

Happy New Year from the Mediterranean! All the best in 2011 and for years ahead!

There are two grounds explaining the name of our cruise, which is “*Ristretto e Lungo*”. First of all, it is already a long established tradition of “coffee cruises” within MOCCHA project. Another motive is the working strategy - short but intensive sampling programs and long transits.

To begin with, it is hard to realise that our cruise is happening during the winter: calm sea, warm, blue sky and sun. So far we are very lucky with the weather, which for any scientific expedition is one of the important conditions determining the success of the sea-going research.

Our scientific team is quite young and international: Spain (Granada University – IACT (CSIC)), Italy (University of Milan-Bicocca and Università Politecnica delle Marche), Germany (Heidelberg University), Switzerland (Basel and Fribourg Universities), and the Netherlands (Utrecht University and Royal NIOZ). Most of our team members are students. For some of them *Ristretto e Lungo* is the first sea-going journey with a new exciting experience, hard work and a lot of learning.

The work was started in the evening of December 28th 2010, soon after the METEOR has left the port of Cadiz. The transit time to the first working area, northern West Alboran Basin, was only 10 hours and during this little time we had to unpack, install all our labs and be completely ready for “shooting the seafloor” with diverse sampling equipment, parasound and multibeam systems. We had only 50 hours in the area and our working program (as usual) was quite ambitious and massive.

Alboran Basin 28-30.12.2010

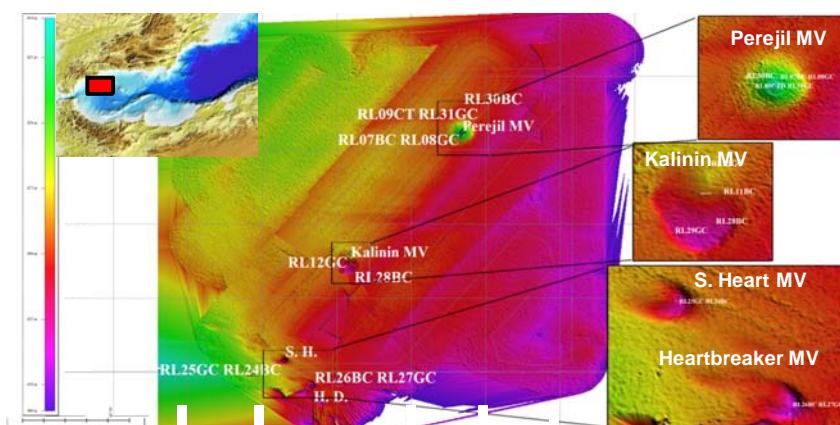


Figure 1. Multibeam profiles of the Northern sector of the WAB obtained during the Alboran part of M83/3 *Ristretto e Lungo* cruise.

Our first study area was located in the northern part of the West Alboran Basin (WAB). Previous surveys during “Training Through Research” (TTR) cruises in 1999, 2002 and 2007 demonstrated the occurrence of mud volcanoes in the Iberian and Moroccan margins behind the Gibraltar Arc. Our intention was to learn more about mud volcanoes and fluid venting in general in the WAB concentrating mainly on two contrasting mud volcanoes, Perejil and Kalinin. For the first

time, a multibeam survey with KONGSBERG EM 122 was performed in the northern Alboran mud volcano province where we discovered two new mud volcanoes with a heart shape (Figure 1). That’s why the first one was preliminary named “S. Heart” and the second one is “Heartbreaker Depression”. We also performed video surveys crossing summits of Perejil, Kalinin and one of the new mud volcanoes, which were followed by sampling with box- and gravity corers and a CTD station above the Perejil mud volcano. Sediments and water samples will be used for a wide-range of inorganic and organic geochemical studies. Hydrocarbon gas and pore water chemistry together with lipid biomarker studies will speak for the origin of migrated fluids and microbial processes in the close subsurface. On board labelling experiment with radio labelled substrates added to sediment samples will give us a perspective about current modes of anaerobic methane consumption in different mud volcanoes. For the first time we found some authigenic carbonates and sulphide-pyrite. Also for



Figure 2. Pyrite concretion and chemosynthetic shells found at the summit of Perejil mud volcano.

the first time alive chemosynthetic shells and methane-associated tube worms were sampled and described in the Perejil mud volcano (Figure 2).

Subsequently METEOR moved to the second working area near Mallorca for the recovering of two biological moorings and to do a CTD station.

