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Supplement of

Influences on chemical distribution patterns across the west Greenland shelf: the roles of ocean currents, sea ice melt, and freshwater runoff

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1 Station information

Table S 1: Station and sample information for cruise on RV *Dana* between 18 and 28 July 2021.

Station	Transect	Latitude [°N]	Longitude [°E]	Bottom depth [m]	Sampling Date	Sample ID	Sampling depth [m]
1	1	64.7407	-53.4109	144	28-07-2021	1 [5]	5.2
						1 [20]	20.5
						1 [27]	27.2
						1 [55]	54.9
						1 [132]	132.5
2	1	64.8657	-53.4767	79	28-07-2021	2 [3]	2.8
						2 [24]	23.9
						2 [51]	50.7
						2 [76]	75.9
6	2	65.914	-53.7813	68	18-07-2021	6 [3]	3.0
						6 [14]	14.0
						6 [61]	61.1
7	2	65.94134	-54.3713	107	18-07-2021	7 [3]	3.0
						7 [14]	13.7
						7 [50]	50.5
						7 [101]	101.3
8	2	65.9274	-54.8590	123	18-07-2021	8 [4]	3.7
						8 [31]	30.8
						8 [50]	49.5
						8 [90]	90.1
						8 [112]	111.5
9	2	65.9256	-55.5807	169	19-07-2021	9 [4]	3.7
						9 [29]	29.2
						9 [51]	50.8
						9 [91]	91.0
						9 [159]	159.3
10	2	65.9288	-56.3024	559	19-07-2021	10 [3]	2.9
						10 [38]	38.0
						10 [51]	50.7
						10 [203]	202.5
						10 [551]	550.9
11	3	67.5012	-54.2072	26	21-07-2021	11 [3]	3.0
						11 [20]	20.2
12	3	67.4999	-54.9548	80	21-07-2021	12 [2]	2.3
						12 [20]	20.3
						12 [38]	37.8

Continuation of Table S 1: Station and sample information for cruise on RV *Dana* between 18 and 28 July 2021.

Station	Transect	Latitude [°N]	Longitude [°E]	Bottom depth [m]	Sampling Date	Sample ID	Sampling depth [m]
13	3	67.5017	-55.9040	110	21-07-2021	13 [2]	2.4
						13 [25]	24.8
						13 [50]	50.1
						13 [104]	103.5
14	3	67.5121	-56.868	210	20-07-2021	14 [3]	2.7
						14 [21]	20.9
						14 [30]	30.0
						14 [42]	41.6
						14 [51]	51.0
						14 [91]	90.6
						14 [121]	120.9
						14 [206]	205.8
15	3	66.9868	-56.9038	673	20-07-2021	15 [3]	2.7
						15 [20]	19.6
						15 [32]	32.5
						15 [50]	50.3
						15 [90]	90.0
						15 [121]	121.0
						15 [199]	198.9
						15 [667]	666.7
17	4	69.1270	-52.8067	502	22-07-2021	17 [3]	2.7
						17 [30]	30.3
						17 [51]	51.0
						17 [121]	120.8
						17 [200]	199.6
						17 [473]	473.4
18	4	69.2018	-53.5217	280	22-07-2021	18 [3]	3.0
						18 [15]	15.3
						18 [50]	50.5
						18 [90]	90.1
						18 [253]	253.2
20	4	69.1277	-55.0081	200	26-07-2021	20 [4]	4.3
						20 [35]	35.1
						20 [50]	50.2
						20 [93]	92.6
						20 [157]	156.8

Continuation of Table S 1: Station and sample information for cruise on RV *Dana* between 18 and 28 July 2021.

