Geophysical Research Abstracts
Vol. 15, EGU2013-8899, 2013
EGU General Assembly 2013

In situ and satellite based estimates of marine productivity: constraints on the seasonal cycle of the Southern Ocean surface pCO_2

Liliane Merlivat (1), Jacqueline Boutin (1), and David Antoine (2)

(1) LOCEAN, CNRS/UPMC/IRD/MNHN, PARIS, France (jb@locean-ipsl.upmc.fr), (2) LOV, CNRS/UPMC, Villefranche sur Mer, France (antoine@obs-vlfr.fr)

We estimate in situ biological carbon production rates from high frequency measurements along the trajectories of 6 CARIOCA drifters in the Atlantic and Indian sector of the Southern Ocean during 2006-2009 spring-summer periods. Net Community production (NCP) integrated over the mixed layer is derived from the daily change of the dissolved inorganic carbon (DIC) combined with mixed layer depths estimated from Argo profiles. Daily values of NCP range from 30 to 140 mmol C m-2d-1. A satellite based ocean color model is used to compute depth integrated marine net primary production (NPP) for the same periods along the trajectories of the buoys. As already mentioned by other authors, the SEAWIFS chlorophyll are underestimated by a factor $\approx$ 2-3 in the Southern Ocean. Taking this into account, the export ratio NCP/NPP is included between 0.2 and 0.9 and decreases with increasing sea surface temperature. Monthly satellite based NPP are computed over the 38°S-55°S, 60°W-60°E area of the Southern Ocean. A seasonal budget of DIC and pCO_2 in the mixed layer is assessed. We quantitatively separate all the physical and biological processes that control their monthly changes. A good agreement is found with pCO_2 climatology of Takahashi (2009). On an annual timescale, mean NCP is $\approx$ 4-5 times greater than mean CO_2 invasion, being respectively equal to -4.9 and 1.1 mol C m-2yr-1. Attention is drawn on key parameters that control the seasonal distribution of surface pCO_2 and air-sea CO_2 uptake that will have to be carefully monitored or modeled under changing environmental conditions.