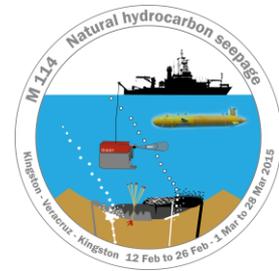


Expedition METEOR 114

Kingston – Veracruz - Kingston



6th Weekly Report: 16 – 22 March 2015

What an intensive week! Six dives were completed with ROV QUEST within seven days-- each with more than 8 hours of time on the bottom. It was a mammoth program for our ROV pilots and the scientists on board. Each dive has to be prepared meticulously with attention to scientific objectives and technical details. For this purpose, all information about the previous dives and samplings from respective locations has to be collected so that they will be available to consult during the dive. After each ROV dive, the latest information has to be documented so the records in the dive protocols will be available for scientific analysis. Various GIS-systems are used to log into a central database; this is available on the ship's scientific server for all scientists over the ship's intra-network. In addition, discussions before and after the dives are crucial in order to continuously evaluate the scientific goals and consider how those goals can be reached based on the latest results. The central place for planning and supervising of all our dives is the METEOR-Universal Lab (Fig. 1). From this lab, the science party is constantly monitoring the efforts of the two scientists and two ROV pilots who are on-watch, steering the mission from the ROV control container. All video images and information are mirrored to the lab so that any decision about the work of ROV QUEST can be optimally coordinated during the dive.



Fig. 1: Scientific party monitoring a dive from the Universal Lab on RV METEOR (Photo: Christian Rohleder)

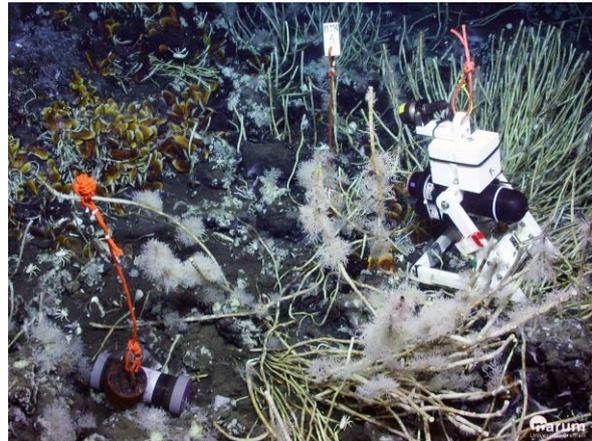


Fig. 2: Gas seep location at Marker 4 with animal trap (left below) and time lapse camera that registered bubble emission activity for 3 days.

Three asphalt volcanoes, in 2,900 to 3,400m water depth, were the target areas this week. Chapopote was investigated most intensively on Monday and Friday. After a good preliminary reconnaissance of the main field of asphalt releases, we visually mapped an area of about 70 x 50m with the ROV's Prosilica camera (oriented downwards). This allowed us to register all relevant asphalt flows in a very-high-resolution photo-mosaic. The chronology of asphalt production of different ages can be reconstructed better in a complete mosaic than in single images. A second focus was on the sampling of asphalt deposits of variable ages with push cores, nets and directed sampling by the ROV-manipulator. Numerous biological samples were also collected. In addition to tubeworms, we sampled mussels, sponges and also mobile benthic animals in traps which our Mexican colleagues had brought (Fig. 2). A special focus was on sampling some *Bathymodiolus*-mussels; these will be investigated more in detail by our MPI colleagues with incubation experiments and other microbiological methods. These mussels are known to have symbiotic sulfur- and/or methane-oxidizing

bacteria. There are also indications of additional symbionts, which possibly can use higher hydrocarbons for energy source. Such higher hydrocarbons are clearly plentiful at Chapopote asphalt volcano.

During the dive on Monday at Chapopote the ROV developed a kink in its umbilical cable. ROV QUEST was safely recovered, but the cable had to be cut and re-terminated—a lengthy job. Therefore, the following day was used for taking six gravity cores from selected locations at the asphalt volcanoes. The deepest asphalt volcano is Tsanyao Yang Knoll where we operated on Thursday in a depth between 3,360 and 3,390m. Also in this case the micro-bathymetry and backscatter intensities of our AUV-map led us accurately to the emission sites of gas and asphalt at the seafloor.



Fig. 3: Snow-white methane hydrate at a gas emission site on the seafloor of Tsanyao Yang Knoll.



Fig 4: Porous gas hydrate with the ice worm *Hesiocaeca methanicola* in 3,380m water depth.

Very large fields of tubeworms were encountered on several occasions, often associated with gas hydrate outcrops (Fig.3). The tubeworms were as numerous as a dense bamboo forest in places and it was sometimes impossible to see the limits of the field from the ROV cameras. By flying with ROV QUEST in transects across the tubeworm fields and photo mosaicking at the same time, we were able to confirm continuous tubeworm aggregations of several hundred square meters. These are some of the largest tubeworm fields yet seen in the Gulf of Mexico.

Investigation of the gas hydrate outcrops by means of the HD-camera revealed a special highlight when we found the ice worm, *Hesiocaeca methanicola* (Fig. 4). This animal was previously known only from northern Gulf of Mexico at depths of about 1,200m or less. It is a polychaete worm, which lives in a network of interconnected burrows in massive gas hydrate. These ice worms appeared right at home in front of our HD-camera, in a water depth of 3,380m and burrowing into a bubbly white gas hydrate. Although so far not well-understood why the ice worm lives in gas hydrate, Frank Schätzing gave this creature a special role in his novel “The Swarm,” wherein it actually caused the fictional destruction of mankind by acting as an agent for the collective intelligence in the deep sea! The real-life ice worms we saw were not so dangerous, but still fascinating.

Due to this huge workload, the 6th week of our expedition was a challenge for all of us. But with the excellent support of the METEOR crew and our ROV pilots, we were able to complete this program. As a result, we have tremendous scientific results. All cruise participants are well; on behalf of them all, I am,

Sincerely,

Gerhard Bohrmann

RV METEOR, Sunday 22 March 2015

Further info on the cruise (in German): http://www.marum.de/Logbuch_METEOR_114-2.html