Station	Transect	Latitude [°N]	Longitude [°E]	Bottom depth [m]	Sampling Date	Sample ID	Sampling depth [m]
21	4	69.1272	-55.9948	161	26-07-2021	21 [3]	3.2
						21 [21]	20.7
						21 [31]	31.1
						21 [52]	52.3
						21 [88]	88.4
						21 [121]	121.1
						21 [149]	148.9
22	4	69.1566	-56.7449	212	26-07-2021	22 [3]	2.7
						22 [20]	20.3
						22 [30]	30.0
						22 [50]	50.0
						22 [90]	90.1
						22 [120]	120.1
						22 [206]	205.9
23	4	69.1318	-57.5917	257	25-07-2021	23 [4]	3.9
						23 [44]	43.8
						23 [52]	52.3
						23 [91]	91.3
						23 [246]	245.9
24	4	69.1309	-58.5797	326	25-07-2021	24 [3]	3.2
						24 [20]	19.8
						24 [30]	29.7
						24 [51]	50.7
						24 [91]	90.8
						24 [120]	120.5
						24 [199]	199.3
						24 [317]	316.8
26	5	70.2082	-55.2765	96	23-07-2021	26 [3]	2.8
						26 [20]	19.8
						26 [51]	50.5
						26 [31]	30.6
27	5	70.3104	-55.75905	97	23-07-2021	27 [4]	3.7
						27 [15]	15.4
						27 [50]	50.4
						27 [84]	83.7

Continuation of Table S 1: Station and sample information for cruise on RV *Dana* between 18 and 28 July 2021.

Station	Transect	Latitude [°N]	Longitude [°E]	Bottom depth [m]	Sampling Date	Sample ID	Sampling depth [m]
28	5	70.4100	-56.2686	207	24-07-2021	28 [3]	3.3
						28 [21]	20.5
						28 [30]	30.3
						28 [50]	49.6
						28 [91]	91.1
						28 [120]	120.2
						28 [197]	197.0
29	5	70.5110	-56.7611	354	24-07-2021	29 [3]	2.9
						29 [25]	25.2
						29 [50]	50.0
						29 [91]	90.6
						29 [347]	347.5
30	5	70.6138	-57.259	486	24-07-2021	30 [3]	3.0
						30 [30]	29.8
						30 [45]	45.3
						30 [50]	49.6
						30 [91]	91.4
						30 [121]	121.3
						30 [200]	200.0
						30 [474]	473.5

2 ICP Instrument settings

Table S 2: Instrument settings of ICP-MS system.

ICP-MS system	Agilent 7900 Single Quadrupole ICP-MS (Agilent Technologies; Tokyo, Japan)
Sample preconcentration	seaFAST SP2 (Elemental Scientific; Omaha, USA)
Interface cone	Ni
Lense	x-lense
RF power	1550 W
Nebulizer pump	0.10 rps
Carrier gas flow	1.00 L min^{-1}
Makeup gas flow	0.11 L min^{-1}
Cell gas 1: He	4.0 mL min^{-1}
Cell gas 2: H2	0.5 mL min^{-1}
Purity cell gases	5.0
Integration time	50 ms
Measured isotopes	51V, 55Mn, 56Fe, 59Co, 60Ni, 65Cu, 111Cd, 208Pb
Extract 1	0.0 V
Extract 2	-170.0 V
Omega Bias	-85 V
Omega Lens	9.9 V
Q1 Entrance	-70 V
Q1 Exit	-80 V
Deflect	4.0 V
Plate Bias	-65 V
OctP Bias	-13.0 V
OctP RF	200 V
Energy Discrimination	5.0 V

3 Validation summary

Table S 3: Validation summary of multi-element and nutrient analysis.

Elements	LOD [ng L^{-1}]	LOQ [ng L^{-1}]	Recovery [%]	
			NASS-7 (n = 10)	KBA-QC (n = 11)
dV	2.1	7.0	105	97
dFe	16	50	119	110
dMn	5.5	18.0	110	99
dCo	0.11	0.40	111	101
dNi	2.5	8.0	112	104
dCu	1.0	5	108	104
dCd	3.0	10	99	100
dPb	0.3	0.98	107	101
Nutrients	LOQ [µmol L^{-1}]			
Nitrate	0.2			
Nitrite	0.01			
Silicate	0.17			
Phosphate	0.017			

