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Supplementary Material: Seasonality of the Physical and Biogeochemical Hydrography in the Inflow to the Arctic Ocean through Fram Strait

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1 CARBONATE SYSTEM ANALYSIS

C_T and A_T were analyzed at the laboratory at the Institute of Marine Research, Norway. Analytical methods for C_T and A_T determination in seawater samples are fully described in Dickson et al. (2007). Briefly, C_T was determined using gas extraction of acidified sample followed by coulometric titration and photometric detection using a Versatile Instrument for the Determination of Titration carbonate (VINDTA 3C, Marianda, Germany). A_T was determined in water column samples from potentiometric titration with 0.1 N hydrochloric acid using a VINDTA 3C. The average standard deviation for C_T and A_T, determined from replicate sample analyses from one sample, was within ± 1 μmol kg^{-1}. The accuracy of the measurements were ensured by routine analyses of Certified Reference Materials (CRM, provided by A. G. Dickson, Scripps Institution of Oceanography, USA) and was better than ± 1 μmol kg^{-1} and ± 2 μmol kg^{-1} for C_T and A_T, respectively.

2 SUPPLEMENTARY TABLES AND FIGURES

Table 1. Process station start and end points. P1 and P5 are approximately co-located. Note the large change in bottom depth at P7. Location and depth of the March station is given for reference.

	Lat [°N]	Lon [°/E]	Bottom depth [m]	UTC Time [mm/dd hh]
P1 start	79 58.05	010 44.30	340	05/18 19
P1 end	79 53.60	009 59.90	450	05/20 04
P3 start	79 43.07	009 27.40	390	05/23 07
P3 end	79 46.73	008 35.87	490	05/24 14
P4 start	79 46.32	006 16.71	1030	05/25 07
P4 end	79 48.67	006 18.49	970	05/26 17
P5 start	79 58.15	010 44.65	340	08/09 05
P5 end	80 06.20	010 48.35	270	08/10 14
P6 start	80 50.96	015 03.07	1290	08/11 22
P6 end	80 51.61	014 28.48	1140	08/13 11
P7 start	80 42.25	015 14.84	1110	08/13 20
P7 end	80 41.12	015 14.53	300	08/15 11
March	80 46.02	016 06.60	1050	03/05 13

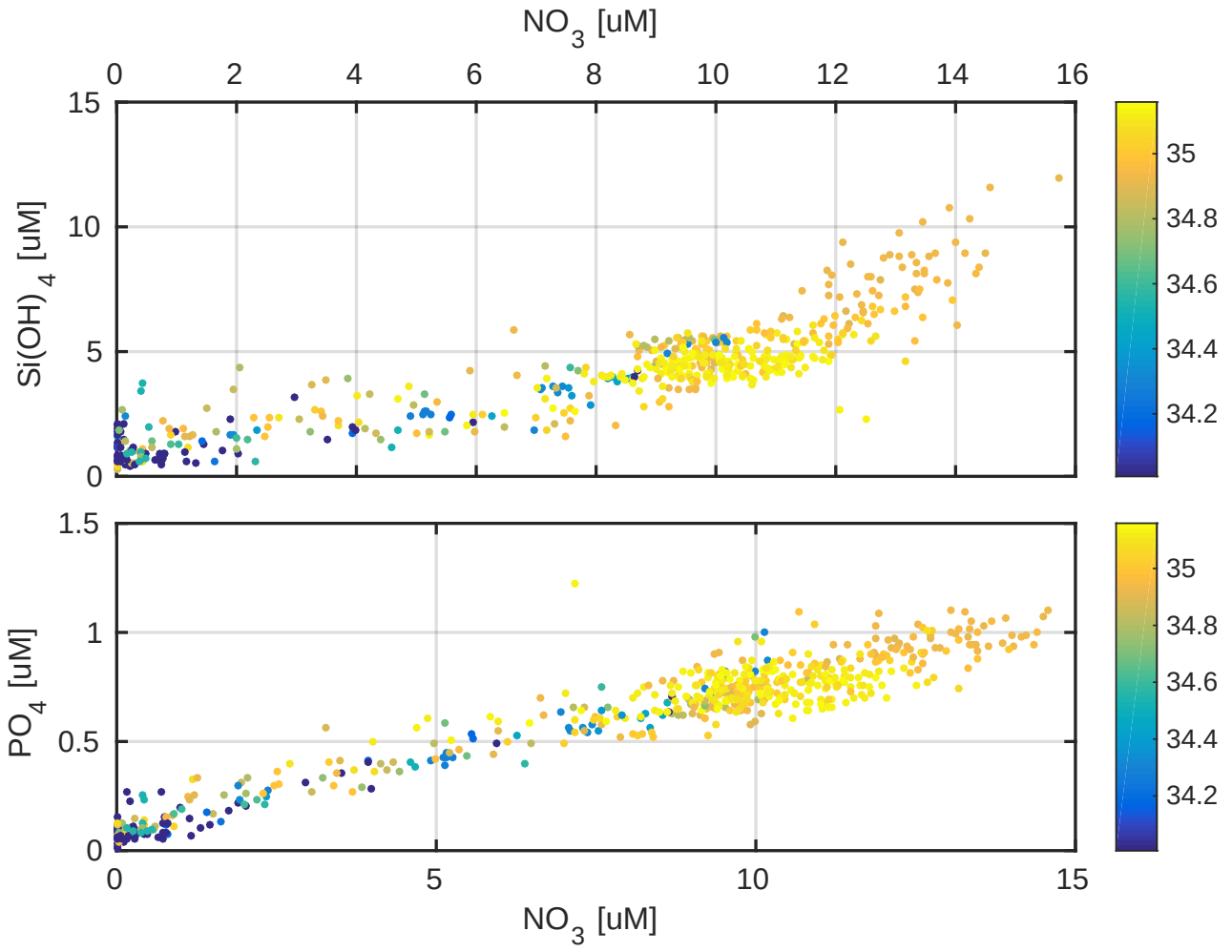

Figure 1. Si:NO_3^- (top) and PO_4^{3-}:NO_3^- (bottom) scatter plots. Color shading: Salinity (PSS). Water above the AW (S maximum, NO_3 $\approx$10 μM, $Si(OH)_4$ $\approx$4.5 μM) follows a slope of approximately 1:2 in $Si(OH)_4$:NO_3^-, while water below the AW-associated salinity maximum continues from there with a slope rather close to 2:1.

