4.1.P03

Regional differences in productivity, dust supply and diagenesis in the Canary Islands area

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The Canary Islands lie in a region with strong interaction between the oceanic and atmospheric circulation systems. Trade winds drive the seasonal coastal upwelling and the formation of filaments. One of the most evident areas of filament activity is located west off Cape Ghir near 31°N which occasionally reaches several hundred kilometres offshore. Dust storm outbreaks are the major source of terrigenous material. To reconstruct changes in wind intensity, wind direction and productivity in the Canary Islands region, the temporal pattern of variability of geochemical proxy records has been analysed at a site on the upper continental slope and another located further offshore influenced by the Cape Ghir filament.

Si/Al and Ti/Al of the solid phase show an increase during glacial periods with maximum values along glacial-interglacial transitions. These observations imply that the wind strength was intensified in the Canary Islands area at terminations and during cooler periods. Regarding Fe/Al used as a proxy parameter for the dust source area, the offshore site seems to be more sensitive to changes in wind direction. Al, typically present in clay minerals which are of continental origin shows a different behaviour at the two sites. In addition to an aeolian input, the fluvial input of Al seems to play an important role at the upper slope site especially during humid periods.

Investigations of proxy parameters for productivity like Ba, TOC and $CaCO_3$ also document great differences between the two locations. At the offshore site an association between Ba and TOC is observed whereas at the continental upper slope site a non-association is evident.

These observations illustrate that a great heterogeneity exists within this relatively small-scale ocean area.

4.1.P04

Magnesium isotopes in Fe-Mn nodules

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Manganese nodules from the Indian ocean and along the circumpolar deep water path have been analyzed for their Mg isotope composition. The Mg isotope measurements were done on the MC-ICP-MS Plasma 54 at ENS of Lyon. The reproducibility of the isotope magnesium standard DSM3 [1] measurements is 0.16‰ and 0.14‰ for δ^{26}Mg and δ^{25}Mg, respectively, at 95% confidence. A second Mg isotope standard, Cambridge I, was measured at δ^{26}Mg =-2.52±0.10‰ in accordance with Galy et al., [1]. Sample runs are bracketed by DSM3 standard measurements. DSM3 is used as the isotopic reference material. Magnesium isotopic composition (δ^{26}Mg) of the nodules range from –1.13 ± 0.06‰ to –0.17 ± 0.16‰. All samples fall on the terrestrial fractionation curve covering about 10% of the previously reported δ^{26}Mg terrestrial range [1,2,3]. Element concentrations were measured by ICP-MS Thermo Elemental X7.

Mg isotope in Fe-Mn nodules correlate positively with Sr (250-1600 ppm), Ca (0.5-1.4%) and Ba (600-2400 ppm), which could suggest that magnesium is sensitive to carbonate chemistry. A weak positive correlation is also observed between δ^{26}Mg and Fe concentration (4-19%), and may suggest the association of magnesium systematics with redox reaction (biological or not). To a lesser extend δ^{26}Mg correlates positively with Pb (100-2400 ppm) and Co (0.02-1.2%). All the above elements display decreasing concentration profile in the water column and are precipitating from seawater at the bottom of the ocean. Nearly no variation of magnesium isotope composition is observed against Zn, Cu, Cd, and Ni which are elements contributed either from the diagenetic fluids or from the degradable sedimentary fraction.

References

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