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Defining carbon export from oxygen minimum zones using isotopic tracers

Sabine Lengger (1,2), Darci Rush (3,4), Jan-Peter Mayser (2), Jerome Blewett (2), Rachel Schwartz-Narbonne (4), Helen Talbot (4), Jack Middelburg (5), Mike Jetten (6), Stefan Schouten (3), Jaap Sinninghe Damste (3), and Rich Pancost (2)

(1) University of Plymouth, BGC, SoGEES, Plymouth, United Kingdom, (2) Organic Geochemistry Unit, School of Chemistry, University of Bristol, BS81TS, Bristol, United Kingdom, (3) Dept. for Marine Microbiology and Biogeochemistry, NIOZ Royal Netherlands Institute for Sea Research, 1797SZ, Texel, The Netherlands, (4) School of Civil Engineering & Geosciences, Newcastle University, Drummond Building, NE1 7RU, Newcastle-upon-Tyne, United Kingdom, (5) Department of Earth Sciences, Utrecht University, 3508 TA, Utrecht, The Netherlands, (6) Department of Microbiology, IWWR, Radboud University Nijmegen, 6525 XZ, Nijmegen, The Netherlands

Oxygen minimum zones (OMZ) are fueled by high primary productivity, resulting in enhanced biological oxygen demand at depth, followed by oxygen depletion and attenuation of remineralization. This results in the deposition of organic carbon-rich sediments, as evidenced by the dark muds deposited in present OMZs, and organic-rich shales from past greenhouse worlds. The amount of carbon drawdown can be estimated by biogeochemical models; however, current models lack in estimations of a major process: carbon fixation in the mid- and lower water column. This contribution is challenging to quantify. Here, we suggest that chemoautotrophically fixed carbon can be estimated from 13C-depleted signatures of individual “biomarker” molecules, and those of total organic carbon, and present results from Arabian Sea. We suggest that OMZ-produced organic matter could form a substantial part of the organic matter deposited within OMZs, discuss sinking mechanisms, and the impact of these findings on biogeochemical models of the carbon cycle.