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Supplement of

Distribution of Fe isotopes in particles and colloids in the salinity gradient along the Lena River plume, Laptev Sea

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Water samples for pH were drawn soon after the rosette was secured on deck, pH samples can be contaminated by the atmosphere and are therefore sampled early. They were then analyzed on board within hours of sampling. The analysis order was the deepest sample first.

From the cruise report (Dudarev 2008):

pH was measured using a spectrophotometric method (Agilent 8453), based on the absorption ratio of the indicator m-Creosol Purple sodium salt (CAS 62625-31-4) at wavelengths 434 and 578 nm. The indicator solution was prepared by dissolution of 0.382 g pre-weighted amount of indicator in 0.5 L seawater with a salinity that resembles the samples. The indicator was adjusted to a pH in the same range as the samples, approximately ± 0.2 pH units, by adding a small volume of conc. HNO₃ or conc. NaOH. Before running a set of samples, the pH of the indicator was measured using a 0.02 cm cuvette. Indicator corrections were made according to the recommendations from Chierici et al. 1999. The pH values are corrected to 15°C on the total scale. No corrections for the sample salinities were made. Oxygen was measured using an automatic Winkler titration with UV detection. In the river plumes this was not always possible due to the brown water and those samples were titrated by visible detection. The same sodium thiosulphate solution was used during the cruise and blanks and standards were run every day using a KIO₃ standard. Precision was determined using replicates from the same depth.

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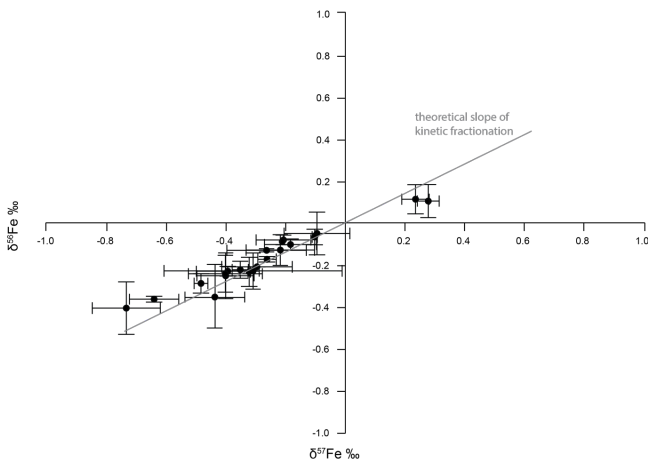


Figure S1: Three-isotope plot of all analyzed samples normalized to IRMM-14. The correlation between $\delta^{56}\text{Fe}$ and $\delta^{57}\text{Fe}$ is consistent and shows the mass-dependent fractionation between Fe isotopes. The average slope is 0.59 ± 0.11 (95%). The gray line displays the theoretical slope of kinetic fractionation (0.672). Uncertainties are reported in 2σ .

Table S1: Iron isotope values for the different fractions.

Station	Particulate >0.22 μm					
	$\delta^{56/54}\text{Fe}$	2σ	$\delta^{57/54}\text{Fe}$	2σ	$\delta^{57/56}\text{Fe}$	2σ
	‰	‰	‰	‰	‰	‰
YS-128	-0.289	0.050	-0.487	0.024	-0.168	0.058
YS-4	-0.406	0.126	-0.735	0.114	-0.196	0.170

YS-6	-0.360	0.014	-0.644	0.082	-0.191	0.078
YS-8	-0.130	0.008	-0.266	0.136	-0.094	0.140
YS-11	-0.067	0.040	-0.106	0.008	-0.035	0.050
YS-14	-0.048	0.106	-0.097	0.114	-0.051	0.098

Colloidal 1kDa-0.22μm

Station	$\delta^{56/54}\text{Fe}$ ‰	2σ ‰	$\delta^{57/54}\text{Fe}$ ‰	2σ ‰	$\delta^{57/56}\text{Fe}$ ‰	2σ ‰
YS-128	0.112	0.069	0.233	0.050	0.106	0.094
YS-4	0.102	0.079	0.277	0.038	0.098	0.136
YS-11	-0.227	0.089	-0.312	0.298	-0.084	0.204
YS-14	-0.171	0.015	-0.267	0.030	-0.120	0.084

Surface Sediment

Station	$\delta^{56/54}\text{Fe}$ ‰	2σ ‰	$\delta^{57/54}\text{Fe}$ ‰	2σ ‰	$\delta^{57/56}\text{Fe}$ ‰	2σ ‰
YS-13	-0.233	0.070	-0.324	0.006	-0.093	0.006
YS-4	-0.220	0.040	-0.355	0.028	-0.125	0.028
YS-26	-0.209	0.002	-0.298	0.116	-0.082	0.156
YS-14	-0.250	0.110	-0.404	0.100	-0.014	0.100
YS-2	-0.351	0.150	-0.439	0.102	-0.177	0.098
YS-3	-0.230	0.024	-0.396	0.106	-0.152	0.106
YS-11	-0.083	0.022	-0.209	0.094	-0.067	0.078
YS-28	-0.131	0.074	-0.220	0.118	-0.071	0.082
YS-30	-0.102	0.028	-0.185	0.088	-0.073	0.084
YS-39	-0.241	0.086	-0.403	0.124	-0.138	0.064

Text S2: The loss of particulate Fe was calculated as follows (equation 1; Table R1).

$$X = 100 - \left(\frac{100}{PFe_{Max}} * PFe_s \right)$$

5 With PFe_{Max} = PFe station YS14 and PFe_s =PFe at each station.

Table S2: Particulate Fe concentration and loss of Fe in % at each station.

Station	loss of PFe %	loss of CFe %	loss of TFe %
YS-128	99.8	89.8	99.7
YS-4	99.2	57.0	98.7
YS-5			
YS-6	98.8	12.5	97.9
YS-7			
YS-8	98.5	-	97.1
YS-9			
YS-10			
YS-11	39.5	2.8	39.1
YS-14	0.0	0.0	0.0

Table S3: Elemental concentration for the oarticulate phase (> 0.22 μm), as well as their ratios. Upper continental crust (UCC) composition after McLennan, 2001)

Station	Al μM	Ti μM	Fe μM	Fe/Al mol ratio	Fe/Ti Mol ratio	Al/Ti Mol ratio
YS128	0.091	0.003	0.086	0.954	32.324	33.866
YS4	0.570	0.011	0.463	0.812	43.305	53.340
YS6	1.106	0.020	0.670	0.605	32.894	54.332
YS8	1.004	0.015	0.861	0.857	57.516	67.080
YS11	96.406	0.964	33.970	0.352	35.252	100.042
YS14	150.622	1.586	56.177	0.373	35.425	94.981
UCC (McLennan, 2001)	0.298	0.009	0.063	0.210	7.317	34.789