SO290 Paleoceanography of the Tasman Sea

RV SONNE

SO290 – Paleoceanography of the Tasman Sea

15th April – 12th May 2022

Nouméa (New Caledonia) – Nouméa (New Caledonia)

4th Weekly Report

(2nd May – 8th May 2022)

After a strong storm on May 1st, we were happy that weather and seas calmed down and we could proceed our work off the southwestern part of New Zealand, the so-called Fjordland. Besides the Chilean fjords in South America, this is the only fjord area in the Southern Hemisphere formed by a small ice-cap on the New Zealand Southern Alps during the past glacial periods. Our shipboard New Zealand scientists Christina Riesselman and Chris Moy (University of Otago) know Fjordland very well from numerous scientific field trips and excursions with students.

Fig. 1: New Zealand scientists Christina Riesselman and Chris Moy (University of Otago) onboard RV SONNE (photo: SO290, G. Winkler, CC BY 4.0).

They also intensively collaborate with Chilean scientists to compare the paleoenvironmental history in similar environments at both sides of the South Pacific. One of the goals of our expedition was also to recover sediment records offshore the New Zealand fjords to link these to the Tasman Sea sediment cores on the one hand, and the fjord records of Christina and Chris on the other hand. However, time-scales covered at these locations are likely to be very different, with high resolution Holocene (the past 11,500 years) sediments in the fjords and most likely much longer time-series covering up to several glacial/interglacial cycles offshore.

Overall, it was very difficult to recover long sediment cores off Fjordland. In contrast to locations further northwest on the Challenger Plateau (part of Zealandia), the southwestern part of the New Zealand margin is characterized by a steep topography and the absence of a significant continental shelf. Moreover, the area is seismically active with earthquakes connected to the active Alpine Fault passing through it.

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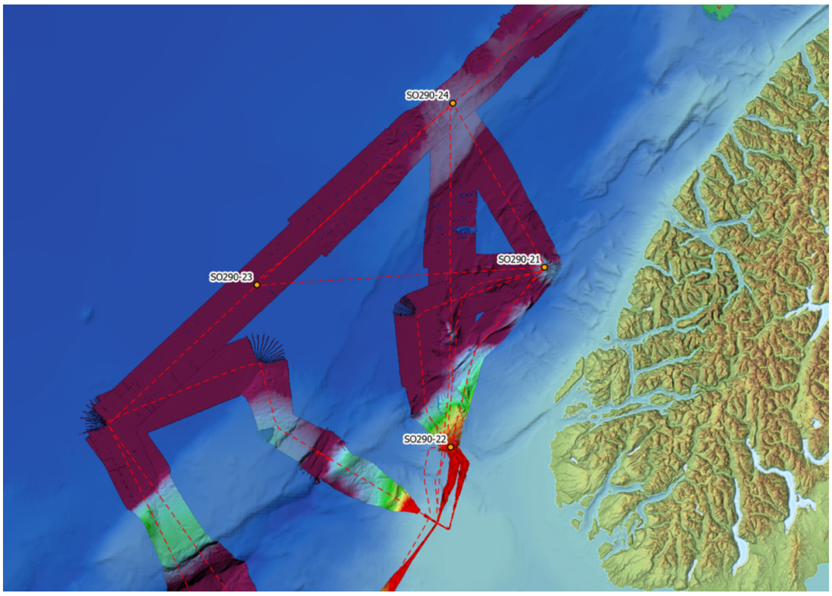

Fig. 2: Map of Fjordland and the adjacent Tasman Sea, dotted red line shows our cruise track with extensive surveys for localizing undisturbed sediment sequences. (photo: SO290,C. Gebhardt, CC BY 4.0).

Together, these factors may explain a generally thin and discontinuous sediment cover as deduced from our extensive PARASOUND surveys. We nevertheless recovered sediments at several stations with the multi and gravity corers, but core lengths were rather short at the continental slope (1.4 to 4 m). This work was complemented by the deployment of several CTDs. Only further offshore, we recovered longer sediment cores with ~2.5 to ~9 m length at water depths of ~3300 to 4400 m. Though these sediment cores contain occasional distal turbidites, they still provide potential for studying deep water paleoceanography and long-term sediment input changes from land.

