

# **REPORT**

## **GLAERE - WP 3 – Remote sensing & GIS**

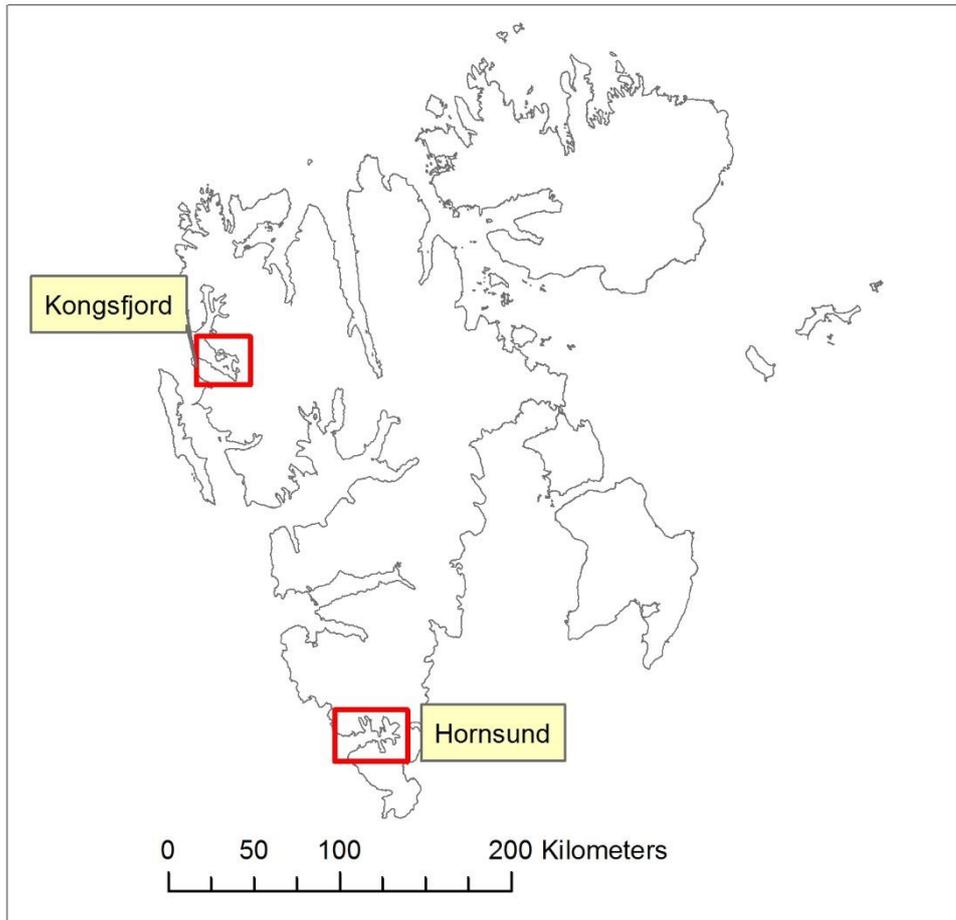
Jacek Urbański, Agnieszka Wochna, Katarzyna Dragańska

**D\_3.2 Completion of new field work data (from expedition to Spitsbergen in 2015)**



**January 2016**

The new field data were collected during expedition to Svalbard in July / August 2015. The measurements were taken in two fjords Hornsund (25 July – 1 August) and Kongsfjord (4 August – 9 August). All water measurements were taken from Zodiac C5 inflatable boat. The collected field work data were delivered to data base (milestone M\_3.2) which is described in details below.



The measurements taken during expeditions:

### CTD profiles

CTD profiles were carried out using SD204 self-contained instrument manufactured by SAIV A/S that measures, calculates and records water salinity, temperature, pressure and turbidity. The turbidity were measured using backscatter sensor in FTU (Formazin Turbidity Units) units. The sensor was calibrated with particles of interest to measure suspended solids concentrations in  $\text{mg l}^{-1}$ , density was calculated using standard salinity, temperature, presser formula. In Hornsund 36 profiles and in Kongsfiord 114 profiles were taken. The formula for conversion of FTU to  $\text{mg l}^{-1}$  was derived from relation between turbidity and SPM measurements (with  $R^2=0.82$ ).

$$SPM - \text{mg l}^{-1} = 1.021 \times TUR - 4.908$$

Profiles were taken up to 20-40 meters.

### **SPM – suspended particulate matter**

Field measurements of SPM were obtained at various locations from discrete water sampling. In Hornsund 35 water samples and in Kongsfjord 73 water samples were taken. Surface suspended particulate matter (SPM; mg/dm<sup>3</sup>) was assessed through vacuum-filtering of water samples onto pre-combusted (450°C, 24 h) pre-weighted MN GF-5 filters (0.4 µm pore size). The amount of filtered water was different depending on the suspended particulate matter concentration and was enough for distinct change in colour of filter. After filtration of sample, a filter was rinsed with distilled water to clear out salt. Large organisms visible to the naked eye were removed from the filters. Filters in Petri dish were stored in a refrigerator until analysis. Each filter was then air dried at 60 °C for 24 h and weighed to determine total suspension dry mass. Concentration was determined by dividing total suspension dry mass by the amount of filtered water. Some samples were analysed twice and mean value was calculated.

### **Sea surface temperature tracking**

The HOBO temperature logger and GPS were used for creating time-position-temperature data file during Zodiac boat movement. In Hornsund 2 SST tracks and in Kongsfjord 5 SST tracks were registered.

### **SD – Secchi disk measurements**

Secchi disk 20 cm in diameter was used to measure water transparency. In Hornsund 35 and in Kongsfjord 73 measurements were taken.

### **Water temperature time series**

The HOBO temperature logger was used to register water temperature time series. Two temperature time series were recorded in Hornsund. First at 20 m depth and second in thermal spring at Gnaloden.

Localization of stations on fjords at 20 m depth:

Kongsfjord    N 78 53.128    E 12 25.852

Hornsund     N 77 0.552     E 16 28.952

### **Sea level time series**

The HOBO sea level pressure logger was used to register water level changes from 27.7 to 1.8 at coast of Gnaloden.

## **C – carbon** (Appendix D page 97)

Field measurements of carbon were obtained at various locations from discrete water sampling. For concentrations of non-purgable organic carbon, water from surface was collected in a plastic bottles, transferred to the laboratory within 2 days and filtered at low pressure through pre-combusted (450°C, 24 h) MN GF-5 filters (0.4 µm pore size). The samples were acidified to pH<2 with concentrated HCl and stored in a refrigerator until analysis. Concentration of non-purgable organic carbon (NPOC) was measured with the high temperature catalytic oxidation (HTCO) technique using Vario TOC Cube analyzer (Elementar Analysensysteme GmbH). Each sample was analysed twice and mean value was calculated.

### **Phytoplankton -**

Field measurements of phytoplankton were obtained at various locations from discrete water sampling. (Appendix D page 97)

### **Bathymetry survey**

The depth measurements were carried out using Valeport Midas Surveyor Echo Sounder in area of experiment in Raudvika in Kongsfjord. The result is a file of contours.

### **Land cover training areas**

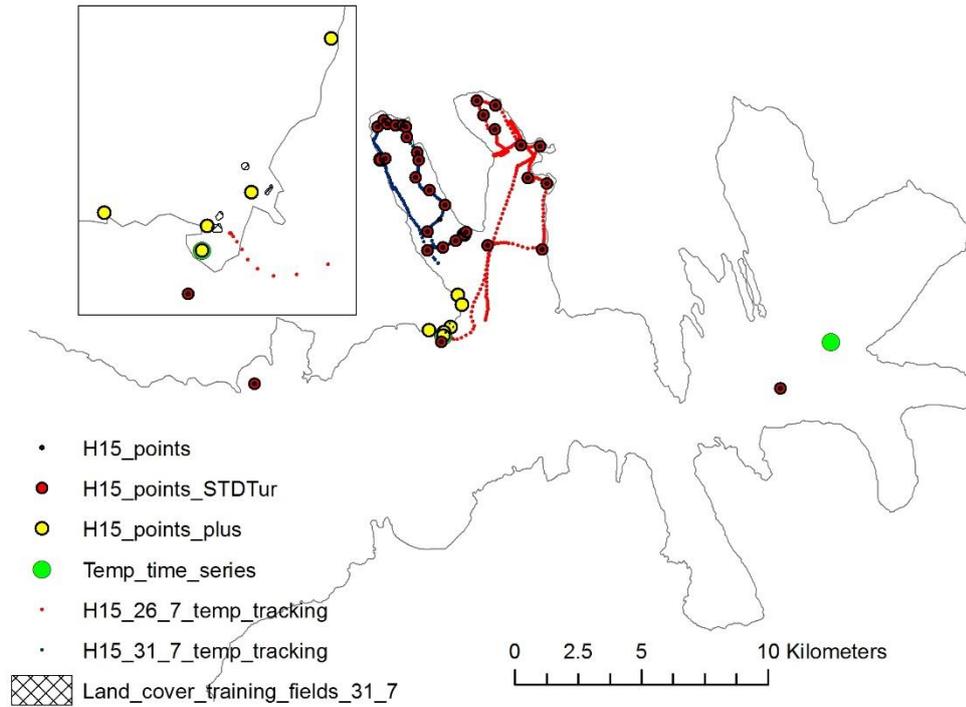
The land cover training areas defined as homogeneous polygons were registered using GPS. Each polygon was documented using photo of the surrounding area.

### **Landsat 8 satellite images**

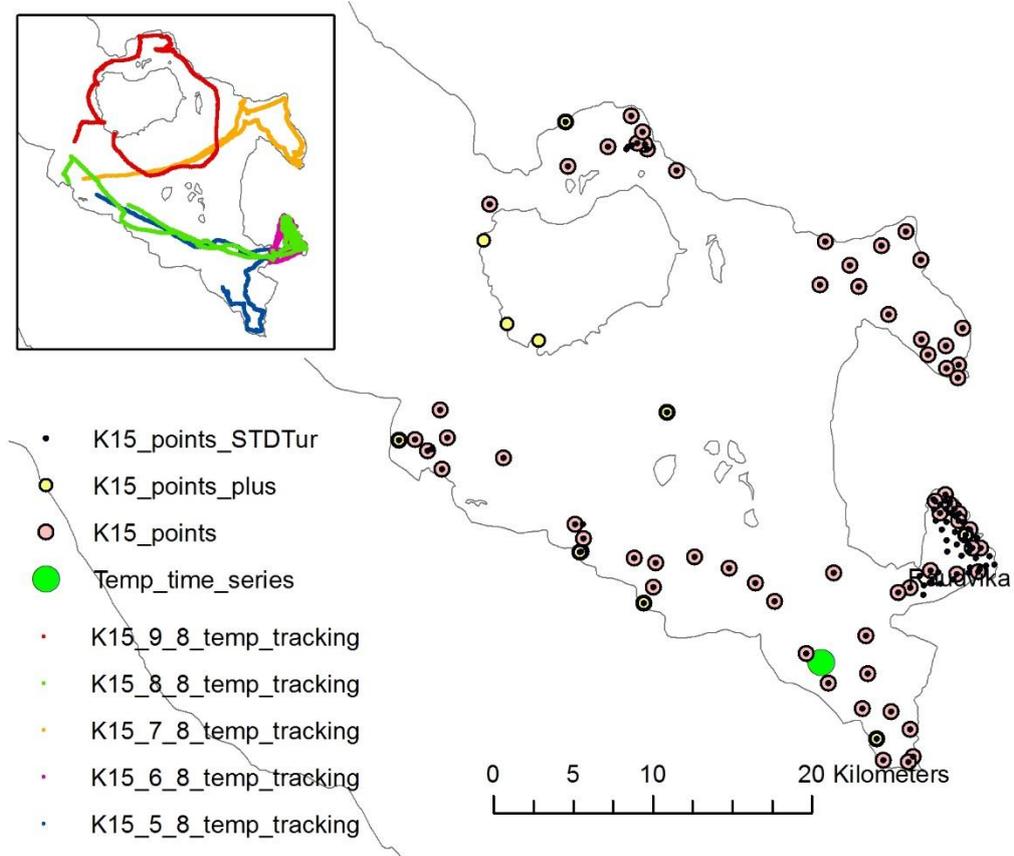
Two cloudless satellite images covering the study area were acquired during the field measurements.

Hornsund 31 July 2015 LC82090052015212LGN00

Kongsfjord 8 August 2015 LC82170032015220LGN00



Measurements in Hornsund 27 July – 1 August 2015



Measurements in Kongsfjord 4 – 9 August 2015

All results of expedition were delivered to geodatabase ( in digital form) which is a part of this report:

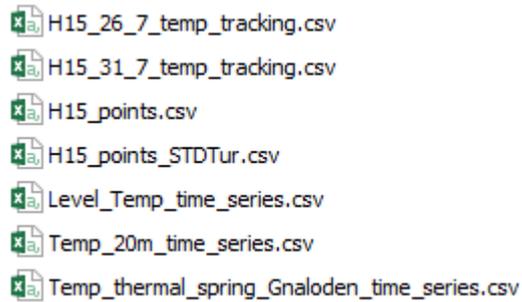
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  - [+]  Landsat8
  - [+]  std\_profiles
  - [-]  EXP\_Hornsund\_2015.gdb
    -  H15\_26\_7\_temp\_tracking
    -  H15\_31\_7\_temp\_tracking
    -  H15\_points
    -  H15\_points\_plus
    -  H15\_points\_STDTur
    -  Land\_cover\_training\_fields\_31\_7
    -  Level\_Temp\_time\_series
    -  Svalbard\_maska\_2015
    -  Temp\_20m\_time\_series
    -  Temp\_thermal\_spring\_Gnaloden\_time\_series
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  - [+]  Exp\_Kongsfjord\_2015\_csv
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    -  K15\_6\_8\_temp\_tracking
    -  K15\_7\_8\_temp\_tracking
    -  K15\_8\_8\_temp\_tracking
    -  K15\_9\_8\_temp\_tracking
    -  K15\_points
    -  K15\_points\_plus
    -  K15\_points\_STDTur
    -  Raudvika\_izobaty5
    -  Svalbard\_maska\_2015
    -  Temp\_20m\_time\_seriesK

## Description of geodatabase:

### HORNSUND

<subfolder> EXP\_Hornsund\_2015\_csv

Layers from file geodatabase converted to text .csv files



<subfolder> foto

Photographs of points of interest

<subfolder> Landsat8

Landsat 8 scene downloaded from Glovis (<http://glovis.usgs.gov/>)

<subfolder> std\_profiles

All std Hornsund profiles figures – Appendix A

<ESRI file geodatabase> EXP\_Hornsund\_2015.gdb

Layers:

H15\_26\_7\_temp\_tracking (26 July 2015)

points

fields:           Field1 – latitude DD  
                    Field2 – longitude DD  
                    Field3 - temperature

H15\_31\_7\_temp\_tracking (31 July 2015)

points

fields:           Field1 – latitude DD  
                    Field2 – longitude DD  
                    Field3 - temperature

H15\_points (surface SD and SPM)

points

fields:           POINT\_ID – point number

NNN – latitude DD

EEE – longitude DD

SD - Secchi disk depth [m]

DAY – day

MONTH – month

HOUR – hour

SPM\_pom - suspended particulate matter [ $\text{mg l}^{-1}$ ] from water sampling

SPM\_pom\_re – reliability of measured value (0-1)

H15\_points\_plus (surface carbon, phytoplankton, SPM) (Appendix D page 97)

points

fields: POINT\_ID – point number

NNN – latitude DD

EEE – longitude DD

DAY – day

MONTH – month

HOUR – hour

SPM\_pom - suspended particulate matter [ $\text{mg l}^{-1}$ ] from water sampling

NPOC - concentrations of non-purgable organic carbon [mg/l]

SD\_NPOC – standard deviation

Phytoplankton\_code

Phytoplankton\_description

H15\_points\_STDTur (temperature, salinity, density, turbidity – spm, records are sorted by points number and depth) Appendix A page 14

points

fields: POINT\_ID – point number

NNN – latitude DD

EEE – longitude DD

SD - Secchi disk depth [m]

DAY – day

MONTH – month

HOURL – hour

NR\_STD – number in STD204 output text file

DDD – depth [m]

