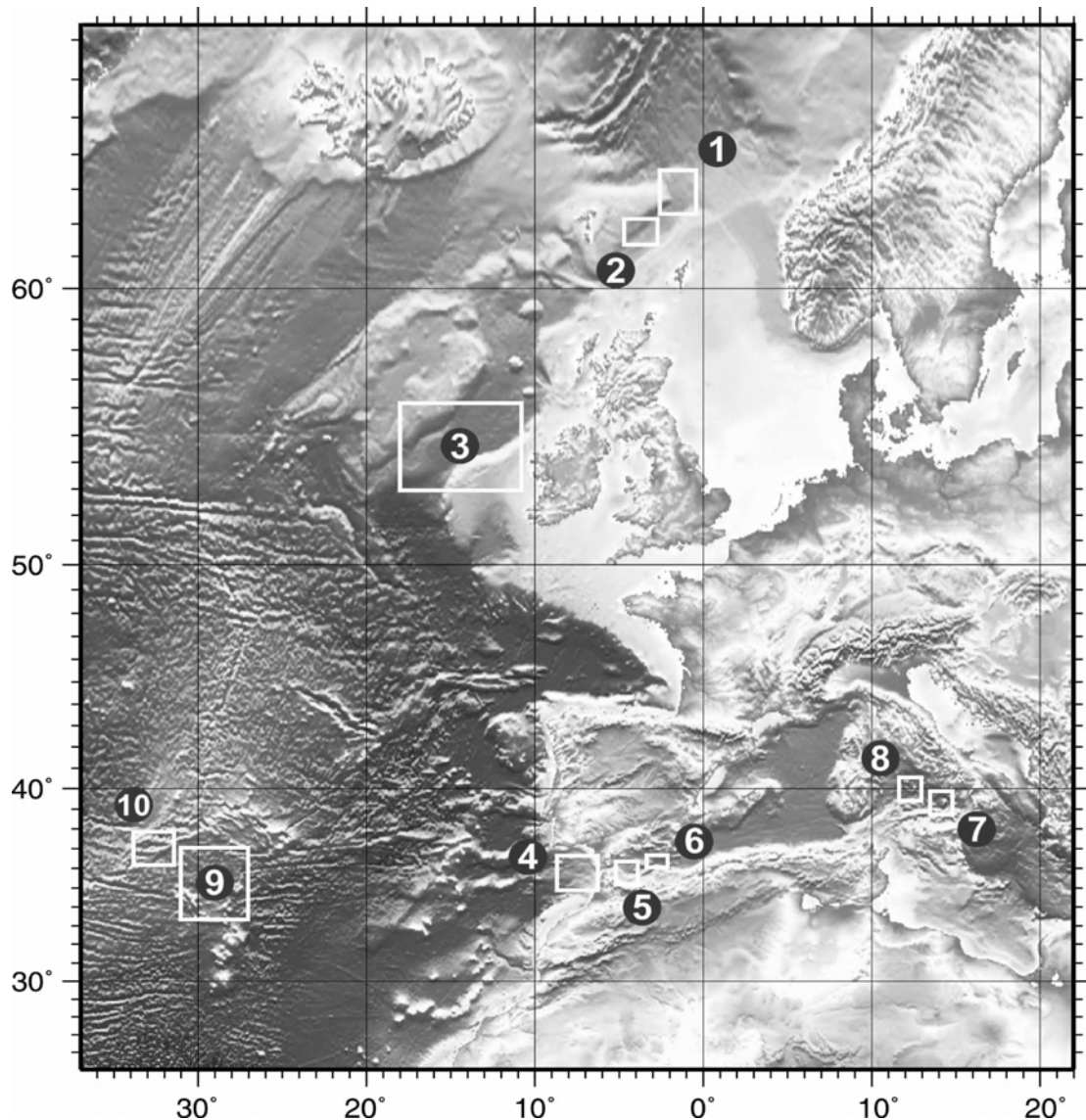
The TTR-12 cruise (2002) was focused on study of geological processes such as fluid venting, sedimentation, slope stability, volcanism, etc. on deep continental margins and oceanic basins (Fig.1). A large set of instruments, including single channel seismic, long-range and deep-towed side scan sonars, acoustic profilers, digital underwater TV and different types of bottom samplers were applied for these investigations.

Seamounts of unknown origin on a basinward continuation of the Fugloy Ridge (to the east of the Faeroes Islands) were mapped with seismic, two types of side-scan sonars, and sampled. Geophysical records indicate the presence of at least two separated groups of diapirs piercing and, as an underwater TV demonstrated, outcropping on the sea-floor. Bottom sampling data suggest that diapirs mainly consist of the Miocene semi-lithified diatom ooze with some admixture of glauconite and foraminifera. No any evidence of coral settlements or recent fluid venting has been documented. Some recent slope processes to the south-west of this area were studied as well.

