SO298

RV Sonne

SO298 "Equatorial Pacific GEOTRACES GP11"

April 14 – June 2, 2023

Guayaquil (Ecuador) – Townsville (Australia)

7th Weekly Report (May 22 - 28, 2023)

We are 6 weeks into our cruise programme, and sailing at 5°S, 153°E through the waters of Papua New Guinea and towards Townsville (Fig. 1). We see islands and plenty of dolphins in the waters at the moment.We have finished station 39 yesterday (Fig. 2) and are now waiting for permission to sample in the waters of Papua New Guinea.

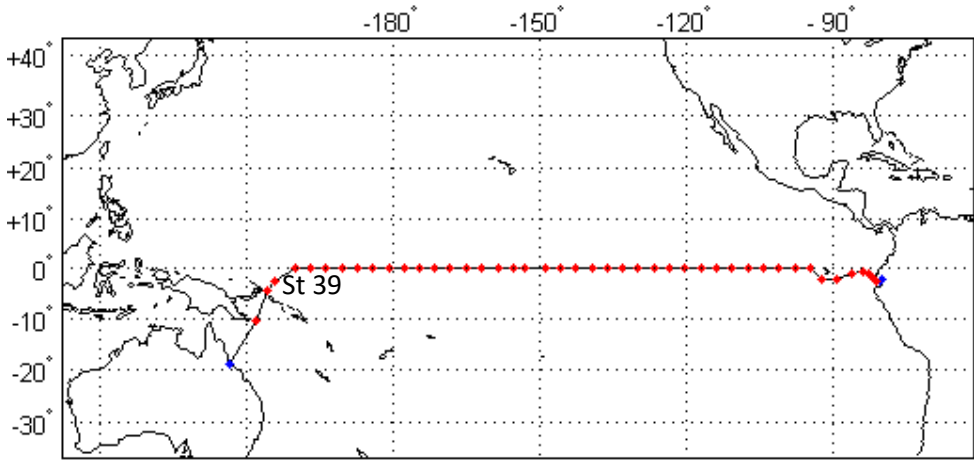

Fig. 1: Map of the Pacific Ocean with our cruise track (black line), stations (red dots) and current station 39 indicated.

Fig. 2: CTD deployments on Sonne. Photos by Lea Blum

Ammonium: Ammonium is released from phytoplankton debris during remineralization in the water column. Ammonium a readily available nitrogen species and therefore the concentrations in the oceanic surface waters are very low, whilst a maximum is often noticeable in subsurface waters. During our cruise we noticed a subsurface ammonium maxima at most stations. Figure 3 shows an example profile for ammonium at station 34 (0° S/175°E).

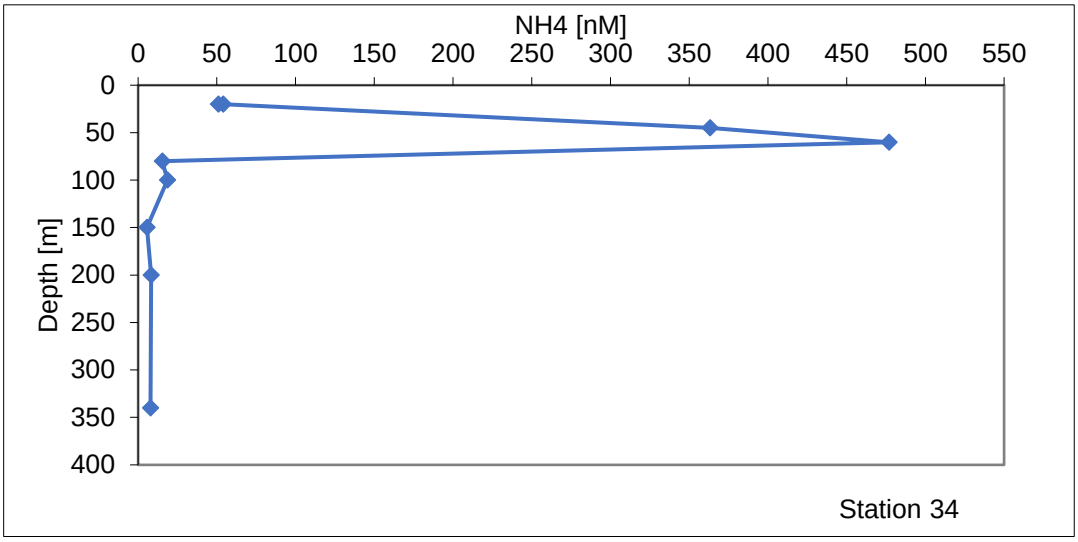

Fig. 3: Depth profile of ammonium in the water column at station 34 (0°S/175°E).

