Short cruise report-– Research Vessel Maria S. Merian-
Cruise MSM 07/2 Las Palmas - Walvis Bay
February 19th – March 8th , 2008

The 'M.S.Merian' left Las Palmas de Gran Canaria on Feb.19th at 1.30 a.m. and reached the first station in the upwelling region off Mauretania on Feb. 20th at 4.00 p.m. Water samples within the first 200 m of the water column were obtained with a CTD-rosette-sampler system, analyses of oxygen and inorganic plant nutrients were performed immediately and particulate material was filtrated for later analysis. Rate measurements for biological element turnover of microalgae and bacteria were performed within the surface mixed layer. Samples were taken for molecular biological characterization of the microbial communities and the distribution of bacteriochlorophyll was measured, the role of which in the production cycle is quite unclear. By means of a LADCP (Lowered Acoustic Doppler Current Profiler), attached to the CTD , current speed and direction in the top 500 m of the Water column was estimated.
This standard programme was repeated at a station within the Mauretanian EEZ at 19 °N, 19 ° W on the 21st and at a station at 10° N, 20° W on the 22nd of February. Temperature, salinity and partial pressure of CO_2 were estimated continuously in surface waters, provided research permits from national authorities were granted, when the cruise track touched territorial waters of African states.
The data, that are available up to now, show a relatively uniform structure of the 30 – 50 m warm surface mixed layer, a deep chlorophyll peak at this depth and directly below, the appearance of an oxygen minimum layer with oxygen concentrations often lower than 1ml l^{-1}. Concentrations of dissolved inorganic nutrients were at the detection limit in the surface mixed layer . With depth, they increased corresponding to the decrease of oxygen, however, with no detectable variation in the ratio between inorganic nitrogen and phosphorus compounds. Rates of microbial degradation were by far higher at the surface than in deeper waters indicating a rapid turnover of organic matter at the surface layer. Rates of primary production are not yet evaluated. The mixed layer shows a stable equilibrium between production and decomposition as indicated by oxygen and carbon dioxide concentrations, which are always close to the atmospheric equilibrium value. Our high resolution sampling in the top 100 metres showed the steep gradients of all variables at the onset of the deep chlorophyll maximum at about 50 m depth.

From Feb. 24th until the 1st of March a transect through the equatorial current system was performed , employing towed instruments (ADCP and Scanfish) and discrete water stations down to 500 m depth every 0.5 degree. At these stations the full set of biological and chemical measurements was caried out as described above, so that a well resolved desription of the aequatorial system in terms of physical and biogeochemical variables is expected. First results show a well resolved equatorial undercurrent (EUC) with higher current speed than expected at this time of the year. The signature of this current became well visible due to the temperature, salt and oxygen characteristics , which could be directly measured with the CTD-probe. The ventilation of the oxigen minimum zone in the Angola-Gyre by this EUC could be clearly observed below a low salinity surface layer in the whole Gulf of Guinea. Interesting results from the biological laboratories concern the lateral distribution of bacteriochlorophyll from north to south. Within this gradient the close coupling between bacteriochlorophyll and algal chlorophyll a in the north starts to weaken with increasing nutrient limitation in the surface layer and in the south-equatorial part of the transect the maxima of Chl.a and bacteriochlorophyll are clearly spacially separate. The molecular biological and flow cytometric analyses of the collected material will supply further insights into the dynamics of this physiologically and ecologically interesting group of organisms.

The rates of nitrogen-fixation will as well be measured at the home-laboratories after the arrival of the material on the ship. A first microscopic survey on board showed the presence of potential nitrogen fixing bacteria of the genus *Trichodesmium* north of the equator, which displayed, however, morphological differences to the forms known to fix atmospheric nitrogen.
The surface layer over the whole transect was dominated by the 'microbial loop' system, with highest rates of production and decomposition at extremely low levels of biomass of algae and bacteria. In this type of system the most important accumulation product is not biomass but dissolved organic carbon . The analysis of this dissolved material will be performed after the collected samples have arrived at the home lab.

After the equatorial transect a single station in the central Angola Gyre at 9° S, 8° E was studied with a hydrocast down to 1500 m depth on the 2nd of March. Here the chlorophyll maximum layer could be found at a depth of 20 m with much higher biomass levels as compared to the stations on the equatorial transect. The oxygen values in the minimum zone at 400 m depth were well below 1 ml l-1 which is both indicative of a highly dynamic and productive system. Nitrate at this depht was , however, still in a balanced ratio to phosphorus and therefore is obviously not employed in denitrification processes.

On the 4th of march benthological work started at the northern part of the namibian coast southwards of the Kunene rivermouth. Here, on a coast-near grid of 20 stations between 17° 16' S and 17° 25' S biological samples were obtained with grab sampler , multicorer and dredge. At every station the watercolumn was sampled for dissolved and particulate contituents as well. At two stations single cores from the multicorer were incubated in a temperature-adapted room for 12 hours and the exchange between water and sediments in terms of oxygen, nitrate, phosphate and silica was examined.
The biological samples from the sediment were preserved and will be analyzed taxonomically in a joint action with Namibian colleagues later. The sediments were extremely muddy and rich in organic matter even at coastal stations. This led to anoxic conditions with free hydrogen sulfide just below the sediment surface. Nevertheless a large amount of clams and snails with a restricted diversity inhabit this area, which obviously can cope with the reduced oxygen concentrations in the bottom water. Here a clear decrease of the nitrate values towards the sediment could be observed, which indicates high sedimentary denitrification rates. The role of the macrofauna in this process is not yet clear but the very high exchange rates between sediment and water in the incubation experiments indicate a dominant role of these organisms in the transport of interstitial water. This part of the program was terminated at the 6th of March and the ship headed towards Walvis Bay.
On the track along the coast on the 200 m depth isoline hydrographical measurements were performed very 20 miles in order to characterize the regional water mass distribution at this time of the year and provide these data for the next leg, which was concerned with the local biogeochemical processes in the Benguela region.
The ship reached Walvis Bay on the 8th of March after a successful cruise with an accomplished programme according to plan and no problems at all.