COD – 1 if in situ value

TTT – temperature [°C]

SSS – salinity [psu]

TUR – turbidity [FTU]

DDDminus – depth with minus sign [m]

DENS – water density [ $\text{kg m}^{-3}$ ]

SPM - suspended particulate matter [ $\text{mg l}^{-1}$ ] from water  
sampling or calculated from turbidity (minimum value  
= 1 [ $\text{mg l}^{-1}$ ])

SPM\_pom - suspended particulate matter [ $\text{mg l}^{-1}$ ] from water  
sampling (0 = lack of data)

Land\_cover\_training\_fields\_31\_7

polygons

fields: Id – id of training polygon

foto – name of photo presenting the land cover in folder foto

Level\_Temp\_time\_series Appendix B (page 33 )

table

fields: nr - number of measurement

Date\_Time – time

Temp – water temperature [°C]

Sensor\_Depth – relative sea level [m]

Temp\_thermal\_spring\_Gnaloden\_time\_series

table

fields: nr - number of measurement

Date\_Time – time

Temp – water temperature [°C]

Temp\_20m\_time\_seriesK Appendix B (figure page )

table

fields: nr - number of measurement

Date\_Time – time

Temp – water temperature [°C]

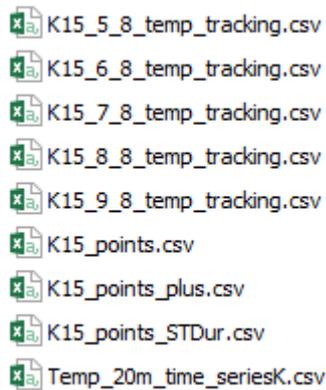
SVAL\_mask2015 - Svalbard coastline 2015 (supplementary layer)

polygons

## KONGSFJORD

<subfolder> EXP\_Kongsfjord\_2015\_csv

Layers from file geodatabase converted to text .csv files



<subfolder> foto

Photographs of points of interest

<subfolder> Landsat8

Landsat 8 scene downloaded from Glovis (<http://glovis.usgs.gov/>)

<subfolder> std\_profiles

All std Kongsfjord profiles figures – Appendix C

<ESRI file geodatabase> EXP\_Kongsfjord\_2015.gdb

Layers:

K15\_5\_8\_temp\_tracking (5 August 2015)

points

fields:           Field1 – latitude DD  
                    Field2 – longitude DD  
                    Field3 - temperature

K15\_6\_8\_temp\_tracking (6 August 2015)

points

fields:           Field1 – latitude DD  
                    Field2 – longitude DD  
                    Field3 – temperature

K15\_7\_8\_temp\_tracking (7 August 2015)

points

fields:           Field1 – latitude DD  
                    Field2 – longitude DD  
                    Field3 - temperature

K15\_8\_8\_temp\_tracking (8 August 2015)

points

fields:           Field1 – latitude DD  
                    Field2 – longitude DD  
                    Field3 - temperature

K15\_9\_8\_temp\_tracking (9 August 2015)

points

fields:           Field1 – latitude DD  
                    Field2 – longitude DD  
                    Field3 - temperature

K15\_points (surface SD and SPM)

points

fields:           POINT\_ID – point number  
                    NNN – latitude DD  
                    EEE – longitude DD  
                    SD - Secchi disk depth [m]  
                    DAY – day  
                    MONTH – month  
                    HOUR – hour  
                    SPM\_pom - suspended particulate matter [mg l<sup>-1</sup>] from water  
                    sampling  
                    SPM\_pom\_re – reliability of measured value (0-1)

K15\_points\_plus (surface carbon, phytoplankton, SPM) (Appendix D page 96)

points

fields: POINT\_ID – point number  
 NNN – latitude DD  
 EEE – longitude DD  
 DAY – day  
 MONTH – month  
 HOUR – hour  
 SPM\_pom - suspended particulate matter [mg l<sup>-1</sup>] from water sampling  
 NPOC - concentrations of non-purgable organic carbon [mg/l]  
 SD\_NPOC – standard deviation  
 Phytoplankton\_code  
 Phytoplankton\_description

K15\_points\_STDTur (temperature, salinity, density, turbidity – spm, records are sorted by points number and depth)

points

fields: POINT\_ID – point number  
 NNN – latitude DD  
 EEE – longitude DD  
 SD - Secchi disk depth [m]  
 DAY – day  
 MONTH – month  
 HOUR – hour  
 NR\_STD – number in STD204 output text file  
 DDD – depth [m]  
 COD – 1 if in situ value  
 TTT – temperature [°C]  
 SSS – salinity [psu]  
 TUR – turbidity [FTU]  
 DDDminus – depth with minus sign [m]  
 DENS – water density [kg m<sup>-3</sup>]  
 SPM - suspended particulate matter [mg l<sup>-1</sup>] from water sampling or calculated from turbidity (minimum value = 1 [mg l<sup>-1</sup>])

SPM\_pom - suspended particulate matter [ $\text{mg l}^{-1}$ ] from water  
sampling (0 = lack of data)

Raudvika\_izobaty5 Appendix B (page 33)

lines

fields: Id – id of contour

CONTOUR – depth (5,10,15,20,25,30)

Level\_Temp\_time\_series Appendix B (page 33 )

table

fields: nr - number of measurement

Date\_Time – time

Temp – water temperature [ $^{\circ}\text{C}$ ]

Sensor\_Depth – relative sea level [m]

Temp\_thermal\_spring\_Gnaloden\_time\_series

table

fields: nr - number of measurement

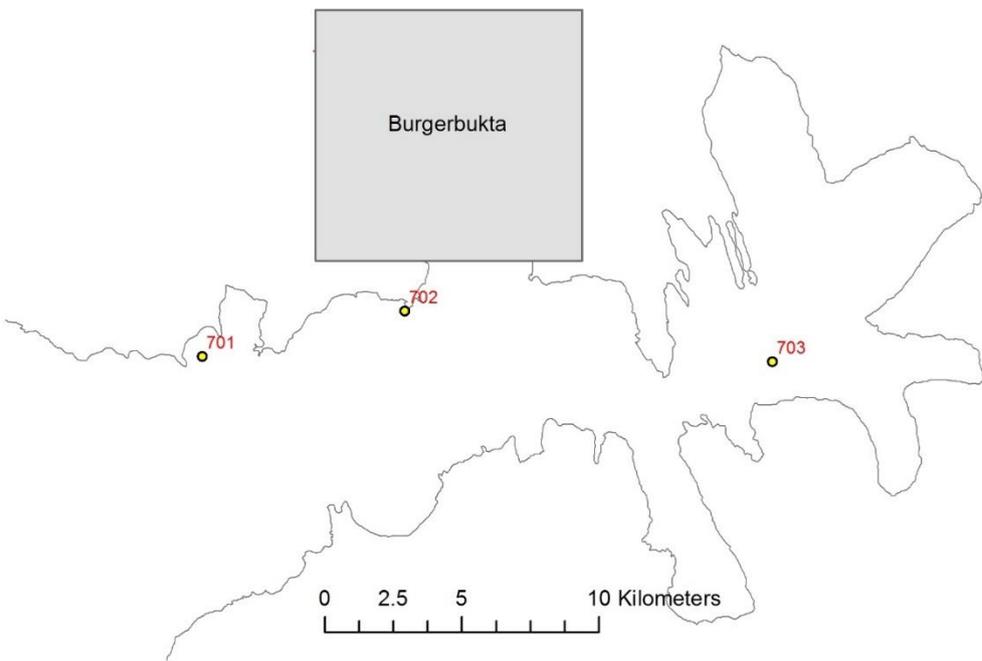
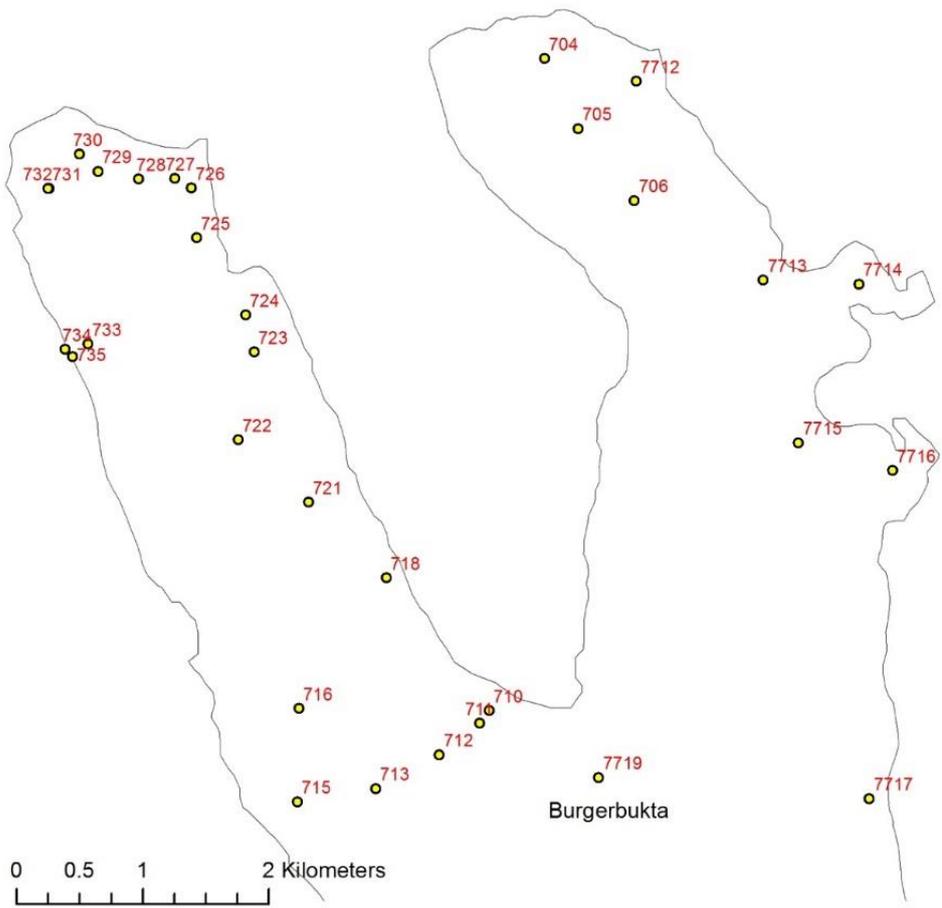
Date\_Time – time

Temp – water temperature [ $^{\circ}\text{C}$ ]

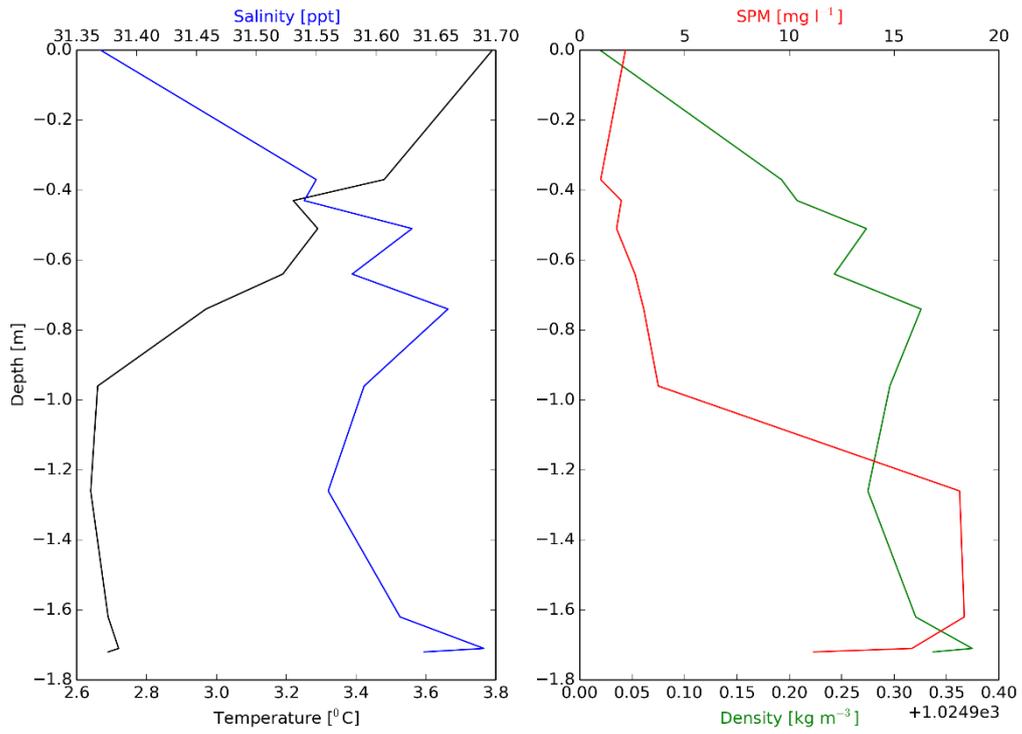
SVAl\_mask2015 - Svalbard coastline 2015 (supplementary layer)

polygons

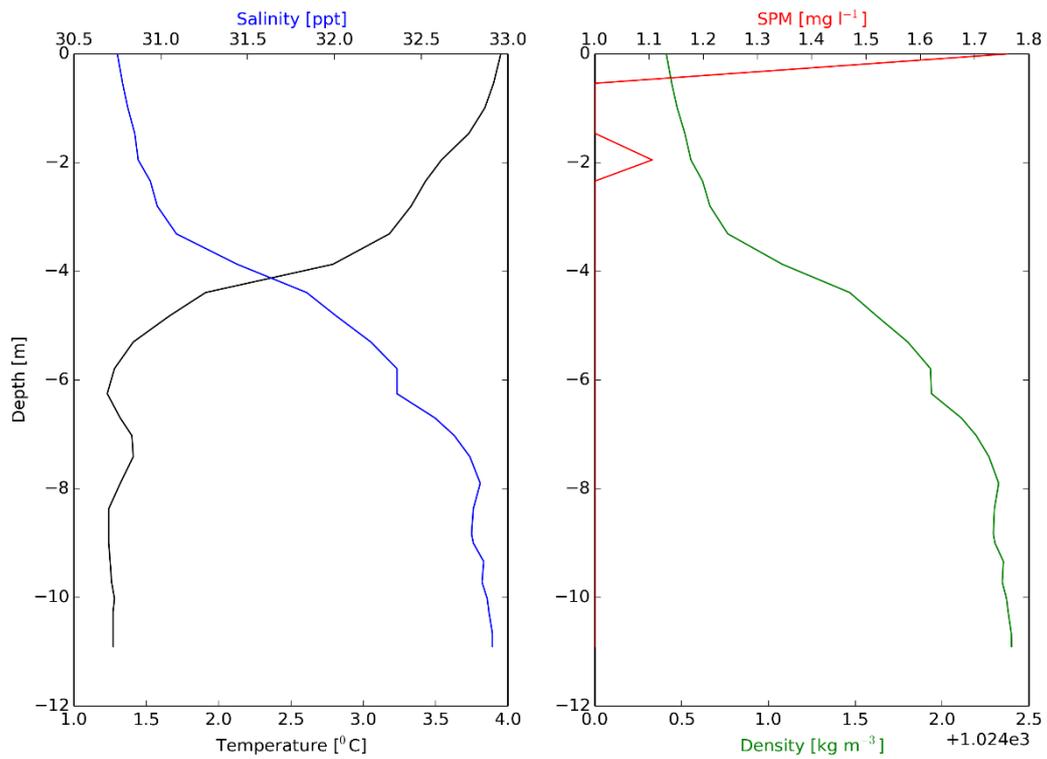
APPENDIX A (Hornsund profiles)