REFERENCES

Dickson, A., Sabine, C., and Christian, J. (2007). Guide to best practices for ocean CO2 measurements. *PICES Special Publication 3*

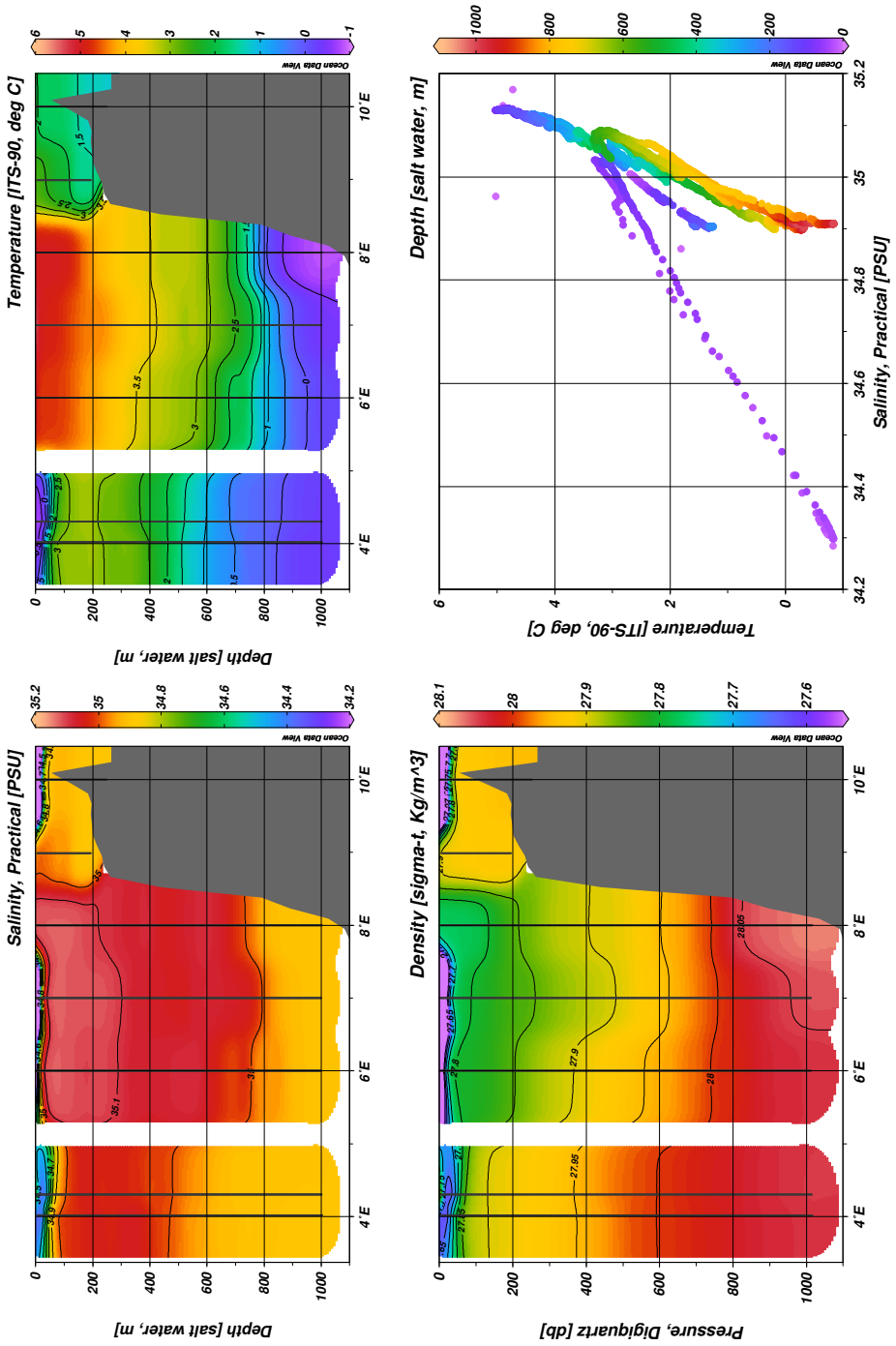

Figure 2. Hydrography during January 2014, transect D: Temperature, practical salinity, density

