



POSTRE-II

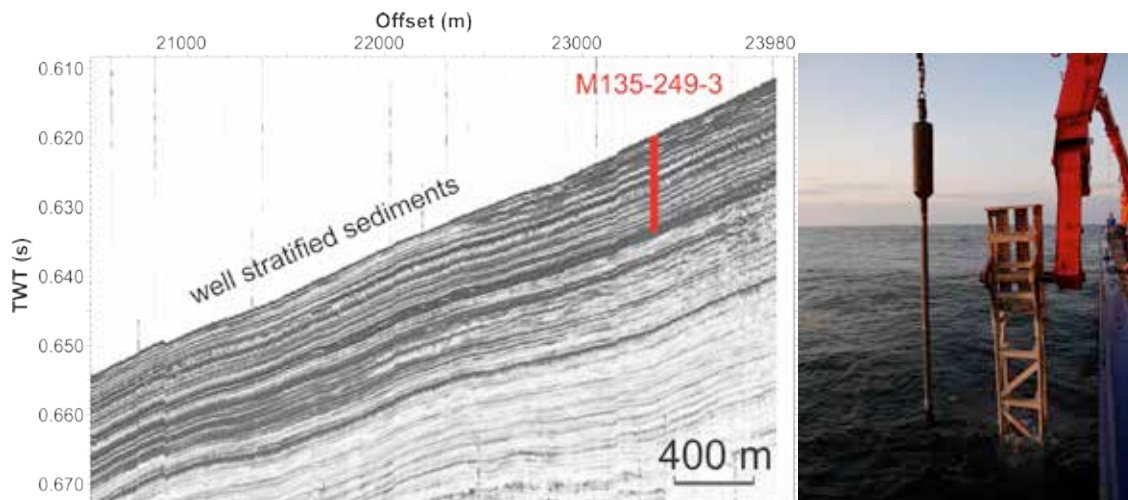
M135

(01.03. – 08.04.2017)



4. weekly report from 26. March 2017

The fourth week of our work off the coast of Peru went very well. Sunday and Monday we have surveyed the sediments in the bay of Arequipa near the city of Ilo using the Parasound echo sounder system. The acoustic data provided valuable information about the conditions of the sediment that were critical to find good locations for the multi and gravity coring operations. Once the nightly surveys were done we selected to most promising sites and revisited them during the day. The coring went smoothly and we managed to get several excellent cores back on deck. Two core were taken in



Left: A profil from the Parasound survey shows the even and undisturbed sediment layers from which we recovered a gravity core (right picture).

deeper waters and two as shallower locations. The scientific goal is to read out the historical evolution of the oxygen minimum zone and in particular its thickness. On Monday night we concluded the geological program of the cruise. We managed to recover a total of six gravity cores with lengths between 4 and 9 meters from water depths between 200m and 1400m. In addition we managed to obtain 40 short cores with lengths between 30 and 50 cm each. The short cores are less disturbed and the multi corer brings a small amount of sea floor on deck. The scientist are then keenly observing the cores and look for some interesting items to explore. The benthic community structure is visibly different for cores within (Arequipa basin) and outside the oxygen minimum zone where we cored last week in the Arica basin of Chile.

For example we found small prawns and fish skeletons lying on the sea floor. Other times we saw worms and spider like deep sea creatures. Some of the short cores were cut in 1cm thick pieces and stored individually. Both the short segments and some of the whole cores will be stored in a cooled container and shipped back to Kiel for the full analysis.



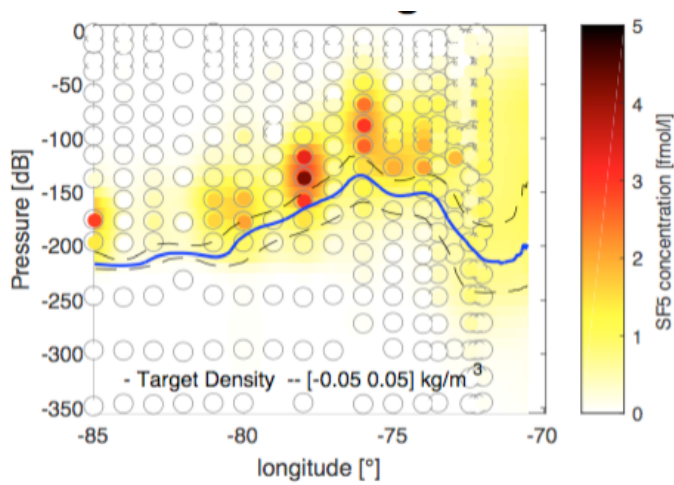
The multi corer returns full of sediment back on ship. The differently colored layers are archives of ocean changes off the past 1000 years..Right Dr. Sümeyya Eroglu cuts the core on 1cm thick slices.

The long cores were cut in half and some initial sampling was done here already. Also this material will be shipped cooled back to Kiel and then fully sampled and analyzed. When the cores are opened a nasty smell (like from rotten eggs) fills the lab but the scientist immediately inspect the bounty. We are looking for nicely preserved layers of sediment and several sections of the long cores exhibited exactly that. Sometimes other interesting objects are found such as a very old shark tooth.



Left: A 2cm long shark tooth preserved in the sediment. Middle: Frederico Velazco and Dr. Renato Salvateci open a core segment. Right: Layer from different epochs are clearly visible and contain the signals we are looking for.

On Saturday we have completed the longest section along 17°S latitude at 86°W. Up to the last station we were able to identify signals of the purposeful released tracer. However, throughout the survey we found the tracer maximum to be located shallower



Vertical tracer distribution along the 17°S section. Towards the west we still find some tracer and towards the shelf (right side) the strong vertical mixing distributes the tracer evenly.

in the water column compared to the depth of injection. This could be an indication for very strong upward mixing shortly after injection. The microstructure measurements as well as the absence of a tracer peak and strong mixing throughout the water column on the shelf support this hypothesis. We will investigate this signal more intensively next week and during the next leg M136.

An additional aspect of our cruise is the nitrogen cycle within the OMZ. Our goal is to describe the pathways of nitrogen enrichment in the OMZ in a new light. By now we know that nitrogen fixation also happens in extreme environments, something that was deemed impossible only a few years ago. Regions with low levels of oxygen such as the conditions here in the coastal waters of Peru are a good example.

To understand those processes water samples are drawn at depths between 10 and 1000m and the particles are filtered out of the water. Some of the water samples are enriched with isotopic signals and incubated for 24 hours at the back of the ship and afterwards also filtered. Where those isotopes end up and in which molecular form are some of the scientific questions we would like to answer. High-end



Sample bottles in the incubator at the back of the ship cool the samples and expose them to the blue light of the deeper ocean.

chromatographic analysis methods will be used to analyze the data and hopefully provide new insights. Both the isotopic studies and the particles within the plain sea water will allow us to determine the factors that control the uptake of ammonia in the OMZ regime.



Different kind of birds visit us on ship and provide some entertainment.

The mood on board is positive, the weather always warm, the food very good and the collaboration with the captain and crew exemplary.

With the best regards from 16° South and 81° West,
Martin Visbeck and the M135 science crew.