4 Depth profiles of potential density

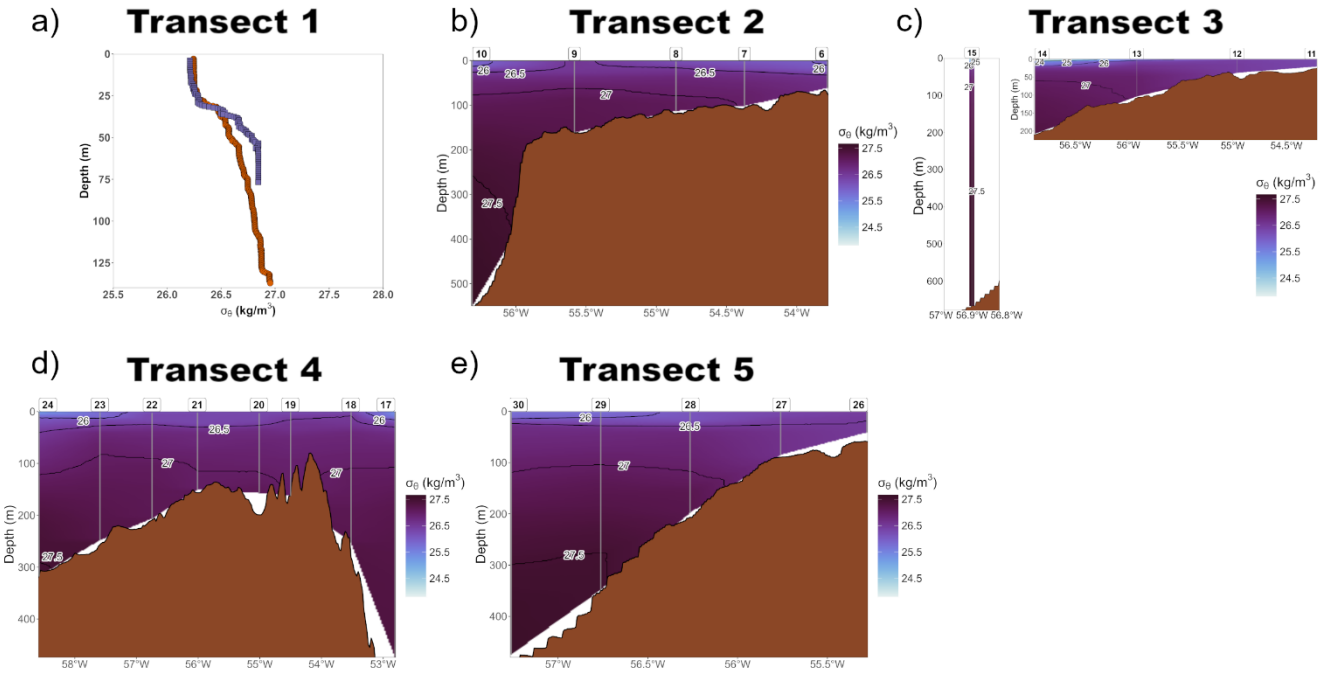

Figure S 1 Water depth profiles illustrating the spatial distribution of potential density along the respective transects. For transect 1 (a), data are not shown as interpolated profiles due to limited data availability. For transect 3 (c), station 15 is displayed separately because of its southerly location.

5 Shapiro-Wilks test and transformations

Table S 4: Results of Shapiro-Wilk test of normality and transformations used to meet the normality criteria.

Parameter	Shapiro-Wilk test	Transformation
Salinity	1.4E-04	-(log10(max(x+1) - x))
Temperature	3.7E-01	
Depth	9.0E-09	Box Cox λ = - 0.02
Oxygen	5.0E-04	-(log10(max(x+1) - x))
AOU	8.6E-05	sqrt(x+52)
NOx	5.9E-07	log10(x)
Silicate	3.3E-08	log10(x)
Phosphate	1.1E-04	log10(x)
AT	9.5E-05	Box Cox λ = 2
CT	5.6E-02	
dV	7.4E-01	
dFe	1.0E-03	Box Cox λ = 0.46
dMn	1.7E-02	
dCo	7.1E-02	
dNi	5.0E-04	Box Cox λ = -2
dCu	9.7E-01	
dCd	2.3E-03	Box Cox λ = 0.22
dPb	3.1E-01	

6 Minimum and maximum ranges of basic water column parameters

Table S 5: Minimum and maximum ranges of primary water column parameters.

