RV SONNE – SO296/2

21.01.2023 - 21.02.2023

Talcahuano (Chile) - Talcahuano (Chile)

5th Weekly Report (13. - 19.02.2023)

During the week, the Canal Concepcion/Canal Wide/Seno Eyre fjord system was investigated hydroacoustically in three steps and geologically sampled at suitable locations - mostly in the center of the partly overdeepened fjord basins. The objective in this work area is to investigate the late glacial and Holocene evolution of the largest glaciated area of the Patagonian Ice Sheet, the Southern Patagonian Ice Field, using the example of the Brüggen or also called Pius XI outlet glacier draining towards the Pacific Ocean. Along a transect of nine stations, the fjord deposits were drilled with the help of a multicorer, with which eight short cores of up to 60 cm length are obtained simultaneously, and a 17 m long gravity corer (Fig. 1).

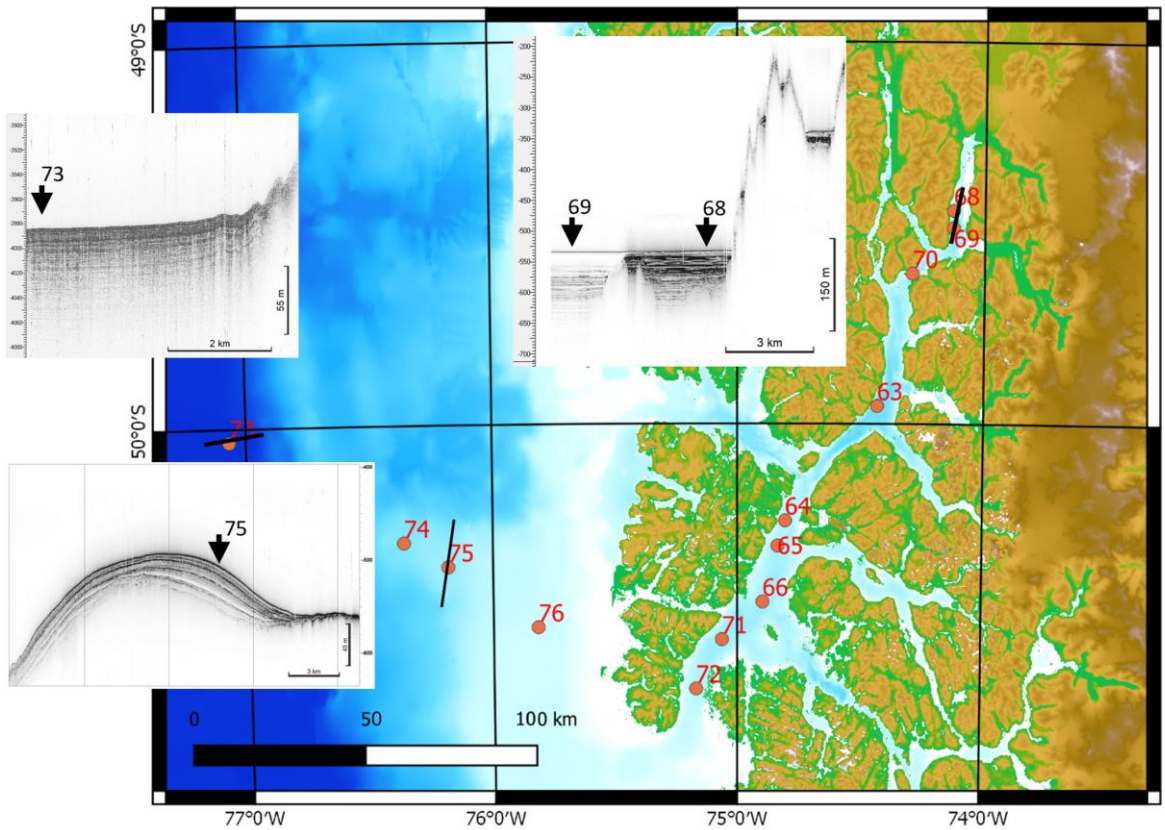

Figure 1: Station work along a transect in the Canal Concepcion/Canal Wide/Seno Eyre fjord system and on the adjacent continental slope. The three sedimentary acoustic sections exemplify the very different sedimentary settings near the Brüggen Glacier (with stations 68 and 69), on the upper continental slope (with station 75), and in the transition to the deep sea at 4000 m water depth (with station 73). Data: P. Feldens and S. Papenmeier.

