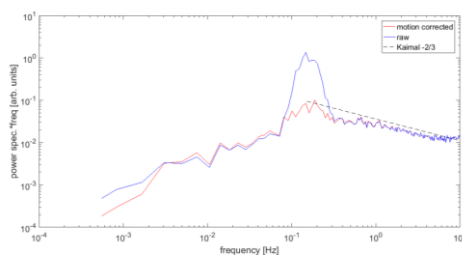


R/V Poseidon cruise POS519

22.01. – 11.02.2018, Las Palmas – Mindelo

3rd Weekly Report

After two weeks at sea and over a week in the patch, there was still no routine for the work onboard. Every four hours we took our samples from the pumping system and every 8 hours we sampled from the CTD. However, we never knew where our stations would be until the last minute. In the meantime, the drifter made off with 3 kn to the southwest and we were unsure if it was still in the upwelling patch. All other measurements showed that we were still in "our" patch and so we concentrated on measuring it as best we could. One focus of the cruise was to directly measure the gas exchange of different gases within the upwelling patch. For the eddy-covariance (EC) method, we had the best conditions during our journey, as we had strong concentration gradients between air and water together with high wind speeds. To determine the gas exchange by means of EC, the fluctuations of the vertical wind and the atmospheric concentration of the desired gas at a high frequency are measured. To calculate the gas flow, these are multiplied together and averaged over a period of 10 - 60 minutes. This method was originally developed for measurements on land and poses further challenges for measurements on the ocean. The fact that the ship moves in the waves, means that the measured wind speeds must be corrected for the movement induced by the ship motions. Nevertheless, EC measurements have been successfully performed on research vessels. During the past few weeks, an eddy-covariance system has been used to measure CO₂ fluxes at the bow of the ship. The graph below shows a power spectrum of vertical wind speed. A power spectrum illustrates how much signal is found with respect to the frequencies of turbulent atmospheric eddies. The blue curve shows the recorded uncorrected signal with a clear peak at frequencies of ship movement. In the red curve, this peak is no longer visible, which shows us that we are able to successfully correct our data. The final correction of all data and calculation of fluxes will take place in Kiel.

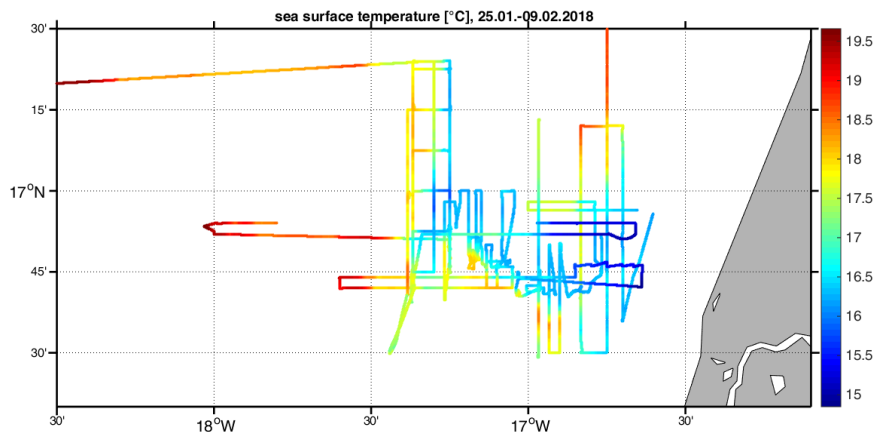


Above: Power spectrum of vertical wind speed. The uncorrected values are in blue and values corrected for ship's motion are in red. Below, left: Katharina adjusts her laser for the COS measurements. (Photo: Lisa Hoffmann)



Bow of the Poseidon with the eddy covariance mast for the eddy covariance measurements. (Photo: Lisa Hoffmann)

In addition to the eddy-covariance measurements of CO_2 , we attempted to measure the carbonyl sulfide (COS) flux for the first time using this method. So far, no EC measurements have been performed for COS and the equipment used (Mini-QCL, Aerodyne Research) has never been tested under such harsh measurement conditions. It is already apparent that the ship's movements have an effect on the measurement performance of the instrument and that the raw data must first be corrected for the ship's movement before fluxes can be calculated. In addition to the EC measurements, measurements of the COS concentration in the water also took place. For this a membrane equilibrator was used. The full data workup will occur on land.



Sea surface temperature along our route. The blue color shows cold temperatures, which indicates upwelling water. (Fig. Tobias Steinhoff)

On the evening of the 7th of February we drove our last transect over the patch and completed our chaotic cruise-track. Then it was time to set course on Mindelo. On the way to Mindelo, we had time to gather all the preliminary results and we can already see that we have exciting data. But, now we have to focus on dismantling everything and packing it in boxes, so that our equipment can be safely transported to Kiel.



Scientific cruise participants of the POS519 expedition.

Greetings, on behalf of all participants in the cruise,

Tobias Steinhoff