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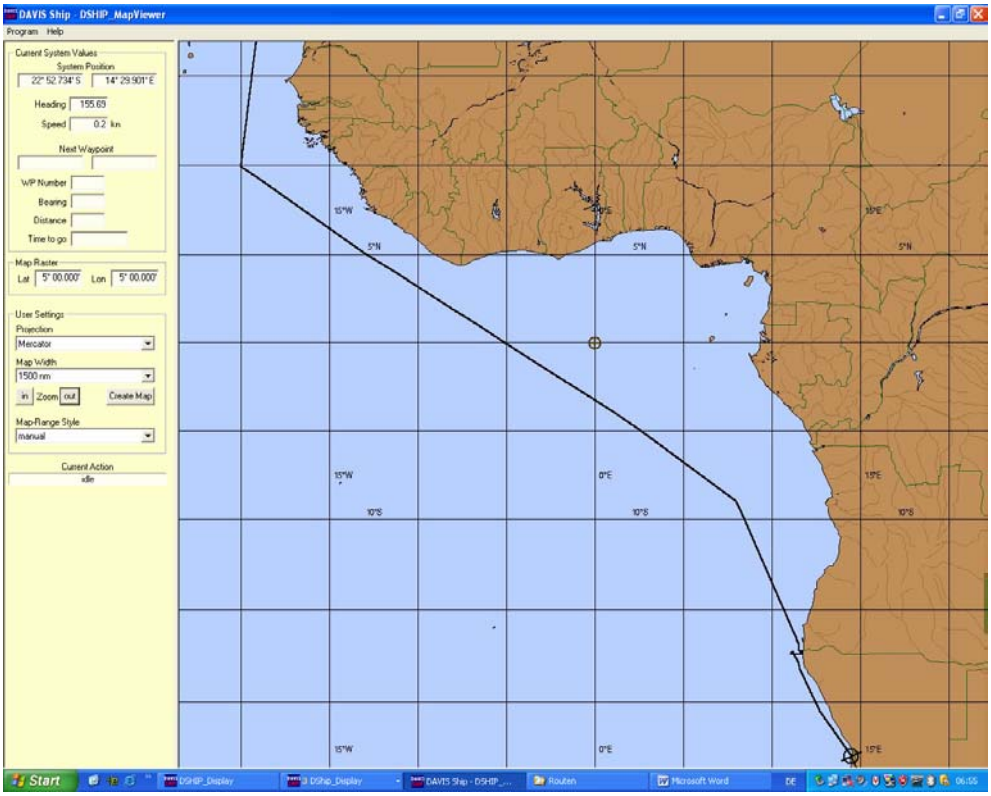

Fig 1: Track of the cruise MSM 7/2a

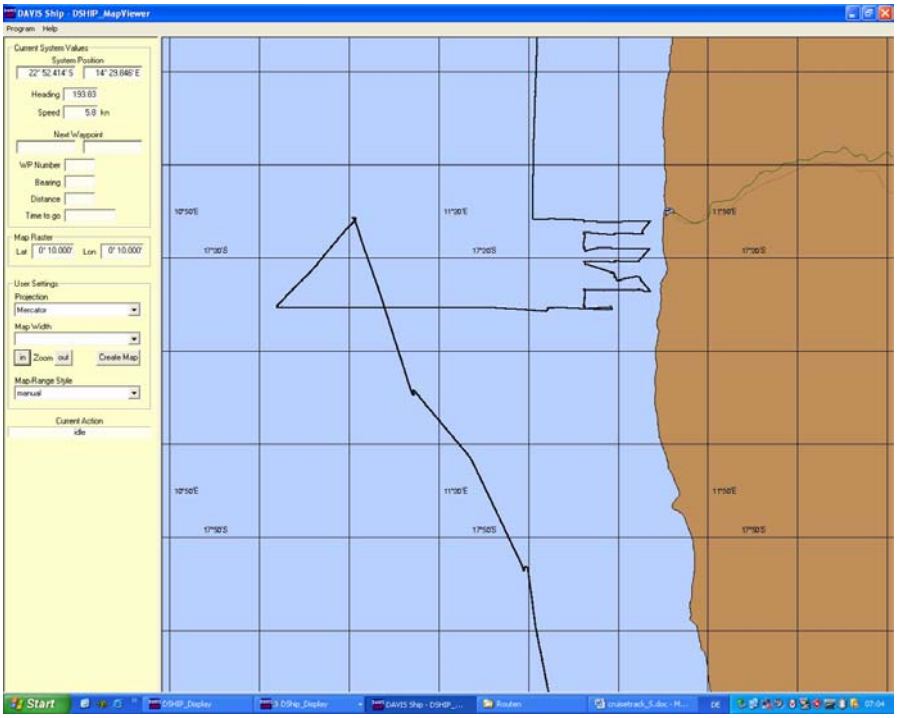

Fig 2: Track in Namibian coastal waters MSM 7/2a