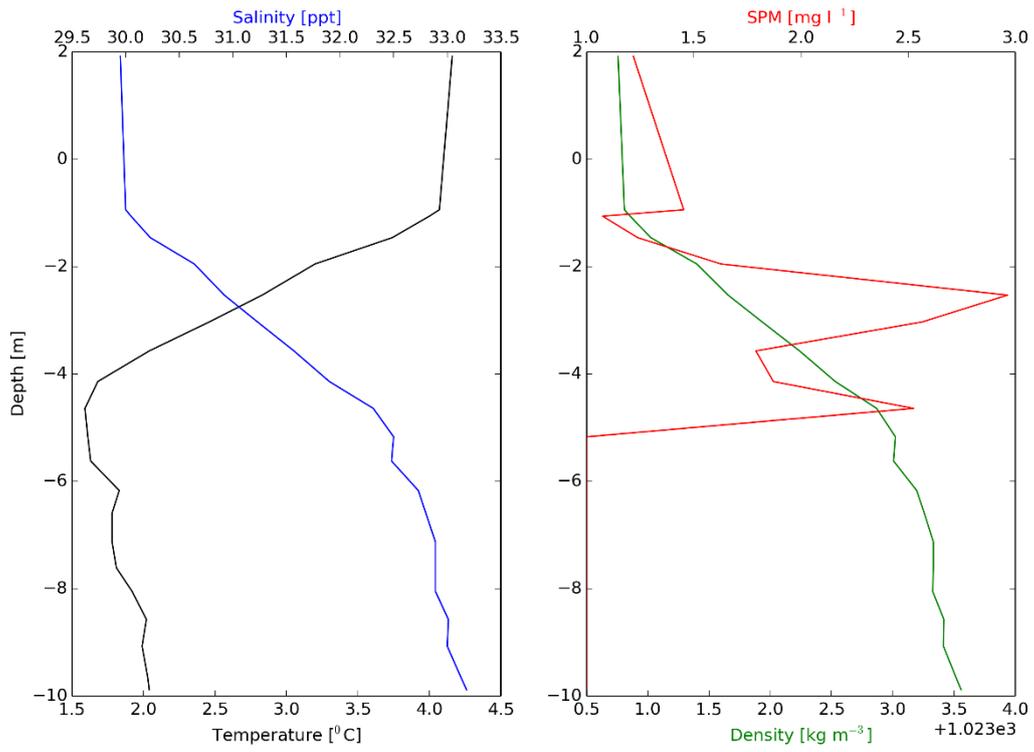
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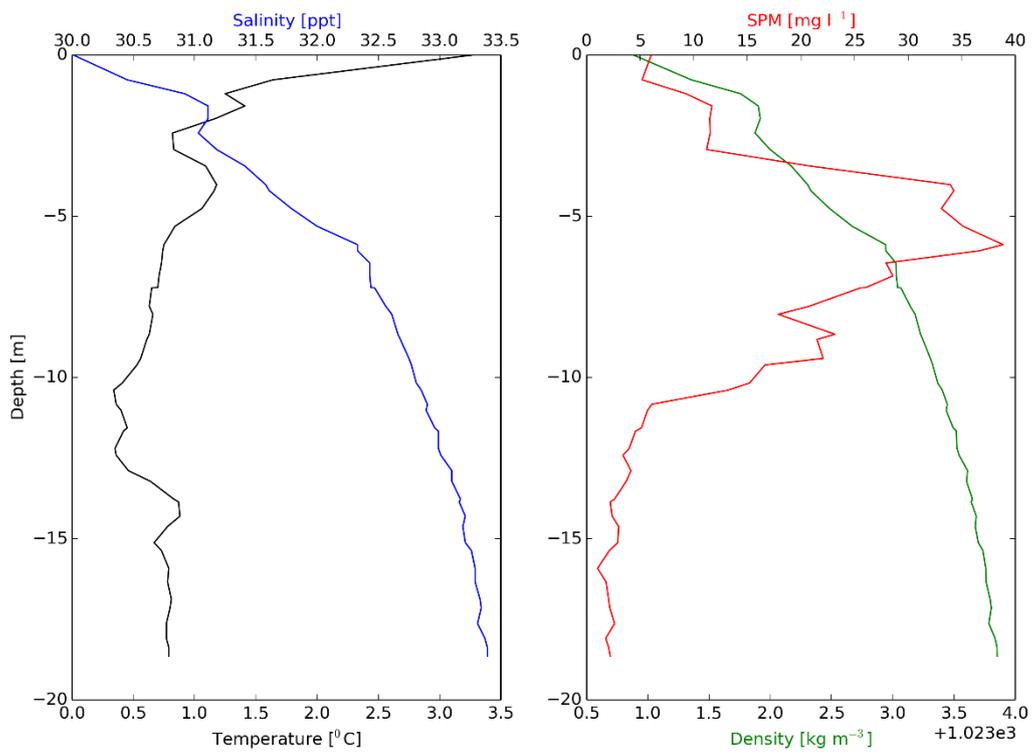
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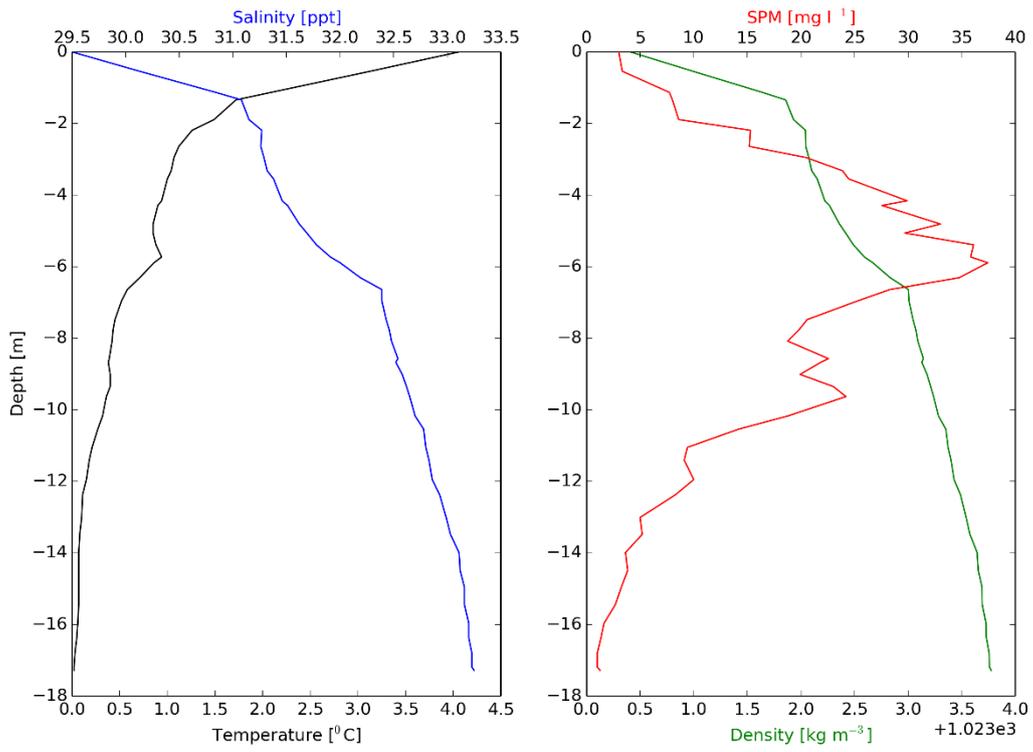
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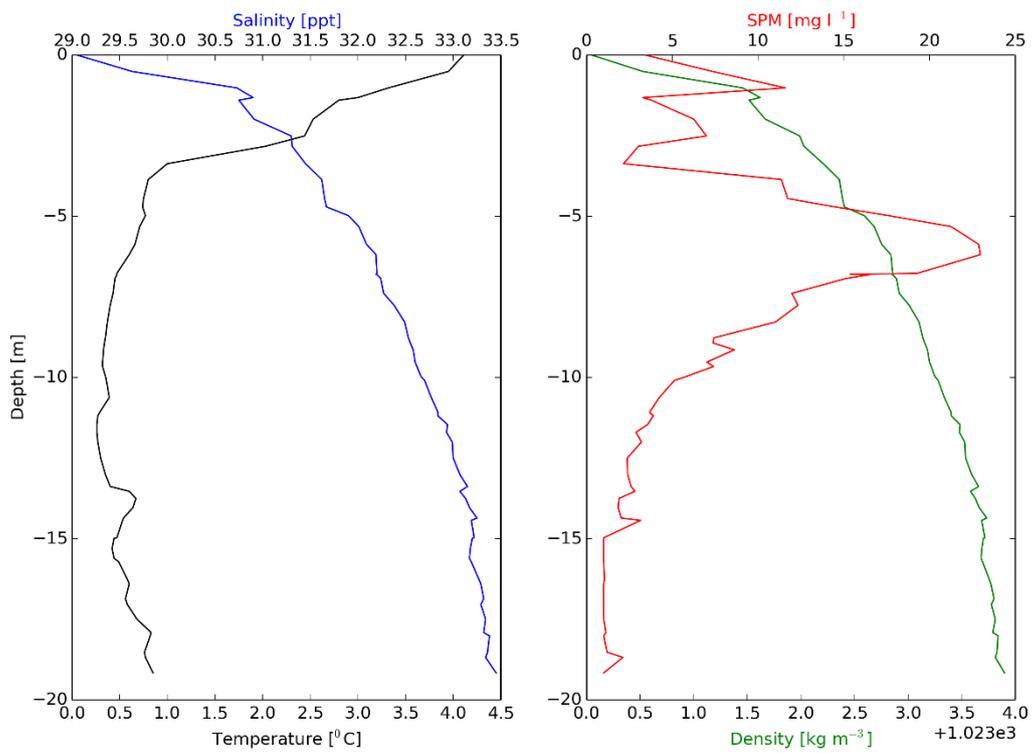
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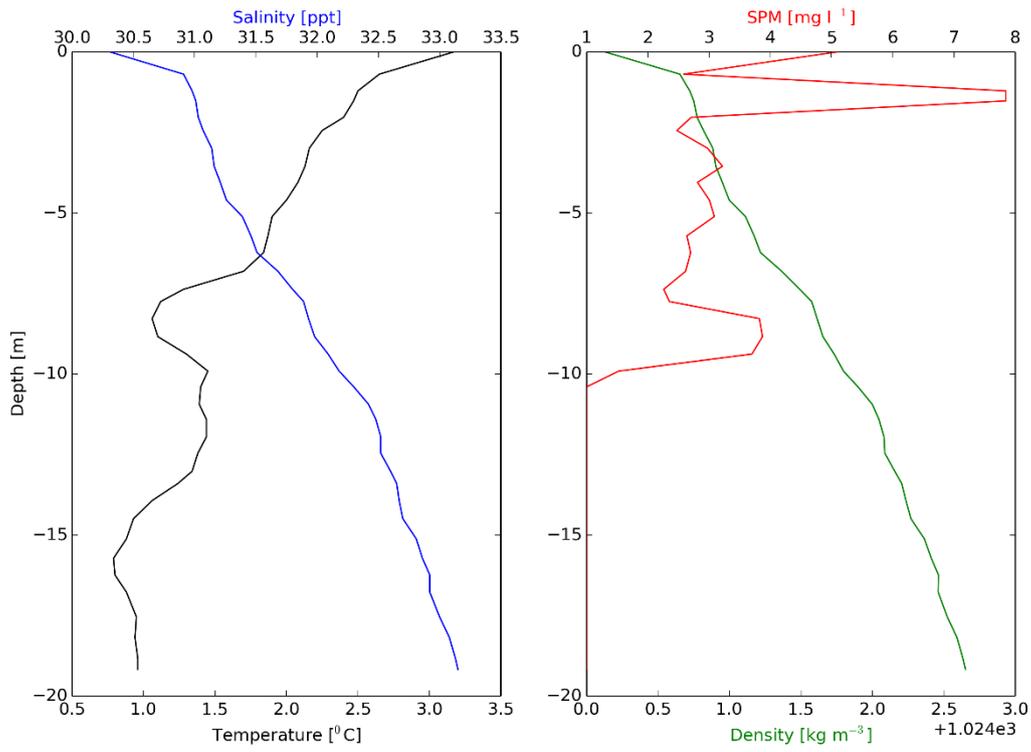
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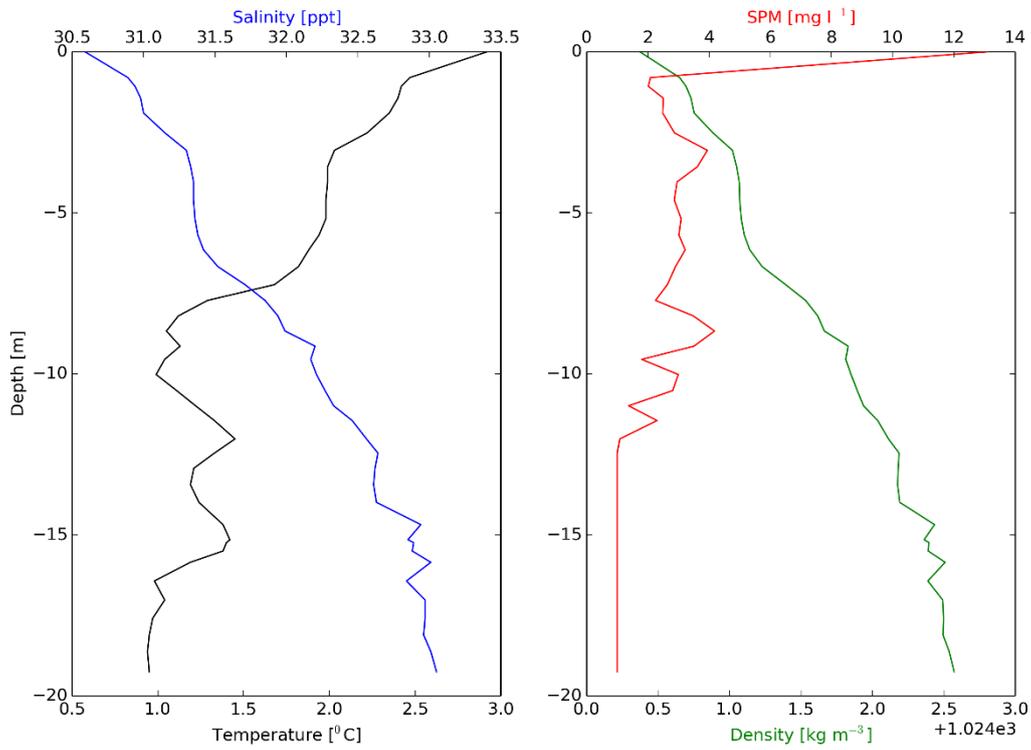
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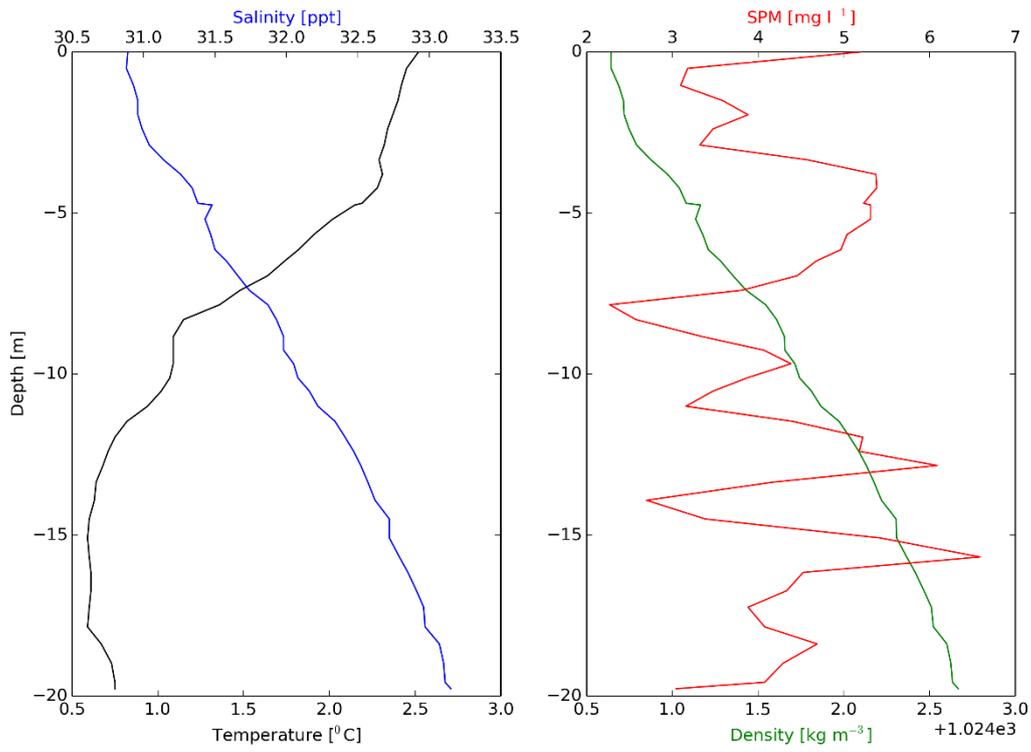
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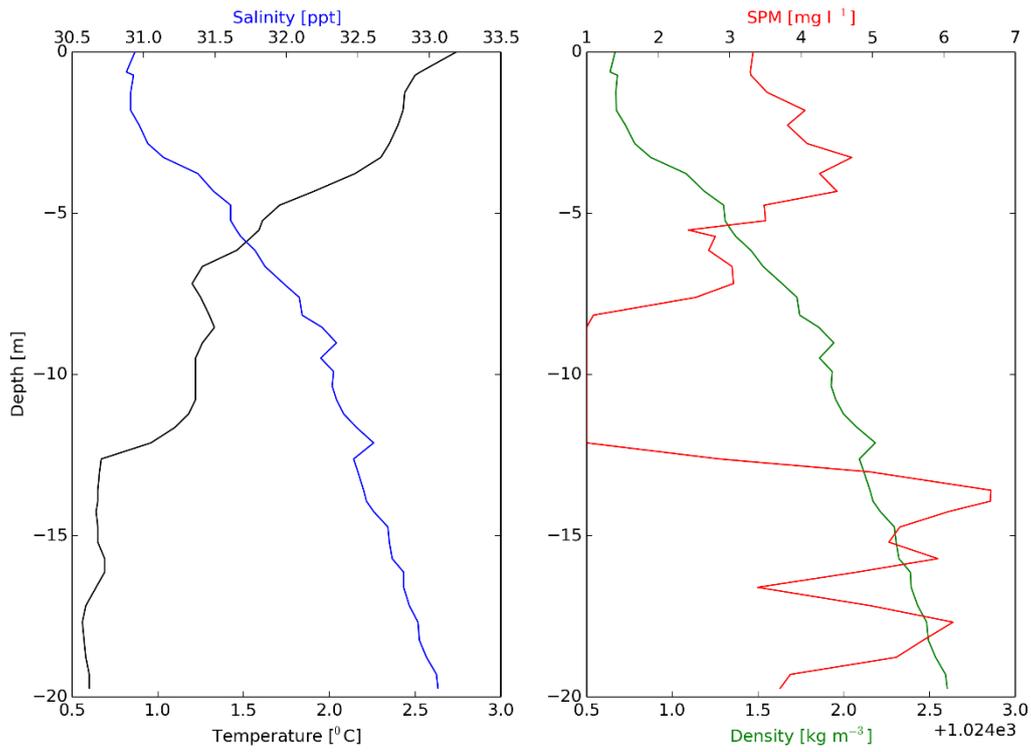
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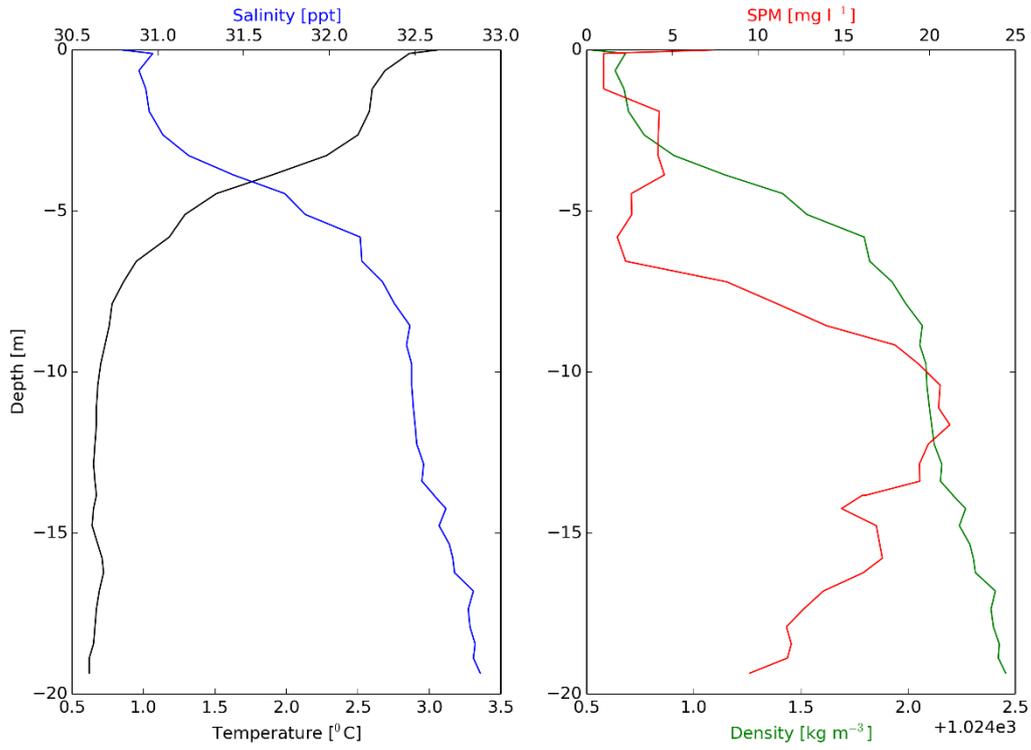
