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Non-conservative behaviour of molybdenum in coastal waters

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Introduction

Molybdenum is the most abundant trace metal in ocean water and generally displays a conservative behaviour unaffected by biological activity. However, several authors observed deviations from conservative behaviour, which they attributed to scavenging by MnO_x phases, utilisation by plankton, and complexing by organic particles (Head & Burton, 1970; Berrang & Grill, 1974; Yamazaki & Gohda, 1990; Tuit & Ravizza; 2003). In this contribution we postulate a conceptual model for non-conservative behaviour of Mo in coastal waters, which is based on the tight coupling of geochemical, biological, and sedimentological processes (Dellwig et al., 2007).

Results and Discussion

Non-conservative behaviour of dissolved Mo was observed during specific time periods in coastal waters of the Southern North Sea. In July 2005 a loss of about 60% of Mo_{diss} was observed within 36 hours. In contrast, in August 2002 Mo_{diss} revealed a tidal cyclicity with maximum values up to 158 nM at low tide. The decrease in Mo_{diss} was accompanied by Mo enrichments on SPM. Parallel to decreasing Mo_{diss} concentrations Mn_{diss} showed an increasing trend while Mn_{part} decreased. Such finding is compatible with the formation of oxygen-depleted zones in aggregates, which provide suitable conditions for the rapid fixation of Mo and parallel release of Mn by chemically and/or microbially mediated processes. This assumption is supported by biological and sedimentological parameters. The production of organic components (e.g. TEP) during breakdown of an algae bloom in July 2005 led to the formation of larger Mo-enriched aggregates, thus depleting the water column in Mo_{diss}. After deposition on and incorporation into sandy tidal flats these aggregates are rapidly decomposed by microbial activity. Pore water profiles document that during microbial decomposition of these aggregates, substantial amounts of Mo are released and may replenish and even enrich Mo in the open water column as seen in August 2002.

References

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