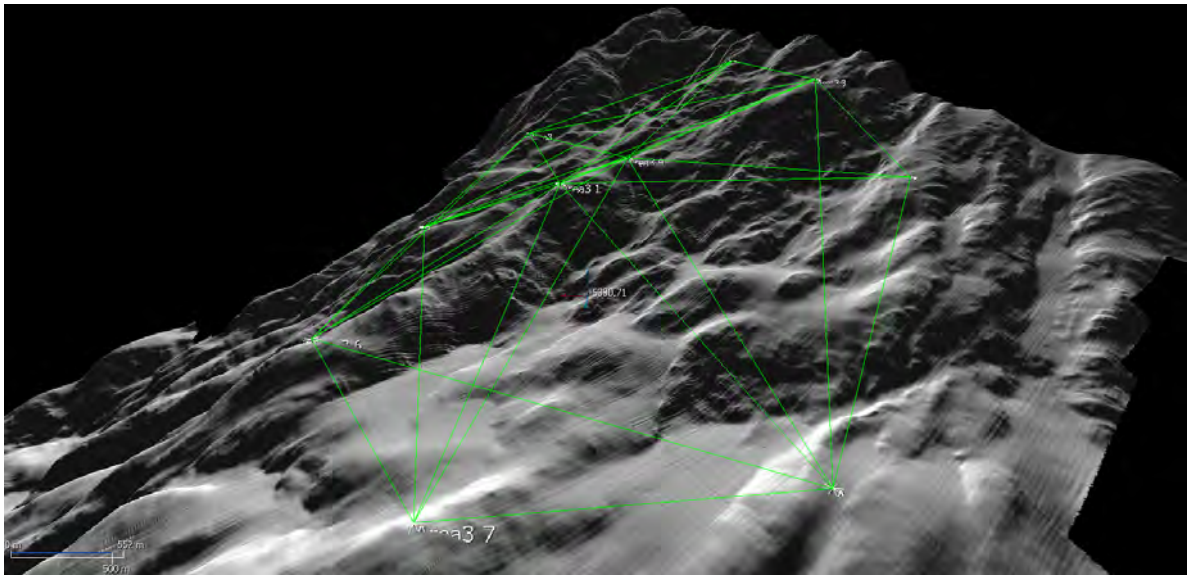
FS SONNE Reise SO244

Antofagasta – Antofagasta

27.11.15 – 13.12.15

3. Weekly Report, 13. Dez. 2015

Our third and final week in the Pacific offshore Chile began with a pleasant start: we deployed our final GeoSEA station in working area 1 and are now excited to have three fully functioning geodesy arrays on the continental margin, which is the site of recurring earthquakes that pose a hazard to the coastal region. This installation is unique, as is the deployment method on the de-coupled deep-sea cable in water depth of more than 5000 m, obviating the use of a remotely operated vehicle (ROV). All stations on the seafloor are operating and communicating, yielding a 100% functionality of the networks. The technical hurdles we had to take in the past days especially in greater water depth did in the end not pose too great a challenge – this is mainly due to the efficient cooperation between vessel's crew and the scientific crew. Special thanks thus go to the officers and the crew of RV SONNE, particularly also to the crew working in the engine room, who make our work possible in the first place.



Array configuration for area 3: A total of 10 stations have been deployed here and surround two central stations. The green lines depict all measured baselines between the stations.

The figure above depicts the large number of baselines that we are able to measure in the tectonically and morphologically complex working area 3.

In the early afternoon of December 7 we deployed our first ocean bottom seismometer (OBS) in the study region. Another 13 OBS were deployed in the following days to register the seismic activity. These instruments will be recovered by RV Langseth in the spring/summer of 2016.

Ocean bottom seismometers are being prepared on the main deck of RV SONNE. The instruments will record the seismic activity along the Chilean plate boundary for a period of 6 months.

We deployed 12 OBS until December 8, when we returned to our first working area to deploy GeoSURF. The wave glider navigated autonomously above our installed stations until the next morning and successfully uploaded and saved the geodesy data.

GeoSURF with RV SONNE in the background. The wave glider navigated autonomously over night to upload the seafloor data and transfer it via satellite.

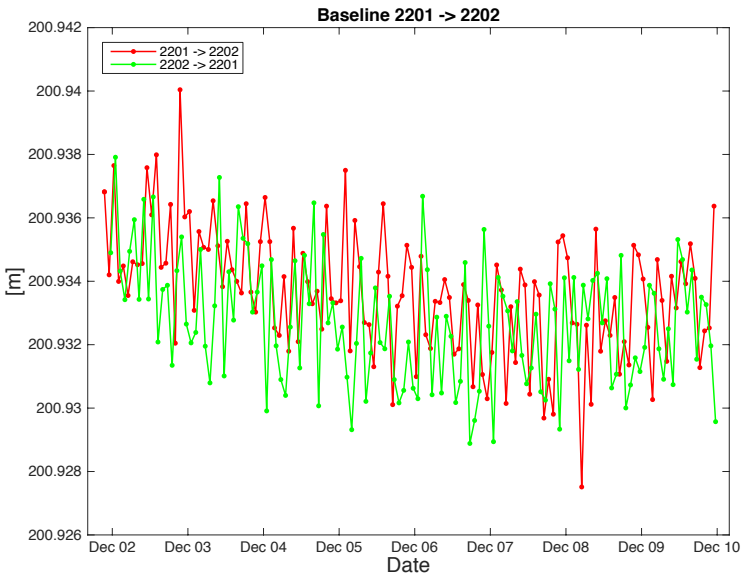
We returned to area 3 in the early afternoon of the following day for a final check of the network functionality and for data upload. We will only be able to return in about 6 months time and hence want to make sure that the system configuration is optimal for our purposes. This is also true for our westernmost area, where we again

deployed GeoSURF so that RV SONNE could leave the area to map previously uncharted areas of the seafloor seaward of the deep-sea trench.

While GeoSURF navigated to upload the data in area 2, RV SONNE left to map unknown parts of the seafloor seaward of the trench.

The mapping activities lasted for the following two days and nights after we had recovered GeoSURF and terminated our work in the western area 2. The figure below shows an example for a baseline between two stations spaced approximately 200 m apart. These yet uncorrected and unprocessed data suggest a repeatability precision of < 4mm.

Data example from working area 2 located in water depth of more than 4000 m. The baselines between two seafloor transponders are shown: the red line 'looks' from station A201 to A202 while the green line is 'looking back' from A202 to A201. The data have not been corrected yet using additional physical parameters of the water column. Processed data will have a precision of ±2 mm on average.



On December 12 at 0:00h we started our transit toward the port of Antofagasta. On the way we deployed the last OBS south of the aftershock region of the Iquique earthquake, which hit the coastal area on April 1, 2014 with a magnitude 8.1.

The good weather remains stable with air temperatures around 22°C and moderate winds. Everybody on board is thrilled with the successful deployment of the GeoSEA

array and excited about the data that it will generate in the years to come. We hence disembark today with mixed feelings: We are looking forward to our loved ones back home while at the same time hope for a soon return to RV SONNE. We thank Captain Lutz Mallon and his entire crew for the professional and efficient work and for the shared days on board!

Kind greetings to everybody back home!

Heidrun Kopp

Port of Antofagasta, 23°39’S / 70°24’W