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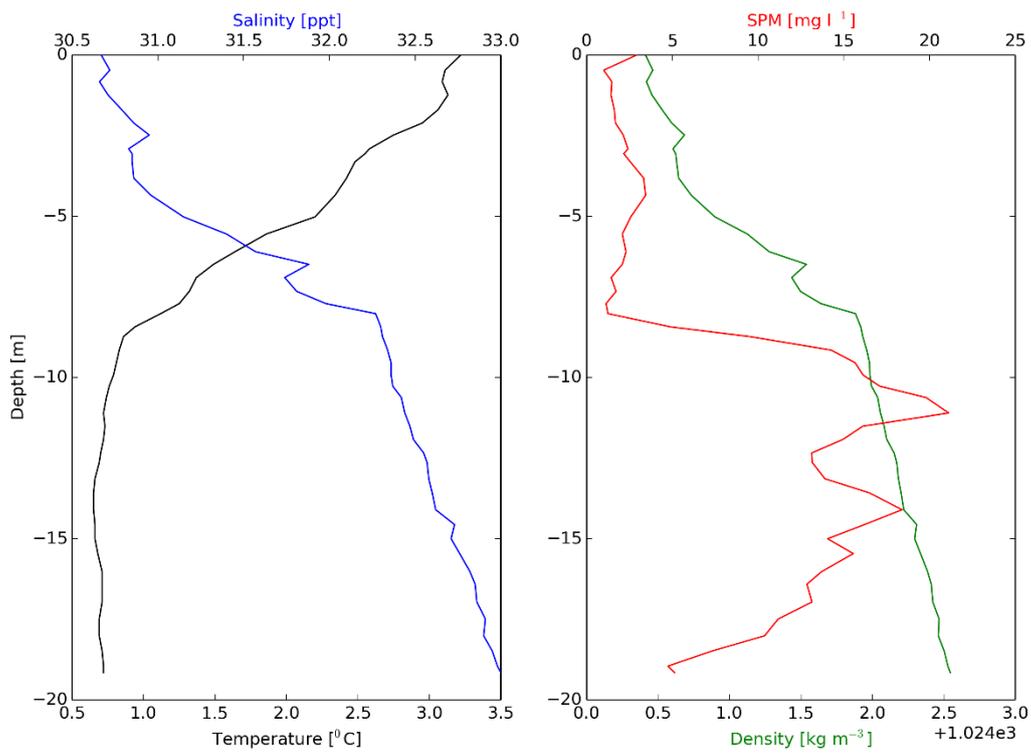
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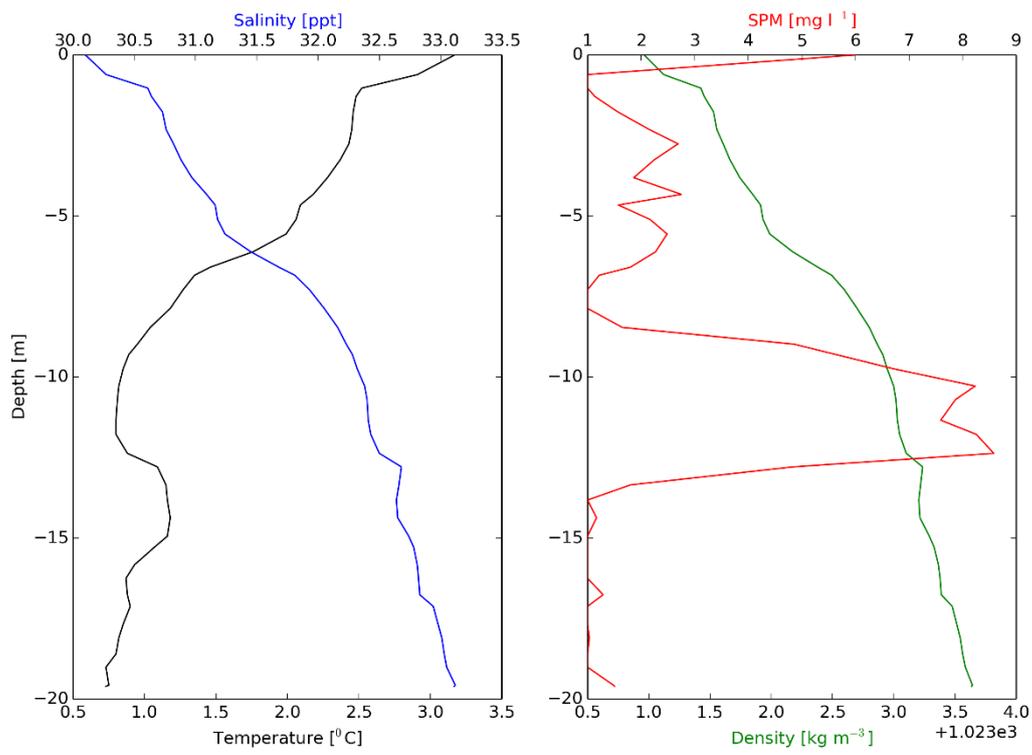
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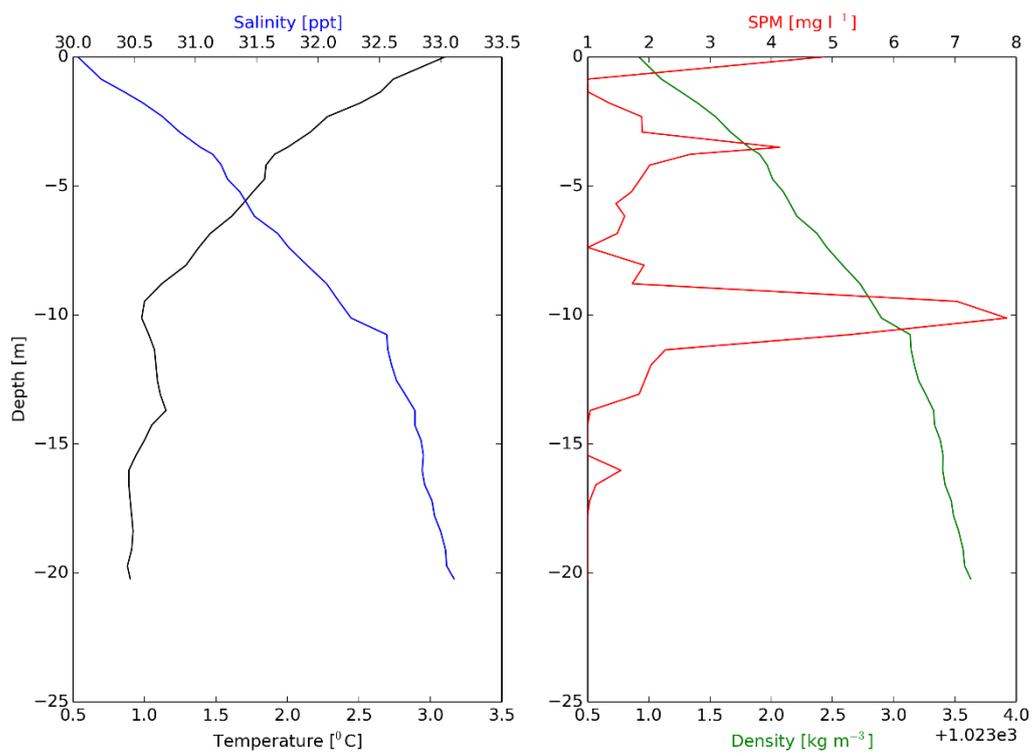
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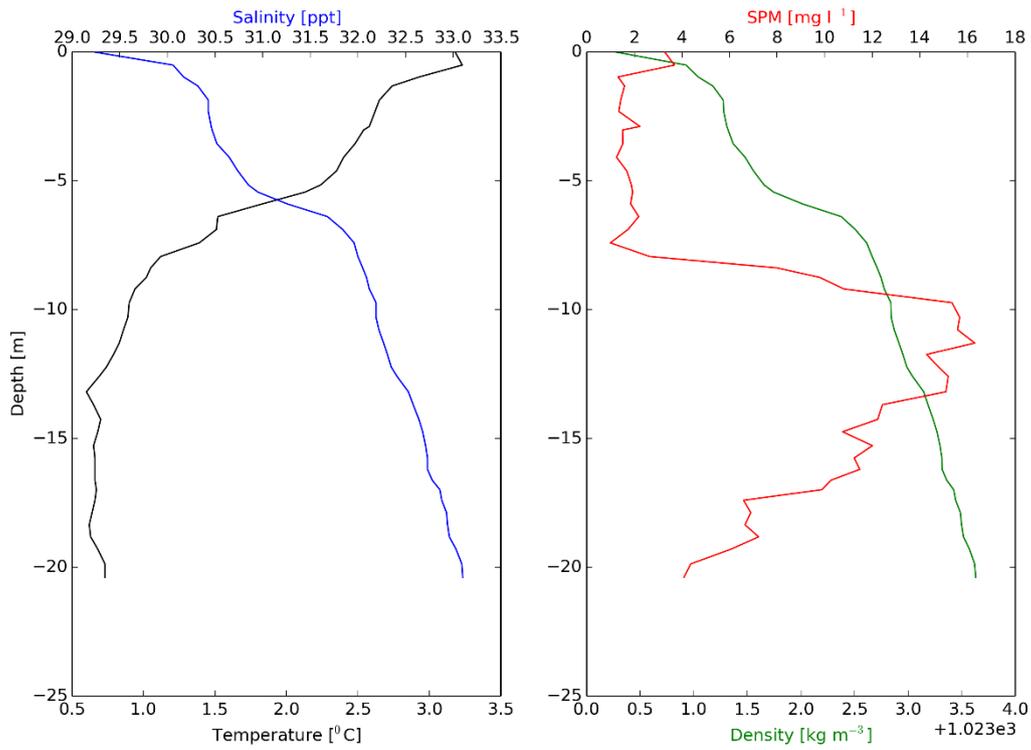
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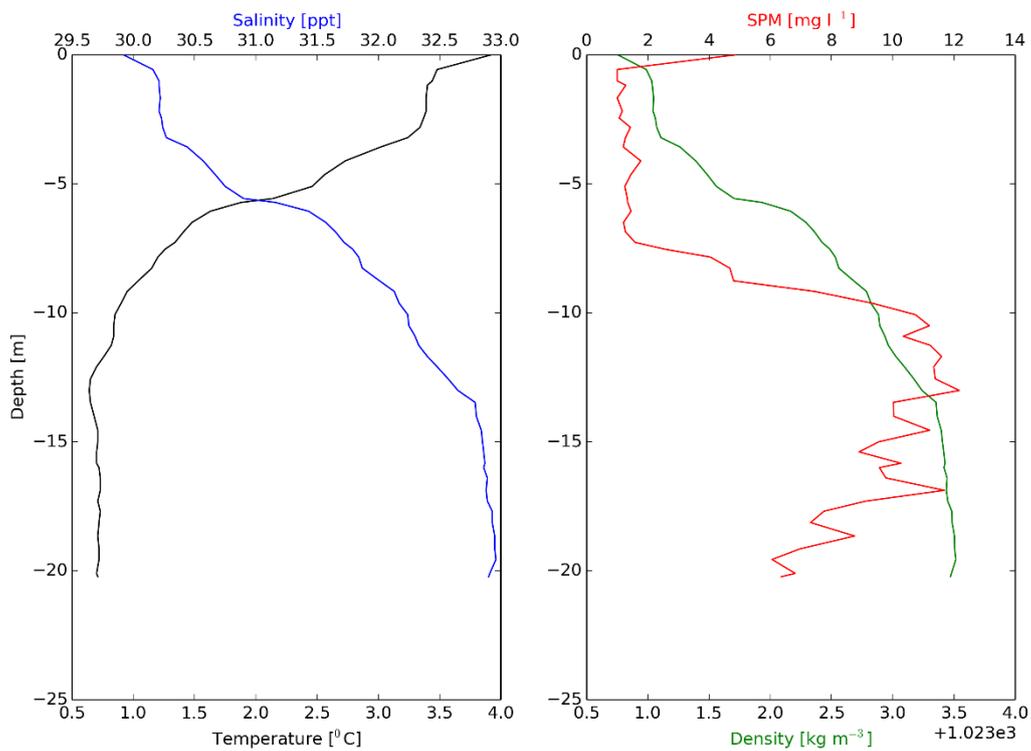
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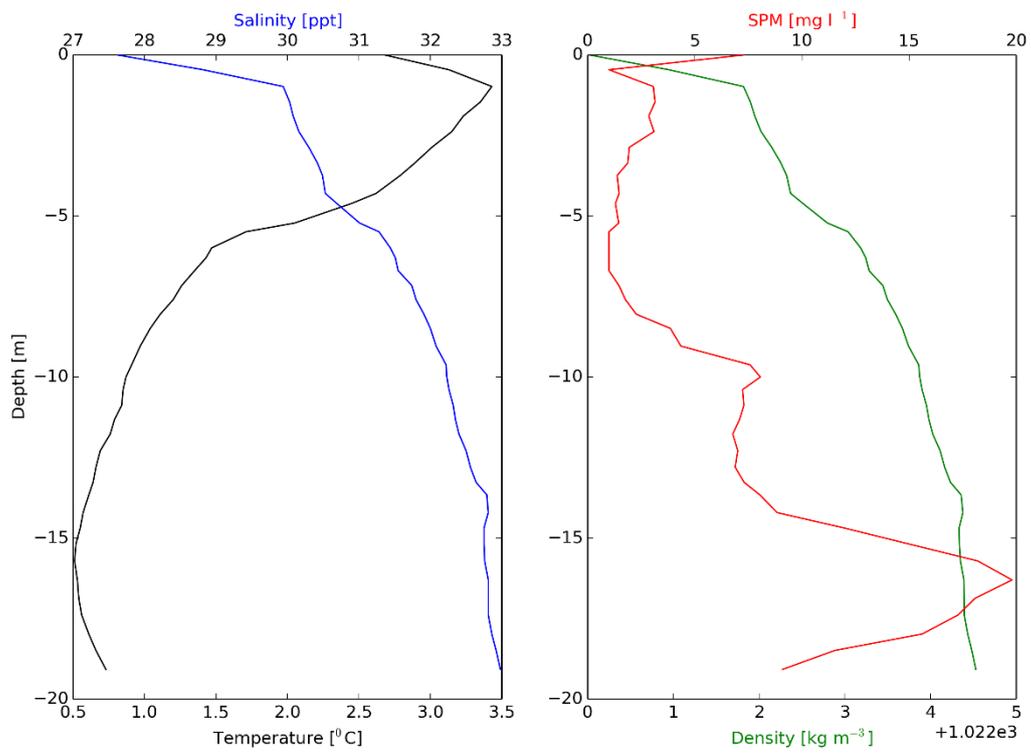
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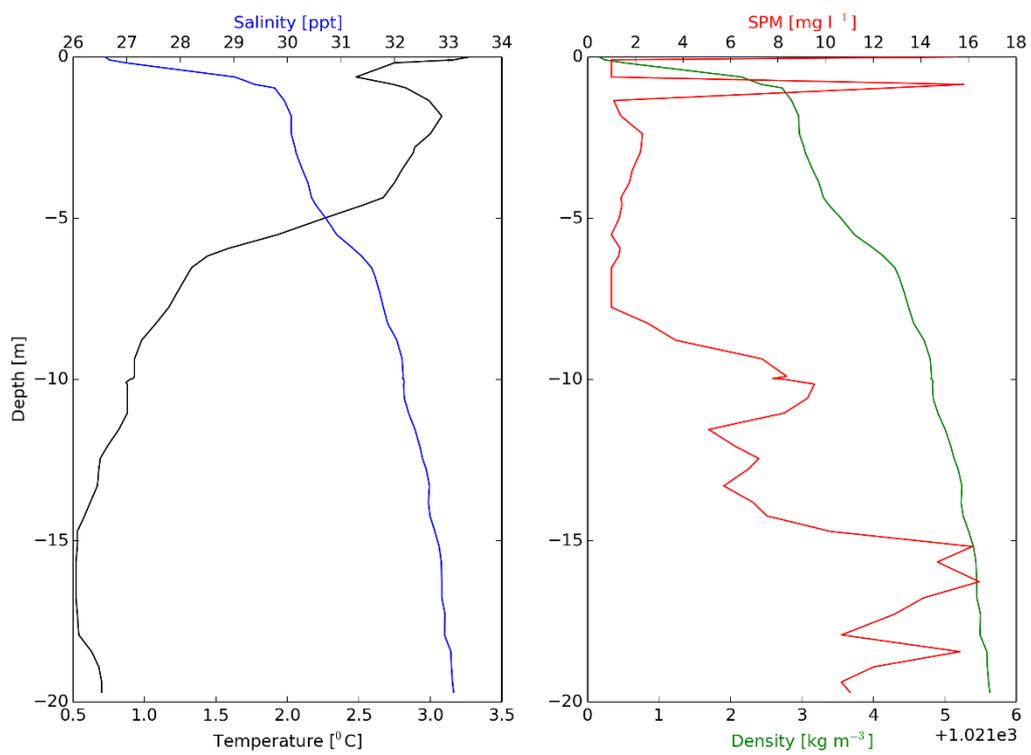
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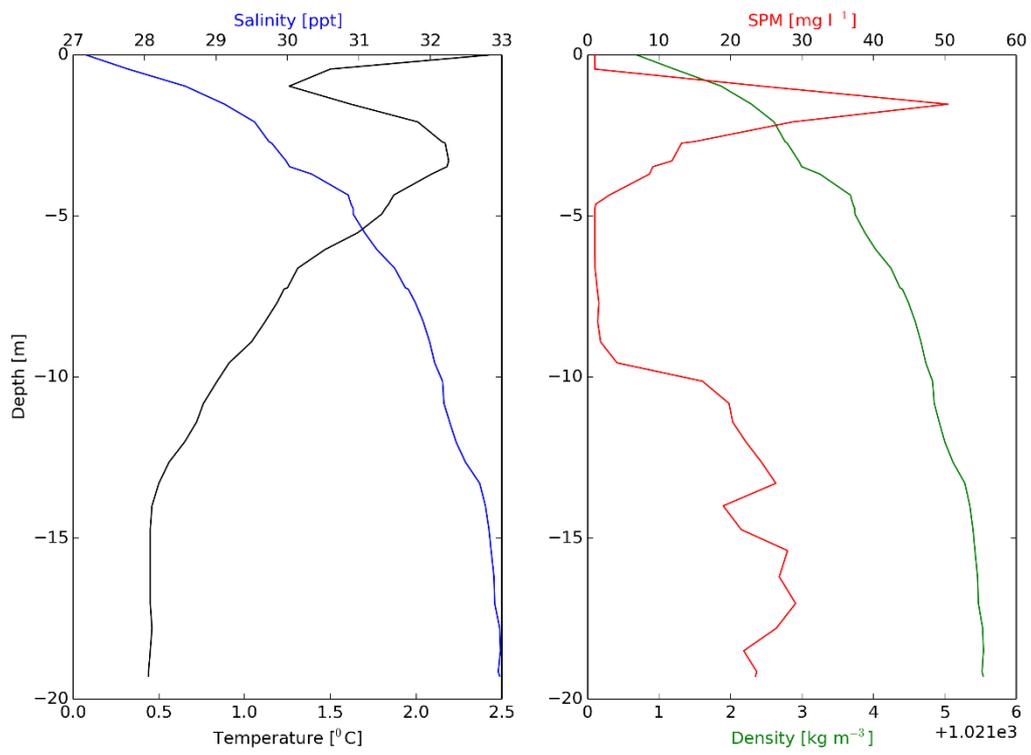
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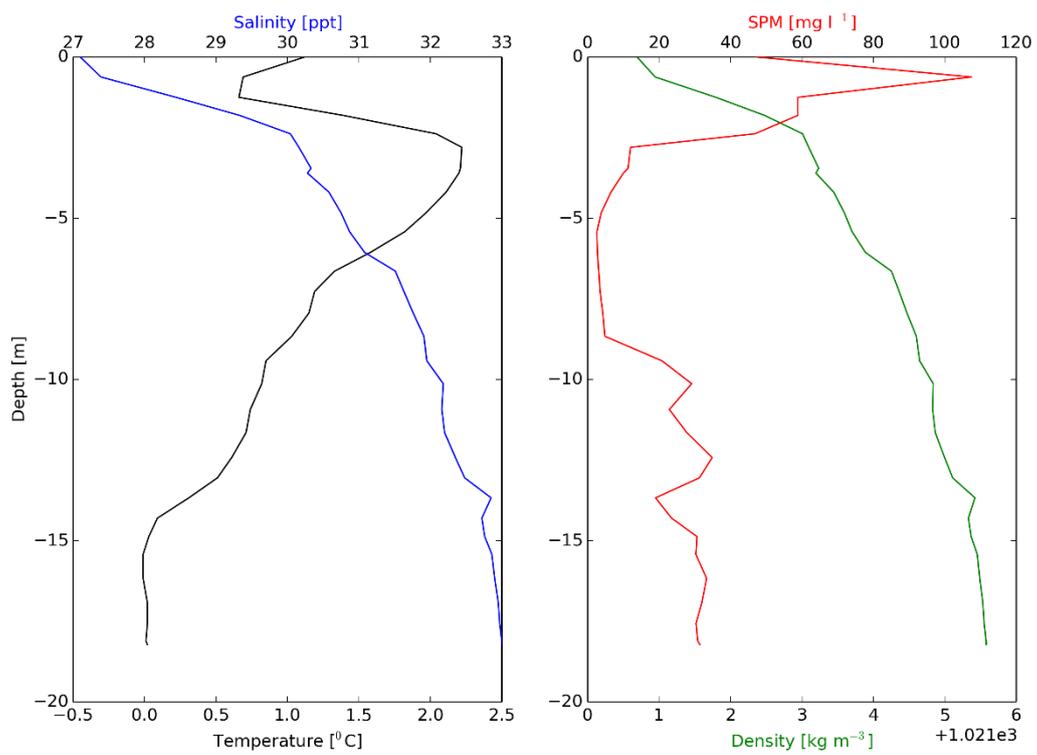
