

## Expedition SO287 – CONNECT

11.12.2021 - 11.01.2022

Las Palmas - Guayaquil

### 2<sup>nd</sup> Weekly Report

13.12. - 19.12.2021



## At the Mid-Atlantic Ridge

The first week of the expedition SO287-CONNECT lies behind us 39 scientists. The hectic and stress of the first set-up days has faded away and in the meantime everyone has settled into a routine. The routine of the expedition is determined by the stations, which we carry out once at noon and once in the middle of the night, in order to have a regular station distance and also to be able to distinguish the light-dependent processes in the seawater.

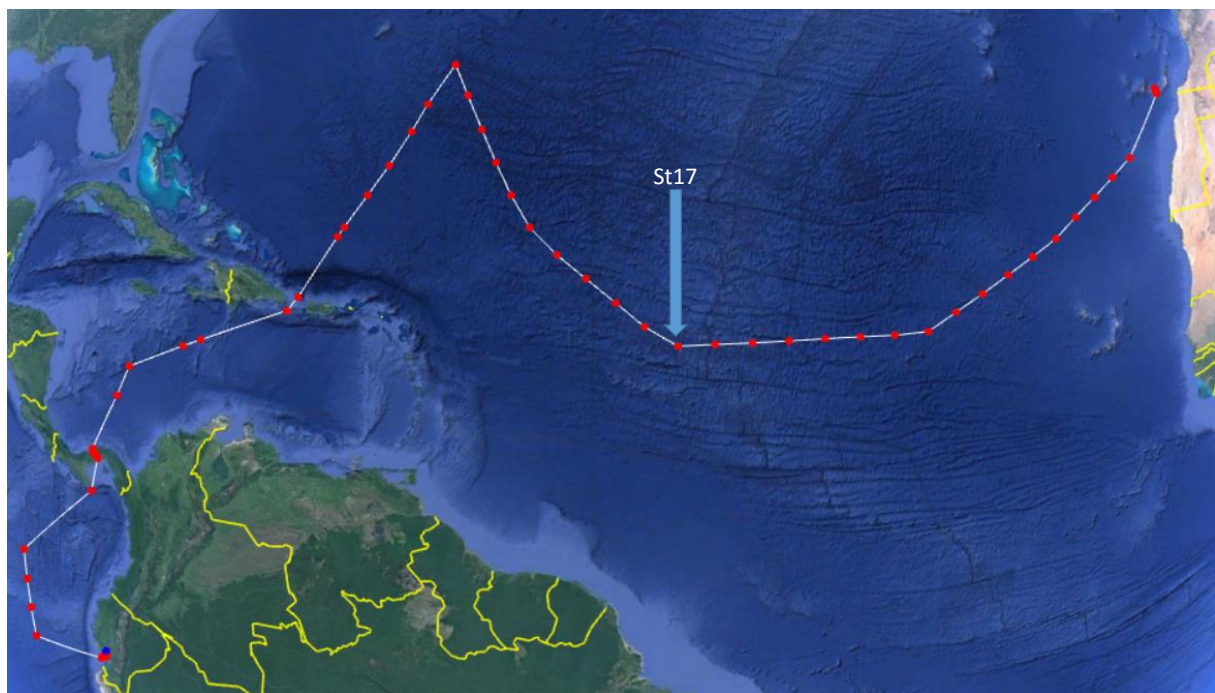


Fig. 1: Planned route SO287-CONNECT. At noon on 20.12.2021 we reached station 17.

Monday noon we reached station 17 after crossing the summit of the Mid-Atlantic Ridge at station 16 the night before. We are well on schedule and have successfully completed all stations so far. Well...successfully means that at noon we conducted three depth profiles a) to 100), b) to 200), c) to 1000 m to collect water samples and measure the water column with a suite of optical and chemical sensors. When the crane water sampler arrives on deck, all 20 samplers are ready with their sample bottles and the initial normal chaos surrounding the inadequate amount of water with some sample containers running empty has now faded. Right at the beginning of the trip, a sampling pump for insitu sampling fell dry, burned out, and has since been unable to be used, putting additional strain on the water budget. We do a deep cast to the bottom in the middle of the night and sampling is generally around 3 am. As groups have successfully formed, people are alternating between sleep and sampling. in the night. The introduction of additional shallow sampling up to 200 m (four depths in the surface with 30 liters of water per depth) relieved the water budget considerably. Unfortunately, sampling of the surface film on the ocean surface is more often unsuccessful because wind and waves make it impossible to launch the boat needed for this purpose. So far it could only be deployed once.