In the innermost area near the glacier tongue, the sediment deposits are dominated by the most recent glacier dynamics, and uncompacted "liquid sediments" near the bottom make undisturbed sampling difficult (Fig. 1, Station 69).

In the central area by far the longest sediment sequence was obtained (Fig. 2), which exemplarily documents the late glacial retreat of the glacier and the spreading of marine conditions at the beginning of the Holocene with high sedimentation rates first of glacier-transported material and later of organic-rich marine sediment.

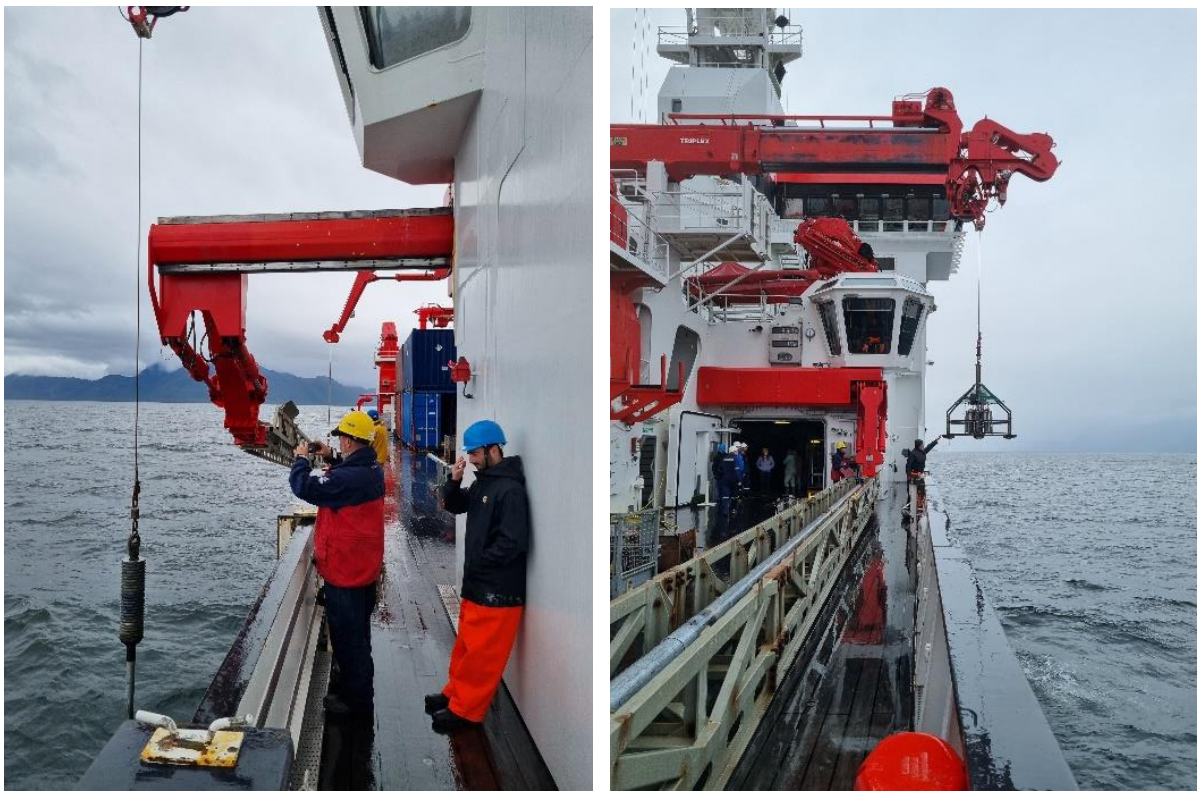

Figure 2: Multicorer and gravity corer sampling under fast changing weather conditions in the central area (transition Canal Concepcion to Canal Wide) of the fjord system. Photo: H. Arz

