RV MARIA S. MERIAN

Cruise MSM113 (GPF 21-1/032 and 22-2/024)

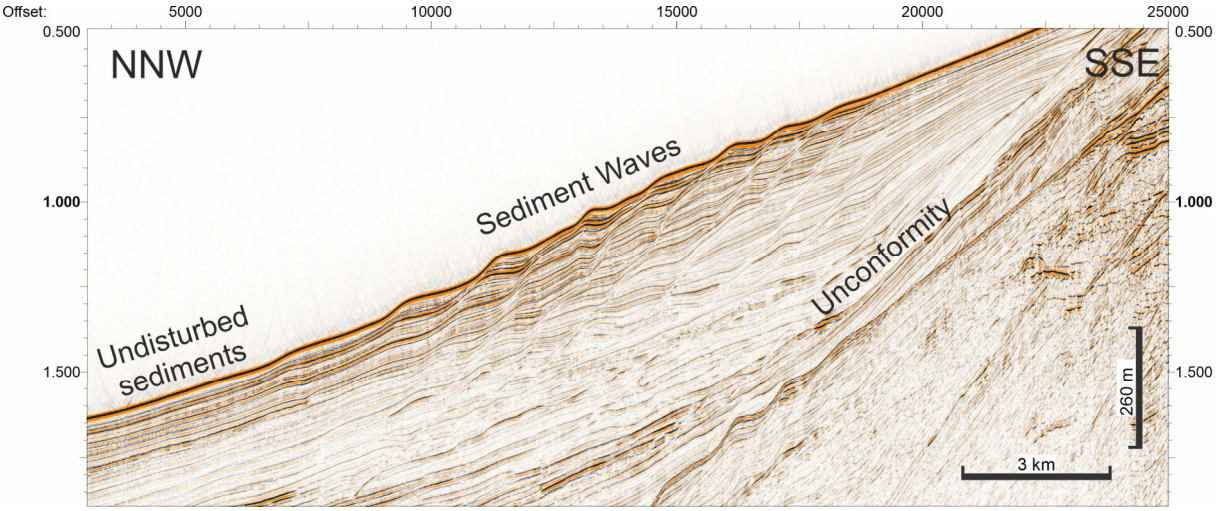
09.12.22. - 12.01.23, Las Palmas - Las Palmas Weekly

Sediment wave generation in continental margins (WAVETEAM)

Structure of the submerged mobile western flank of Cumbre Vieja Volcano, La Palma (Sub:Palma)

5th Weekly Report (02. - 08.01.2023)

We continued our work in the area off Agadir In the new year. During the night of January 2, we collected seismic data across the sediment wavefield. The data show very regular migrating waves above an unconformity. The sediment waves on the seafloor are located in water depths between 500 and 1200 m. The wave field has a thickness of about 300 m. The seismic data show a fairly uniform upslope migration of the waves. Since we have recorded a series of parallel profiles, we will be able to investigate lateral differences in the evolution of the sediment waves.