The replacement plan of our boatswain Frank for the light grid net (1.20 x 60 cm) needed for sampling, was feasible except for yesterday. Here the net is led over a winch from deck, but that was yesterday and the day before, because of the strong wind also too dangerous, since the sharp-edged metal net was thrown upward jerkily. So the sampling had to be stopped here as well.

				Isabala 0.4	Goose 0.7	Grebe 0.6	Jubal/H 0.5	Totana 0.3	Karoo 0.2	Haref 0.2	Quarim 1.0/4.2	Jim 0.7	Jim 2.2/4.2	Sandra 0.4	Tania 2	Markus 0.5	Tobi 1.2	Tota 1.2	Flötger 1.5	Karsten 2	Petering 0.12	Katharina 1.2
1	287 023 73	5000	3.6	0.4		0.6	0.5	0.3	0.1	0.2									1.5			
2	287 023 74	5000	8.4		0.7							0.7					7					
3	287 023 75	3500	3	0.4			0.5	0.3	0.1	0.2									1.5			
4	287 023 76	3500	8.4		0.7							0.7				7						
5	287 023 77	3500	2.8											0.4			1.2	1.2				
6	287 023 78	2000	3.3	0.4		0.6	0.5		0.1	0.2									1.5			
7	287 023 79	2000	8.4		0.7							0.7				7						
8	287 023 80	2000	2.8											0.4			1.2	1.2				
9	287 023 81	OMZ (470)	6.2	0.4	0.7		0.5		0.1	0.2				0.4			1.2	1.2	1.5			

Fig. 2: Water sampling plan of the night CTD, which is driven to the bottom.

Otherwise, all instruments and samplings are running excellently right now with only a few other exceptions, which include an atmospheric measurement instrument and our ADCP 300Khz that we brought along.

Back to the day before yesterday! After sailing in vain wind from behind and calm with the wave during the first days, we now entered the areas of superimposed wind seas. Waves from different directions and with different heights, caused by current and days ago prevailing winds in the North Atlantic and storms, which now push their wave crests to here (17°N -40-50° W) rock the ship. So, unexpectedly for many, there were one/two very strong sidelayes of the RV SONNE, which carried everything that was not tied down from the tables to the ground. However, since most of the equipment had already been well tied down at the time of departure, there was little rattling and no serious damage. Also, since yesterday, one can clearly feel the increasing leg and abdominal muscle work that is necessary to keep balance on the ship and to walk reasonably straight through the corridors or to get up and down the stairs without hitting the walls with the shoulders. Speaking of stairs; the RV SONNE is very expansive and quite tall with its 10 floors and it was quite exhausting for me, especially in the first few days, to have to switch between bridge deck 8, working deck 3, then back to compass deck 9 and back to bow deck 6, then to deck 3..... But even that is getting better and I am already a bit fitter and also the Corona home office belly fat is already decreasing a bit. Whereby it is made impossible for all, which had decided to slim down, to hold on to their good thoughts with the good kitchen. But fitter is already something...

Text passage by Markus Schartau: The station work began shortly after leaving the Canary Islands. There was no water sampling before reaching international waters (Figure A). Even before embarkation in Las Palmas, northwesterly winds prevailed for several days, with fairly constant wind speeds, between 5 and 8 m/s. The first two stations showed that the upper water column was well mixed down to about 100 to 120 m (Figure D-E). At the second station (23° 42.62'N 21o 20.25'W), an increased phytoplankton biomass with appreciable primary production was observed, which was accompanied by concomitant elevated oxygen levels (> 200 µmol kg-1) (Figures B and C). Southwest of the Canary Islands, a weak, yet pronounced, deep chlorophyll maximum formed just below a mixing depth of 50 m. Already after the first two stations we could observe effects of lateral water masses coming from the coast in our CTD profiles (as well as satellite images). These water masses are advancing into the upper 200 m of the previously well-mixed waters of the Canary Current (the southwestern current component of the subtropical gyre in the North Atlantic). These lateral signals

have higher salinity ( $S > 37$ , Figure E) between 50 and 120 m. This occurs in a depth range that was previously completely mixed.

