The geochemistry of tungsten in the Baltic Sea

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The biogeochemistry of tungsten (W) in the environment is still poorly understood. Tungsten and molybdenum (Mo) occur as oxyanion in oxic fresh and seawater. Their ratio in average crust is about 1, in river water there is already 10 times more Mo than W and in seawater (35 psu) Mo is aprroximately 2000 times more abundant.

We studied W and Mo in the Kalix River, the Råne River, their estuaries and the Bothnian Bay in the north of the Baltic sea and a detailed profile across the redoxcline of the stratified Landsort Deep in the Baltic Proper. All water samples were filtered (0.22 μm) and analysed by ICP-SFMS for dissolved and particulate fraction.

Tungsten shows different patterns in dissolved and particulate form. While dissolved W concentrations increase slightly with increasing salinity along the estuaries, particle concentrations decrease. The total W concentration is constant from the rivers to the sea surface water, just the partition between dissolved and particulate fraction differs.

Our results show that dissolved W as well as Mo adsorb to freshly formed Mn particles in the pelagic redox zone (Fig. 1). Below the redoxcline dissolved W is enriched by a factor of 10 compared to river water, while Mo is depleated by more than 15 % relative to salinity. A second difference in the sulphidic water is the increased occurance of Mo particles compared to W. Differences in speciation cause an uptake of Mo on particles. A com-parable mechanism for W was not observed.

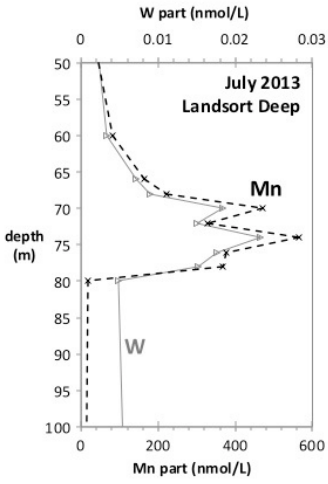

Figure 1: Particulate W follows closly particulate Mn in the redox zone.