Session: C14 Poster: T48B

Remote estimates of marine primary productivity in the Southern Ocean from Carioca drifters and satellite based observations

Liliane Merlivat[†]; Jacqueline Boutin; David Antoine
[†] LOCEAN/CNRS, France
Leading author: merlivat@locean-ipsl.upmc.fr

The uptake of atmospheric CO2 by the ocean is controlled by the magnitude and variability of carbon oceanic sources and sinks. An understanding of the physical and biogeochemical key parameters is a needed step to quantify the role of the ocean in the carbon cycle. Biological processes control the consumption of dissolved inorganic carbon at the ocean surface. Productivity measurements in the open ocean are usually performed during ship-based studies using in vitro methods. This is a very time-consuming work and expensive approach. We present new in situ estimates of biological carbon production rates deduced from high frequency measurements recorded along the trajectories of lagrangian autonomous drifters CARIOCA. They are compared to the marine net primary productivity as derived from Seawifs observations and an ocean color model. Our study is focused on spring-summer periods, December 1st- March 31st, over the years 2006 to 2009 based on data obtained along the trajectories of 6 drifters in the Atlantic and Indian sector of the Southern Ocean. We concentrate on biological periods during which derived hourly values of the surface dissolved inorganic carbon (DIC) displayed conspicuous daily variations with a close to sunrise maximum and a close to sunset minimum. This decrease of DIC is an in situ measurement of the Net Community Production (NCP) during daytime at 2 meters depth (NCP daylight). NCP integrated over the mixed layer is computed from the daily change of the maxima of DIC combined with mixed layer depths estimated from Argo floats. The daily values of NCP are significantly smaller in the subantarctic and polar zone than close to the subtropical front. Bursts of net community production (NCP) lasting up to a few days are observed. The individual values of NCP are in many cases associated with filaments or eddies observed on ocean color images collocated with the trajectories of the buoys. An ocean color model is used to compute depth integrated marine net primary production (NPP) for the same periods along the trajectories of the buoys. The relative trends of buoy derived estimates of NCP and Seawifs derived NPP are analyzed. This study highlights the possibility of estimating the magnitude of the ocean carbon biological pump by an in situ non-intrusive method from unattended platforms and establishing links between remote field data and satellite based ocean color estimates, which will play a critical role in the integration of in situ data for reliable global estimates of ocean primary productivity. This is of special interest in remote areas like the Southern Ocean.