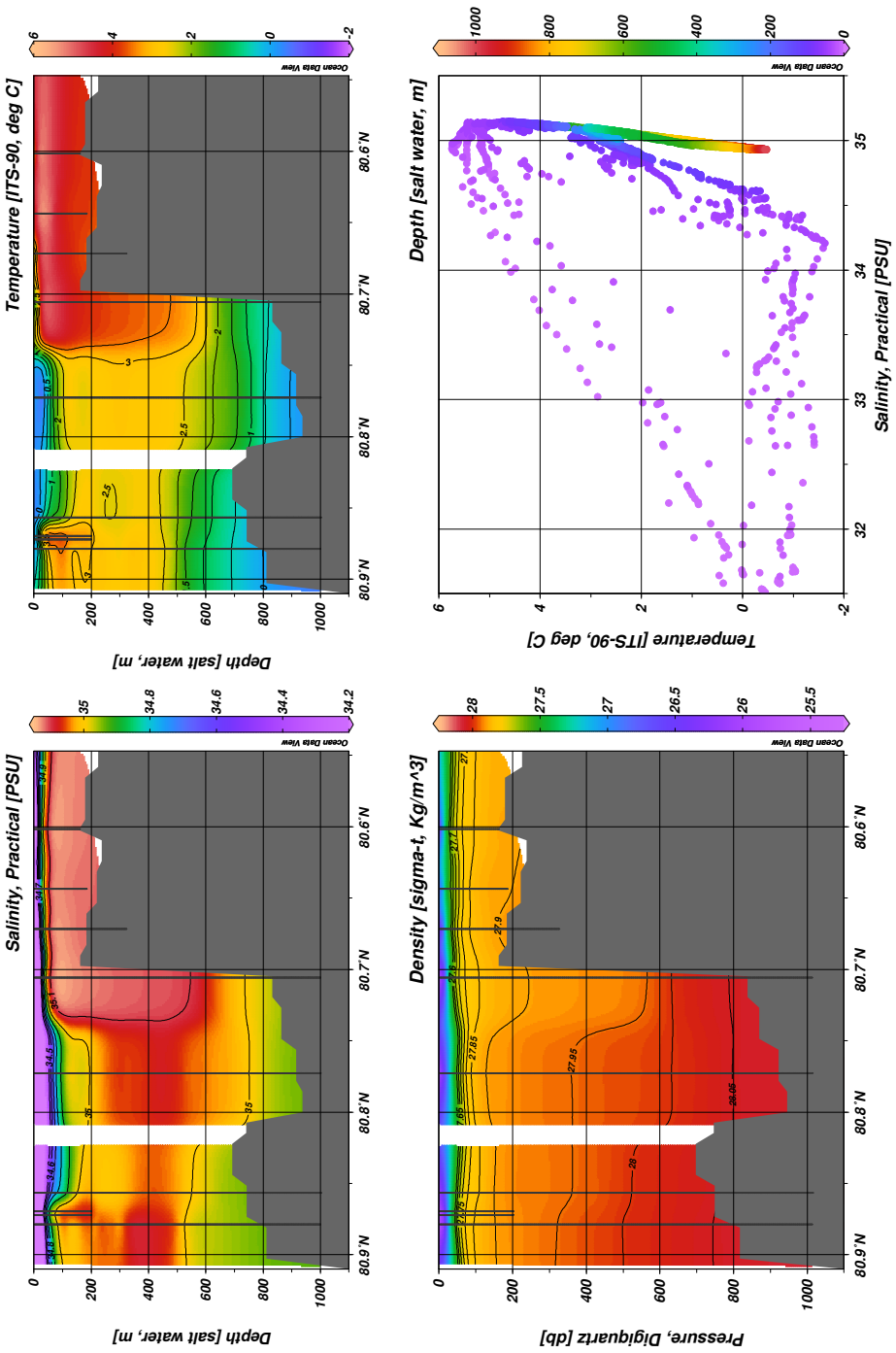

Figure 3. Hydrography during August 2014, transect E: Temperature, practical salinity, density

