

S0292 ICECARB

Towards an understanding of carbonate platforms in the icehouse world

RV SONNE

15. May – 21. June 2022

Nouméa – Nouméa (New Caledonia)



5. Weekly report

June 6th – June 12th

During the last week we performed a further seismic survey between Willis Islets carbonate bank and Holmes Reef, also cross-cutting the location of ODP Site 811. The seismic survey was accompanied by multibeam and Parasound mapping. These hydroacoustic data reveal that the slopes and basins around the Queensland Plateau carbonate banks are characterized by an interplay of mass-transport processes and bottom current-controlled sedimentation. Figure 1 shows an example of this setting south of the Willis Islets carbonate bank with several mass-transport complexes and drifts as imaged in the Parasound data.

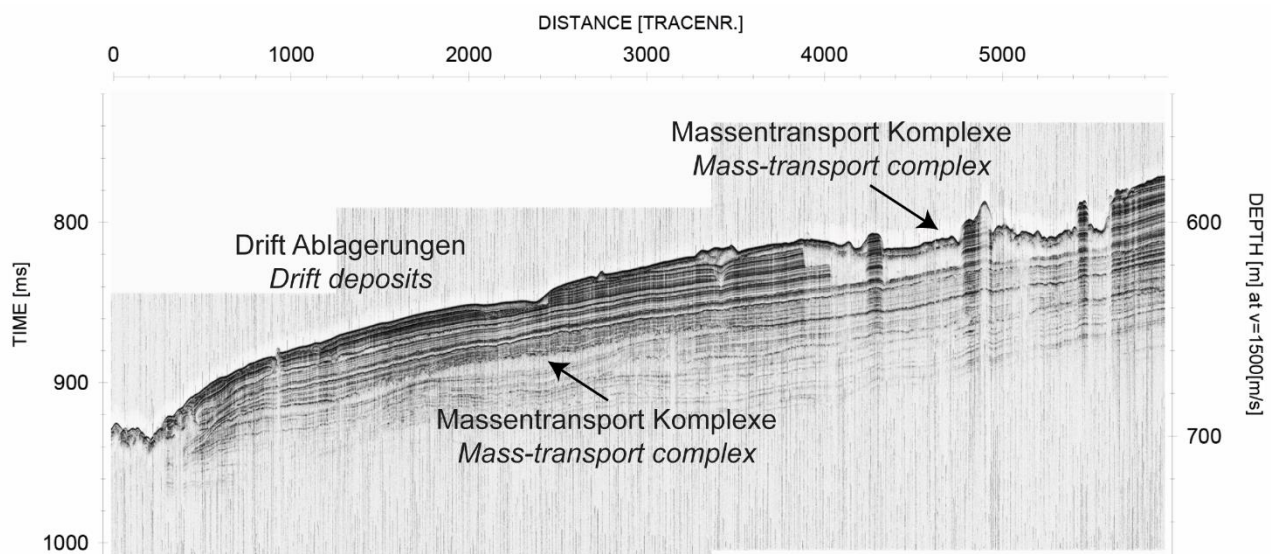


Fig. 1: Parasound line acquired south of the Willis Islets carbonate bank. The sea floor is irregular as a consequence of mass transport bodies and erosion, presumably triggered by bottom currents.

CTD measurements on water mass properties are essential for the interpretation of the present sedimentation processes in terms of water column and bottom current activity. Our CTD profiles enable us to further subdivide the South Equatorial Current (SEC), the dominant water mass in the Coral Sea. CTD casts are performed both on the up current and down current sides of isolated carbonate banks which gives us the opportunity to determine potential upwelling and element cycling at our target positions. In addition, so-called Yoyo-CTD stations with up to 26 hours of continuous data acquisition are a good approach to study tidal effects on water column changes and thus also on sedimentological processes. Moreover, CTD casts are a valuable tool to support ADCP and hydroacoustic measurements. Understanding water mass composition and its processes are a prerequisite for interpreting currents, tidal effects, and erosion in relation to sedimentation and depositional processes around carbonate platforms.

