Third Weekly Report
M76/3b-Guineco Leg 2

28.07.-03.08.08

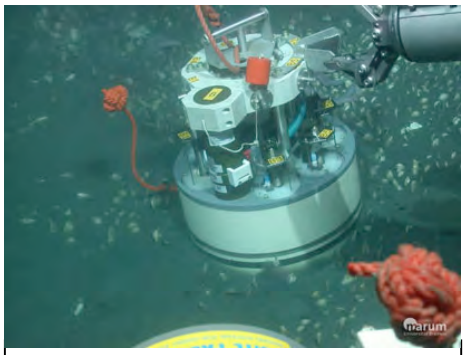


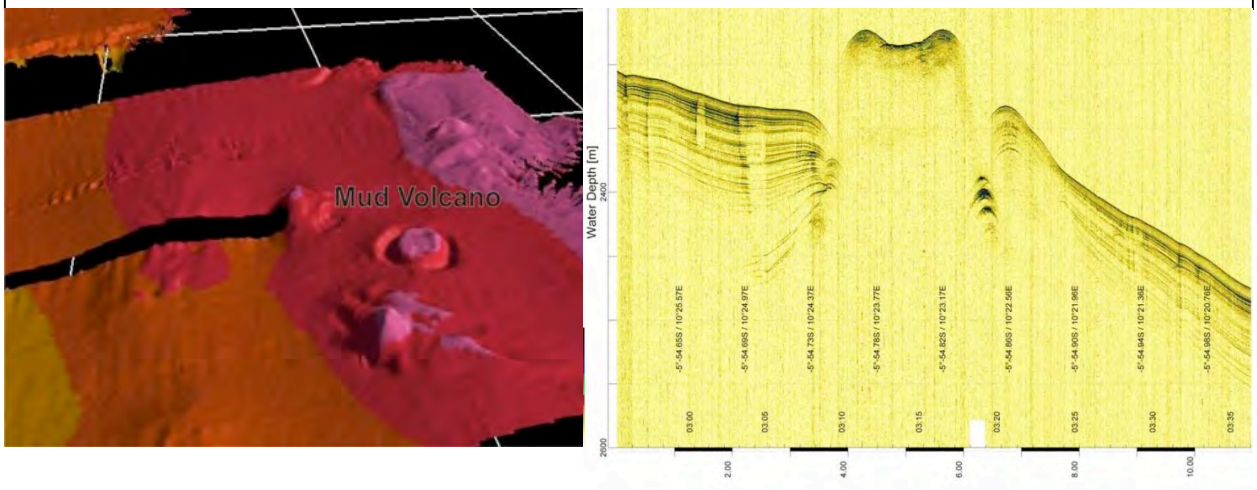
Photo 1: Respiration measurements on field of vesicomyid clams with the benthic chamber CALMAR of IFREMER

The third week of the GUINECO expedition started with two short dives to deploy and recover two types of benthic chambers for the measurements of the respiration of the benthic communities at REGAB (Picture 1). We focused first on a species of bivalves, which dwell the sediments for sulfide to nourish the thiotrophic symbionts hosted in their gills. The vesicomyid clams are often found at cold seeps and in association with hydrate bearing sediments. At REGAB the healthy clams form typical assemblages in the reduced sediments close to the central area of the pockmark. We also came across large fields of dead bivalve shells witnessing previous areas of gas emission, which went extinct. With the chambers we also measure fluxes of dissolved methane from the seafloor as well as those of other compounds like sulfide, CO2, ammonium etc. After having measured the respiration of the clams and their associated community, we sampled the patches with blade and push cores for biogeochemical and biological analyses. Our main goal for the work at REGAB is to identify the main geological, geochemical and biological factors shaping the geobio-system and the habitats of the main megafauna at REGAB – the vesicomyid and mytilid bivalves (Picture 2) as well as the giant tubeworms.

Picture 2: Mytilid bivalves and tubeworms above gassy sediments at REGAB

Despite the continuing problems with oil leakage, we had three short dives on the 28 -30 July targeted to the vesicomyid bivalve site. The problem with the oil leakage improved from dive to dive, because more leakage spots are found and repaired. However, we encountered a major problem with the cable of the ROV. After dive 212, it came up strongly distorted and bent in its top part at the connection to the ROV. Together with the ship a solution was found, namely to cut the top 200 m of cable which showed signs of degradation after 5 years and >210 dives, to steam out the 3500 m of remaining cable in use, and to refit the cable to the ROV. This operation was successful, allowing us to dive on the 31 July to finish the work at the first habitat site. In between the ROV operations we continued work with the gravity corer and multiple corer as well as with Parasound and Multibeam mapping of the wider region around the Congo pockmarks. Cesar Capacharin, the responsible geophysicist on board made a nice discovery of three previously unknown mud volcanoes between the REGAB and the DIAPIR site (Picture 3). We will certainly try to explore if these are active gas emitting structures.

Picture 3: South of REGAB: a mud volcano field. Left: the bathymetry of 2 cone-shaped and one pie-shaped mud volcano. Right: the subsurface structure of the pie-shaped mud volcano, which is about 1.5 km in diameter and extends 100m above the seafloor.



But first we will try to investigate in detail another spectacular habitat at the REGAB site, the associations between the mytilid bivalves with surficial hydrate accumulations as well as gas bubble emission. The sediments in the center of the REGAB pockmark associated with the mussels are oversaturated with gas, and gas bubbles are released upon disturbance, such as landing of the ROV, or sampling. Hence, even at 3200 m and 2.5 °C within the methane clathrate stability zone, free gas remains mobile and hydrate formation seems repressed under some unknown circumstances. However, we observed that hydrate forms where the gas is trapped, e.g. below carbonate crusts or under a dense mussel patch (Picture 4), and we also found hydrate in the gravity cores between 1-5 m depth. Unfortunately, our dives to measure methane fluxes, turnover and respiration rates of the mussel communities were delayed for 2 days by another problem: the replacement of dysfunctional hardware in the main control PCs of the ROV console became necessary on 1-2 August. But today (Sunday evening) we have just completed the first dive to the hydrate and mussel sites, and are happy to have obtained spectacular images from the seafloor.

Picture 4: Bulk gas hydrate accumulating under a carbonate crust. At this site, we also observed streams of free gas bubbles escaping the seafloor

Further details of our daily work and the scientists on board can be found on the expedition BLOG hosted by www.planeterde.de.

With regards - Antje Boetius and the Scientific Crew of GUINECO leg 2