Insights on the link between surface productivity and benthic communities in the deep sea

Lins Lidia[1,2], Katja Guilini[1], Freija Hauquier[1], M. André Esteves[2] and Ann Vanreusel[1]

[1] Marine Biology Department, Ghent University, Krijgslaan 281/s8 9000, Belgium
E-mail: lidia.linspereira@ugent.be

[2] Laboratório de Meiofauna, Universidade Federal de Pernambuco, Av. prof Moraes Rego, 1235 CEP 50670-901, Brazil

The biological pump, looked as the fraction of primary production exported from the euphotic zone, is considered an important mechanism responsible for the coupling between the primary productivity carried out in surface waters and the sea bottom, the so-called benthic-pelagic coupling (De La Rocha and Passow, 2007). These export fluxes reflect general patterns of primary production, reaching the seabed and acting as food sources for benthic organisms, such as the small benthic-dwelling metazoans named meiofauna (Lutz *et al.*, 2002; Ramirez-Llodra *et al.*, 2010). Samples for this study were collected in the deep sea Southern Ocean, along the Polar Front, and differed in an increasing east-west surface-based chlorophyll *a* (Chla) gradient. Surface and benthic environmental parameters were measured, as well as the particulate organic carbon (POC) flux through algorithms based on satellite measurements. In addition, their link with meiofauna total and relative abundances and standing stocks was analysed. The results revealed an east-west increase in net primary productivity (NPP) and bottom Chla concentration ($p<0.001$), while the POC flux divergently decreased westwards ($p<0.001$) and showed an inverse relationship with depth, revealing that a lower amount of the net primary productivity reaches deeper regions. Nematodes were the most abundant group in the meiofauna (84.4% - 92.4%) and its relative abundances increased westwards, being mainly correlated with the NPP and the Chla. Concerning the nematode standing stocks, no clear patterns in relation to the different surface and benthic variables was observed. The inverse correlation between meiofauna abundance and POC flux might be due to differences in depth (3760.5m-4154.2m), which plays a crucial role in the transfer efficiency of POC or because the processes influencing POC fluxes are not quantitatively understood, despite being well studied. Moreover, POC fluxes estimates are based in a model (Lutz *et al.*, 2002) with an equal-area grid of 9-km resolution and might not reflect small-scale patterns. Furthermore, considering the influence of strong currents in the Southern Ocean, lateral advection processes may be driven and move waters with a high Chla concentration eastwards (Demivov *et al.*, 2012). Nevertheless, based on the positive correlation between meiofauna and Chla and NPP monthly-averaged values we can assume that more productive regions support higher meiofauna and nematode abundances.

References

De La Rocha C.L. and U. Passow. 2007. Factors influencing the sinking of POC and the efficiency of the biological carbon pump. Deep-Sea Research Part II-Topical Studies in Oceanography 54(5-7):639-658.

Demidov A.B., S.A. Mosharov et al. 2012. Meridional asymmetric distribution of the primary production in the Atlantic Sector of the Southern Ocean in the austral spring and summer. Oceanology 52(5):623-634.

Lutz M., R. Dunbar et al. 2002. Regional variability in the vertical flux of particulate organic carbon in the ocean interior. Global Biogeochemical Cycles 16(3).

Ramirez-Llodra E., A. Brandt et al. 2010. Deep, diverse and definitely different: unique attributes of the world's largest ecosystem. Biogeosciences 7(9):2851-2899.