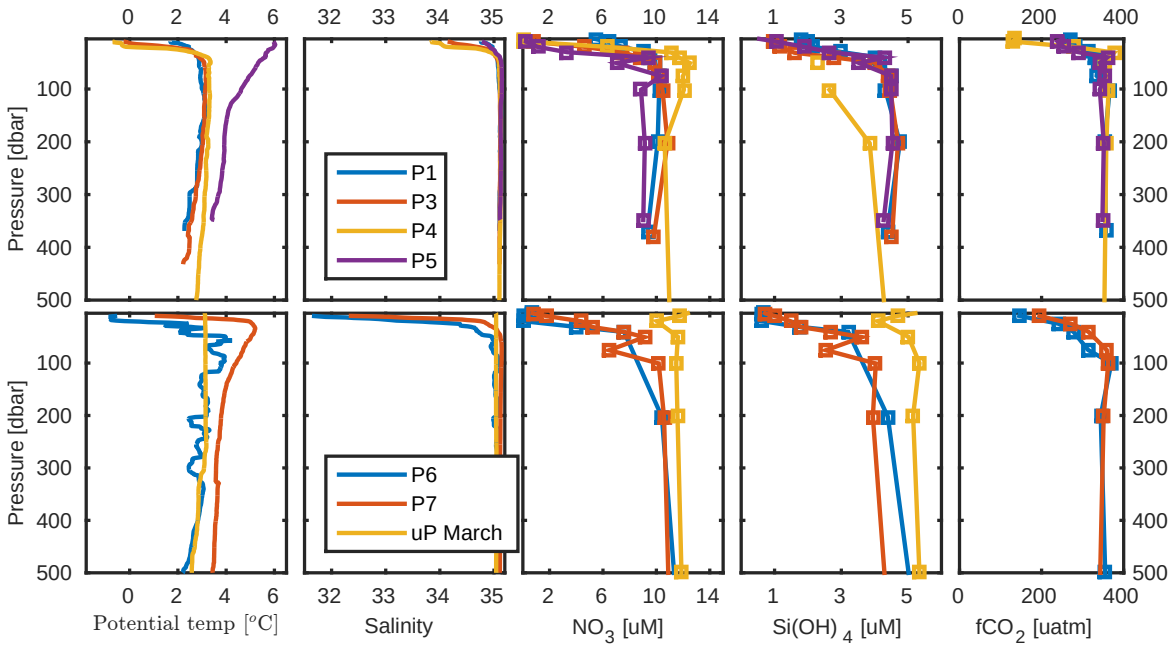

Figure 4. Process stations P1-P7 and March station

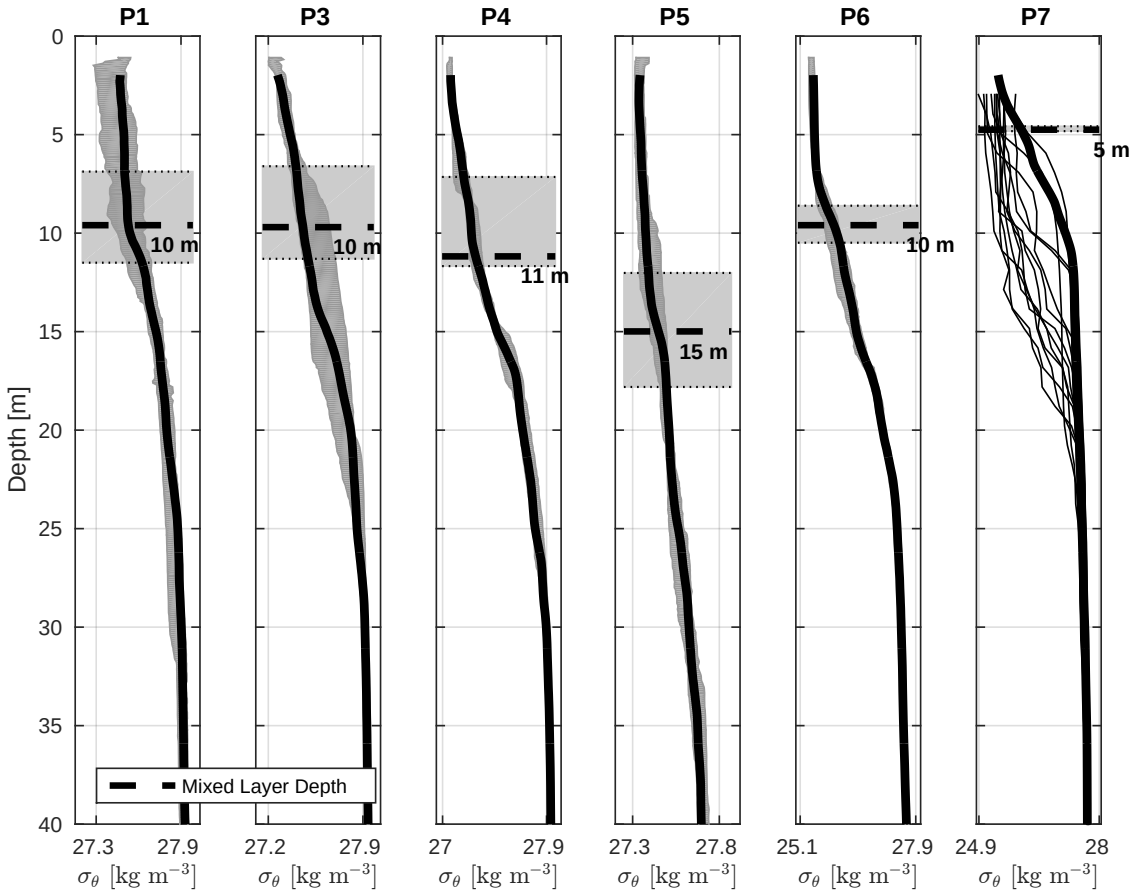

Figure 5. Potential density profiles and mixed layer depth derived from MSS (see text). MSS profiles supplemented by CTD profiles at P7 due to otherwise insufficient temporal coverage. Shaded areas are quartile ranges of either potential density or mixed layer depth.