Parameter	Unit	Minimum		Maximum	
		Value	Station [Depth in m]	Value	Station [Depth in m]
Salinity		29.70	14 [3]	34.89	10 [530-558]
Pot. Temp.	°C	-1.63	30 [40-55]	6.7	8 [2.5-6]
Pot. Density	kg m^3	23.8	14 [3]	27.7	10 [530-558]
Oxygen	µmol L^{-1}	204	15 [645-673]	406	10 [34-37]
AOU	µmol L^{-1}	-72	10 [34-37]	147	15 [645-673]

7 Surface water concentrations of nutrients

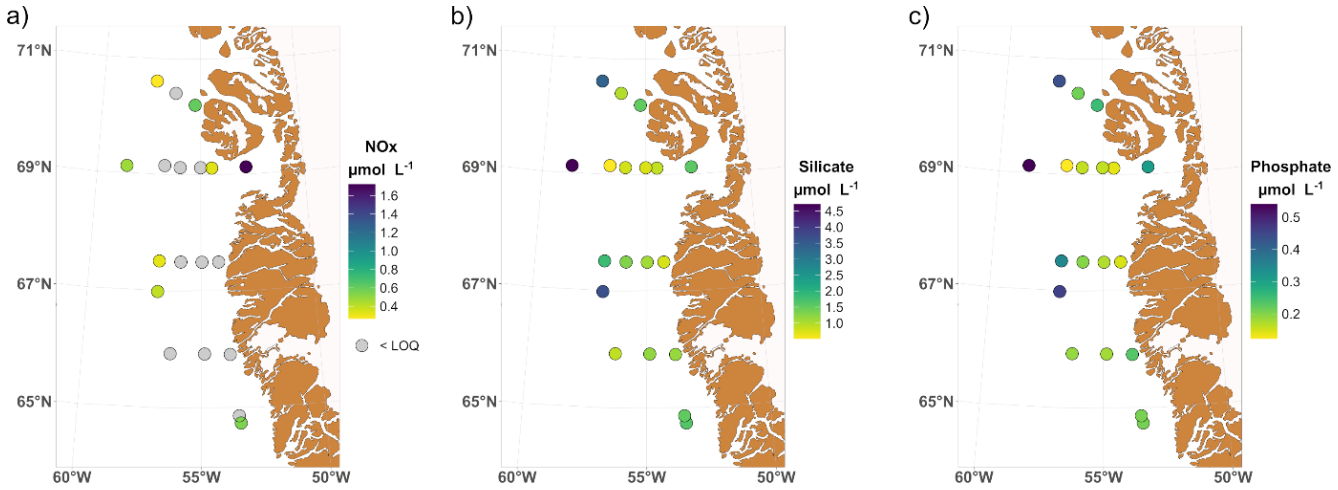

Figure S 2: Surface water concentrations of nutrients.