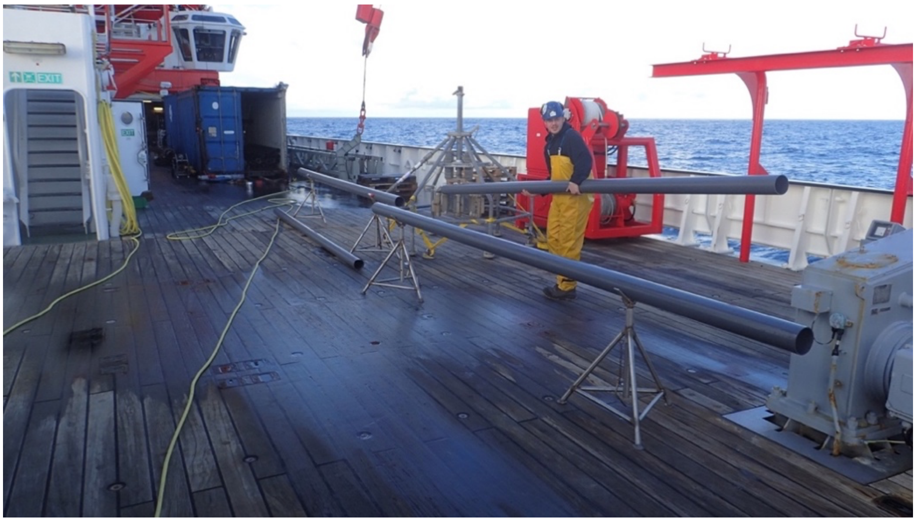

Fig. 3: Jelle Nürnberg preparing the liners for deployment of the gravity corer. (photo: SO290, S. Plewe, CC BY 4.0).

On May 4th, we finished our work in the deep Tasman Sea and revisited our 2nd continental margin transect that we could not complete during our way southward. A number of CTD, multicorer and coring deployments were still on our schedule. This time, wind and sea conditions were much more favorable and we started to work at this transect from deep to shallow water depths. This continental margin section is characterized by a thick continuous sediment cover, particularly at water depths between ~900 m and ~1700 m. This depth range is important for global (paleo)oceanography as it covers Antarctic Intermediate Water. This water mass is formed in the Polar Frontal Zone in the Southern Ocean and also passes through the Tasman Sea on its way to the tropics. Antarctic Intermediate Water is very important for heat and nutrient export from high to low latitudes and plays a critical role in predicting future climates.

Both PARASOUND and downcore physical properties records suggest that the sedimentary sequences along our transect can be connected in detail across different water depths. As continental clay and silt input increase towards New Zealand, our cores provide increasing resolution at shallower water depth. Taken together, we hope to obtain detailed insight into short-term climate and ocean variability and longer-term variations in the region.

Fig. 4: View of New Zealand´s Fjordland from RV SONNE just outside the 12-nm zone. (photo: SO290, F. Lamy, CC BY 4.0).

We stopped station work at the New Zealand margin on May 5th in the late afternoon and subsequently started our transit northward along the edge of the Challenger Plateau. We originally planned to revisit a location at ~36°30´S that was cored in 1969 with the U.S. research vessel Eltanin. The famous Eltanin cruises were a unique oceanographic program that obtained a large set of sediment cores from all over the world. Unfortunately, the positioning system was not very exact during that time and we could therefore not find a suitable coring location in vicinity of the supposed Eltanin coring site. Slightly disappointed, we continued northward, but sediment cover improved and on May 7th we decided to stop at a location with a water depth of ~3100 m for a successful multicorer deployment, gravity coring, and a CTD. Thereafter, we proceeded across the Lord Howe Rise and reached shallower water depths with two further sediment and CTD stations at water depths of ~1100 m and ~900 m.

We have now finally reached calmer waters. Sea surface temperatures are above 21°C with similar air temperatures. Though sunshine is rare and occasional rain showers not uncommon, everybody enjoys the subtropical climate. We are looking forward to the final station tomorrow and the following small celebration of a successful cruise.

Greetings from RV SONNE at 33°S, 163°E!

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