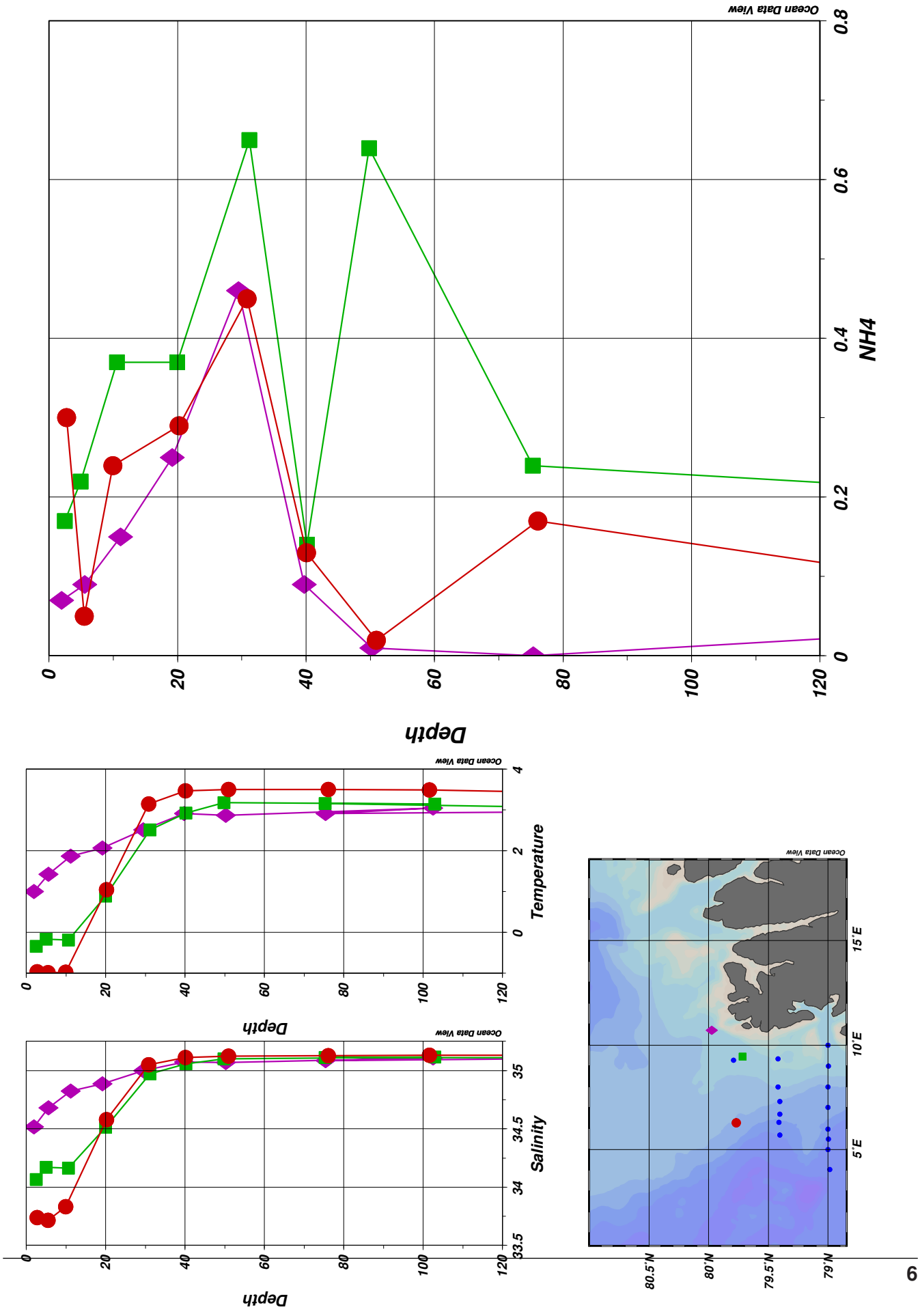

Figure 6. Ammonium NH_4^+ during May 2014, P1, P3, P4

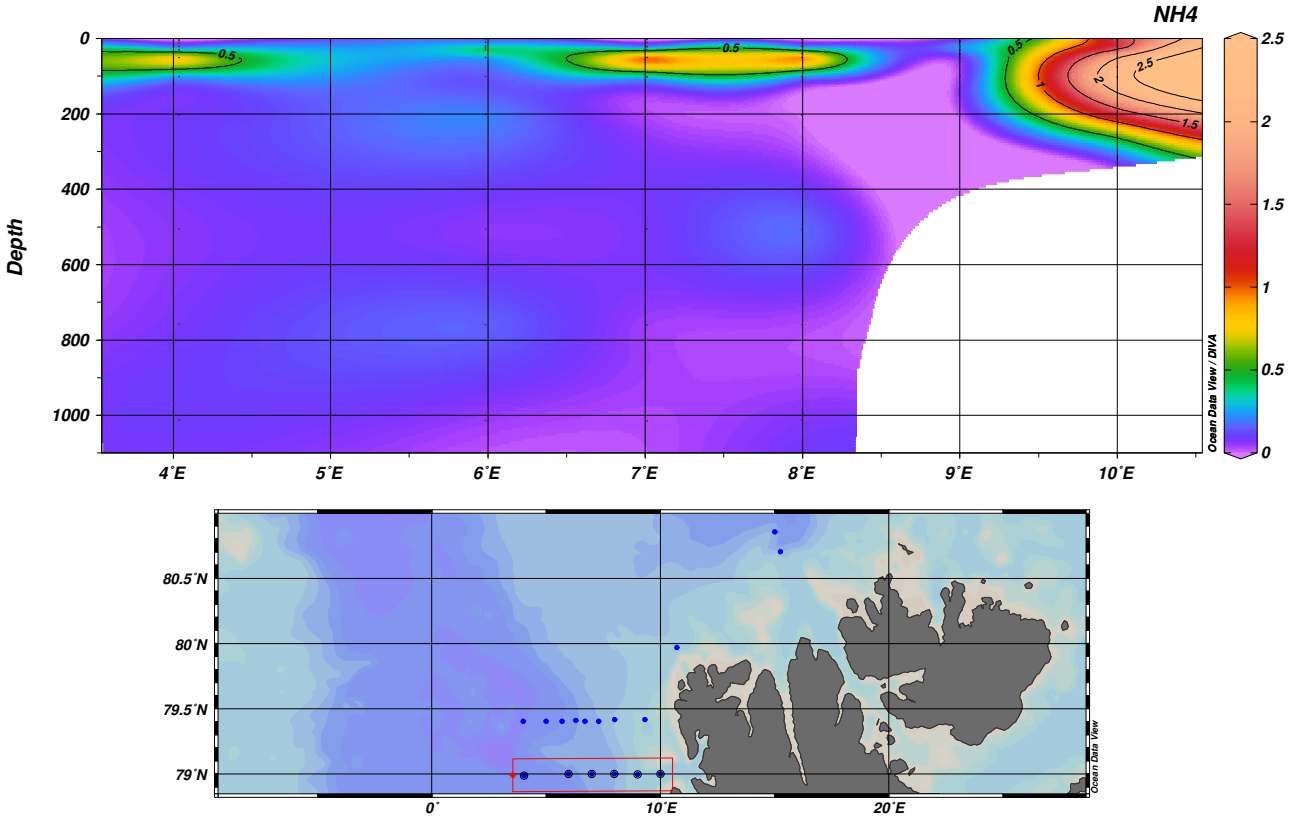

