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Carbon Flux to the Deep in three open sites of the Southern European Seas

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In this study we investigate the functioning of the biological pump in the Southern European Seas (SES). In order to constrain the rates of carbon production and export to depth, we combine estimations of satellite primary production data, algorithm-generated fluxes out of the euphotic layer and particulate organic carbon (POC) fluxes, as measured by sediment traps at the mesopelagic and bathypelagic layers in three sites located in the Western Mediterranean (WMED), the Eastern Mediterranean (EMED), and the Black Sea (BS). POC fluxes were monitored during one year period (Sept 2007 - Sept 2008) in the frame of SESAME project.

Annual primary production by satellite estimations yielded values of 396 mg C $m^{-2}d^{-1}$ (EMED), 563 mg C $m^{-2}d^{-1}$ (WMED) and 617 mg C $m^{-2}d^{-1}$ (BS) (SeaWiFS; http://emis.jrc.ec.europa.eu). At the scale of the whole Mediterranean and the Black Sea basins, spatiotemporal variability of Chl-a concentrations during the time of our experiments revealed significant differences in the seasonal cycles. While the WMED site showed increased biomass centred around spring (March-April 2008), the EMED site showed higher values in mid-winter (January 2008), even thought almost one order of magnitude lower than those recorded in the western site. In contrast, the BS site showed increased Chl-a concentration in autumn (Nov 2007) and a lower increase in early spring (March 2008). Overall, the observed Chl-a seasonal patterns for the WMED and EMED sites match quite well the typical seasonal patterns ascribed to their hosting areas, corresponding to "blooming" and "non-blooming" biogeographic regions, respectively, as proposed by D'Ortenzio and Ribera d'Alcala (D'Ortenzio and Ribera d'Alcala, 2009). Moreover, based on the timing of the bloom (late fall) the seasonal pattern of the BS site is quite similar to that observed in Mediterranean regions having a "coastal" regime. Thus, specific physical and biogeochemical settings in the three contrasting sites affect the seasonality of the POC production and export to depth.

The fraction of primary production that is exported out of the euphotic zone ranges from 7 to 15%, while the fraction of primary production exported below 2000 m depth was 0.61%, 0.34% and 0.97% in the WMED, EMED and BS, respectively. Export rates at the BS and WMED sites found to be slightly higher, while this at the EMED site to be comparable to the global ocean average of 0.31% at 2500 m depth (Lutz et al., 2007). POC export to depth are driven by meso-scale current activity, vertical mixing events, riverine discharges and atmospheric deposition.

Understanding the processes driving carbon cycle in the SES is important for assessing the impacts of the predicted climate change in this region, with an ultimate goal to be included in the global ocean carbon models.

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References

D'Ortenzio, F. and Ribera d'Alcala, M., 2009. Biogeosciences 6, 1-10.

Lutz, M., Caldeira, K., Dunbar, R.B., Behrenfeld, M.J., 2007. J. Geophys. Res. 112, C10011.