2. Wochenbericht
FS Pelagia Expedition 64PE-445, SaltAx

During the second week of our cruise to the Red Sea we mainly performed seafloor mapping and sparker seismic surveys. As indicated in the last weekly report, we reached our working area in the early Monday morning around 02:00 h. We directly started with the mapping of the seafloor, a bathymetric survey, with the ships own multibeam echo sounder system. The principle of an echo sounder is simple: a sound wave (ping) is send from the vessel towards the seafloor. Knowing the sound velocity in seawater, and by measuring the time the echo needs to come back to the ship we can calculate the depth under the ship. At a water depth of 3,000 m and an average sound velocity in seawater of 1500 m/s it will take 4 seconds for the echo to come back to the ship – 2 seconds down and 2 seconds up. The main difference to this principle on RV Pelagia is that we do not send out a single ping only but a swath of over 250 pings at the same time. This swath of pings scans a broad, up to several kilometres wide area of the seabed.

Dessert dust and no wind create a surreal atmosphere with a silver sun and very humid air. For seismic and bathymetric surveys, the perfect sea condition. Picture: N. Augustin (GEOMAR)

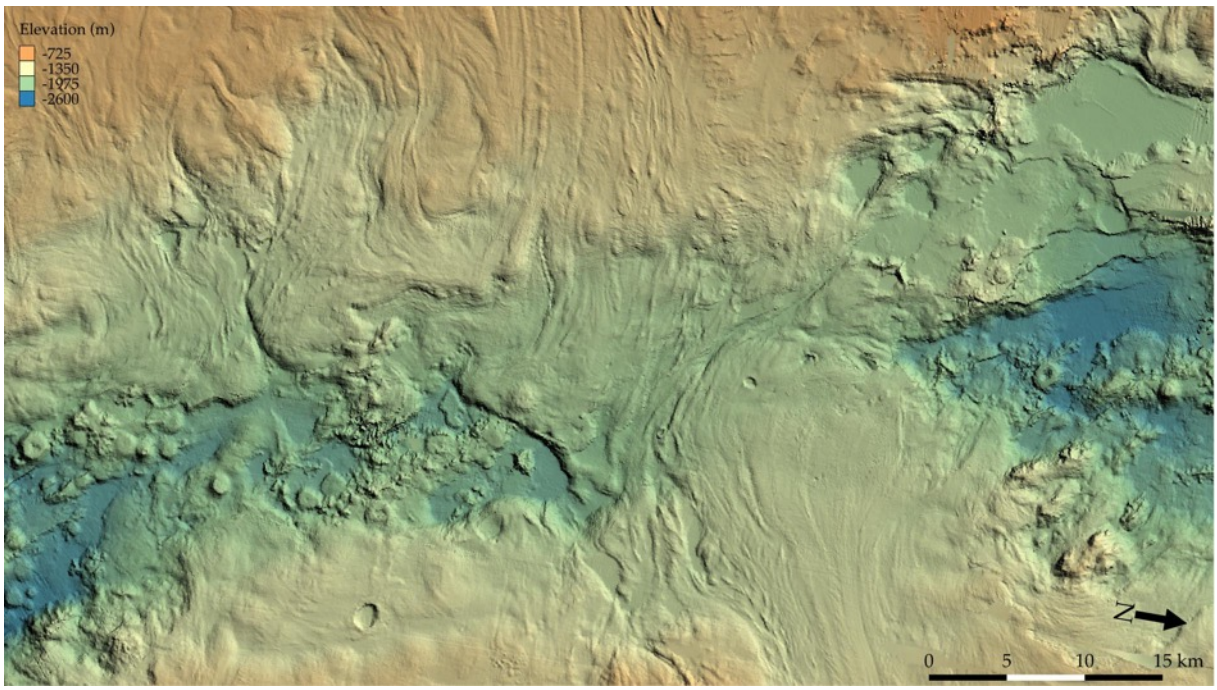
Of course, this task involves a lot of computer power. The echoes need to be sorted in the right order, motion sensors monitor heave, roll and pitch of the vessel to correct the geometry of the received signals and very accurate GPS antennas give us Pelagias exact position. Since the speed of sound in water varies, we needed to get a sound velocity profile of the water column to correct the depth measurements accordingly. Therefore, we made a short break in the bathymetric survey on Monday to cast a CTD, which measured physical parameters of the water column in the southern part of our working area. From temperature, salinity and pressure we can calculate the sound velocity and feed

our software with this information. Our Sudanese colleagues took the chance to get some sea water samples from water depths up to 1,700 m. After that, we directly tested the sparker seismic system, which worked perfectly well. But first we continued the bathymetric survey in the afternoon of the same day.
The reason for this extensive seafloor mapping program is that we do not know much about the unique submarine salt and sediment movement in the Red Sea. We want to study the nature of the submarine salt glaciers and their interaction with the active volcanic rift. To do this we first need to get a better picture about the seafloor morphology, that we can translate to geological interpretations and thus, plan the further work program of this expedition accordingly. Together with the bathymetric surveys we employ magnetometers to collect data on variations of the earth's magnetic field that give additional information about geological changes underneath the seafloor.

The crew of RV Pelagia and our Scientists are working together to launch the magnetometers that we got for this expedition from the University of Hamburg. One of the magnetometers you can see in the foreground – it is in the orange tube on the yellow cable. Picture: F. v.d. Zwan, GEOMAR

In the meantime, we mapped an area of about 2,300 km^2 of unmapped seafloor which is comparable to the land area of the Netherlands province of Groningen. The morphology of the salt and sediment masses that move into the young Red Sea Rift is simply stunning! We see long strains and ridges that flow towards the rift and get stopped or redirected by volcanoes and volcanic ridges. We see salt flowing stepwise over hidden faults and how salt glaciers that come from opposite rift flanks to meet in the centre and force each other to change directions.
But how do these structures look beneath the seafloor? How much salt and sediment is actually moving into the rift valley? To answer such questions, we started Tuesday with very long seismic profiles across the flows and the rift valley under nearly perfect weather conditions with almost windless days and a very calm sea. However, summer in the Red Sea means that incredible heat (almost 40° C) and high humidity makes the deck works very demanding to our crew and the scientists. We need to process the seismic data very detailed in our home labs after the cruise but we can already say that we achieved an awesome data quality due to the calm weather conditions and some profiles even excelled our expectations – but may I keep that for the next weekly report...

Towards the end of the week we achieved most important goals in the southern working area and moved on to the northern part. Saturday afternoon we began with some bathymetric mapping and started today, Sunday with a new seismic survey that will keep us busy until Monday night.



The salt and sediment glaciers in the Red Sea are very unique and little studied. We achieve a high resolution of our maps and here you can see long strains flowing into the volcanically active rift valley in the middle of the Red Sea. The volcanoes can be identified as circular structures in the deeper, blue parts of the map. North is towards the right side. Data processing: A.-C. Wölfl and M. Schade, Map: N. Augustin, all GEOMAR

All on board are well and the mood is outstanding (which is partly related to the fact that we can communicate with the outside world again) and we are very much looking forward to the coming data.

With best regards,
Nico Augustin