Figure 7. Ammonium NH_4^+ during August 2014, transect D

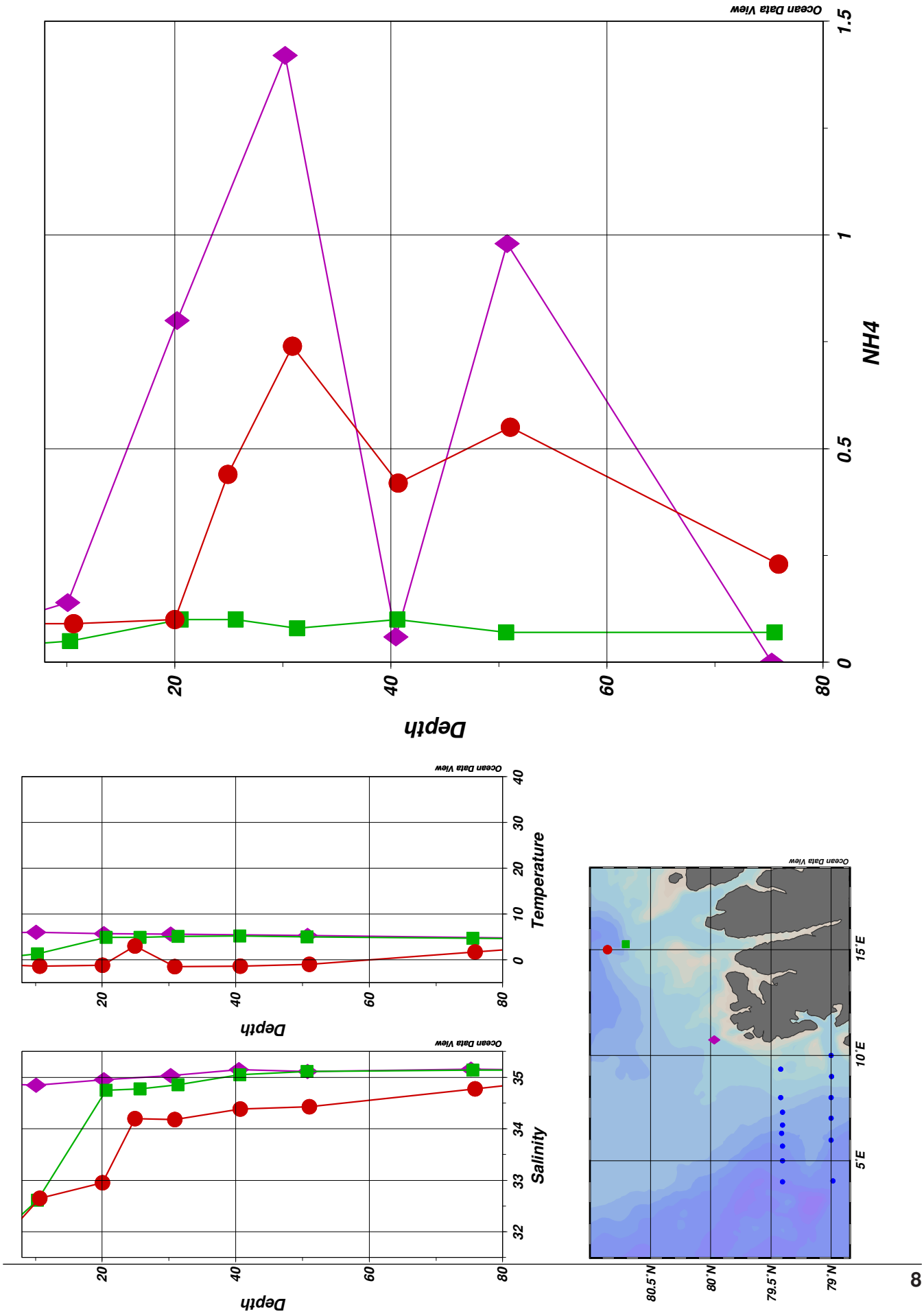

Figure 8. Ammonium NH_4^+ during the August process stations: P5, P6, P7.

