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GEOTRACES Cruise GA08 in the Benguela upwelling region

The GEOTRACES GA08 section was conducted in the southeast Atlantic in November/December 2015 focusing on the Benguela Upwelling region and the associated oxygen minimum zone. Combining an along-shelf section with off-shelf transects, the main scientific goal of the cruise was the detailed investigation of the impact of continental inputs on the distribution of trace elements and isotopes, such as exchange with the African continental margin, dust input from the Namibian desert, and the inputs of dissolved and particulate loads from the major Congo and Orange rivers. The relationships between the distributions of trace elements, and large and small scale ocean circulation will be subject of data synthesis activities, which will allow an evaluation of the biogeochemical mechanisms affecting the size of the oxygen minimum zone.

Here we present a broad over-view of our first results. A trace metal clean laboratory, rosette system and towfish were deployed on board the RV Meteor. Analysis of dissolved Al, H₂O₂ and Fe(II) via flow injection analysis was undertaken at sea, and dissolved/colloidal/particulate transition elements determined via ICPMS on preserved samples at GEOMAR. Additionally, River Congo freshwater samples were collected throughout the year. The influence of the river Congo plume towards the north of our transect was evident in all terrestrially derived element signals resulting in particularly elevated concentrations of, for example, dissolved Fe, dissolved Al, and Ra over 100 km offshore, and maintaining high concentrations in low salinity waters on the shelf. Towards the south of our study region, an elevated Ra and Fe signal, with the majority of dissolved Fe present as Fe(II), in benthic boundary waters, with a steady decline proceeding into the water column was strong evidence of a benthic trace element source mechanism dominating the supply of trace elements into the water column. These biogeochemical features aligned well with incubation bioassay experiments which demonstrated small scale regional differences in the bottom-up control on primary production between light, nitrate and Fe.

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