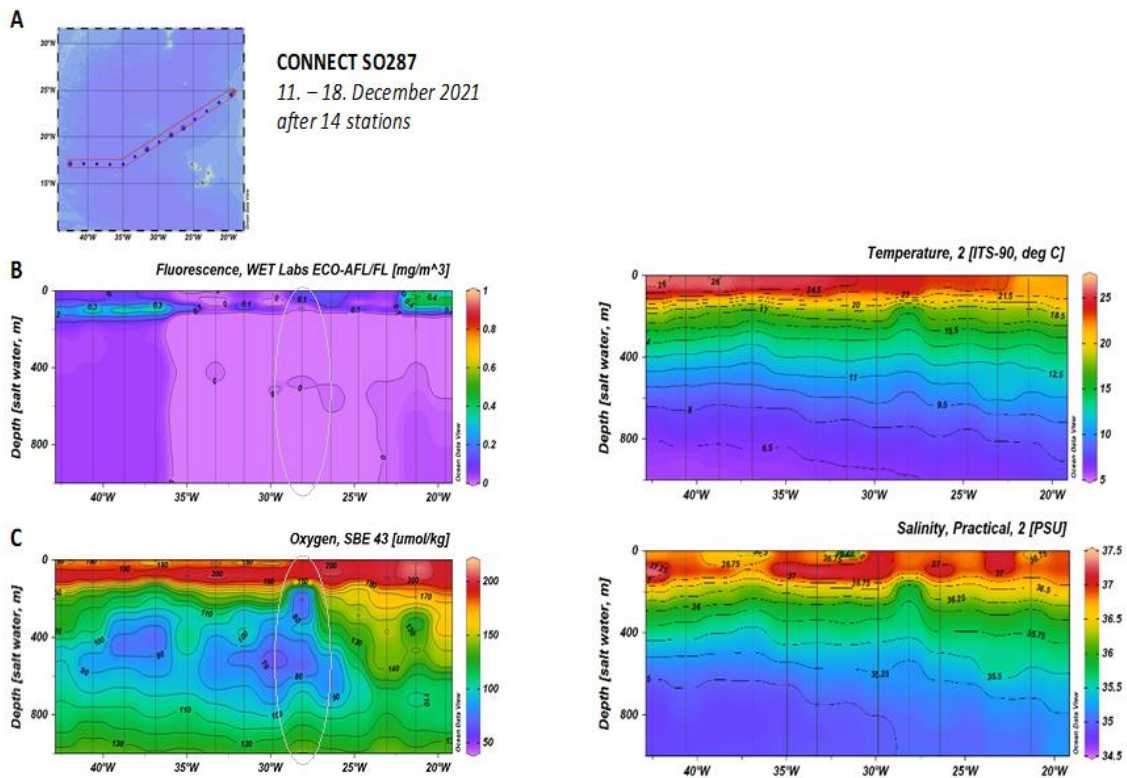


Fig. 3: Route and stations of SO287-CONNECT until 18 December 2021. Figures by Alexandra Rosa, Jesus Reis and Claudio Cardoso (ARDITI).

With increasing distance from the Canary Islands (stations 3 and 4), lower phytoplankton biomass and lower primary production have already been observed. Due to this low biomass, lateral advection and meandering of filaments of productive water originating from the nearshore upwelling region (Mauritanian upwelling) leave clearly detectable traces in the biogeochemistry. A particular event is the discovery of a vortex-like phenomenon at Station 6 (see marked station in Figures B and C). Strikingly, this signal introduces phytoplankton, albeit at low concentrations, but at the same time shows a pronounced reduction in oxygen just below the productive upper layers (Figure C).

As RV Sonne began to move westward, away from the African shelf region, oligotrophic conditions occurred, and we found a deep chlorophyll-a maximum (DCM), typically between 90 and 110 m. ...First colonies of nitrogen-fixing algae were found on filters...and we are excited to see what happens next. And the Christmas preparations are also in full swing....

With best regards, the team of SO287-CONNECT - all safe and sound on board - will see you next week.

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GEOMAR Helmholtz Centre for Ocean Research Kiel