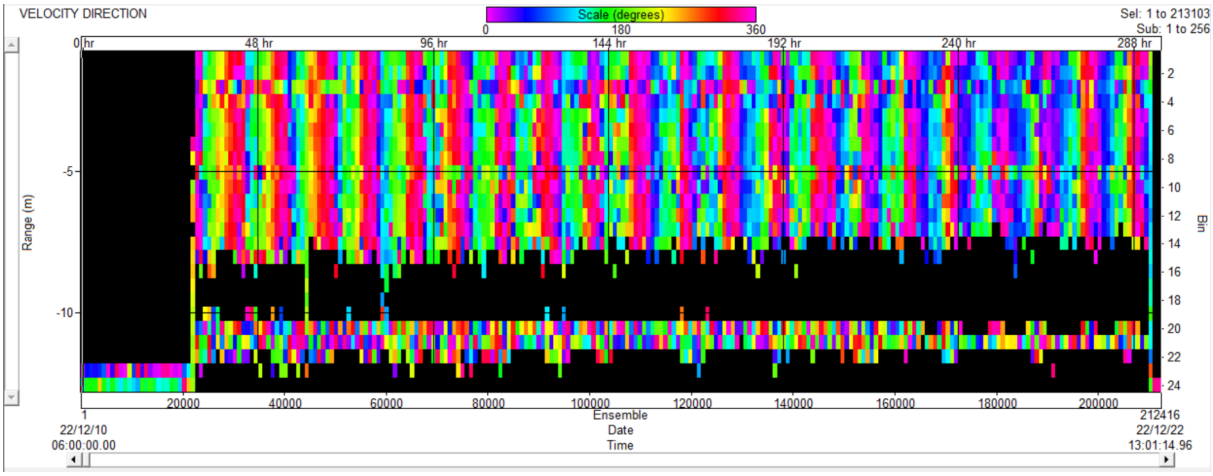


Seismic profile across sediment waves in the working area off Agadir.

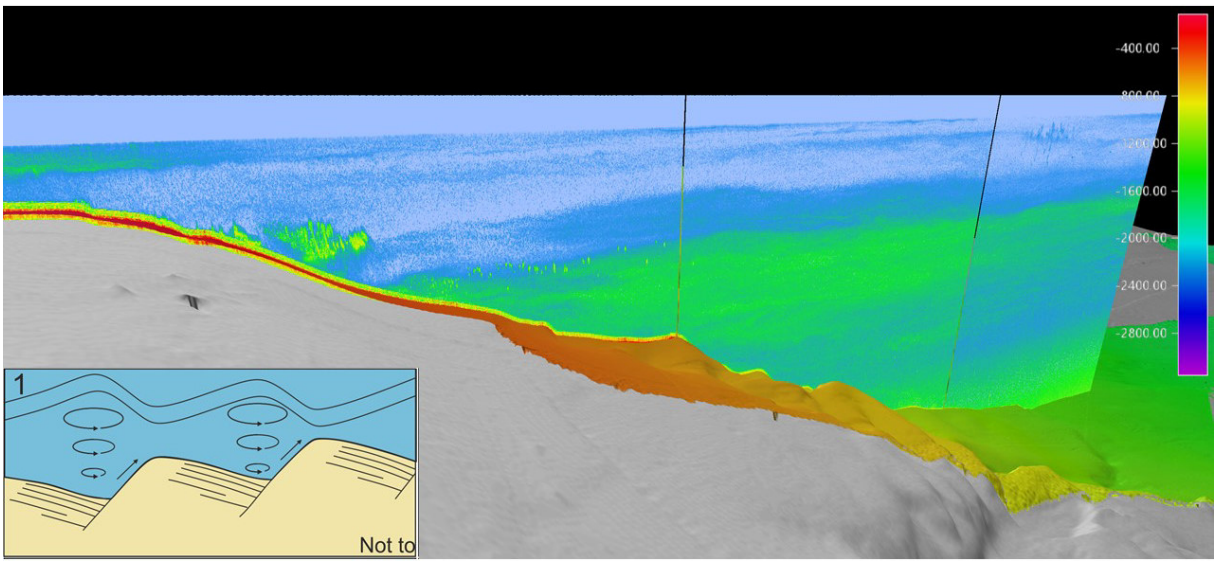
The seismic equipment was retrieved at 08:00h on January 2. Coring across a single sediment wave was done during the day. Gravity and giant box cores were taken at three different positions. CTD casts were done at two of the stations. All gravity cores yielded a good core recovery exceeding 8 m. The cores show significant differences in grain size distributions, both within a core and between cores. An example of a sediment core in the trough of a sediment wave is shown below (although from the first working area). This core shows discrete layers with gradual contacts. Overall, the grain size spectrum is sandier than on the crests of the sediment waves. A debris flow is found at the base of the core, showing that gravitational sediment transport is also important in the development of the sediment waves.

Image of a sediment core in the area of a sediment waves.