Accompanying the geological work, we continued our hydrographic investigations in the water column. Here, our focus was on the change in water mass properties from the entrance of the fjord to its end, which is formed by the Brügge Glacier. Along the profile, the vertical stratification of the water column towards the glacier became much shallower but also increasingly complex.

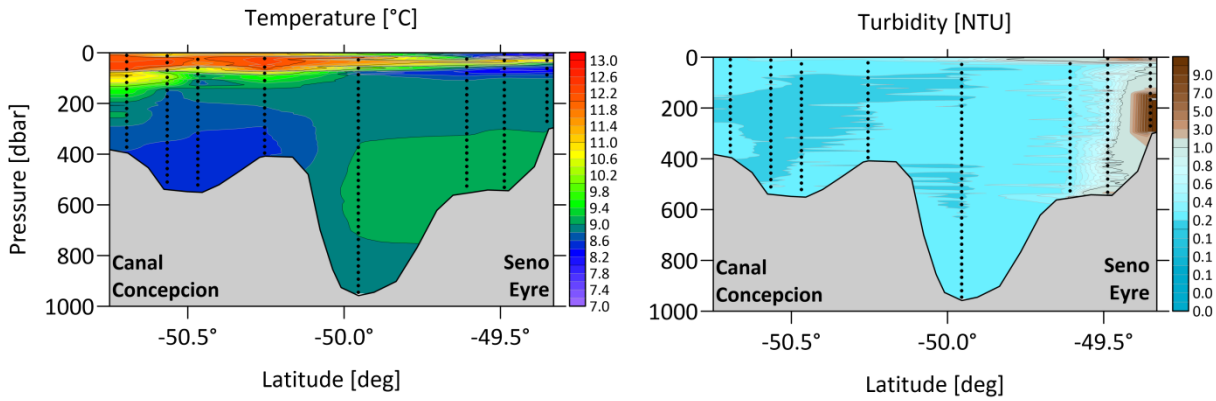

Figure 3: Vertical distribution of temperature and turbidity along the fjord formed by Canal Concepcion, Canal Wide and Seno Eyre. The temperature gradient in the surface water (left) and the extreme turbidity near the glacier (right) can be seen. Data: T. Heene and V. Mohrholz.

Since we were unable to operate with the Sonne up to the vicinity of the glacier tongue due to drifting ice chunks, we decided to continue the hydrographic measurements with the workboat. The storage microstructure probe (MSS) was used, which can autonomously measure hydrographic parameters as well as turbulence and mixing in the water column. The observations made with it revealed a shallow turbidity layer at 10 to 20 m depth, where mineral material drains from the glacier into the fjord (Fig.3). The collected data provide information on how the observed vertical stratification develops seasonally.

Figure 4: Toralf Heene prepares the storage MSS in the workboat for the measurement. The glacier tongue is visible in the background.

In the second part of the geological investigations in this third working area, sediment work on the offshore continental slope was planned. Under still difficult weather conditions, hydroacoustic surveys could be carried out during the night from Wednesday to Thursday. The Chilean continental slope is dominated in this region by strong currents from the southward flowing Cape Horn Current as part of the Antarctic Circumpolar Current and mostly only coarse-grained residual sediments are found on the seafloor. Even the hydroacoustically promising drift sediments in 500 to 800 m water depth (Fig. 1, Station 75) are fine-grained sands that withstood the gravity coring on the following Friday in a continuously improving sea.

On Friday morning, February 17, the research activities were stopped and this last working area was left for Talcahuano (Chile) northwards, where the expedition will end on February 21.

Greetings on behalf of all participants,

Heide Schulz-Vogt

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