



Physicochemical speciation and isotopic composition of iron in the Lena River freshwater plume

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The physicochemical speciation of Fe and Fe-isotopes were measured in the Lena River freshwater plume during the International Siberian Shelf Study 2008 (ISSS-08). Particulate iron ($>0.2 \mu\text{m}$) decreased from 57000 nM to 1000 nM during the first 200 km of mixing, whereas iron in the ultrafiltered fraction ($< 1000\text{D}$) remained approximately constant, at 8 nM, throughout the transect. The ^{56}Fe value was around zero in the particulate fraction within the Lena River and close to the river mouth, but changed systematic to more negative values (-0.3 per mille) in the outer parts of the plume. Colloidal iron changed from -0.2 to +0.1 per mille during mixing. Although the salinity was around 25 PSU at the outermost station (600 km) a relatively high concentration of total Fe, 150 nM, still remained in the surface water, indicating that a significant amount of river introduced Fe is reaching the open Arctic basin from the Lena River system. Removal of Fe from the freshwater plume is mainly due to sedimentation of particulate Fe (colloidal Fe decreased from 625 nM to 64 nM). We suggest that the changing ^{56}Fe pattern in the suspended particulate fraction is caused by sedimentation of Fe-oxyhydroxides with a positive ^{56}Fe value, leaving a particulate suspended fraction with more negative values in the outer parts of the freshwater plume. The positive value in the colloidal fraction at the outermost stations probably indicates small remaining oxyhydroxide particles (colloids).