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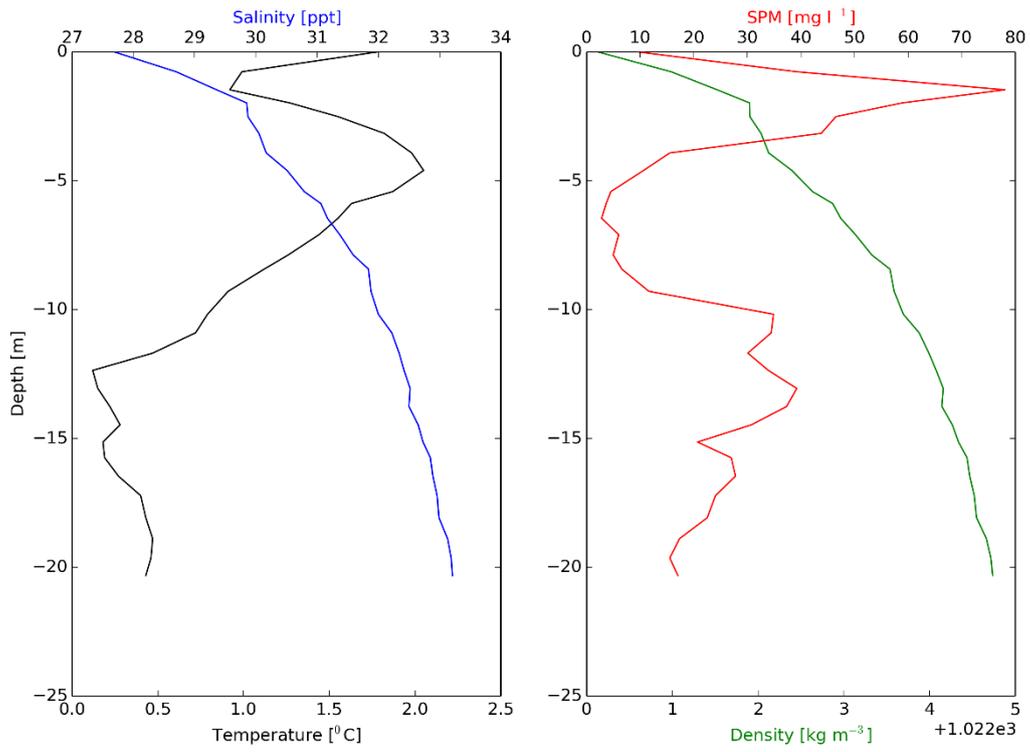
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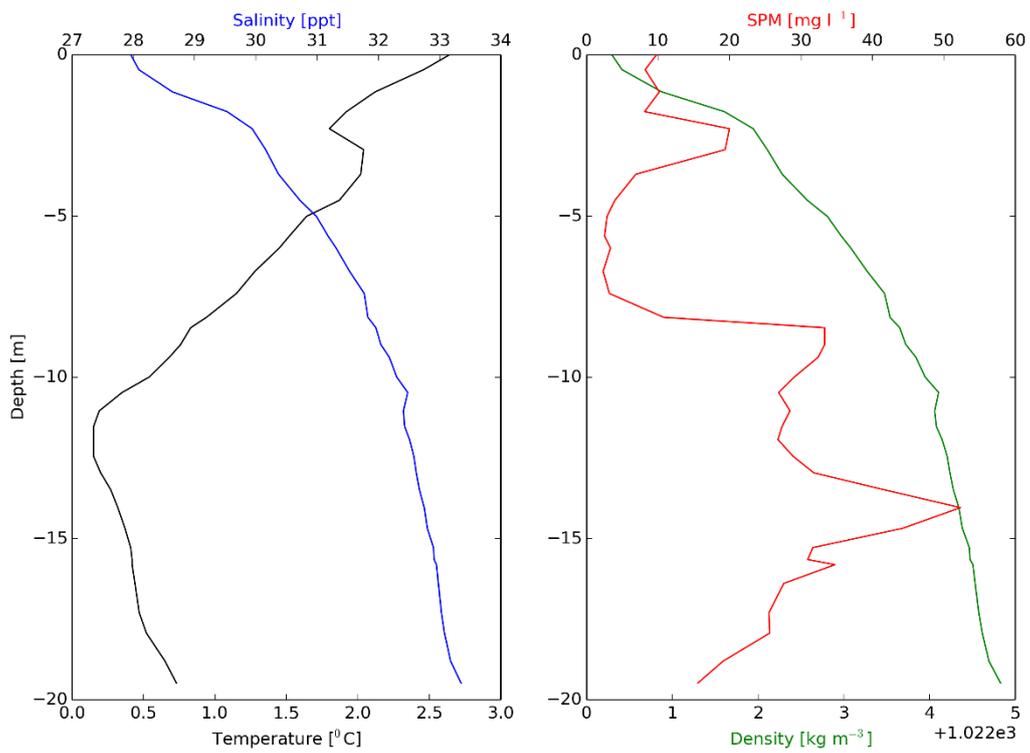
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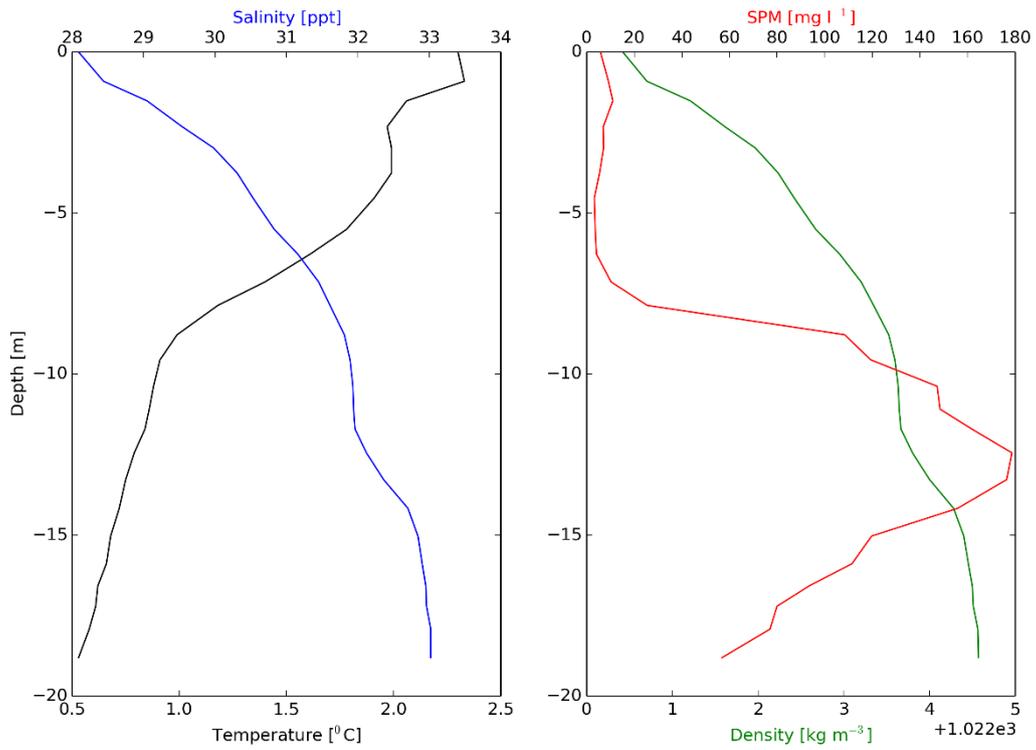
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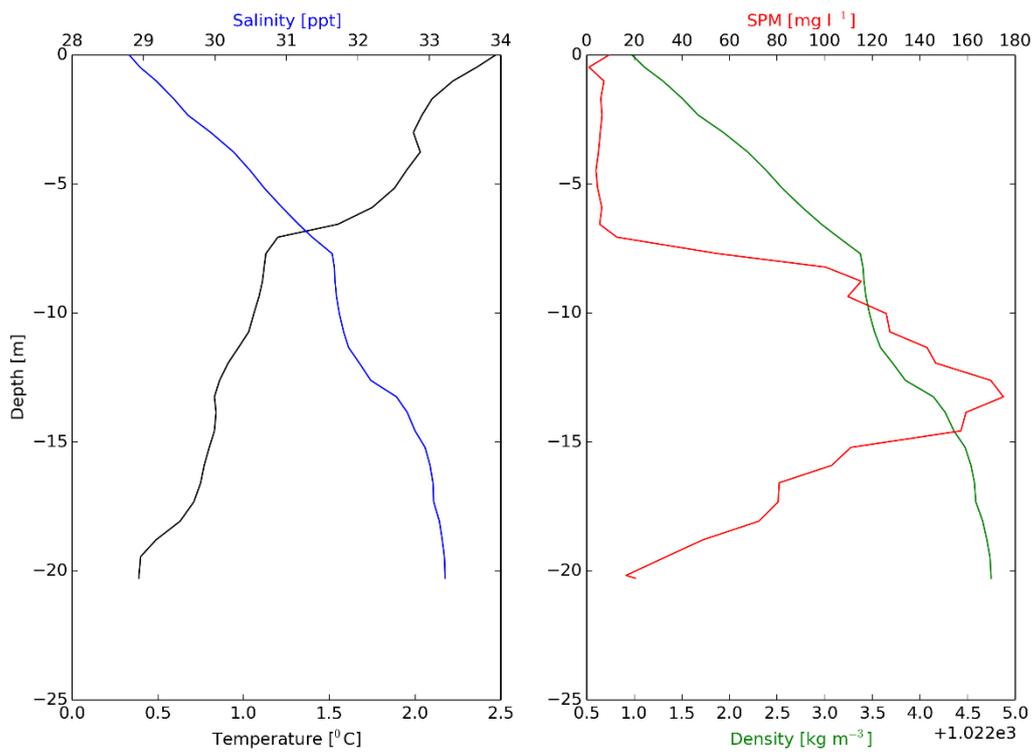
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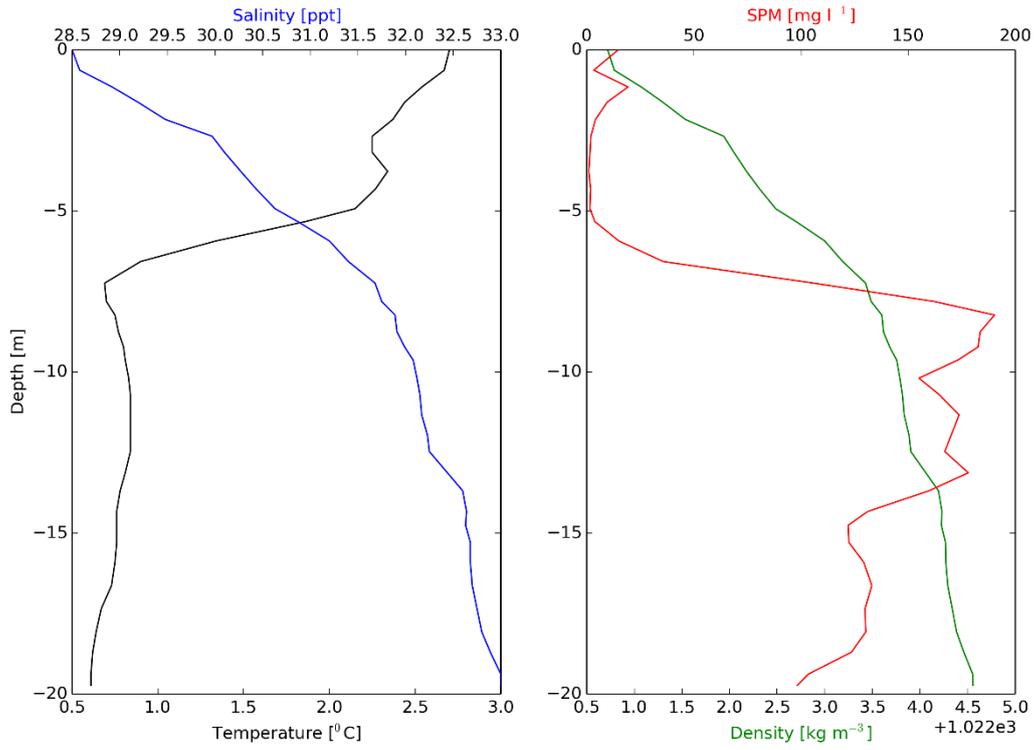
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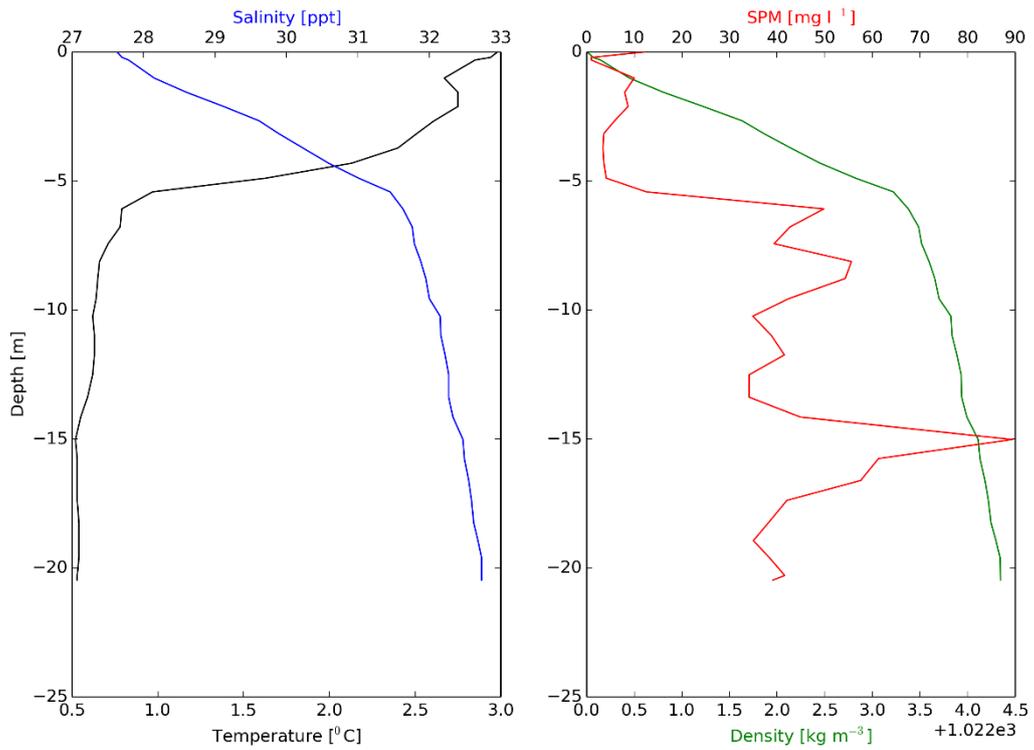
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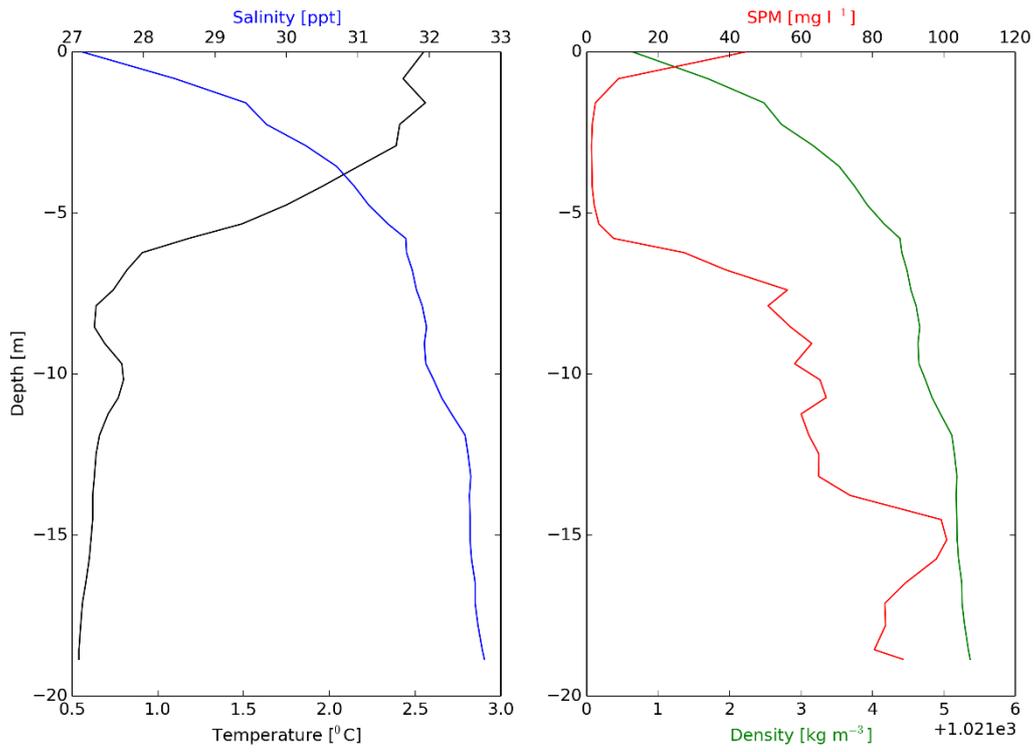
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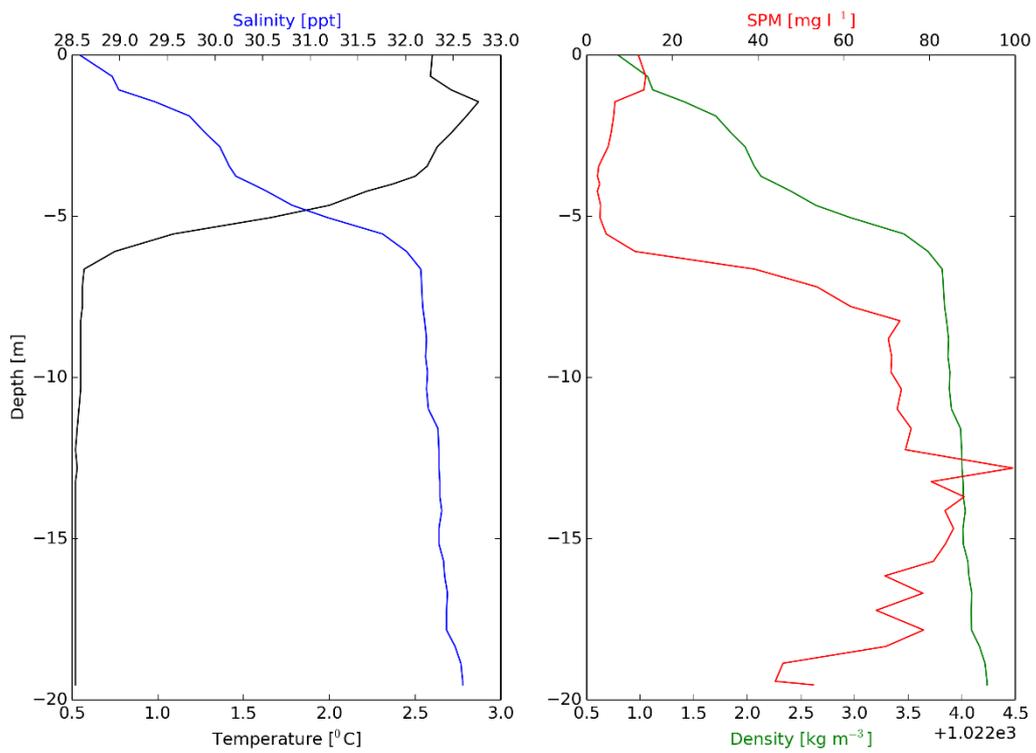
