

Rare earth elements in pore waters of the Bering Sea sediments

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The rare earth elements (REEs) were measured in pore waters of the Bering Sea sediments using HR-ICP-MS after RE-spec column separation. Site U1345 was drilled during IODP Exp. 323 at the gateway to the Arctic Ocean to a depth of 140 mbsf. This is an area of high biological productivity and the drill site was at a water depth of 1008m in the center of modern oxygen minimum zone [1]. The pore water sampling depth resolution was 10m in Hole A (n=17) and 0.25m in Hole B (n=77).

The pore water REE concentrations were higher than sea water. Maximum concentrations were found below the sulfate-methane transition zone (6.5 mbsf) and centered at approximately 8–17 m: e.g. 790 pmol kg⁻¹ Nd, 3000 pmol kg⁻¹ Yb. The concentrations then decreased toward the bottom.

Shale-normalized REE patterns were HREE-enriched at all depths. This pattern has been linked to remineralization of POC and complexation of the HREE with DOC [3]. The HREE-enrichment was most extreme at the depth of maximum REE concentrations. There was a slight MREE bulge in the upper 3m. Ce anomalies were negligible throughout the depth profile.

Comparison to other chemical species (shipboard analyses of dissolved Fe, Mn, Ba, phosphate, etc.) will be presented.

[1] Takahashi *et al.* (2010) Proc. IODP, 323. [2] Wehrmann *et al.* (2010) *Chem. Geol.* in press. [3] Haley *et al.* (2004) *GCA* **68**, 1265-1279.

State-dependent chemistry of model atmospheric aerosol

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The chemical reactivity of aerosols is often studied by techniques such as aerosol flow tubes and environmental chambers, which are well suited to study processes with timescales of minutes to many hours. However, given the multiday longevity of aerosol in the atmosphere and the potential of aerosol to access a diffusion limited, glassy state, longer timescale studies are needed to understand the physical and chemical properties of glassy (or once-glassy) aerosols in the atmosphere.

An electrodynamic balance is used to trap a single particle of 1-10 micrometer diameter for up to a week at a time. The timescale of these experiments allows us to use atmospherically relevant oxidation conditions. The particle size and composition are nondestructively monitored as a function of relative humidity and temperature (and thus, physical state) and exposure to oxidant.

We explore the properties of binary and ternary systems (of which one component is water) including the evaporation rate and hygroscopicity of the particle. The particle is oxidized and subsequently recharacterized to discern the influence of this oxidation on e.g. the hygroscopicity. The relative humidity in the balance may be reduced to decrease water content of the sample, leading to vitrification and altered hygroscopicity, volatility, and potentially reactivity.

Results will be compared with numerical solutions of the diffusion equation providing information into the role of diffusion in limiting chemical reactivity. These results provide insight into the relationship between physical state and chemical reactivity, (including the potential of chemical processing to alter physical state or properties such as hygroscopicity) and the influence, if any, of past chemical processing on future chemical reactivity.