Carbon monoxide (CO) cycling in the Fram Strait, Arctic Ocean

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Supporting information

Table S1

Water mass characterization after Fofonoff and Millard Jr (1983) and Rudels et al. (2005). PML: Polar Mixed Layer, PSW: Polar Surface Water, AAW: Arctic Atlantic Water, AIW: Arctic Intermediate Water

Station	depth (m)	Density0, (g L^{-1})-1000	Salinity	Temp., °C	water mass	water/origin	remarks
NT6A	**5**	24.12	30.04	1.36	**PSWw - Warm Surface Water**	**North_Atlantic**	
NT6A	**31**	27.49	34.41	2.49	PSWw - Warm Surface Water	North_Atlantic	
NT6A	**100**	27.88	34.97	2.87	AW & RAW - Atlantic Water & Recirculating Atlantic Water	North_Atlantic	
Ice2	**5**	24.83	29.02	-1.05	**PSW - Polar Surface Water**	**Arctic**	Ice edge,
Ice2	**35**	27.24	33.91	-1.15	PSW - Polar Surface Water	Arctic	shelf
Ice2	**75**	27.55	34.35	-0.42	PSW - Polar Surface Water	Arctic	break
Ice2	**102**	27.69	34.59	0.74	AAW - Arctic Atlantic Water	Arctic	
D5	**5**	25.61	32.00	1.37	**PSWw - Warm Surface Water**	**North_Atlantic**	Sea ice melting on warmer (Atlantic) water
D5	**10**	26.56	33.44	3.82	PSWw - Warm Surface Water	North_Atlantic	
D5	**25**	27.39	34.86	6.41	PSWw - Warm Surface Water	North_Atlantic	
D5	**40**	27.56	34.73	4.15	PSWw - Warm Surface Water	North_Atlantic	
D5	**75**	27.67	34.93	4.56	PSWw - Warm Surface Water	North_Atlantic	
D5	**110**	27.72	34.99	4.52	AW & RAW - Atlantic Water & Recirculating Atlantic Water	North_Atlantic	
D7	**5**	27.22	34.78	5.68	**PSWw - Warm Surface Water**	**North_Atlantic**	Open
D7	**10**	27.41	34.79	5.70	PSWw - Warm Surface Water	North_Atlantic	ocean
D7	**100**	27.78	34.99	3.98	AW & RAW - Atlantic Water & Recirculating Atlantic Water	North_Atlantic	

S2 Methods

S2.1 Ancillary measurements

The spectral absorption coefficient of CDOM at 330 nm (a330) was determined for the seawater samples in 5 m from the CTD/rosette cast preceding the incubation experiments (= t_0) and from the individual experimental units at each timepoint (t_{12}, t_{24}, t_{48}) during the incubations. Each CDOM sample was filtered through a sterile, sample-washed 0.2 µm membrane (GWSP, Millipore) into pre-combusted, sterile brown glass vials. CDOM absorption was measured according to the procedure as described in Lennartz et al. (2019) and the mean error of the method was 8%. We used purified MilliQ water as the reference. A Seabird SBE9plus sensor package (https://www.bodc.ac.uk/data/documents/nodb/pdf/03plusbrochurejan07.pdf) including an oxygen optode, a fluorescence sensor (Chl a) and a sensor for photosynthetic active radiation (PAR). All sensors were attached to the CTD/rosette. Vertical profiles recorded during lowering the CTD/rosette were considered here only.

Inorganic dissolved nutrients including nitrate were analysed using a Technicon segmented 4-channel flow colorimetric autoanalyser (Bran & Luebbe AAIII, SEAL Analytical). The analytical methods applied are described in Grasshoff et al. (1999). The detection limit was 2 nmol l^{-1} during the cruise. The precision of the method was 8%, and of the colorimetric autoanalytical techniques was > 5% (Woodward and Rees, 2001).

S2.2 Note on statistical analysis

Simple regression test was chosen because multiple regression test had too low explanatory power due to the small number of experimental replicates.

