

Particulate trace element export in the North Atlantic (GA01 transect)

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Trace elements (TEs) play a crucial role in the functioning of the biological carbon pump, yet the magnitude of their vertical export through the sinking particles remains poorly constrained. We determined the particulate export fluxes of Fe, Mn, Al, Co, Ni, Cu, Zn, Cd and P using the ²³⁴Th-based approach in different biogeochemical provinces of the North Atlantic, as part of the GEOTRACES GA01 cruise (GEOVIDE; May-June 2014). TE export fluxes varied by one order of magnitude along the section, the highest being observed close to the margins.

Near the Iberian margin, the TEs/Al export ratios were equal or close to the crustal ratio, highlighting the contribution of lithogenic particles to the export. Near the Greenland margin, the TEs/Al export ratios were close to ratios reported in Greenland sediments, suggesting that the fluxes may be driven by resuspended sedimentary particles laterally advected.

Relatively high TE export fluxes were also found in the open-ocean. There, some stations were characterized by TEs/POC and TEs/P export ratios within the range observed in phytoplankton, highlighting that biogenic particles can also drive TE export fluxes. This is confirmed by the linear relationships between TE exports and BSi or CaCO₃ exports.

Finally and noteworthy, two stations were characterized by TEs/Al export ratios larger than crustal ratios, and by TEs/POC and TEs/P export ratios larger than intracellular phytoplankton quotas. These stations also presented high Mn and Fe fluxes suggesting the potential contribution of Fe and Mn authigenic oxides to the export of TEs.