4.2.48

Trace metal composition of natural water colloids studied by online coupling of Flow FFF to High Resolution ICPMS

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Flow Field-Flow Fractionation (FlFFF) has been used to size fractionate small colloidal material (1-50 nm hydrodynamic diameter) in natural water samples. The FlFFF system was coupled online to a High Resolution ICPMS instrument and the techniques together made possible to simultaneously study the association of over 50 elements with colloidal material. 47 elements were possible to quantify in a sample from a creek near Göteborg, having concentrations above detection limits and satisfactory repeatabilities. Among these were all the alkaline earth elements, the upper row transition elements, rare earth elements and toxic metals such as Cd, As, Sb and Pb. 15 of the elements have not yet been studied by FlFFF-ICPMS due to the insufficiant mass resolution of the ICPMS instruments used before. Some applications of the methos will also be presented, for example the results of a seasonal variation study of a watercourse on the Swedish west coast and from analysis of seawater samples.

4.2.51

Trace metal accumulation in the sediments of Baldeggersee under contrasting environmental conditions during the last 8000 years

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The sediments of Baldeggersee, a 65 m deep prealpine lake on the Swiss Plateau, show different periods with varved sediments alternating with bioturbated sections during the last 8000 years. The biogenic varves are characterized by enrichments in the manganese and iron concentrations by factors of 3 and 2, respectively. The main iron phase in sulfide-rich layers was identified as mackinawite by EXAFS spectroscopy [1]. The pathways of trace metal accumulation and remobilization in these sediments were followed during a one-year cycle by sediment traps and pore-water analyses [2]. Under present day conditions the short-term sedimentation rates of Mg, V, and Cr, are strongly linked to allochthonous inputs from the catchment. A single strong flood event provided more thant 50% of the annual sediment accumulation of these elements. On the other hand, more than 66% of Ca, Zn, Cu, Cd as well as As and Sb appeared during the productive phase in the sediment traps, indicating strong association with biogenic particles including $CaCO_3$.

The analysis of dated piston cores revealed a drastic change in Ca/Mg ratios due to the conversion of the forested catchment into agricultural land in the period of 4000 – 2000 BP. As excpected based on the recent process study, increased particle imput due to land-use changes is refleced in higher concentrations of V and Cr. The periods of sulfide-rich varves, however, revealed only minor enrichments in trace elements like Cu, Cd and Mo.

References

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