S3 Figures

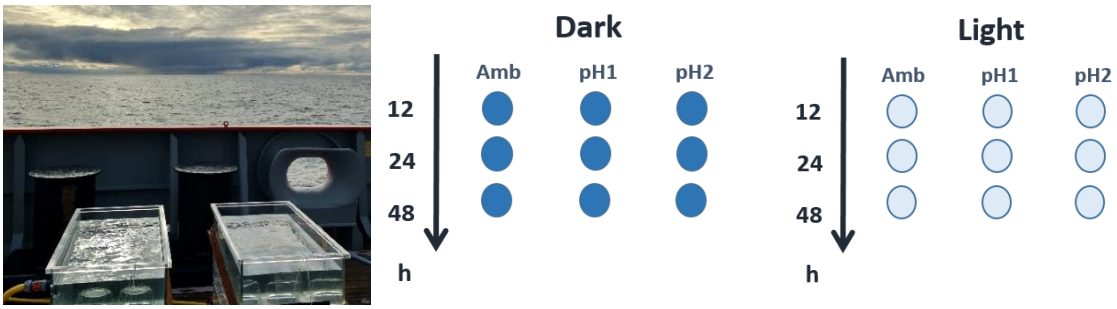

Fig. S3.1 Experimental set up of incubations. Left: The incubator tanks, which were, installed on-deck, supplied with natural seawater and made of natural sunlight-transmitting material, so that natural conditions of the surface ocean were mimicked. Right: Incubations were performed over a total of 48 hours in darkened and light tanks. Each dot represents one experimental unit referring to one treatment and sampling timepoint and was discarded after sampling (gases, CDOM, pH) was done. Samples were taken after 12, 24 and 48 hours. The pH in each experiment was manipulated to two lowered pCO_2 (pH) levels ph1: 670 ppm and pH2: 936 ppm CO_2 in comparison to the ambient pH (amb) as a control.

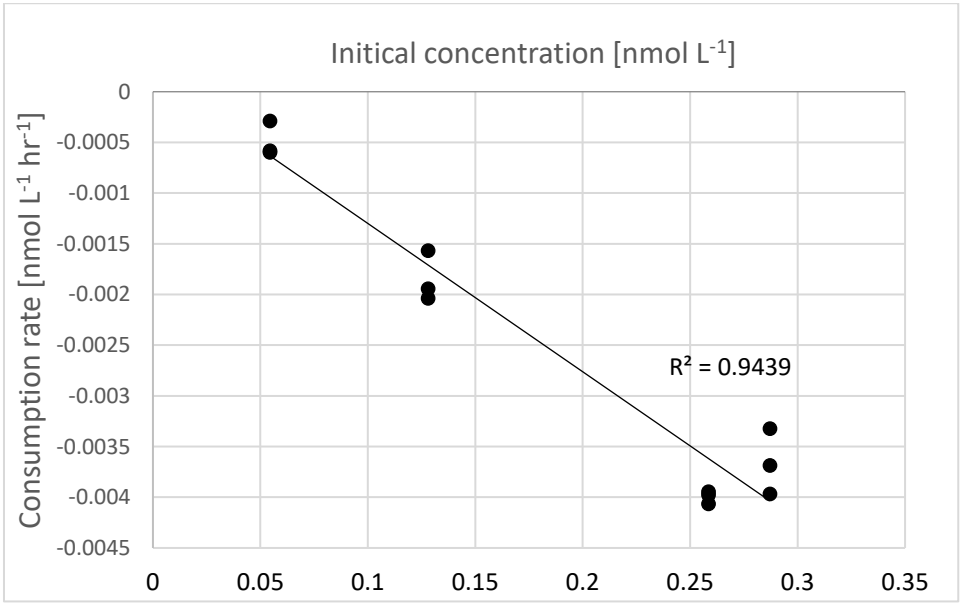

Fig. S3.2 Initial concentrations plotted against overall consumption rates per experiment. All consumption rates depend on the initial CO concentration (i.e. first order loss). R2 = 0.94 with $p < 0.05$.

