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Buried export productivity in the Last Glacial ocean, a global reconstruction

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It is an unresolved question whether marine export productivity was, on large scale basis, higher or lower than at present during the Last Glacial Maximum (LGM), given the conflicting information provided by different proxies and even by the same proxy in a given region. The aim of the present study is to provide a large scale overview and reconstruct regional patterns in the changes of export productivity at the LGM in comparison to late Holocene values by using phytoplanktonic biomarkers. Proxies based on the measurement of sedimentary mass accumulation rates of bulk or molecular organic carbon do not reconstruct primary productivity as sometimes claimed but rather the organic carbon component of export primary productivity that is buried in sediments (i.e. buried export productivity or BEP). This is in itself useful to reconstruct the role of the marine biological carbon pump in removing carbon from the surface ocean and hence in the variability of atmospheric CO_2 through time. By using the same approach in multiple locations worldwide we expect to circumvent some of the challenges faced in the interpretation of global multiproxy reconstructions.

We have compiled a global suite of 60 deep sea sediment cores with carefully defined chronostratigraphies, and measured biomarkers (i.e. total chlorins and alkenones) mass accumulation rates in two main intervals, the late Holocene and the LGM as defined by the EPILOG project. Results have been interpreted to reconstruct the anomaly of export productivity. The time-slice reconstruction show a complex geographical pattern without a globally uniform trend of change. We can thus corroborate claims that proposed the absence of enhanced global glacial export productivity during the LGM. For instance, BEP in both equatorial and coastal upwelling systems is not con-

sistenly higher during the LGM. In addition, western and eastern continental margins show a difference in their response during the LGM in the Atlantic and the Pacific Ocean. It is thus likely that the biological pump did not play a single, and simple, role in driving CO_2 concentrations between glacial and interglacial periods.

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