Figure 2 shows the results of a Yoyo-CTD station that lasted a total of 26 hours (time stamps are given in Julian days). Here, salinity values (PSU) are represented by the color scale and density by contour lines. It can be clearly seen that the upper mixed layer up to 50 and 80 m below surface is a single homogenous water mass (Tropical Surface Water - TSW), most-likely with little biological activity due to depleted nutrient concentrations. Below the pycnocline, salinity significantly increases well above 35.5 PSU, which is an indication for South Pacific Tropical Water (SPTW). Below about 200 m water depth, salinity drops again to values even lower than 34.5 PSU below 500 m, suggesting Antarctic Intermediate Water (AAIW) dominance in the deeper part of the profile. The Yoyo CTD also visualizes the tidal effect (vertical oscillation of water masses) on the water mass distribution. The highest density gradients are found below the surface mixed layer between 80 and 150 m. There, internal waves with the highest frequency of more than 10 buoyant waves per hour occur.

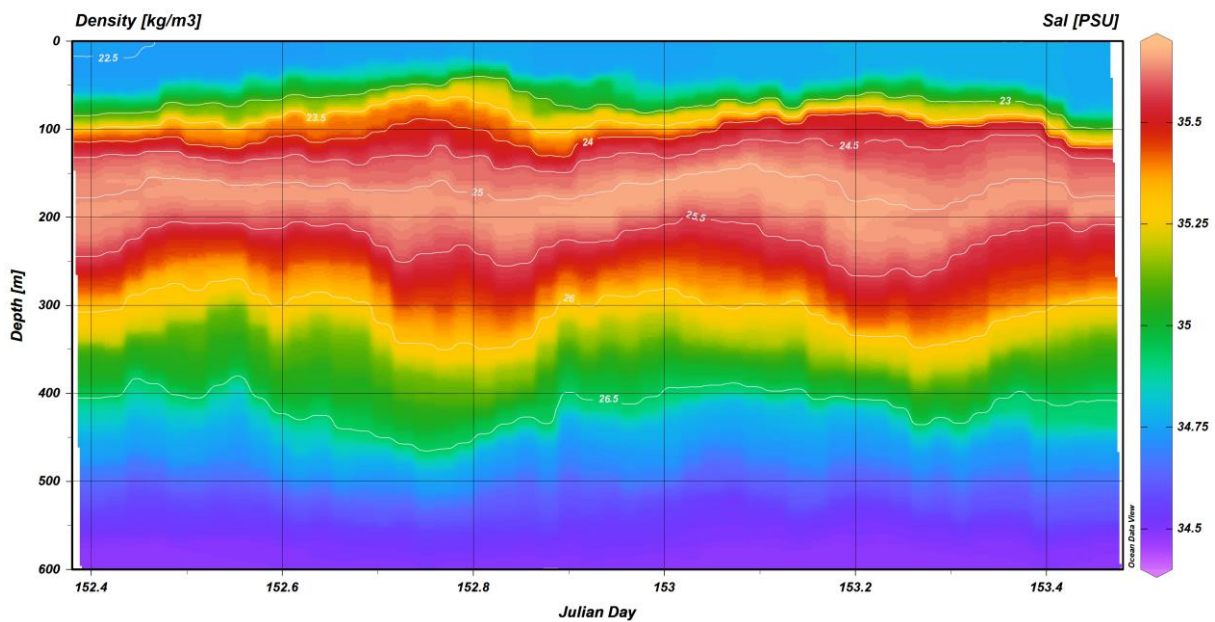


Fig. 2: Yoyo CTD profile of 26 hours continuous measurements. Salinity values are a good indicator for different water masses that govern the Coral Sea.

The past days of the cruise brought RV SONNE to the northernmost research area of Cruise SO292, which is located around Diane Bank. Currently we are performing hydroacoustic surveys, OFOS surveys and sediment sampling. We will later move back to the more southward located research areas, to fill in gaps in our multibeam and Parasound data.

Everyone is in good health and sends greetings home.

Christian Betzler

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