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Variance of molecular structures in pore water dissolved organic matter in continental shelf systems

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Continental shelves are an important reservoir for organic matter (OM) burial in the marine environment. Recycling and preservation of OM is complex and difficult to assess due to its highly variable composition. Terrestrial detritus and marine OM are accumulated in the sediment, affected by several factors and processes.

Our study addresses the fate of organic matter, shortly after deposition in shelf environments. We applied a two-pronged approach through analysis of dissolved organic matter (DOM) in sedimentary pore water and particulate organic matter (POM) in shelf sediments of the NW Iberian margin in order to assess transformation processes. As a relatively novel tool, high resolution Fourier Ion Cyclotron Mass Spectrometry (FT-ICR-MS) extends the analytical window for DOM and gives insights into its complex molecular mixture (e.g. Koch et al., 2005). Within the POM, we analyzed the lipid biomarker composition by GC-MS, which enabled us to identify the sources and degradation state of OM. A cluster analysis of the molecular variation in the DOM revealed that sampling sites with similar lipid distributions are distinct with respect to the DOM. As POM is more difficult to access for organisms, the source signal is still preserved in the surface sediments, with degradation becoming more important along the main transport routes. DOM is more efficiently utilized by organisms and reflects a high microbial activity in fresh sediments (i.e. mid-shelf mudbelt). Compared to the DOM in the local rivers, we detected the highest H/C-ratios in pore water of the mudbelt, which is consistent with release of H-rich DOM from fresh marine OM by microbial degradation in the rapidly accumulating mudbelt.

Koch B.P. et al.(2005): GCA 69 (13), 3299 – 308.