

GEOTRACES SO298

RV SONNE

SO298 "Equatorial Pacific GEOTRACES GP11"

14th April – 2nd June 2023

Guayaquil (Ecuador) – Townsville (Australia)

4th Weekly Report (01th – 07th May 2023)



We are now just over 3 weeks into our cruise programme, and sailing along the equator at 145°W towards the Islands of Kiribati (Fig. 1) . We are still sailing into the currents, which is slowing us down. We hope that the currents will decrease in strength over the coming days.

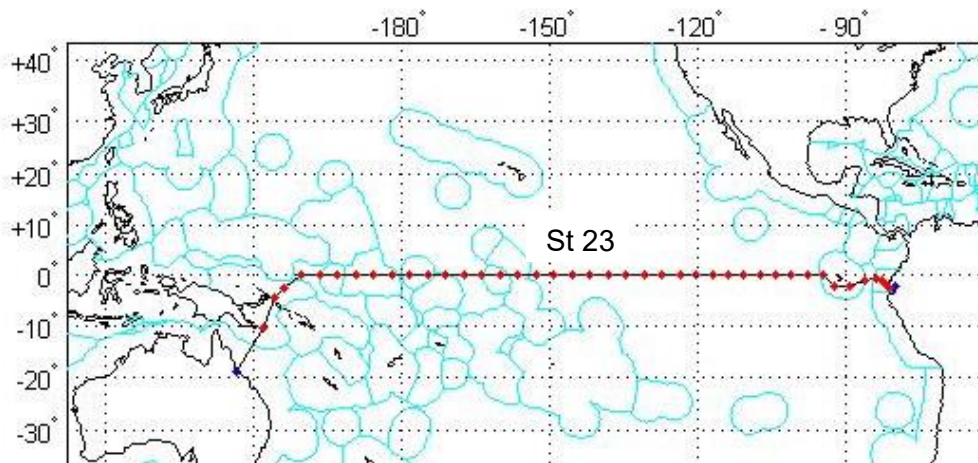


Fig. 1: Map of Pacific Ocean with our cruise track (black line), stations (red dots) and current station 23 indicated. Blue lines indicated Exclusive Economic Zones of states.

Our work at sea is processing well. We steam for about 21 h each day and then conduct a station which lasts between 6 and 10 hours. Our sampling time therefore moves gradually through the day and night. The most favourite time for station activities appears to be during daylight hours (Fig. 2).

As mentioned in my weekly report from the last weeks, the current that is slowing us down is the Equatorial Undercurrent (EUC). Our detailed data from the lowered ADCP (Acoustic Doppler Current Profiler) which is attached to the CTD frame, show that the core of the EUC is gradually deepening, and now found at depths over 100 m (Fig. 3), with speeds >3 knots.

The EUC carries colder high pCO₂ waters from the west Pacific to the east Pacific. PhD student Rieke Schäfer (PTB/GEOMAR), is conducting continuous surface ocean measurements of pCO₂ and pH. The underway measurements are conducted in the ship's underway supply, which is taking water from a depth of 6.5 m. The pCO₂ measurements are conducted every



Fig. 2: Setting up trace metal clean CTD during day-light hours. Photo Lea Blum.

minute, and the sensor is based on infra red detection of CO₂ after membrane equilibration (Contros HydroC sensor).

The pCO₂ data (Fig. 4) indicate values below current atmospheric pCO₂ (ca. 424 ppm at the moment) in the vicinity of the Ecuadorean coast. Along our transect away from the coast, pCO₂ gradually increases, with values higher than the level in the atmosphere. Consequently, the ocean waters have become a CO₂ source for the atmosphere, with pCO₂ towards 550 μ atm.

We observed enhanced nutrient concentrations over the last week in surface waters, with nitrate levels up to 5 μ M (Fig. 5), indicating supply of nutrient enriched (with also enhanced pCO₂) subsurface waters, which will facilitate enhanced productivity along our cruise track.

RV SONNE at sea 0°S/145.0°W

Eric Achterberg, GEOMAR Helmholtz Centre for Ocean Research Kiel/ University of Kiel

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<http://www.oceanblogs.org/so298>