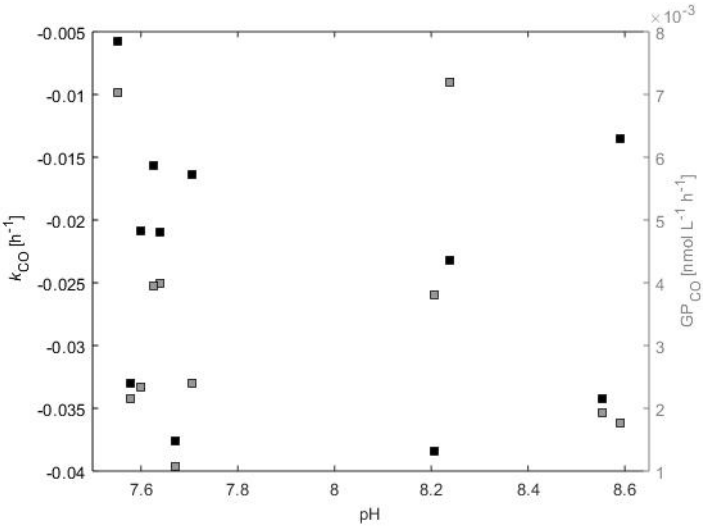

Fig S3.3 pH vs. k_{CO} and GP_{CO}.