New Year's Eve on METEOR

Something we will never forget! Indeed, it is very spectacular to make a step in the New Year being in the middle of the Mediterranean Sea! This was an excellent, amazing Eve with lots of fun. The party was not long though since the first CTD station was scheduled at 8:00 on the first morning of 2011.

Mallorca area 01-02.01.2011

The moorings East of Mallorca were efficiently recovered and we moved to the SE of Malta area.

SE of Malta 04.-08.01.2011



Figure 3. Coral fragments collected from the top of the discovered mound.

Here we did two multibeam profiles. These data revealed the presence of ca. 20 m high mound and a few reef-like structures at the water depths of 360 m. TV-controlled box-corer profiles accompanied with the sampling of the mound top had confirmed that the structure is a carbonate mound covered by hard carbonate pavements with debris of cold water corals most likely affiliated with *Madrepora oculata* specimens (Figure 3). Only a very occasional living fauna was found.

From our multibeam data we also selected potential sampling stations for the BIOFUN project and for paleoceanographic studies. The aim of BIOFUN is to sample pelagic sediments from 1200 m to 2800 m of water depth to screen biological diversity in the deep Mediterranean Basin. An almost 24-hour/day sampling program kept all of us awake during these days. Finally, everybody is happy and our biologist has enough samples to work with.

For BIOFUN at each of the chose biodiversity areas, three large box-corers (\varnothing 50 cm) had to be taken at the same site... At one site METEOR and its crew managed to take this very literally. The second box-corer with camera came to the seafloor EXACTELY (within 30 cm) to the same site as the previous, which is quite a challenge at a water depth of 1200 m, but under favourable weather conditions (Figure 4). Besides professionalism of METEOR's staff, the atmosphere on board is excellent!



Figure 4. Preceding box-corer sampling site.

Undoubtedly, it is great to be here!

Gert de Lange, Alina Stadnitskaia and the scientific party of *Ristretto e Lungo* M83/3 cruise

Warm greetings from METEOR!

First of all, we bring our sincere apologies forgetting to mention in the previous week report another two young participants of *Ristretto e Lungo* cruise from the University of Sofia (Bulgaria). These two ladies are really snowed under with measuring alkalinity and chlorinity from hundreds of pore-water and brine lake samples collected by “greedy” scientists (i.e. us) who want to have everything and at once. How typical ☺! Admit it! ☺

The weather during the most of the week was outstanding: nicely warm; still-mirror-flat sea and blue sky. Our work was continued in the Ionian Basin, where *Ristretto e Lungo* planned “to hit” several ecologically different brine lakes: Medee, Thetis, Kryos, Urania and Discovery (Figure 1).

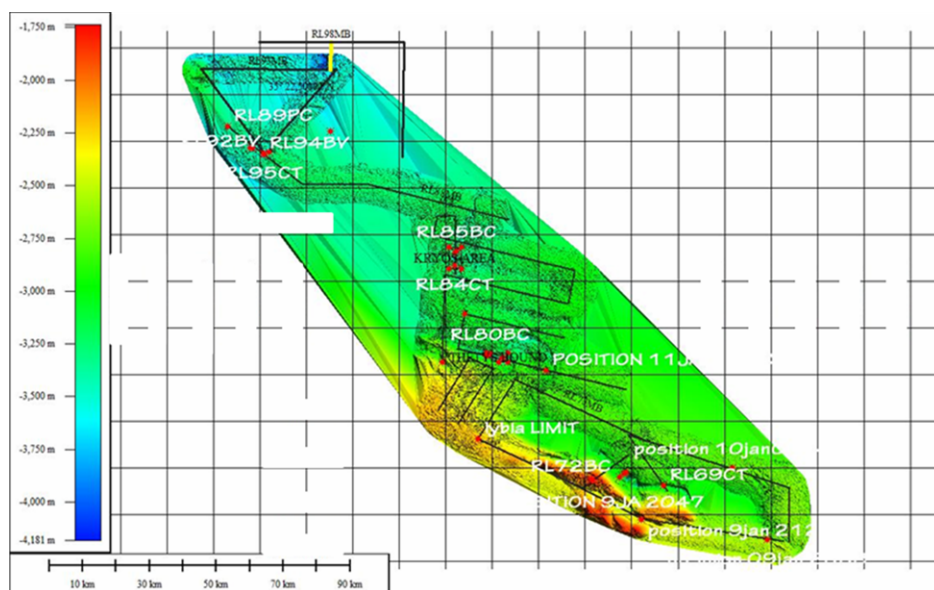


Figure 1. Multibeam mosaic done during the second week of *Ristretto e Lungo* cruise with sampling locations.