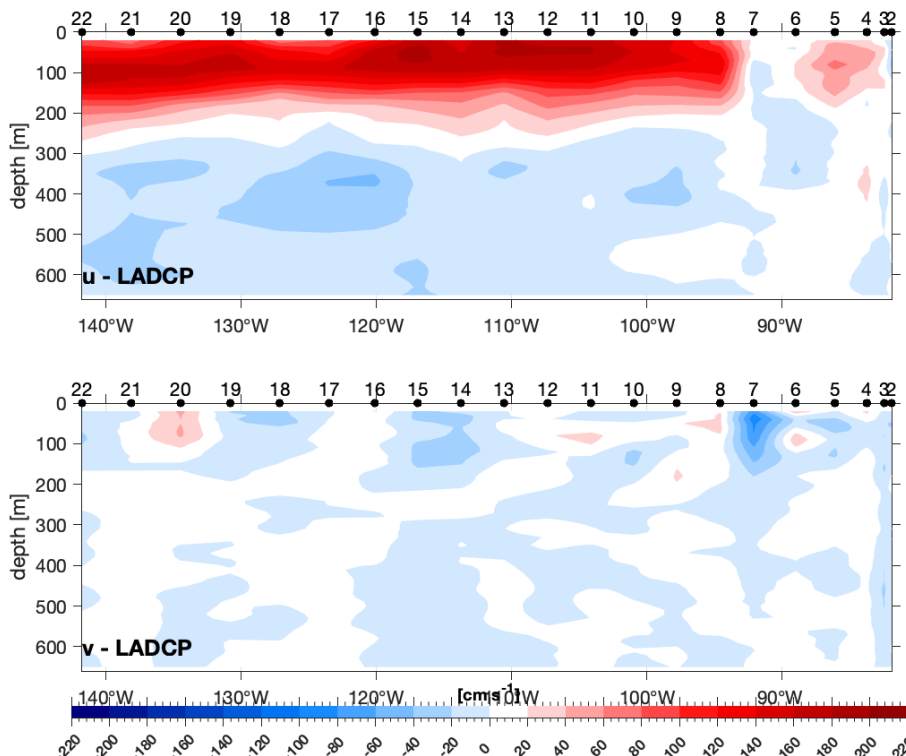


Fig. 3a: Zonal (west to east) ADCP observations in top 600 m of water column. Core of the EUC with currents >3 knots is deepening towards the west, and now at more than 100 m.

Fig. 3b: Meridional (south to north) currents along the transect. Data from Rena Czeschel.

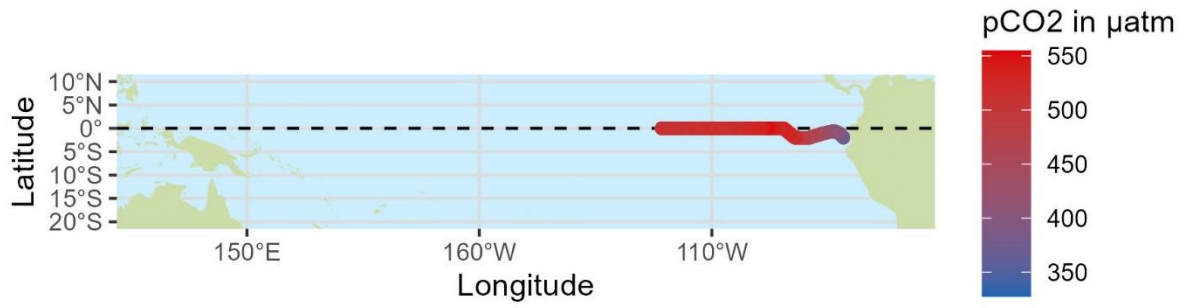


Fig. 4: pCO₂ data in surface waters along cruise track. Data obtained using Contros pCO₂ sensor. Data by Rieke Schäfer.

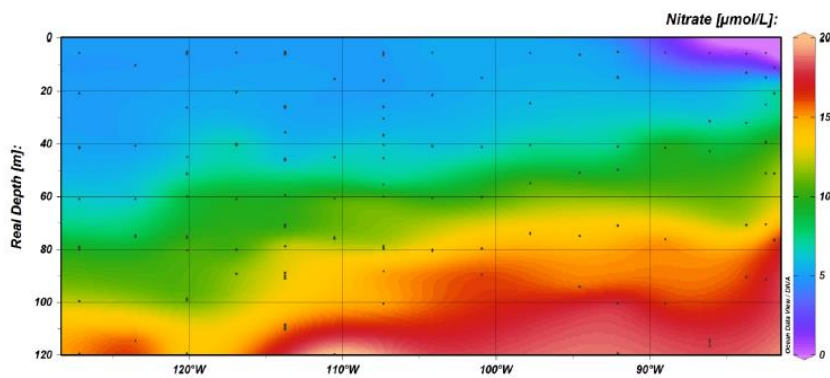


Fig. 5: Nitrate data in surface waters (top 120 m) along cruise track. Data provided by Andre Mutzberg and plotted by Angele Nicolas.



Fig. 6: CTD with L ADCP back on deck. Photo: Eric Achterberg.