An intensive bottom sampling programme was performed in the Rockall Trough area. It was mainly devoted to environmental studies of the area, but also was to calibrate acoustic facies for interpretation of a multibeam reflectivity data. Excellent collection of undisturbed sediments from different parts of the trough was obtained and subsampled for chemical, biological and physical properties investigations. However it was understood that the penetration of a box corer is not always enough for the calibration of acoustic signals with the frequency of about 10 kHz.

The main results of surveying in the Gulf of Cadiz can be summarized as following:

- finding of a new field of carbonate chimneys in the northern part of the Gulf of Cadiz, complementary to those discovered by the *Anastasia*-2000 and TTR-11 (2001) cruises;
- detailed study of a new active mud volcano in the central part of the Gulf, sampling of heavy hydrocarbon gases and gas hydrates from this structure;
- detailed study and sampling of a new mud volcanic field on the Moroccan margin, disclosed and mapped with seismic and multibeam by the Ghent University group during the *Belgica*-2002 cruise;
- mapping and sampling of deep-water coral settlements in different locations;



*TTR-12 cruise map*

- discovery of exotic blocks of sandstones, igneous and metamorphic rocks on tops of some shallow water mud volcanoes;
- complete mapping of the Jil Janesh deep-water sandy system with a 100 kHz side scan sonar and 5.5 kHz profiler.

Four new mud volcanoes and large fields of pockmarks were found in the Western Alboran Sea. Two of them, Kalinin and Perejill, are located in the Spanish part of the basin. Both structures are covered with relatively thick hemipelagic sediments and they look non-active in the present time. However samples of hydrocarbon gases and clasts of ancient rocks in the mud volcanic breccia gave us a good chance to define the source formation.

Investigations in the Eastern Alboran basin concentrated mostly on studying a basinward continuation of the Almeria turbidite system, which upper part was mapped with the MAK-1M deep-towed side scan sonar ten years ago, during the TTR-2 cruise. Mapping of the distal part of this system was carried out with the same instrument to show a very complex structure represented by overlapping channels and sedimentary lobes.

In the Tyrrhenian Sea the investigations focused on studies of the morphology and volcano-tectonic processes related to three biggest submarine volcanos: the Marsili, the Palinuro, and the Vavilov. Mapping of the northern side of the Marsili with a deep-towed side scan sonar has sufficiently increased our knowledge about morphology and recent activity of this volcano. Many of small-scale features corresponding to recent activities of the volcano have been found on acoustic records. Several areas of current low temperature hydrothermal activities have been observed on the top of the Marsili and the Palinuro volcanoes with an underwater TV system.

A long seismic line with two 3-litre airguns was performed across a young sedimentary basin to the south of the Azores plateau. Seismic records have demonstrated a surprisingly thick sedimentary cover - more than 1 km in thickness.

TV observations and sampling of different types of igneous rocks in the Lucky Strike segment were also carried out.

The TTR-12 cruise was the longest until present and one of the most successful cruises in the history of the TTR programme.

### **Fluid escape and related processes**

## **GEOCHEMICAL CHARACTERISTICS OF HYDROCARBON GASES AND ORGANIC MATTER FROM MUD VOLCANIC DEPOSITS OF THE ALBORAN SEA**

E. Poludetkina, E. Kozlova

*UNESCO-MSU Research and Training Centre for Marine Geology and Geophysics, Faculty of Geology, Moscow State University, Vorobjevy Gory, Moscow 119899 Russia, fu@geol.msu.ru*

The Neogene basin of the Alboran Sea corresponds to the westernmost Mediterranean extensional basin. The basin is located within Miocene arc-shaped thrust belt formed by the Betic and Maghrebian Cordilleras (Multidisciplinary study of Geological processes on the NE Atlantic and Western Mediterranean margins, UNESCO 2000). It has been the site of a vigorous programme of oil and gas exploration since 1970`s and attracts nowadays attention as a potential oil and gas generating basin.

The materials to this research work are obtained during TTR-9 (1999) and TTR-12 (2002) cruises. During these cruises several mud volcanic structures were discovered and investigated and four of them (Kalinin and Perejil on the Spanish margin, Dhaka and Granada on the Moroccan margin) were sampled.

Methodics of our geochemical investigations included subsampling of the gas phase, matrix and clasts from mud breccia deposits. Hydrocarbon gas then was studied on gas chromatograph. Sediments and clasts were analyzed by fluorescent-bituminological method; total organic carbon (TOC) content was determined. The rock clasts were studied in thin sections. Rock-eval analysis was done for 40 samples of clasts for determination of generation potential and maturity level of organic matter (OM); for 2 samples bitumen chromatography was done. Determination of age of the samples was fulfilled by A. Sautkin.

Geochemical investigations started with determination of background concentrations of hydrocarbons. In pelagic environment, the TTR12-290G core, represented by marl, mediate content of methane is up to 0.01 ml/l. Homologues are represented by a set of alkanes from ethane to propylene with predominance of alkenes under n-alkanes, that attests to biogenic origin of the gas phase.

The cores from mud volcanic structures are characterized by abnormally high concentrations of hydrocarbon gases – concentration of methane reaches up to 0.15 ml/l. Homologues are represented by the set of alkanes from ethane to butanes, including alkenes and