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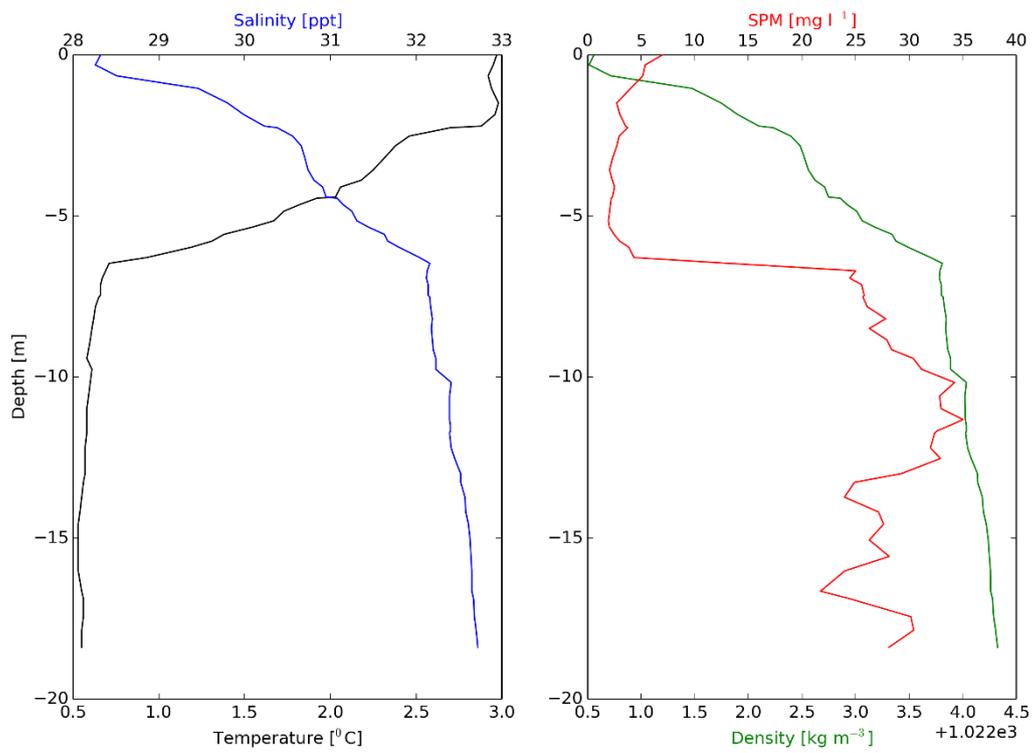
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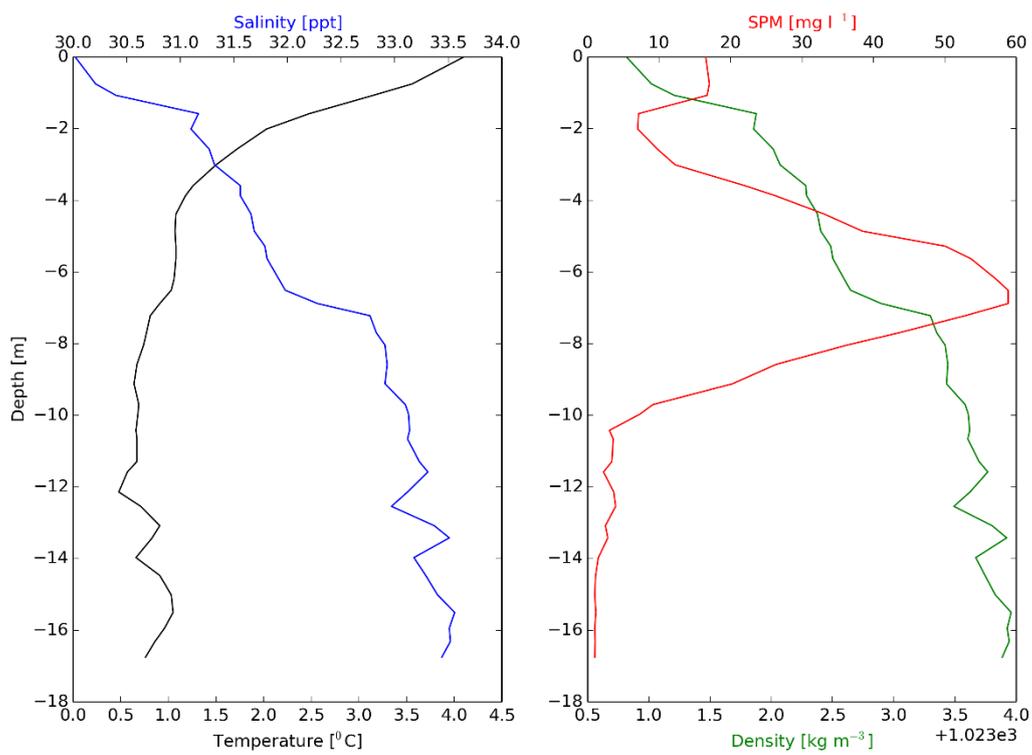
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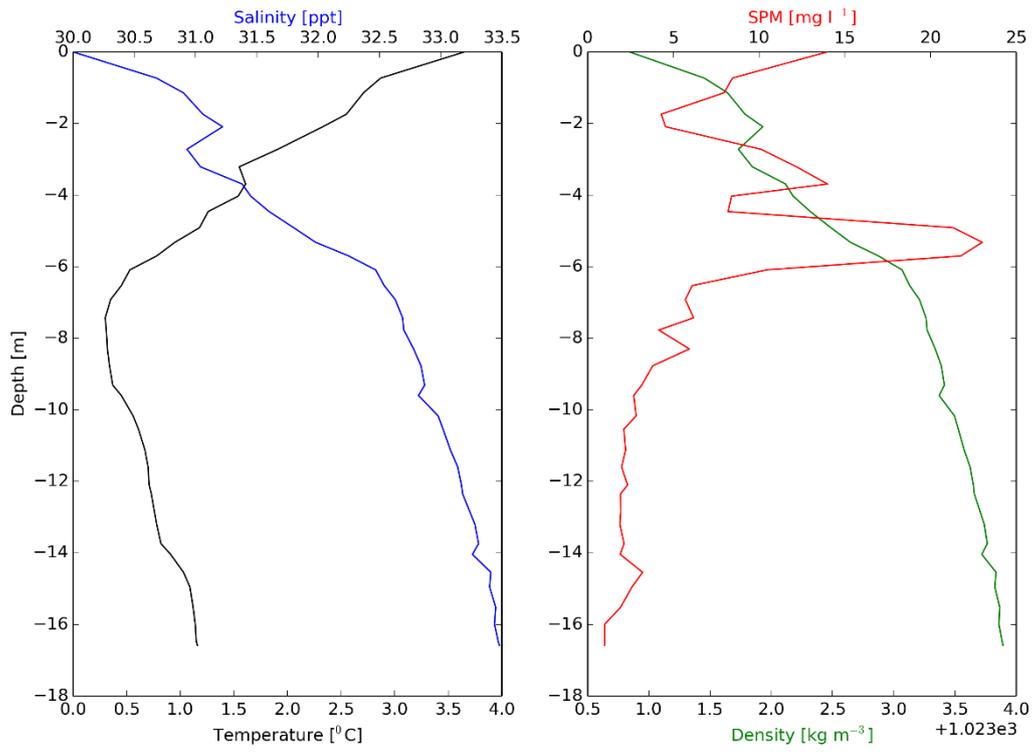
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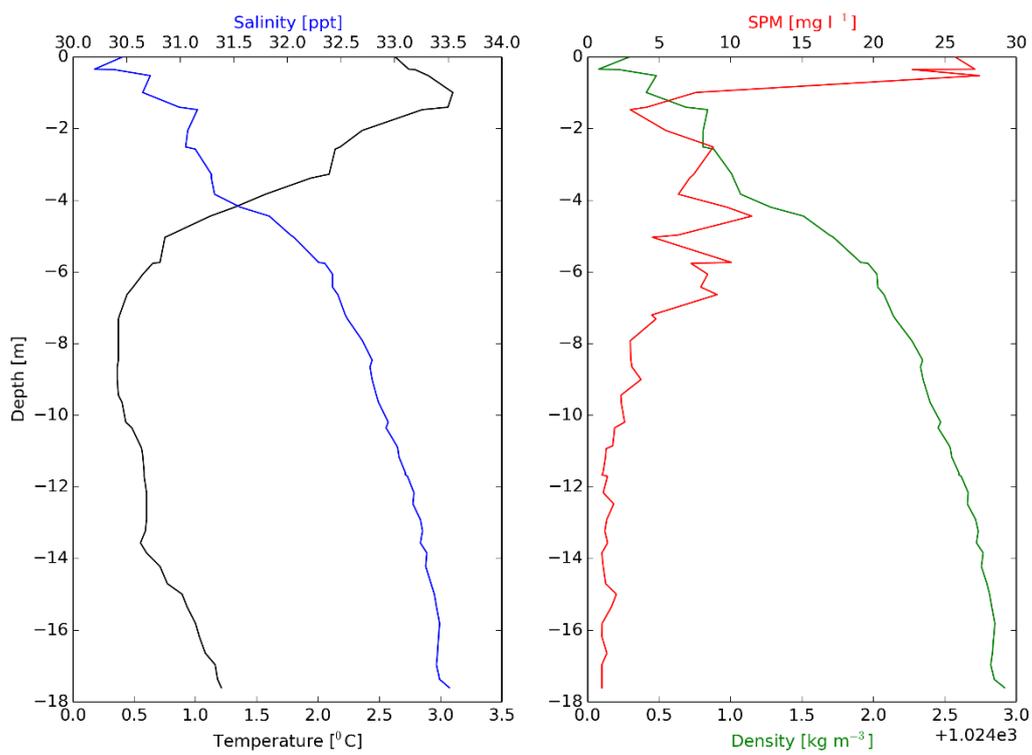
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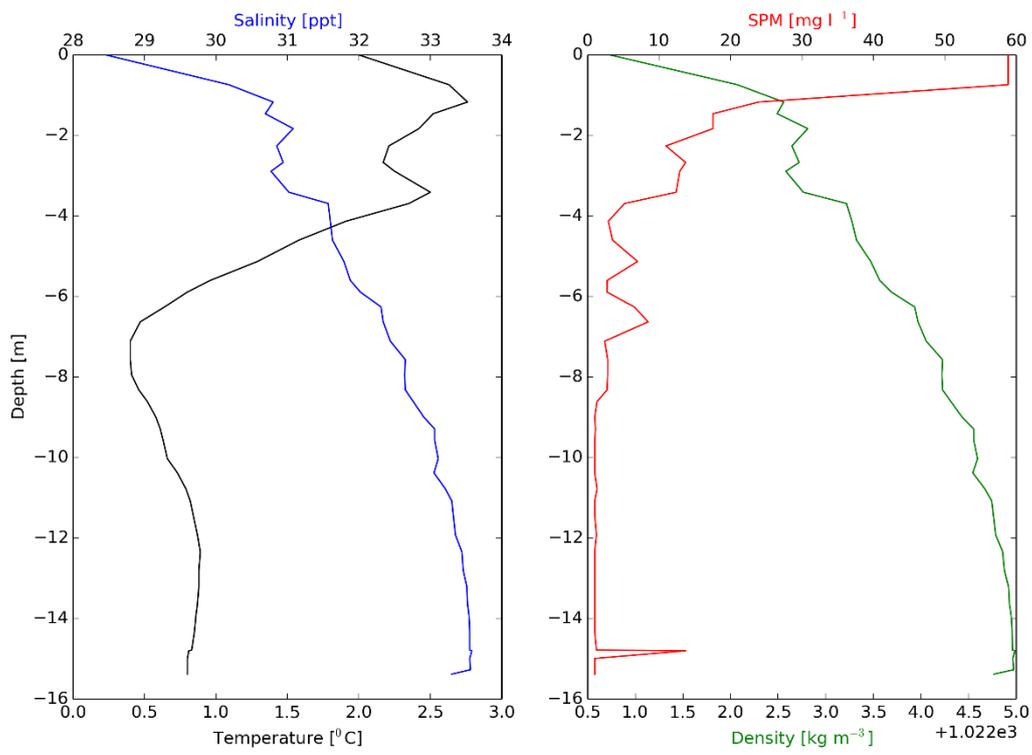
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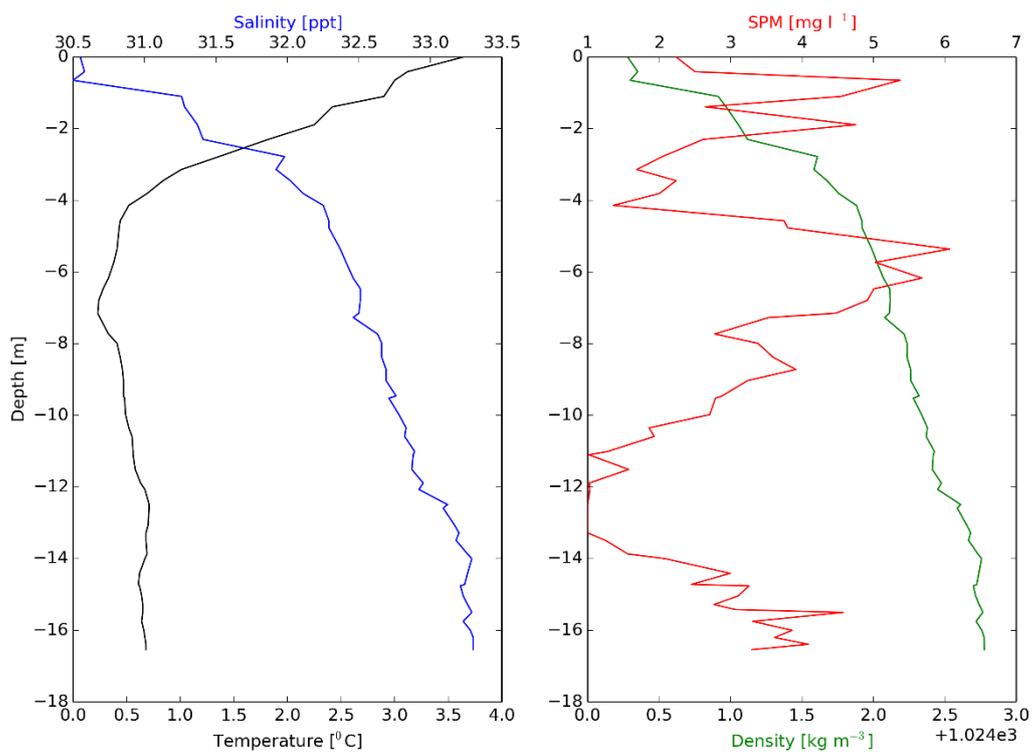
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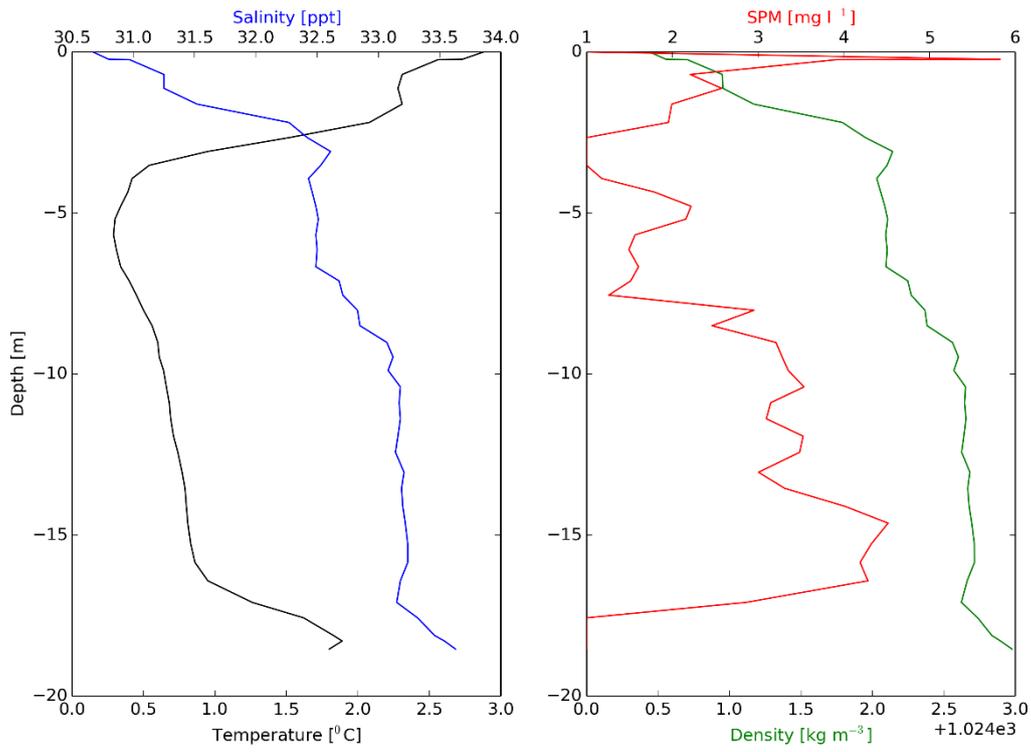
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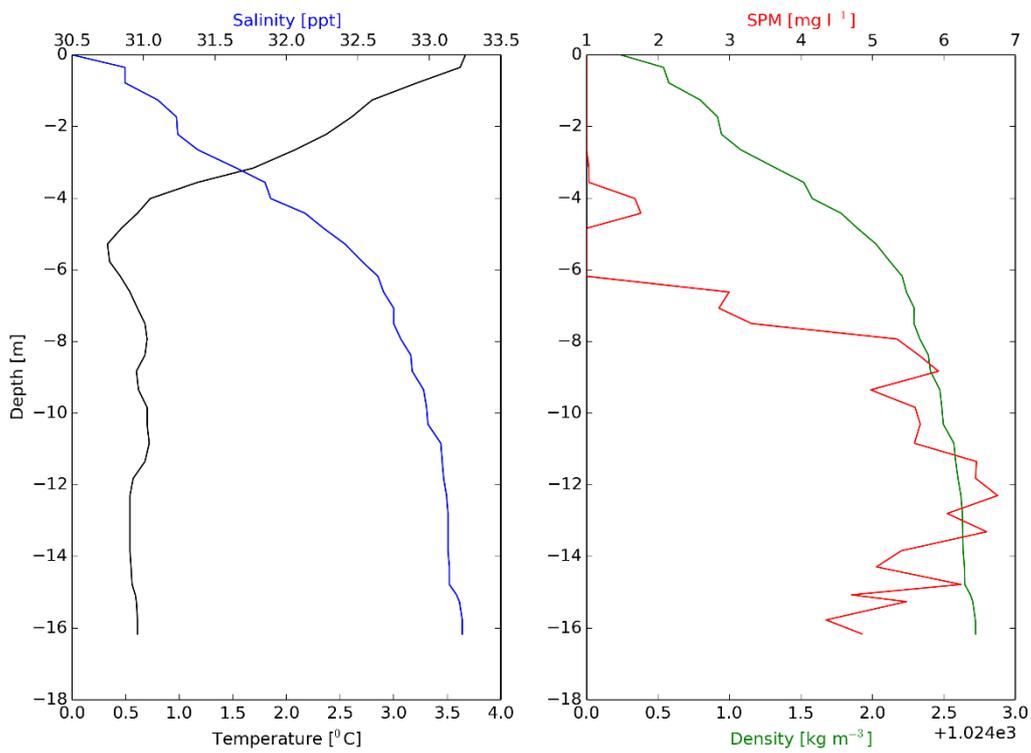
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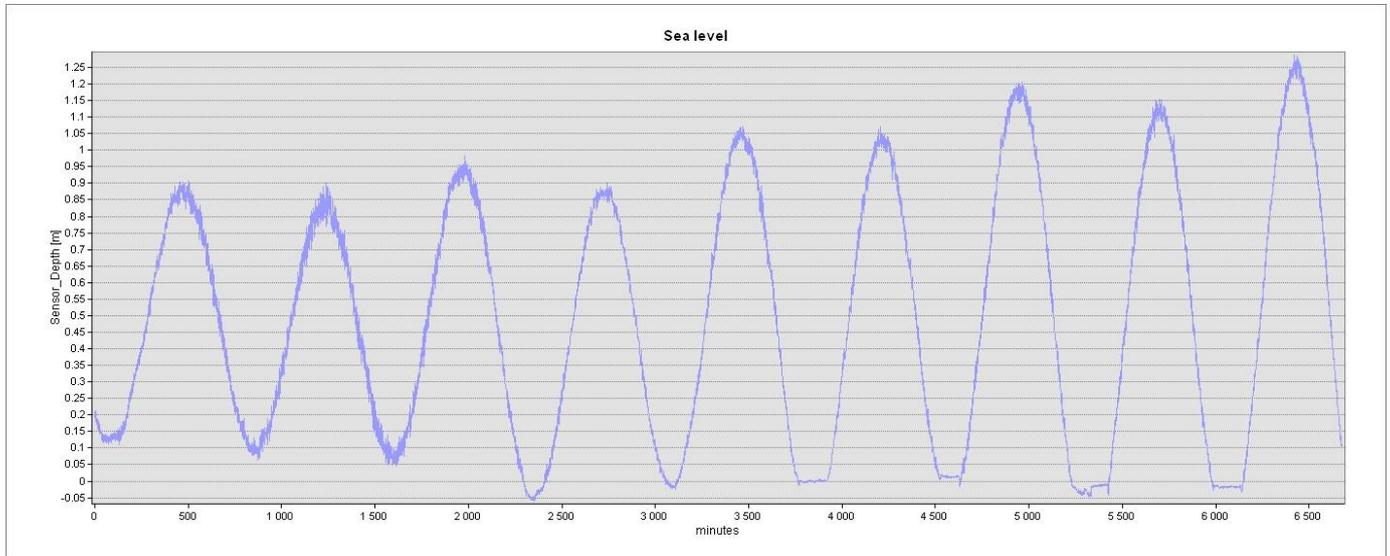


