

Evaluating sources and transport of zinc and cadmium and their complexing ligands in the Atlantic and Pacific Oceans

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Introduction and Methods

Using Anodic Stripping Voltammetry [1], the complexation and chemical speciation of Zn and Cd has been determined in the water column in the Western North Pacific, the Equatorial South Atlantic as well as in the Elizabeth River and the Chesapeake Bay waters and benthos. Using a novel mathematical interpretative tool (Titration Data Interpreter) that allows for precise, non-biased ligand parameter optimization of the Gerringa linearization [2], the speciation of these two metals data was calculated.

Discussion

The results obtained in these oceanic regions indicate marginal seas and other pointed sources provide both metals and strong ligands, combining riverine, terrestrial, marine and anthropogenic matter, as recent literature suggests [3-7]. The ligands are transported and decay with time along water masses in both Atlantic and Pacific Oceans, implying connections to ligands produced the water formation regions [3,7,8] and from estuarine origin. A consortium of strong ligands complexes these two metals, affecting their chemical speciation in surface, intermediate and deep waters. The ramifications of this phenomenon on the close and remote upwelling of potentially limiting concentrations of bioavailable Zn and Cd will be discussed.

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Amino sugar and amino acid degradation and transformation in two lakes with different redox state

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Transformation and degradation processes of organic matter in aquatic systems play a key role in the global carbon cycle. Although lakes seem to store carbon efficiently, little is known about organic matter degradation in these systems. In order to study the fate of organic nitrogen compounds in lacustrine systems under different redox conditions, Lake Brienz (oligotroph, fully oxic) and Lake Zug (eutrophic, stratified oxic/anoxic) were investigated. Profiles of particulate amino sugar and amino acid concentrations were measured in the water column of both lakes as well as in the first centimeters of the sediments by gas chromatography. Decreasing carbon normalized amino sugar yields with increasing water depth indicated enhanced degradation of amino sugars compared to the bulk organic matter in both lakes. Under oxic conditions the degradation was more pronounced. The amino sugar composition of the particulate organic matter revealed a replacement of planktonic biomass by heterotrophic microorganisms from the upper water layers towards the lake bottom. The contribution of bacteria to the organic carbon was estimated using the amino sugar muramic acid, which is unique to bacteria as part of their cell wall. In the oligotrophic lake 0.8-11% of the organic carbon derived from bacteria and in the eutrophic lake this contribution was 0.3-5%. These findings underline that bacteria are not only drivers of organic matter degradation in lacustrine systems but also a significant source of organic matter themselves.