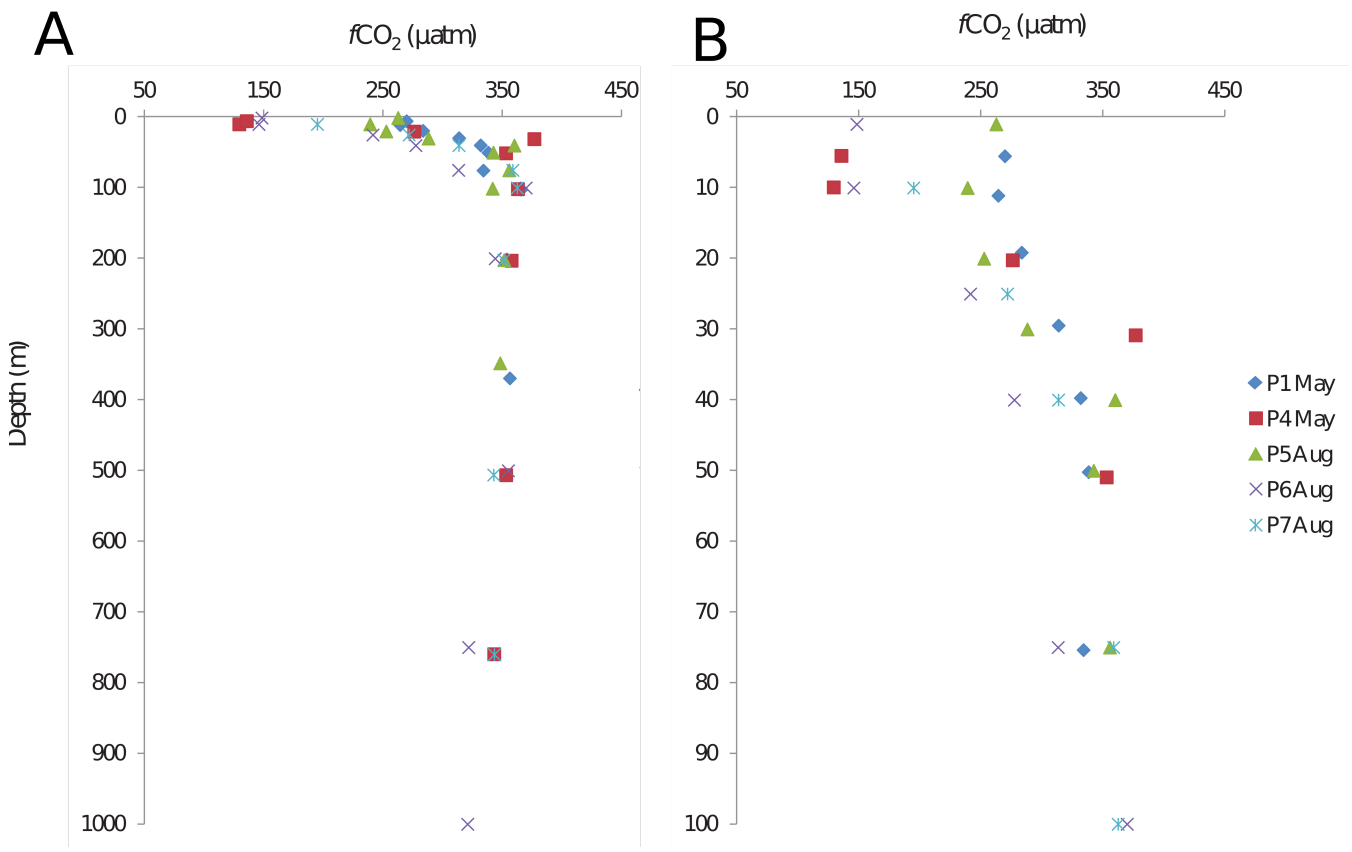

Figure 9. Vertical profiles fCO2 at the process stations over the full depth (A) and zoomed in on the upper 100 m (B).