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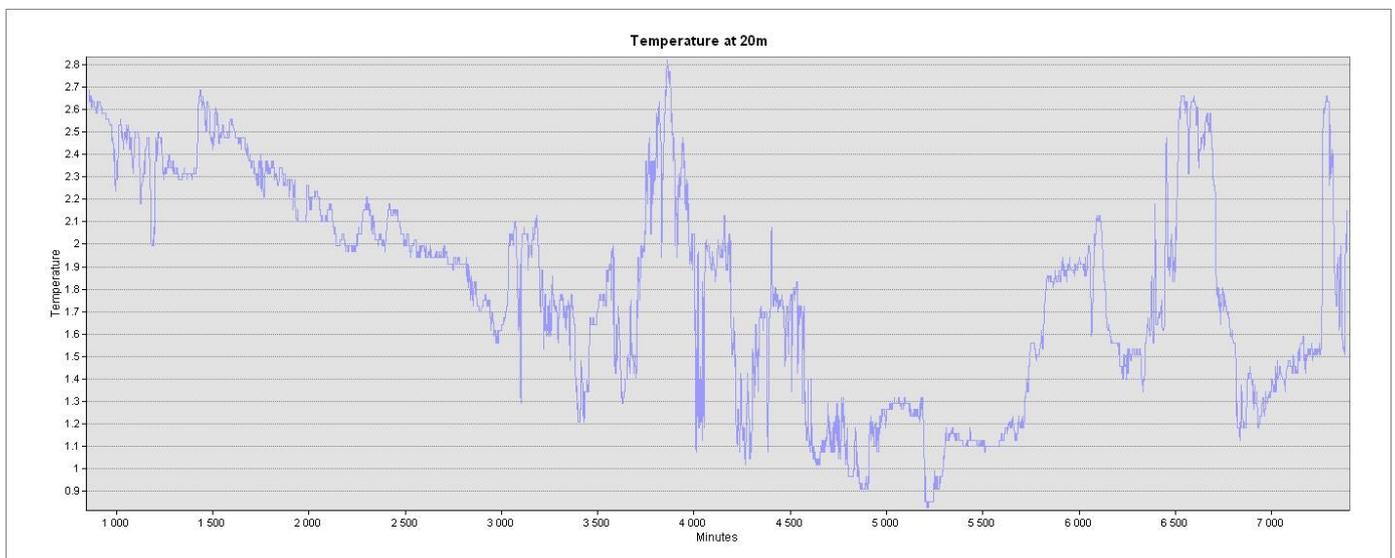


