

Trace element composition of size-fractionated particulates in the Mauritanian upwelling zone of the Eastern North Atlantic U.S. GEOTRACES section

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Sinking (>51 μ m) and suspended (<51 μ m) particulates were collected via *in situ* filtration during the first US GEOTRACES North Atlantic Zonal Transect on the *R/V Knorr* in October-November, 2010. Total and acetic-acid leachable compositional profiles for key trace elements and isotopes (TEIs—Fe, Al, Zn, Mn, Cd, Cu) and other TEIs of interest (Co, Ti, Ba, V, Ni, Mo) are presented from four stations along the eastern tropical North Atlantic oxygen minimum zone (OMZ) extending from the coast of Mauritania to the Cape Verde Islands.

This dataset provides the first look at full (16-point) ocean-depth profiles of size-fractionated particulate trace elements in this productive and biogeochemically complex region. Particulate inputs, including mineral dust deposition from the Sahara, resuspended particles from the African margin, and in bottom nepheloid layers, are examined via bulk compositional data. Acetic acid-leachable phases are used to examine scavenging and remineralization processes of redox-sensitive and surface-active TEIs, especially within the Mauritanian OMZ and along upwelling-driven transport pathways away from the African continent.

Information from these particulate analyses, and soon the full particulate section of the US GEOTRACES North Atlantic zonal transect, will provide critical insights into TEI remineralization length and depth scales, elemental scavenging behavior in the OMZ and benthic nepheloid zones, and trace nutrient recycling rates within and below the euphotic zone.

Isotopic fractionation of Mg, Ca and Sr in calcite and aragonite

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The alkaline earth metals such as magnesium, calcium and strontium play an important role in a variety of geochemical and biological processes. The element ratios (Mg/Ca and Sr/Ca) in marine carbonates have been used as proxies for reconstruction of the past environment. Recently several studies suggested that the study for the isotopic fractionation of the alkaline earth metals in marine carbonates has a potentially significant influence in geochemical research fields (e.g. Eisenhauer *et al.* 2009). However there are few studies for possible correlations between the level of isotopic fractionation of Ca and that of other alkaline earth metals during carbonate precipitation.

The purpose of this study is to see if there are any correlations between the isotope fractionation factor of Ca during carbonate precipitation and that of Mg and Sr. Moreover, we investigated whether fractionations of Mg, Ca and Sr isotopes could differ between calcium carbonate polymorphs (Calcite and Aragonite). In order to examine the isotope fractionation factor of Mg, Ca and Sr during carbonate precipitation, calcite and aragonite were synthesized from calcium bicarbonate solution in which the amount of magnesium was controlled based on Kitano method (Kitano, 1962). Calcium carbonates were also prepared from the mixture of calcium chlorite and sodium hydrogen carbonate solutions for the purpose of comparison among the methods. The isotope fractionation factors were measured by MC-ICPMS (Nu plasma).

Results suggested that the level of isotopic fractionation of Mg during carbonate precipitation was correlated with that of Sr and that the change of the carbonate crystal structure could make differences of isotopic fractionations of Mg and Ca, however no difference was found in the case of Sr. In this presentation, the possible mechanism will be discussed.