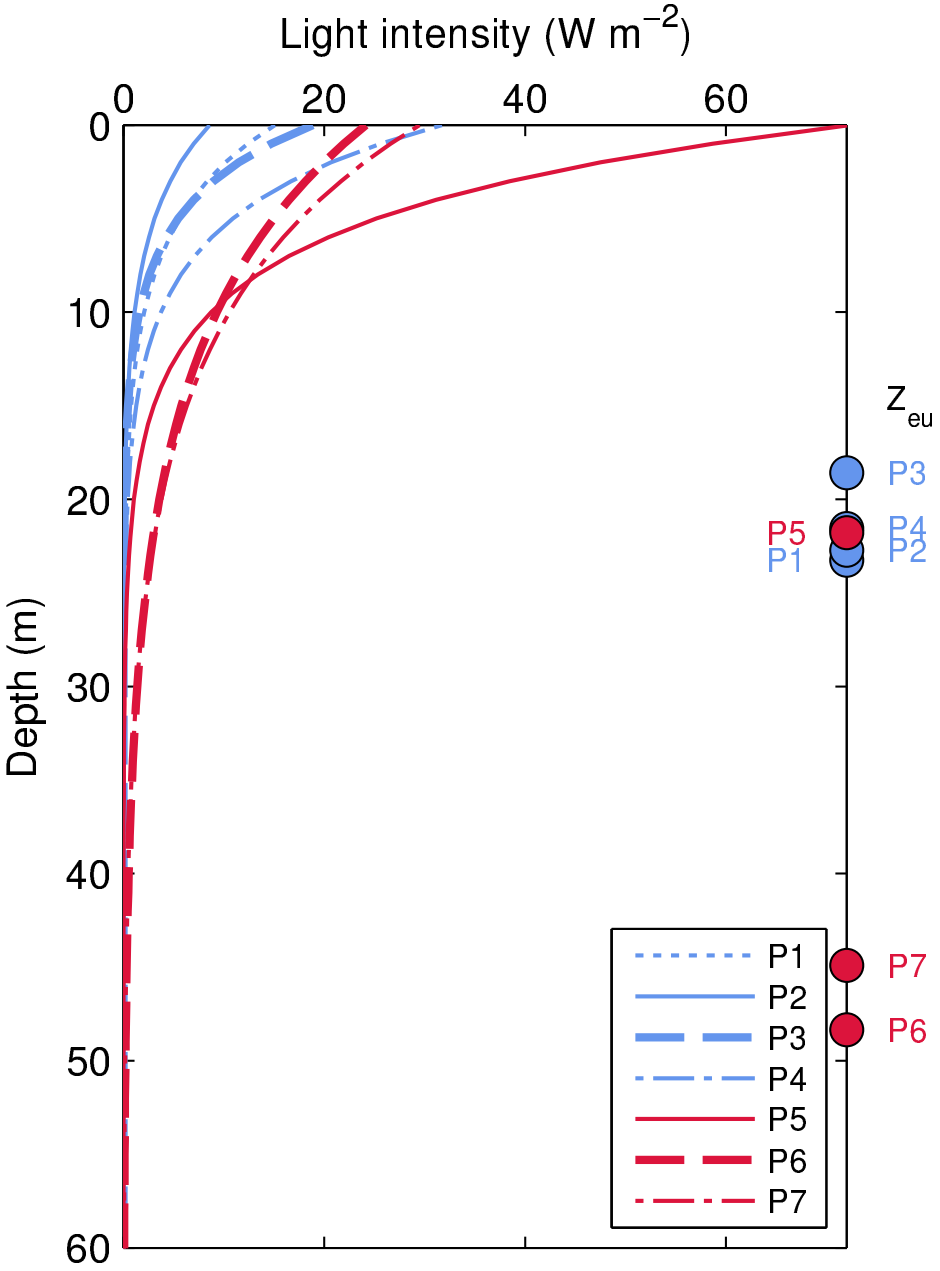

Figure 10. Profiles of underwater irradiance northwest and north of Spitsbergen, May and August 2014. In situ data was fitted using Eq. (**??**) and plotted. Z_{eu}, depth of 1% surface irradiance, was calculated using Eq. (**??**). Parameter values can be found in Table **??**.

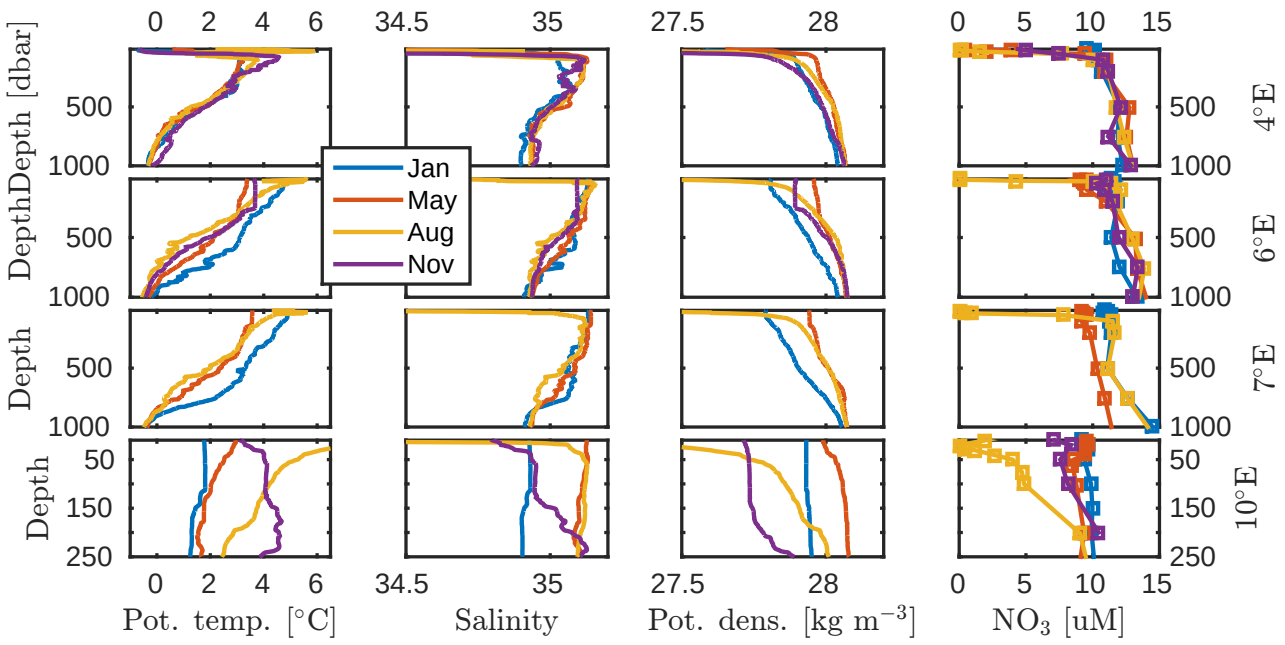

Figure 11. Temporal evolution on the D transect. The AW core is located closest to the 7°E station, but no profile was available there for November. The 4°E profile in November is from 2°E.

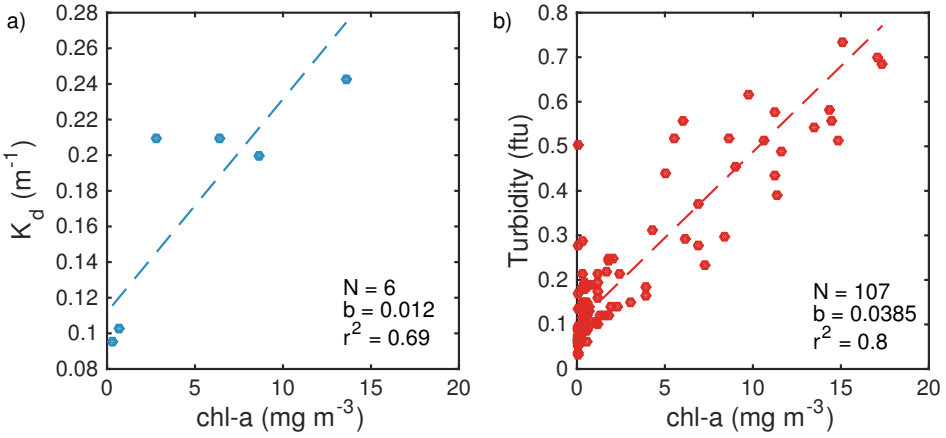

Figure 12. Relationship between a) mean euphotic zone extracted chl-a and the diffuse attenuation coefficient K_d and b) discrete extracted chl-a and turbidity at summer sampling stations.