Concentrations ranged from ca. 50 nM in the surface waters of station 34, to a maximum of 470 nM at 60 m depth. In waters below 100 or 200 m, the ammonium concentrations are typically below the limit of detection of about 5 nM as the ammonium will be converted to nitrate. The ammonium measurements were conducted by Anne Imig, using a fluorescent OPA method.

Total Alkalinity and pCO_2: Along our cruise track whilst on the equator, we had pCO_2 levels which were higher than atmospheric levels (Fig. 4). This indicated that the ocean acted as a source of CO_2 to the atmosphere. The shoaling of the Equatorial Undercurrent during our cruise resulted in subsurface supply of this older water which was enriched in CO_2 and nutrients. After station 38 on the equator, we turned southwest and as soon as we left the equator, the surface ocean pCO_2 levels declined below atmospheric levels (currently about 424 ppm) due to CO2 uptake during photosynthesis (Fig. 4).

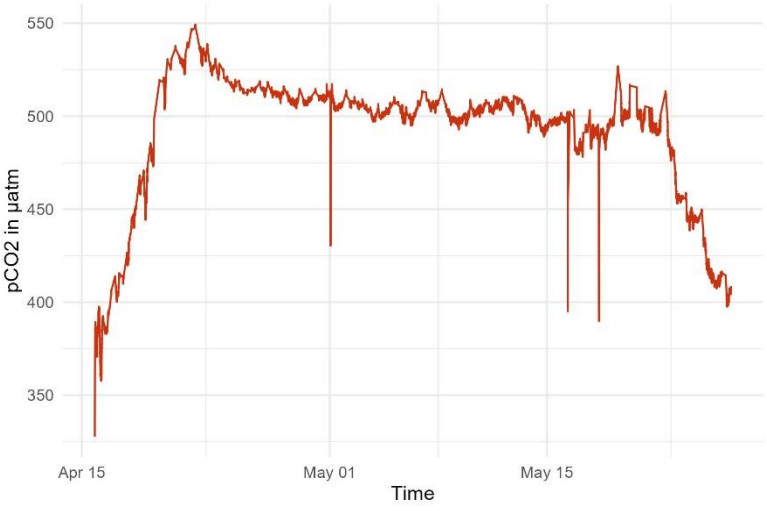

Fig. 4: Preliminary data for pCO2 during cruise. Data by Rieke Schäfer.

Rieke Schäfer (PTB/GEOMAR) is also measuring total alkalinity continuously in the surface waters along the cruise track. She is using a novel underway alkalinity system for this, and is supported by Li Qiu (GEOMAR/Xiamen). Alkalinity ranged from about 2300 µmol/kg in coastal waters of Ecuador to a maximum of 2450 µmol/kg along the equator, with most variability related to salinity.

We thank captain and crew for their outstanding support during SO298.

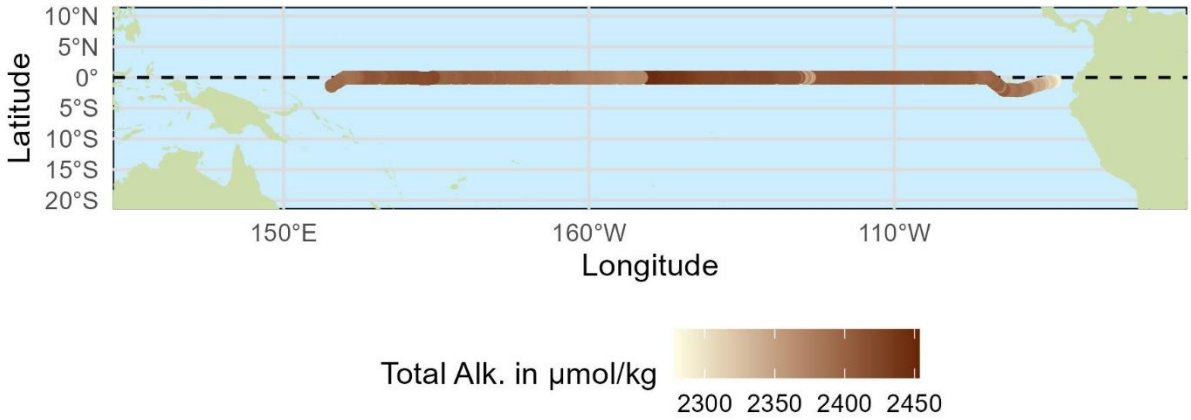

Fig. 5: Preliminary data for total alkalinity along the cruise track. Data by Rieke Schäfer.

RV Sonne at sea 5°S/154°E

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