8 Surface waters concentrations of trace elements

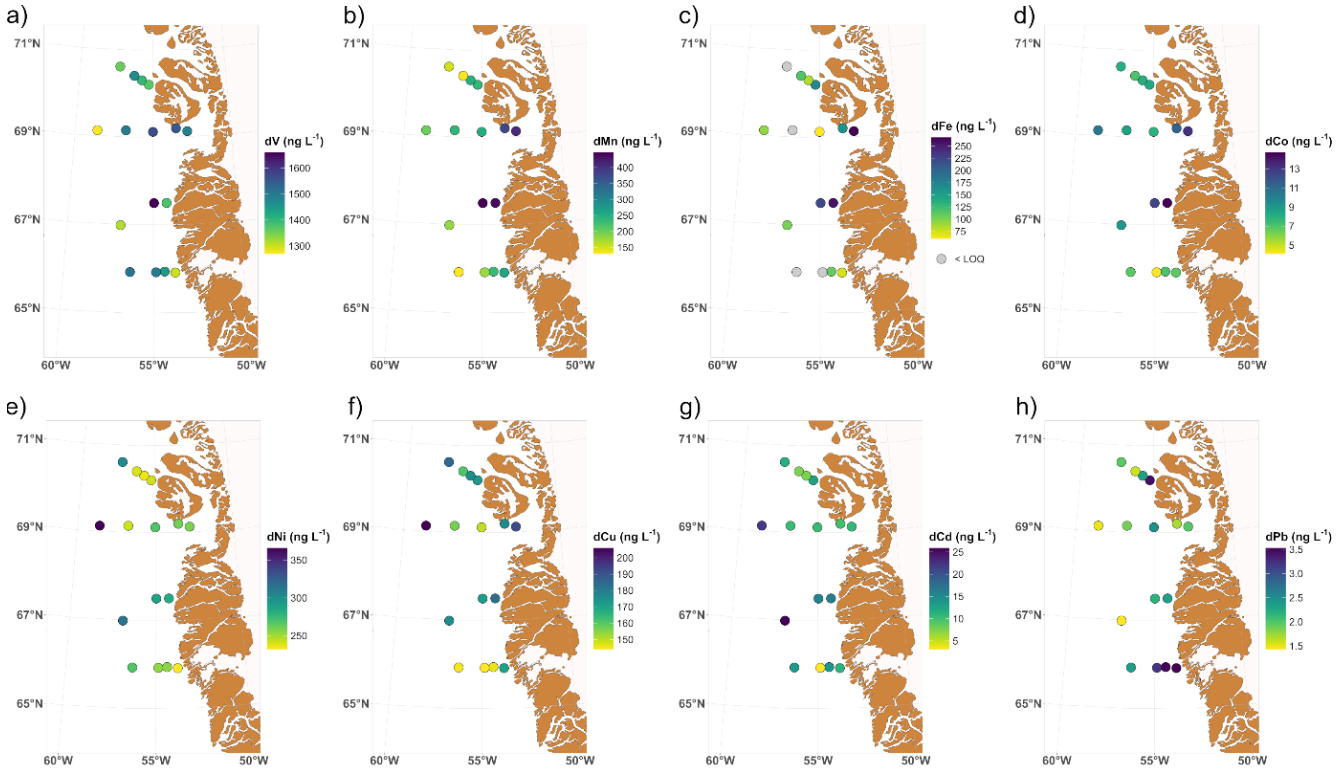

Figure S 3: Surface waters concentrations of trace elements.