Hydroacoustic data of the upper continental slope west of the mooring sites were recorded during the night. Some line adjustments were again required due to fishing activity. A single gravity core was taken around noon on January 3. This core was located upslope of a small landslide, providing an opportunity to sample the glide plane of the slide at a depth of approximately 7m. The glide plane is clearly visible in the core. A final seismic survey over the sediment wavefield east of the mooring stations was recorded on the night of January 4. Fishing activity, now well known, again led to some last-minute adjustments to the planned profiles. On January 5, a CTD transect was collected across the mooring sites. Eight CTD casts were measured along a 15 nautical mile profile in water depths ranging from 150 to 1500 meters. The transect was completed at 19:00h. Additional water column data using the EM712 multibeam echosounder were collected during the night. We triangulated the moorings to obtain their exact positions on the sediment waves early in the morning of January 5. The first mooring was released shortly before 08:00h and was already on deck by 09:00h. This mooring was located in a wave trough. After the mooring was recovered, a gravity and giant box core were taken on the upslope wave crest. The second mooring was recovered before lunch. This mooring was located in shallower water on a wave crest. Cores in the neighboring wave trough were subsequently taken. Geological station work was completed at 13:45h on 5 January. In the meantime, we had the opportunity to view data from the first moorings. All devices from both moorings recorded data throughout. An example of an ADCP record of one of the moorings is shown below. A cyclic signal of flow direction (and also velocities) is clearly visible, suggesting the presence of internal waves. A detailed evaluation can only be done after the cruise in Kiel. However, this observation fits well with the water column data we recorded during repeated surveys along a profile across the moorings. In particular, the EM712 multibeam echosounder has proved useful here. The EM712 data clearly image internal waves hitting the slope.



Flow directions measured by an ADCP about 11 m above the seafloor in a mooring. Cyclic changes of the flow direction are clearly visible.



EM712 water column data imaging internal waves hitting the continental slope.

We finished a last hydroacoustic survey in the working area off Agadir on January 6 at 04:00h. Afterwards we started the short transit to Las Palmas to exchange a small part of the scientific crew. During the port call on 7 January, 4 persons of the scientific crew were disembarked, while one scientist each from Kiel University, Centro Oceanográfico de Málaga and Instituto Español de Oceanografia (Madrid) came on board. In addition, two professional marine mammal observers (MMO) embarked in Las Palmas, as this is a prerequisite for the work off La Palma. Unfortunately, one of the MMOs tested positive for Covid-19 and had to be replaced. Therefore the departure from Las Palmas was delayed to 17:00h the same day. This morning, La Palma came into view as the last target of our cruise. We will map the marine continuation of the Cumbre Vieja volcano in the remaining days. Cumbre Vieja volcano, which forms the southern part of La Palma Island, experienced its longest documented eruption in late 2021. Although the eruption appears to have ended for now, it is unclear what hazards remain, especially since it is not known what changes have occurred on the submarine flank.

Transit to La Palma (Photo: Felix Gross).

Cruise MSM113 will end in Las Palmas on January 12. Since the investigation of sediment waves as the main part of the cruise is finished, we can already draw a first preliminary balance. So far we have recorded about 3000 nautical miles of hydroacoustic data, of which about 1400 km together with seismic data. The seismic data are of excellent quality. We deployed and recovered short-term moorings at 4 locations. In total, we recorded 31 CTD casts. 31 gravity core stations resulted in a recovery of 210 m of sediment cores. Samples with the giant box core were taken at 14 locations. We thus have all the data in hand to reconstruct the formation of sediment waves in an integrative approach and can already say that the cruise was a great success.

The MARIA S. MERIAN has served as an excellent platform for our work. Smaller and larger requests were always fulfilled very quickly and to our complete satisfaction. We would like to express our sincere thanks to Captain Schmidt and the entire crew for their great support and the very good working atmosphere on board. You are a great team and we will be very happy to come back! We all enjoyed our time on the MARIA S. MERIAN very much.

Best regards

Sebastian Krastel
(Christian-Albrechts-Universität zu Kiel)
On board, 28°26'N, 017°55'W

Group photo of the MSM113 scientific team.