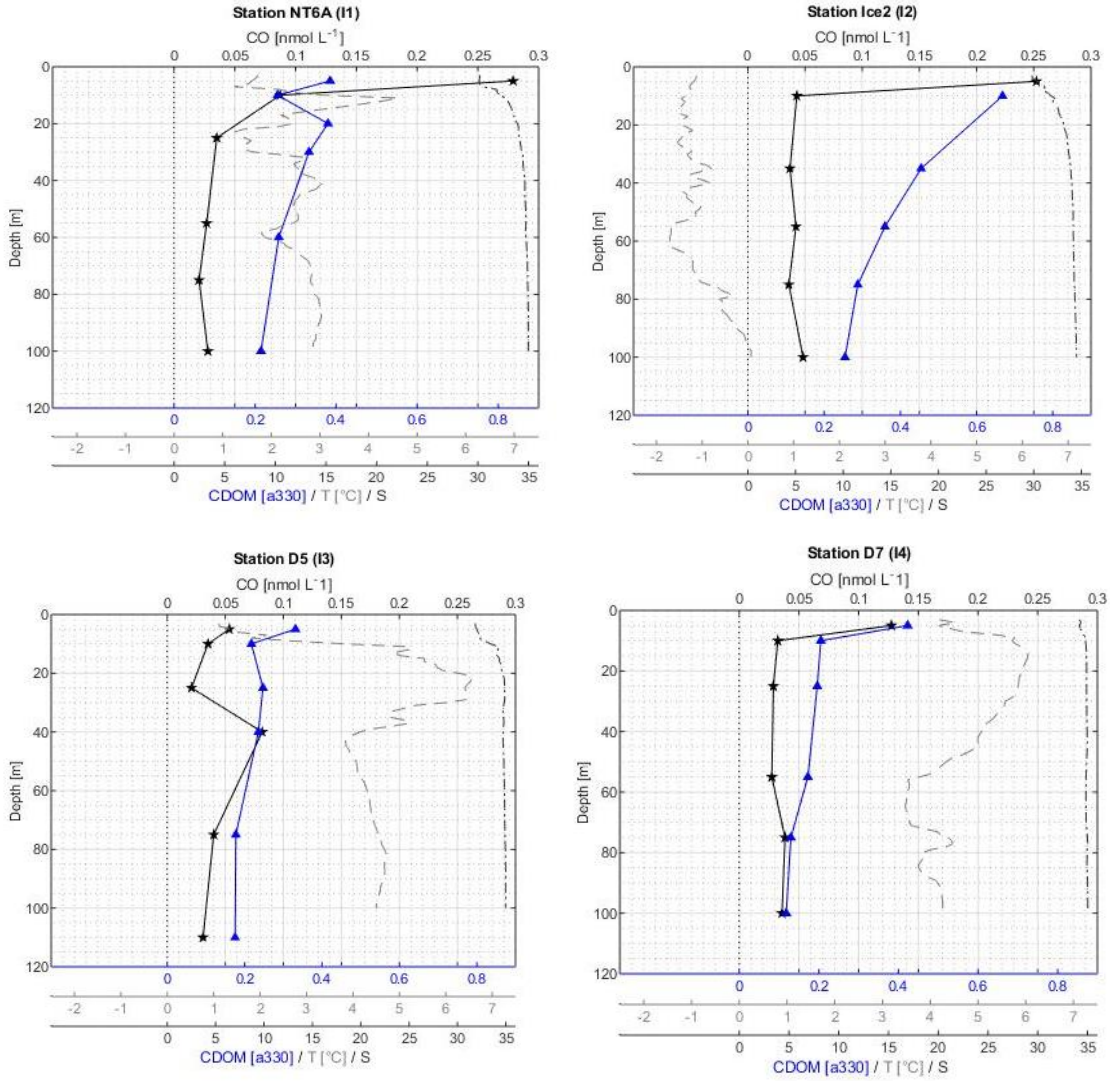

Fig. S3.4 Vertical profiles of dissolved CO concentration, salinity, temperature and CDOM at t_0 at each incubation location

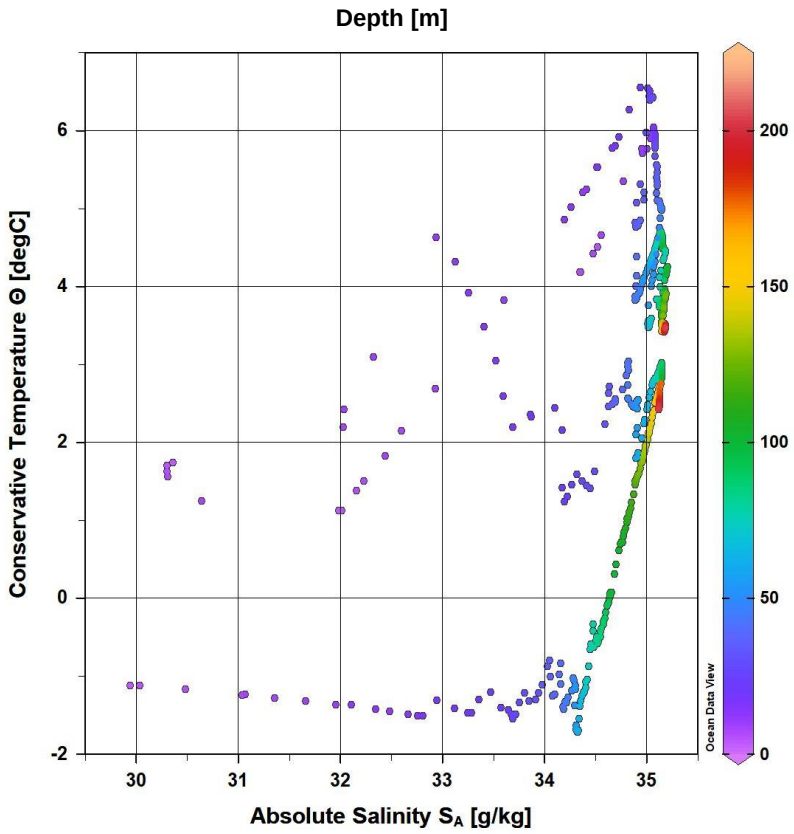

Fig S3.5 T/S distribution per depth at the incubation stations

References

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