9 Surface water concentrations of carbonate system parameters

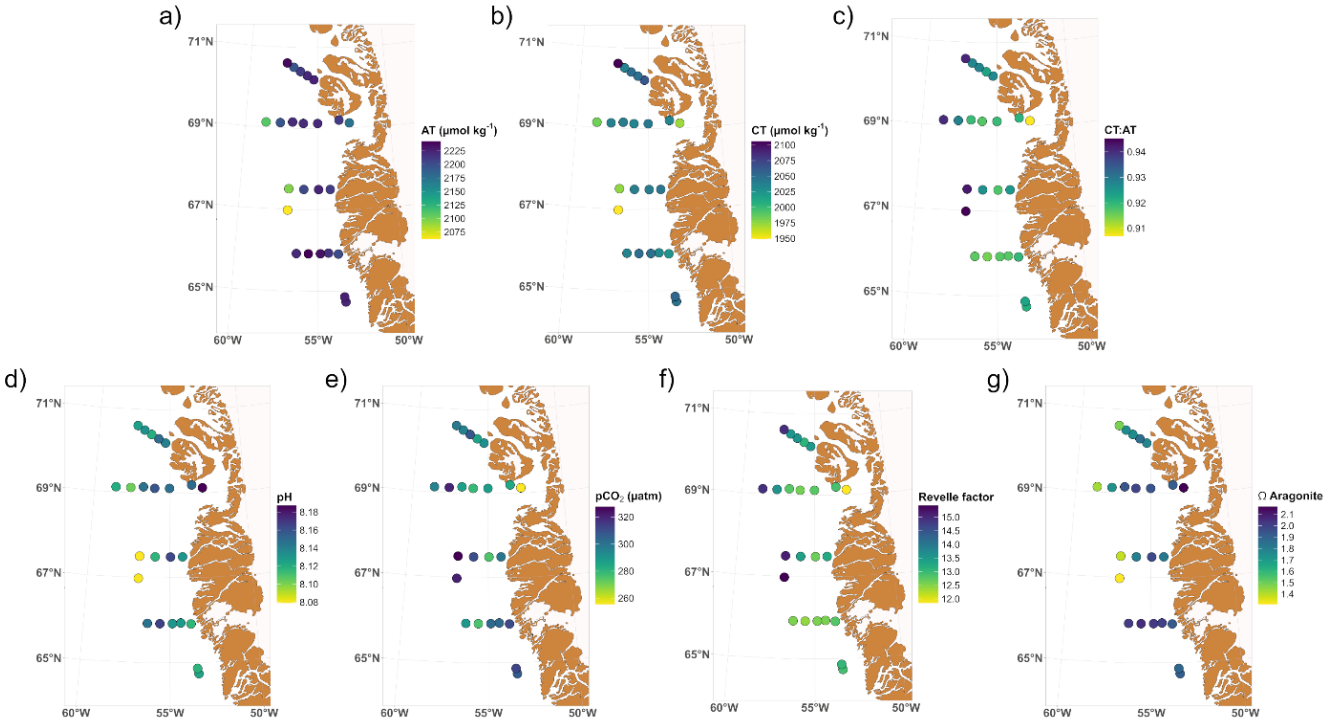

Figure S 4: Surface water concentrations of carbonate system parameters.

10 Statistics – PCA Results

Table S 6: Loadings of varimax rotated principal components (PCs) of 17 parameters. Significant loadings according to broken stick analysis are shown in bold.

Parameter	PC 1 Loading	PC 2 Loading	PC 3 Loading
Salinity	**0.97**	0.04	-0.14
Temperature	0.10	**-0.85**	0.20
Depth	**0.79**	0.45	-0.16
Oxygen	**-0.87**	-0.24	0.01
AOU	0.67	**0.65**	-0.10
NOx	0.60	**0.67**	-0.20
$Si(OH)_4$	0.52	**0.77**	-0.19
PO_4^{3-}	0.49	**0.77**	-0.23
AT	**0.90**	0.00	-0.15
CT	**0.76**	0.47	-0.17
dV	**0.83**	0.02	0.10
dFe	0.58	0.40	**0.54**
dMn	-0.05	-0.22	**0.93**
dCo	-0.35	0.12	**0.88**
dNi	-0.12	**0.73**	**0.35**
dCu	**-0.79**	0.09	**0.46**
dCd	0.46	**0.79**	0.06
dPb	0.04	**-0.62**	-0.28
Eigenvalue	9.3	3.3	2.1
Explained variance [%]	52	18	12
Cumulative variance [%]	52	70	82

11 Conservative mixing along the salinity gradient

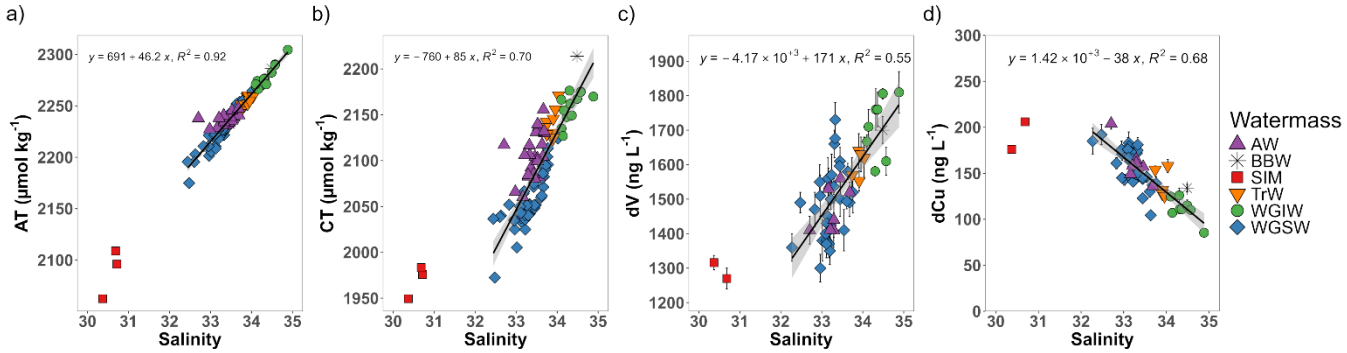

Figure S 5: a) AT; b) CT; c) dV; and d) dCu concentrations versus salinity. Sea ice samples were excluded from the linear regression. Error bars of trace elements correspond to 2 SD. The affiliation of each data point is represented by shape and color of the water masses: West Greenland Shelf Water (WGSW), West Greenland Intermediate Water (WGIW), Transitional Water (TrW), Arctic Water (AW), Baffin Bay Water (BBW) and sea ice meltwater (SIM).