FS METEOR M193 “REPLENISH“

Limassol – Jeddah

3. Weekly Report (18.09. - 24.09.23)

Over the weekend, the acquisition of seismic data continued until Tuesday morning (September 19th). The retrieval and deployment of the approx. 900 m long streamer and the air pulsers requires a well-rehearsed team, which is supported by the experienced crew in handling the heavy equipment. The students in the team have the opportunity to get hands-onexperience with the research equipment, methods, and the results of measurement. This exposes them to the workflow and techniqes thatform the basis of their theses work. The obtained seismic data show a complex pattern of subsurface structures characterized by the plastic properties of the salt, which, due to its low density and fluidity, can rise in the form of diapirs even at relatively low temperatures (halokinesis). In areas of faulting, the salt can reach the seafloor and form submarine salt glaciers. The seismic profiles show that the overlying layers are tilted during uplift, causing seafloor steepening. This, in turn, can lead to destabilization of the uppermost layers, where landslides can be triggered, filling the mini-basins between the ridges. In the Parasound data, these slope failures are very well imaged, so that these basins, with their disturbed sedimentary succession, can be easily excluded for sampling undistrubed pelagic records through time.

Figure. 1: Pull in of the hydrophone cable (Streamer) at night. (Foto: T. Lüdmann).

Meanwhile, under the influence of low atmospheric pressure the weather has deteriorated slightly. The research area was exposed to a northwesterly current, with wind strengths of 4 to 5 Bft and wave heights of 1 to 1.5.

At 8:00 LT on September 19th, a second ROV deployment was planned on a steep slope 20 km offshore. The slope here drops from 100 m to 720 m over a distance of only 1 km. Unfortunately, the dive had to be aborted because there was air in the hydraulic system of the

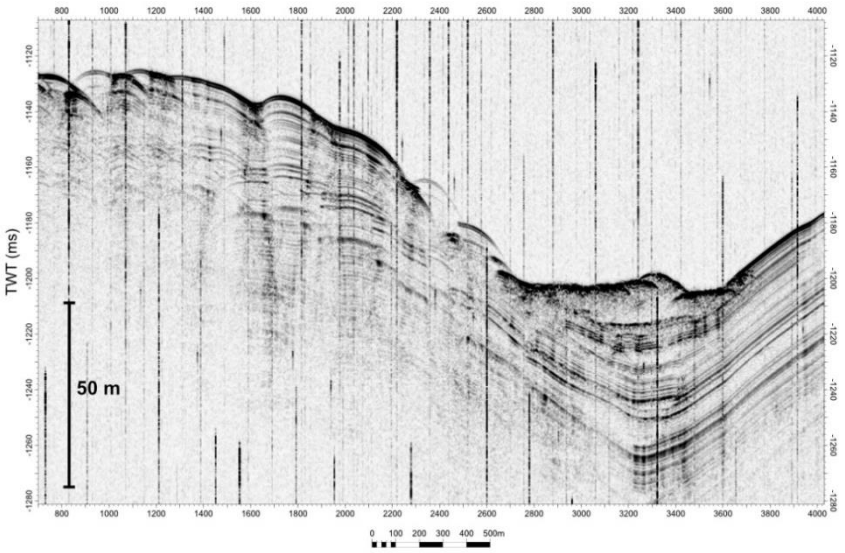

Figure. 2: Parasound profile crossing a mini-basin, which is filled with a slump appearing transparent without internal layering. Below, well-stratified strata occur which are folded by the ascending salt.

ROV This required time consuming repairs. Therefore, we decided to drop the ROV station and continue with the program instead. Near the ROV station, first a CTD was run to measure temperature, conductivity, density and oxygen content in the water column. These are important physical parameters to characterize the mesophotic and deep-water habitats in the Red Sea. In addition, a profile of the water sound velocity can be determined from the data, which is used for the proper correction of the depth soundings. The sampling program was completed with van Veen grab and box core sampling. Thereafter, we steamed to the second gravity core station, which we reached at about 20:00 LT on 19th September. The location was on a ridge in 780 m water depth. The subsurface showed in the Parasound very well stratified, layering, undisturbed by gravity slides, faulting or other distortions. Here, too, a CTD was first run, but this time water samples were also collected from different depths with the aim of recording the composition of carbonate plankton in the water column.

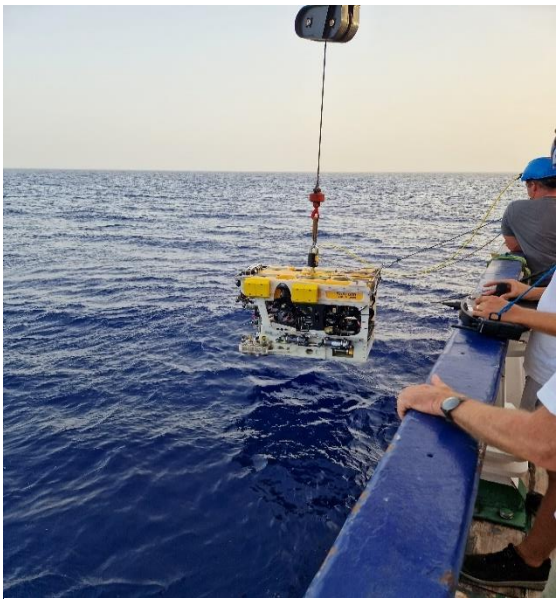

Figure. 3: The MARUM Squid ROV during the preparation for a dive mission. Before each dive, which takes about 6-8 hours, all systems and functions of the ROV are thoroughly checked by the four-member ROV team. (Foto: T. Lüdmann).

The first sampling device at the station was the box corer, which came on deck filled to the brim with cohesive carbonate mud. We then decided to take a long core (12 m) instead of a short one (6 m) at this station. The core penetrated the sediment full length and was lifted successfully onto the deck with the heel frame. Another gravity core was taken in a 1650 m deep mini-basin, with a nearly complete core recovery of about 12 m. After that, hydroacoustic profiles were run for about 17 hours to close the gaps in the bathymetry left after the seismic profile acquisition.

On September 21st at 8:00 LT, another ROV mission was scheduled after the damage been successfully repaired. This time the target was a conical submarine mesa with a diameter of 1 km at its base, on which deep water corals were expected to have settled. This location was to be explored with the ROV with the planned dive profile covering the depth of between 1064 to about 584 m, from the base to the top of the mountain. However, shortly before reaching the seafloor at 1064 m, the ROV's power supply suddenly cut out and the unmaneuverable

underwater vehicle had to be pulled to the surface by its supply cable. With the ROV safely recovered, Afterwards, the mesa was sampled with van Veen grab samples, followed by hydroacoustic profiles for another coring station nearby on the well-stratified crest of a ridge. After the collection of a box core the gravity corer was readied. However, a hydraulic failure in the lifter arm caused by an oil leakage prevented the execution of the coring. As it was clear that repairs would take time, we abandoned this station and moved into study area B where we started the acquisition of seismic block 2. In total, we collected within study area A: 456 nm of seismic data, 631 nm of hydroacoustic data, 4 gravity cores, 21 Van Veen grabs, 8 box cores and 6 CTD casts.

Despite the technical failures, the mood on board is positive, all participants are highly motivated and are actively supported by the ship's leadership and crew. The two cooks Rainer and Gerd provide for the physical well-being with their unusual and delicious creations – for Saudi National Day they created Kunafa for us – a popular local sweet!

With best regards on behalf of all participants of the expedition M193,

Thomas Lüdmann

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