O27

RE-INTERPRETING THE CHLORIN SIGNAL IN SEDIMENTS TO DECIPHER PAST CHANGES IN THE MARINE CARBON CYCLE

Natalia NÚÑEZ[1] and Antoni ROSELL-MELÉ[1,2]

1. ICTA, Autonomous University of Barcelona, Bellaterra 08193, Catalonia, Spain.
2. ICREA, Passeig Lluís Companys, 23, Barcelona 09010, Catalonia, Spain.

Finding an explanation for the occurrence of the glacial/interglacial CO_2 cycles is still one of the main challenges faced by the paleoceanographic community. The oceans, as they hold 50 times more carbon than the atmosphere, are one of the key elements of the puzzle. Marine biota plays a central role in the sequestration of atmospheric carbon dioxide by the oceans by extracting organic carbon from the surface and transferring it to the deep sea. This is the process of export production and is one of the fundamental parameters of the the biological carbon pump. A reliable tool for reconstructing past export productivity is needed to determine the efficiency of the biological pump through time since it plays a key role in the global carbon cycle. Unfortunately, none of the proxies used so far are by themselves reliable indicators of export production. In here we re-evaluate the use of total chlorophyll derivatives for the purpose of reconstructing global glacial-interglacial differences in marine export production.

The concentrations or mass accumulation rates in sediments of phytoplanktonic biomarkers have often been used to reconstruct past primary productivity of individual plant functional types or general phytoplanktonic production. A few studies have attempted the reconstruction of changes in primary productivity using total chlorins mass accumulation rates in sediments (e.g. Summerhayes et al., 1995; Harris et al., 1996). However, chlorin mass accumulation rates in sediments is the result of both phytoplankton primary productivity and the transfer efficiency of chlorins mediated by a range of degradation processes ocurring in the water column and in the water-sediment interface. One of the main questions to resolve is to determine which are the degradation processes controlling chlorin fluxes signal in diferent sedimentary regimes.

To address this question we have compiled a suite of 60 deep sea sediment cores and measured chlorin mass accumulation rates in two main intervals, the late Holocene and the Last Glacial Maximum (Figure 1). The aim is to provide a large scale overview and reconstruct regional patterns in the changes of mass accumulation rates of chlorins in diferent sedimentary and productivity regimes. By comparing surface sediment chlorin data with satellite observations on marine primary productivity and information from the water column

on oxygen content and particle fluxes we are developing a transfer function for primary export production. However, it is unlikely that information on absolute export values can be obtained with enough confidence. Therefore a key element of the approach is to rely on the relative changes between two climatic relevant periods as a way to infer changes in the marine carbon cycle.

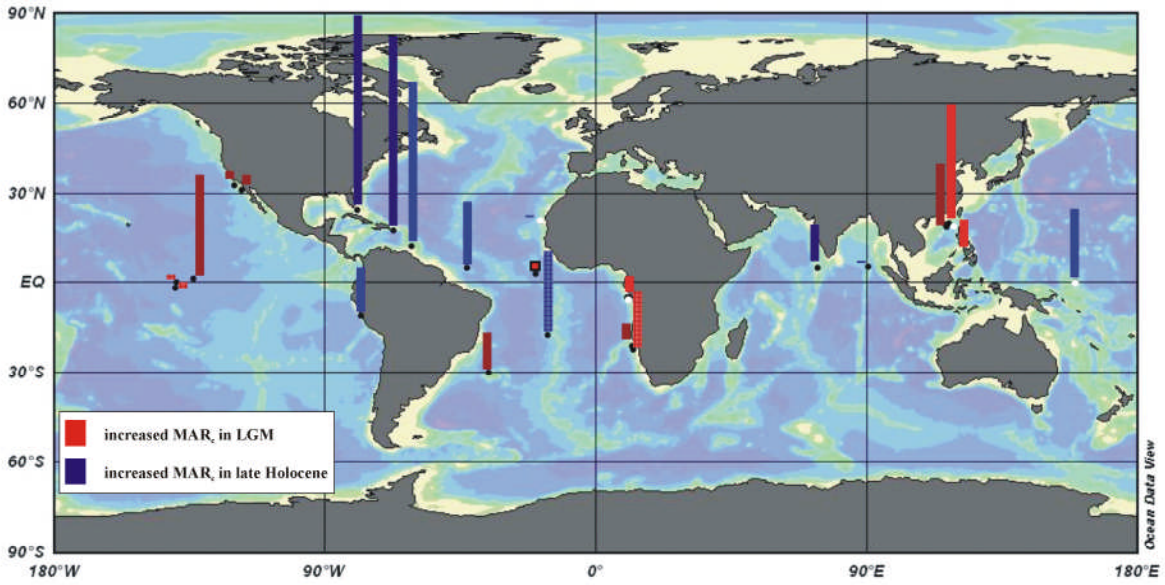

Figure 1. Preliminary results of the relative change on chlorin mass accumulation rates (MAR_C) between Last Glacial Maximum (LGM) and late Holocene. Colors bars indicate whether the chlorin mass accumulation rate increased (red) or decreased (blue) during LGM compared to late Holocene.

REFERENCES

Harris, P.G., Zhao, M., Rosell-Melé, A., Tiedemann, R., Sarnthein, M., Maxwell, J.R., (1996) Chlorin accumulation rate as a proxy for Quaternary marine primary productivity proxy. *Nature*, 383, 63-65.

Summerhayes, C.P., Kroon, D., Rosell-Melé, A., Jordan, R.W., Schrader, H.J., Hearn, R., Grimalt, J.O., Eglinton, G., (1995) Variability in the Benguela Current upwelling system over the past 70,000 years. *Progress in Oceanography*, 35, 207-251.