

Supplementary Information

Novel approach for determination of the dissolved and the particulate fractions in aqueous samples by flow field flow fractionation via online monitoring of both the cross flow and the detector flow using ICP-MS

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Table S1 Overview of AF4 flow rates and ICP-MS monitoring for the combined CF-DF method

	Time [min]	Focus pump (focus flow) [mL min ⁻¹]	Tip pump (elution flow) [mL min ⁻¹]	Syringe pumps (cross flow) [mL min ⁻¹]	Switching valve	ICP-MS
Focusing Step	0 - 30	2.2	0.3	2	Cross flow to ICP-MS	Monitoring cross flow
Elution Step	30 - 121	0	2.5 followed by gradient matching the cross flow decrease	2 followed by gradient down to 0	Detector flow to ICP-MS	Monitoring detector flow

Table S2 Quantitative determination of the dissolved fraction in 5 water samples from Taihu via online monitoring of the cross flow (CF; n=2). For comparison the dissolved fraction obtained by ultrafiltration with offline quantification by ICP-MS is included (UF; n=2). The results are given as mean and standard deviation (SD). In addition, the percentage dissolved fraction based on the total concentrations of the respective elements in the 10 μm filtrates is presented.

Si	CF Mean \pm SD [$\mu\text{g L}^{-1}$]	UF Mean \pm SD [$\mu\text{g L}^{-1}$]	Recovery CF / UF [%]	Dissolved (CF) in % of 10 μm total	Dissolved (UF) in % of 10 μm total
Sample 1	940 \pm 160	840 \pm 30	112 \pm 19	46 \pm 8	41 \pm 2
Sample 2	690 \pm 120	550 \pm 80	125 \pm 28	56 \pm 11	44 \pm 8
Sample 3	990 \pm 120	840 \pm 60	118 \pm 16	54 \pm 7	46 \pm 4
Sample 4	920 \pm 110	770 \pm 20	118 \pm 14	53 \pm 6	45 \pm 2
Sample 5	830 \pm 170	650 \pm 20	129 \pm 26	57 \pm 12	44 \pm 2

Ca	CF Mean \pm SD [$\mu\text{g L}^{-1}$]	UF Mean \pm SD [$\mu\text{g L}^{-1}$]	Recovery CF / UF [%]	Dissolved (CF) in % of 10 μm total	Dissolved (UF) in % of 10 μm total
Sample 1	37180 \pm 1730	42850 \pm 1750	87 \pm 5	105 \pm 5	121 \pm 5
Sample 2	39100 \pm 1180	43840 \pm 1700	89 \pm 4	104 \pm 4	116 \pm 5
Sample 3	39390 \pm 1600	45100 \pm 1340	87 \pm 4	106 \pm 4	121 \pm 4
Sample 4	38840 \pm 3550	44690 \pm 1080	87 \pm 8	101 \pm 9	116 \pm 3
Sample 5	38020 \pm 4070	44050 \pm 1000	86 \pm 9	98 \pm 11	114 \pm 6

Table S3 Quantitative determination of the particulate fractions in 5 water samples from Taihu (10 μm filtrates) using the novel combined CF-DF method (n=1) compared to the original method (DF only, n=1). The percentage amount based on the total concentrations of the respective elements in the 10 μm filtrates is given in brackets. The mass balance calculated from the percentage dissolved fraction (Table 3) and the two percentage particulate fractions as well as the third particulate fraction was established for the CF-DF method.

Mg	CF-DF method Part. fraction 1 [$\mu\text{g L}^{-1}$]	CF-DF method Part. fraction 2 [$\mu\text{g L}^{-1}$]	CF-DF method Mass balance [%]	original method Part. fraction 1 [$\mu\text{g L}^{-1}$]	original method Part. fraction 2 [$\mu\text{g L}^{-1}$]
Sample 1	10.2 (0.1%)	13.8 (0.2%)	95.3	145 (1.6%)	49.2 (0.5%)
Sample 2	8.4 (0.1%)	9.4 (0.1%)	93.9	146 (1.5%)	41.1 (0.4%)
Sample 3	11.0 (0.1%)	12.3 (0.1%)	95.5	148 (1.5%)	42.5 (0.4%)
Sample 4	10.8 (0.1%)	10.9 (0.1%)	92.3	150 (1.5%)	41.4 (0.4%)
Sample 5	11.2 (0.1%)	11.6 (0.1%)	93.8	148 (1.5%)	42.3 (0.4%)

Si	CF-DF method Part. fraction 1 [$\mu\text{g L}^{-1}$]	CF-DF method Part. fraction 2 [$\mu\text{g L}^{-1}$]	CF-DF method Mass balance [%]	original method Part. fraction 1 [$\mu\text{g L}^{-1}$]	original method Part. fraction 2 [$\mu\text{g L}^{-1}$]
Sample 1	8.0 (0.4%)	200 (9.8%)	57.6	35.2 (1.7%)	163 (8.0%)
Sample 2	7.8 (0.6%)	160 (12.9%)	70.7	20.5 (1.6%)	129 (10.4%)
Sample 3	36.3 (2.0%)	194 (10.6%)	67.9	25.9 (1.4%)	145 (7.9%)
Sample 4	35.5 (2.0%)	179 (10.3%)	66.6	24.3 (1.4%)	132 (7.6%)
Sample 5	49.6 (3.4%)	145 (9.8%)	71.3	24.6 (1.7%)	136 (9.2%)

Ca	CF-DF method Part. fraction 1 [$\mu\text{g L}^{-1}$]	CF-DF method Part. fraction 2 [$\mu\text{g L}^{-1}$]	CF-DF method Mass balance [%]	original method Part. fraction 1 [$\mu\text{g L}^{-1}$]	original method Part. fraction 2 [$\mu\text{g L}^{-1}$]
Sample 1	69.9 (0.2%)	65.3 (0.2%)	105.8	765 (2.2%)	279 (0.8%)
Sample 2	57.4 (0.2%)	54.5 (0.1%)	104.0	786 (2.1%)	222 (0.6%)
Sample 3	65.4 (0.2%)	57.0 (0.2%)	105.9	783 (2.1%)	221 (0.6%)
Sample 4	58.6 (0.2%)	35.8 (0.1%)	101.0	785 (2.0%)	232 (0.6%)
Sample 5	59.8 (0.2%)	57.3 (0.2%)	98.7	774 (2.0%)	212 (0.5%)

Mn	CF-DF method Part. fraction 1 [$\mu\text{g L}^{-1}$]	CF-DF method Part. fraction 2 [$\mu\text{g L}^{-1}$]	CF-DF method Mass balance [%]	original method Part. fraction 1 [$\mu\text{g L}^{-1}$]	original method Part. fraction 2 [$\mu\text{g L}^{-1}$]
Sample 1	0.4 (4.0%)	0.9 (10.2%)	23.4	1.1 (12.1%)	1.1 (12.9%)
Sample 2	0.3 (3.7%)	0.9 (11.0%)	21.6	0.5 (6.7%)	1.0 (12.7%)
Sample 3	0.4 (6.4%)	0.7 (11.0%)	21.0	0.4 (5.4%)	0.6 (9.3%)
Sample 4	0.3 (4.0%)	0.7 (8.6%)	18.6	0.3 (4.0%)	0.8 (9.5%)
Sample 5	0.4 (6.0%)	0.7 (10.1%)	18.4	0.3 (4.4%)	0.7 (9.6%)