Chlorophyll-a and sea surface observations along the Brazilian Coastal Current front

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The Southwest Atlantic has an outstanding role in the carbon sinking from the atmosphere according to recent studies. Photosynthesis has been shown to be the main mechanism responsible for CO_2 sequestration in this area. The Brazilian Continental Shelf south of 25°S is marked by the winter northward flow of the Brazilian Coastal Current (BCC). The cold and very productive waters of the BCC form a lateral front with the warm (less productive) tropical waters transported southwards by the Brazil Current (BC). During June 2012 the Brazilian Oceanographic vessel Cruzeiro do Sul performed an oceanographic campaign along the southern coast of Brazil as part of the Atlantic Ocean Carbon Experiment (ACEx). Both oceanographic and meteorological data were collected along 5 cross-shore transects between 25.7°S and 33.7°S. Sea Surface Temperature (SST), Sea Surface Salinity (SSS), chlorophyll-a concentration and meteorological variables were collected along each of the 5 transects by standard oceanographic instruments and by the automatic weather station onboard the ship. Chlorophyll concentration and SST were validated against satellite estimates showing good agreement (RMSE = 0.75 $mg.m^{-3}$ and 0.83°C). The highest SST gradient (0.32°C/km) was observed around 33.7°S, where the BCC's SST reached a minimum of 14.3°C and the maximum BC's SST was 19.7°C. Previous studies have indicated the 18.5°C isotherm as a good geographical limit between waters carried by both currents. This isotherm was located south of 29°S during the campaign, in agreement with its expected mean northern limit in June. SSS gradient was also highest in the southernmost transect. While SSS presented little variability in BC's waters (36.1 ±0.66) it constantly decreased southwards in the BCC, getting as low as 27.3. These SST and SSS values unfold the three surface water masses known in the region: the Tropical Water, the Subtropical Shelf Water and the Plata Plume Water. An inverse correlation between chlorophyll concentration and SST was also observed (R^2 = 0.60). This is expected for the water masses in southern Brazil during winter. The maximum chlorophyll concentration, 6.29 $mg.m^{-3}$, was measured inside the BCC at the southernmost profile (33.7°S) and very near to the coast (19 m isobath). In the BC the

maximum chlorophyll concentration was 1.58 mg.m^{-3}. Finally, heat fluxes between ocean and atmosphere were calculated along the transects. Higher heat fluxes directed from the ocean to the atmosphere were observed over the BC, a fact that, combined with highest values of SST than surface air temperature, contributed to a more unstable atmospheric boundary layer over the BC. Future steps of this work will relate these results and the phytoplankton community composition with CO_2 fluxes measured during the campaign.

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