Due to the low water activity, extreme saline habitats were always considered as anathema to life or an abode to very few species at best. Recent studies though began to reveal the tremendous diversity of halotolerant microorganisms and eukaryotes, indicating that such habitats foster the evolution of diverse, highly adapted communities. The chemistry of brine systems is also not well understood due to the variety of

environmental factors such as the presence/absence of methane/hydrocarbons, range in alkalinity, sulphide saturation, dissolved inorganic carbon content, etc. Deep sea brines are not just a homogenous saline puddle at the deep sea, which due to density difference have almost no mixing with the overlaid sea water. Brines are very complex, dynamical systems, coupling carbon, sulphur, and other important elemental cycles.

For multiple aspects of scientific research within the divisions of bio(geo)chemistry and (micro)biology it is intriguing to get the picture of what is happening above, below, and within the interface between the brine solution and the sea water. Since we were VERY lucky with the weather, we had a good chance to perform a high resolution sampling of brine/sea water interface using a brine-designed Roseta CTD system. Each CTD station was followed up by box/gravity coring and TV observations exploring an ambience of brine basins. Continuous sub-sampling for gases, pore and brine fluids, mineral precipitates and chemosynthetic fauna, documentation of obtained material, on-board measurements and immediate data processing, an industrial amount of filtrations and labelling experiments kept us in a steady-state hard-working mode ☺. We still have a week ahead!

Conclusively, the second week of *Ristretto e Lungo* brought us additional discoveries. Multibeam surveys revealed a number of so far unknown geological structures that potentially can be mud volcanoes/salt diapirs. Sampling revealed that some brines are very similar to mud volcanoes in origin, i.e. deep generated fluids dissolved in highly saline solutions that were released at the seafloor together with mud and rock clasts from the sedimentary layers below. This type of brines is a kind of strange fusion of a brine lake and a mud volcano.



Figure 2. Authigenic carbonates recovered from the top of a diapiric ridge next to the Medee Brine Basin.

For the first time in the area we found authigenic carbonates in the close vicinity of a brine (Figure 2). Plenty of gypsum crystals with different crystal structure were recovered from brine-floor sediments. Astonishing finding of diverse chemosynthetic organisms confirmed that indeed hypersaline (in some cases alkaline) environments of the Ionian brines are somehow suitable for so far poorly understood life.

We also deployed a sediment trap mooring in the middle of the basin and tried to search for the lost one with video system. Even with a highly professional METEOR staff and NIOZ technicians, unfortunately this exercise was not successful. Nevertheless, it was worth to try since eventually we have got a precise location

of our lost mooring and we obtained four hours of TV-transect through the beach and brine lake learning more about hypersaline habitats and associated sea floor.

Yesterday night the weather turned out to be rough: wind force 8. Our work is stopped for a while. It is not bad though as we have a time for writing the cruise report and just have a short break to catch up.

Certainly, we enjoy METEOR and *Ristretto e Lungo*!

Gert de Lange, Alina Stadnitskaia and the scientific party of *Ristretto e Lungo* M83/3 cruise

Warm greetings from METEOR!

The last days of *Ristretto e Lungo* went so fast that it is hard to realize that today we will be already in La Valetta. During these days we continued with our intensive sampling program completing a unique sample collection from the Urania and Discovery brine pools. We were busy with finishing measurements, documentation of mineral precipitates and chemosynthetic fauna, core descriptions and writing cruise report. At the same time we had another important task to fulfil - presents for our Captain, Michael Schneider, since on 19th it was his birthday. The working plan for 19th of January was specifically designed with a care of the event, because we sincerely wanted to express our gratitude to the Captain and to METEOR's crew for the superior cruise, professionalism and general atmosphere on board during our *Ristretto e Lungo* journey.

Next day we started to pack and to clean. In the evening we reached our last planned location for the BIOFUN project. After video survey and the box corer station we started towards Malta.

Without doubt, *Ristretto e Lungo* was a great success!

**WE ARE SINCERELY GREATFUL TO THE CAPITAIN, OFFICER PERSONNEL AND
TO THE CREW OF THE R/V METEOR!**

Gert de Lange, Alina Stadnitskaia and the scientific party of *Ristretto e Lungo* M83/3 cruise (December 2010-January 2011)