

FS Sonne
Cruise SO310 (S-555)

20.02.25 – 22.03.25, Wellington – Wellington

Weekly Report No. 1, 20.02. – 23.02.2025

Quantifying the role of mass wasting in submarine canyons on active and passive margins (MAWACAAP)



1. Weekly Report

Submarine canyons incise active and passive continental margins around the world. They are highly dynamic submarine systems forming complex seafloor structures. Turbidity currents and mass wasting are dominant processes in formation of canyon topography. Canyon head and flank failures often progress upslope forming retrogressive terraces. Usually being located close to populated areas, such failures in canyons do have a hazard potential to settlements and submarine installations. Canyons have been investigated in different tectonic settings but direct comparisons based on field data are rare. This joint project aims in comparing canyon systems from a passive and an active margin off New Zealand (Palliser and Pegasus Canyon). We will develop frequency-volume relationships of landslides in canyons with special focus on systematic differences between different tectonic settings. In addition, we will investigate factors controlling the size and location of failures including topographic amplification effects of canyons for earthquake waves. The integrated analysis of the data shall lead to an improved assessment of hazards and risks related to sediment failures in canyons at active and passive margins. We address this topic by collecting hydroacoustic and seismic data as well as taking sediment samples from the seafloor.



Research vessel Sonne leaving Wellington for expedition SO310 Photo: Sebastian Krastel.

For the expedition, 12 scientists from Kiel University, 10 scientists from GEOMAR - Helmholtz Centre for Ocean Research Kiel, 3 scientists from NIWA (Wellington), 2 scientists from GNS Science (Lower Hutt), 1 representative of Iwi/Maori, 1 scientist from the Geological Survey of Israel and 1 meteorologist from the German Weather Service are on board. During the time in port, the German Embassy hosted the 'Climate Talks' event on the evening of 17 February, followed by a reception to highlight the close cooperation between New Zealand and Germany in the marine sciences. In the run-up to the 'Climate Talks', numerous groups (students, diplomats, journalists) were given a tour of the ship.

We left our berth in Wellington harbor at 09:00 on 20 February in sunny weather. As the first working area (Palliser Canyon) is located directly in the Cook Strait, we had practically no transit and began recording hydroacoustic data as soon as we reached the working area at 12:00 on the same day. After a releaser test, the recording of a sound velocity profile and the first systematic Parasound survey, Ocean Bottom Seismometers (OBS) were deployed on the night of 21 February. Eight OBS will remain on the seafloor throughout the expedition to permanently record small earthquakes; four more OBS were deployed for active seismic measurements.



Deployment of an OBS. Photo: Sebastian Krastel

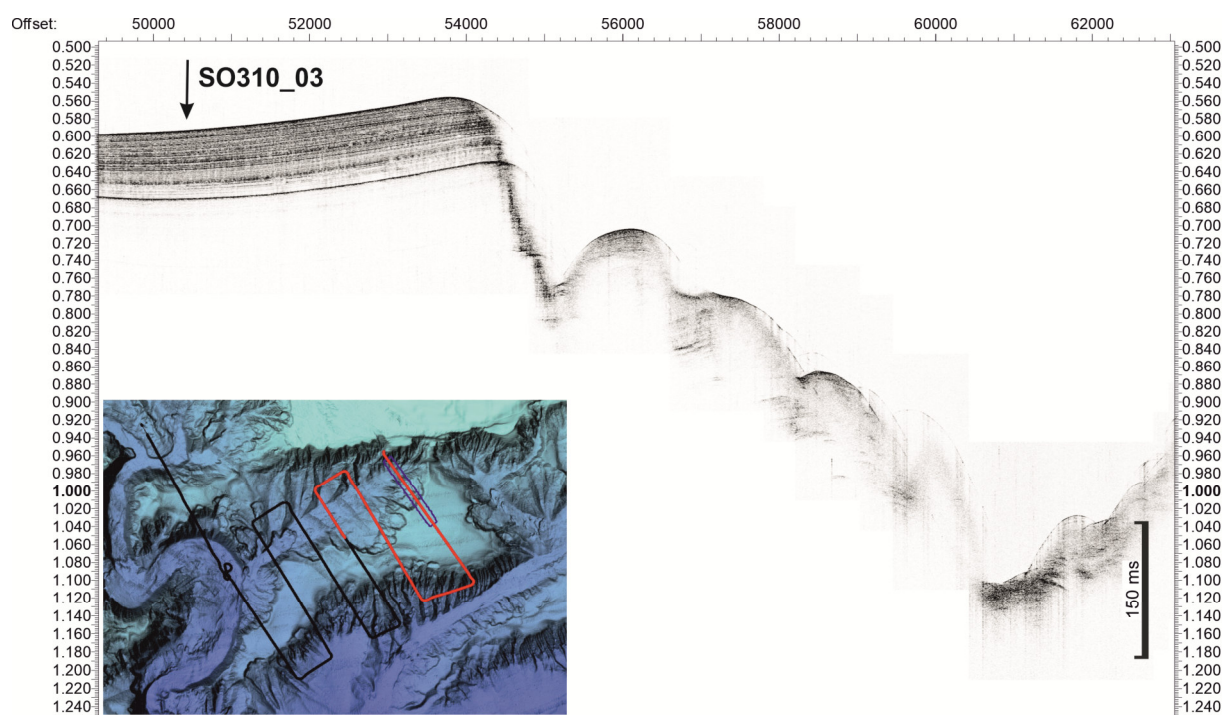
After deploying the OBS, we took a first core on the Palliser Bank based on the results of the Parasound data. The Palliser Bank is the southern boundary of the Palliser Canyon. The morphological map shows a large number of landslides on the flanks of the Palliser Bank. The first core successfully sampled undisturbed sediments on the Palliser Bank. The 5m-long core consists of relatively homogeneous clay-rich sediments.

After the sampling we started with reflection seismic measurements on 21 February at 12:00h. Two systems are on board for this purpose. The GEOMAR system will be used in particular for 3D seismic measurements. For 2D seismic measurements, we are currently using the NIWA streamer, which is 600 meters long and contains 96 channels. We started with regional overview profiles over the Palliser Canyon. Since this morning we have been recording a close-meshed grid of 2D lines across the northern flank of the Palliser Bank. These lines will help us to define the box for the 3D measurements.

Everyone on board is well and looking forward to the time ahead of us on RV Sonne.

With best wishes on behalf of all participants

Sebastian Krastel
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Auf See, 41°44.34'S, 175°12.90'E



Parasound Profile across the northern flank of Palliser Bank. The arrow marks the location of the first core.