## APPENDIX B

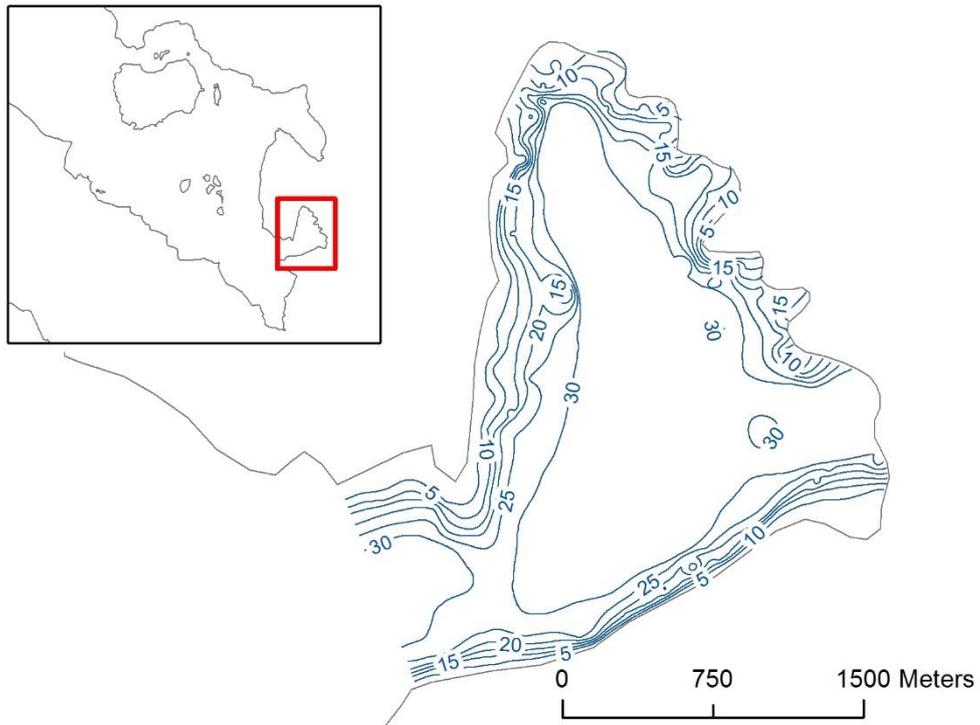
### Sea level at coast of Gnaloden in Hornsund



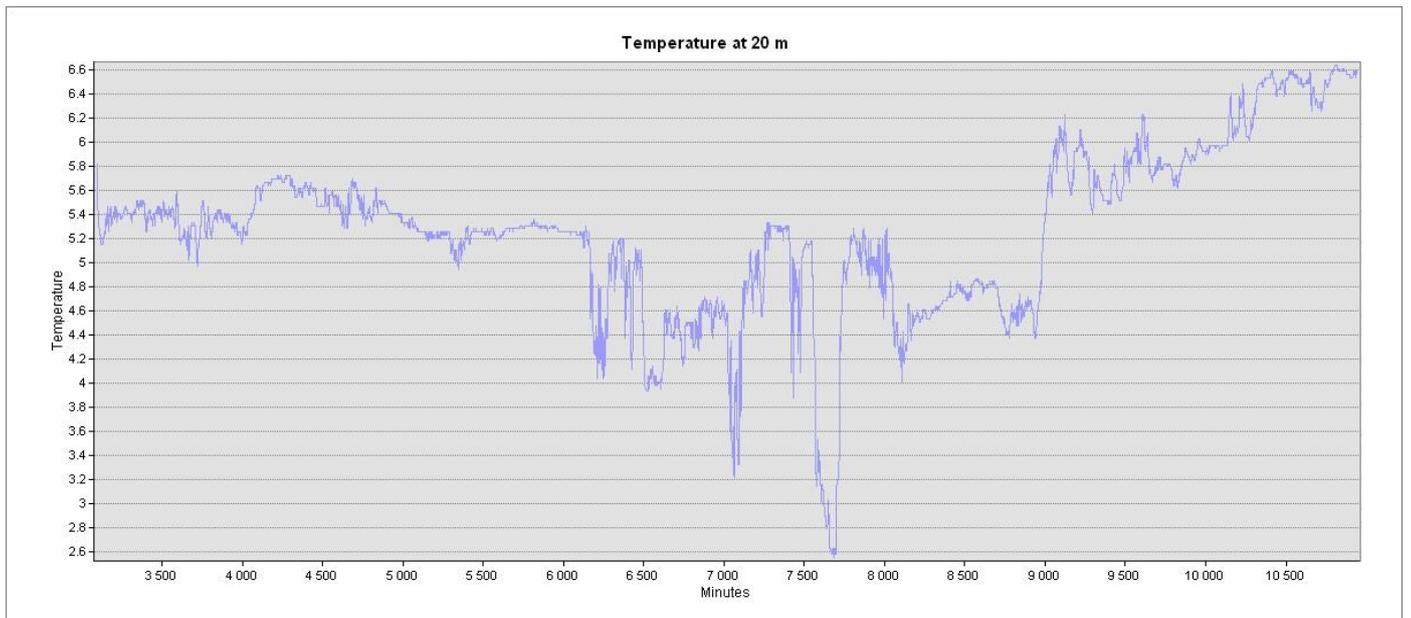
### Temperature time series at 20m in Hornsund (Brepolen) [minutes x 2]



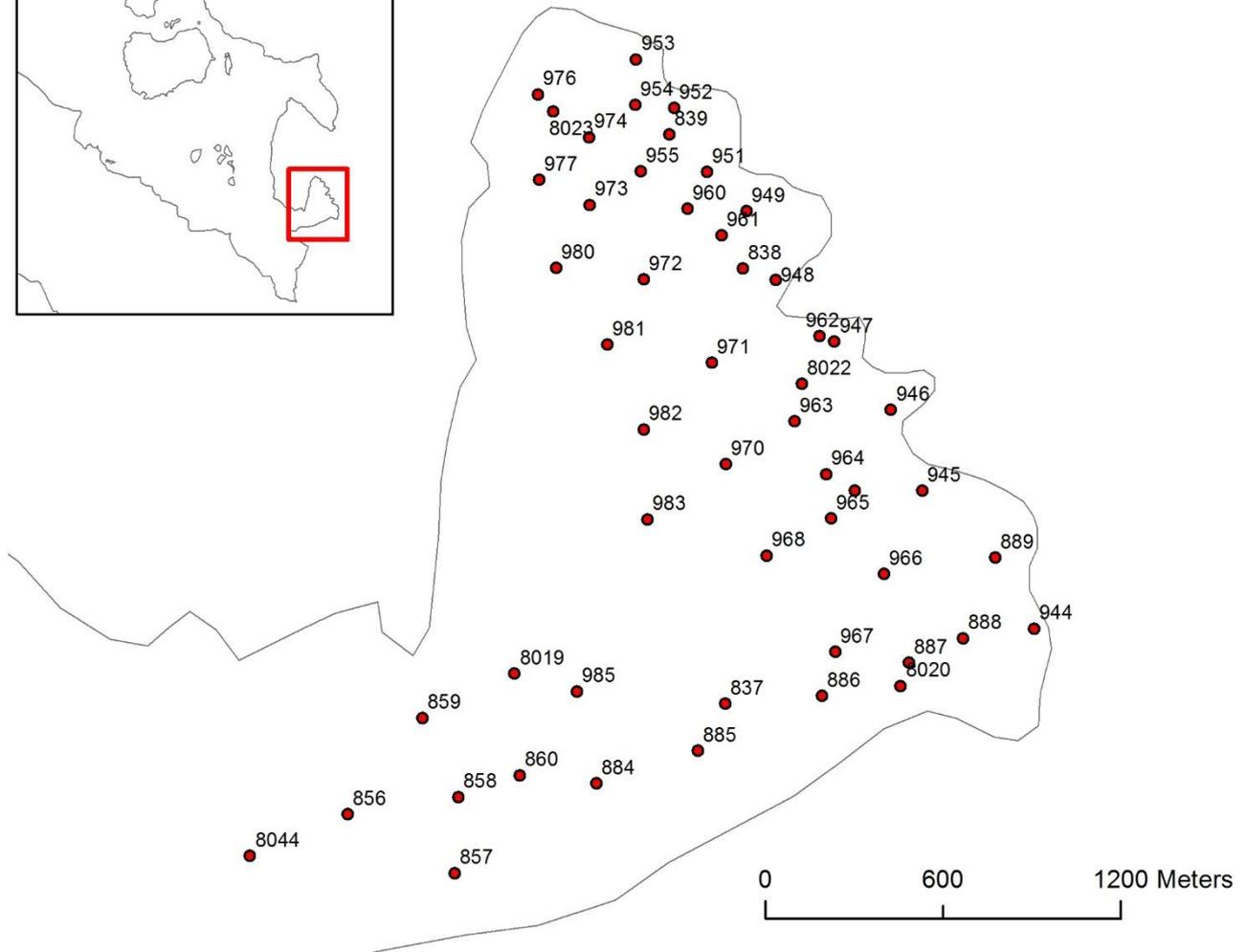
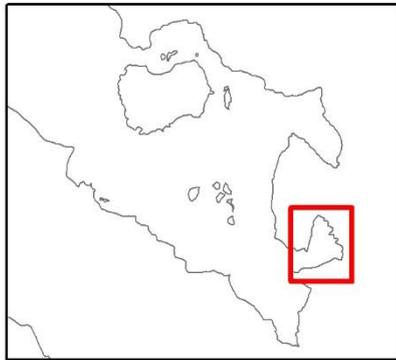
### Raudvika contours (Kongsfjord)



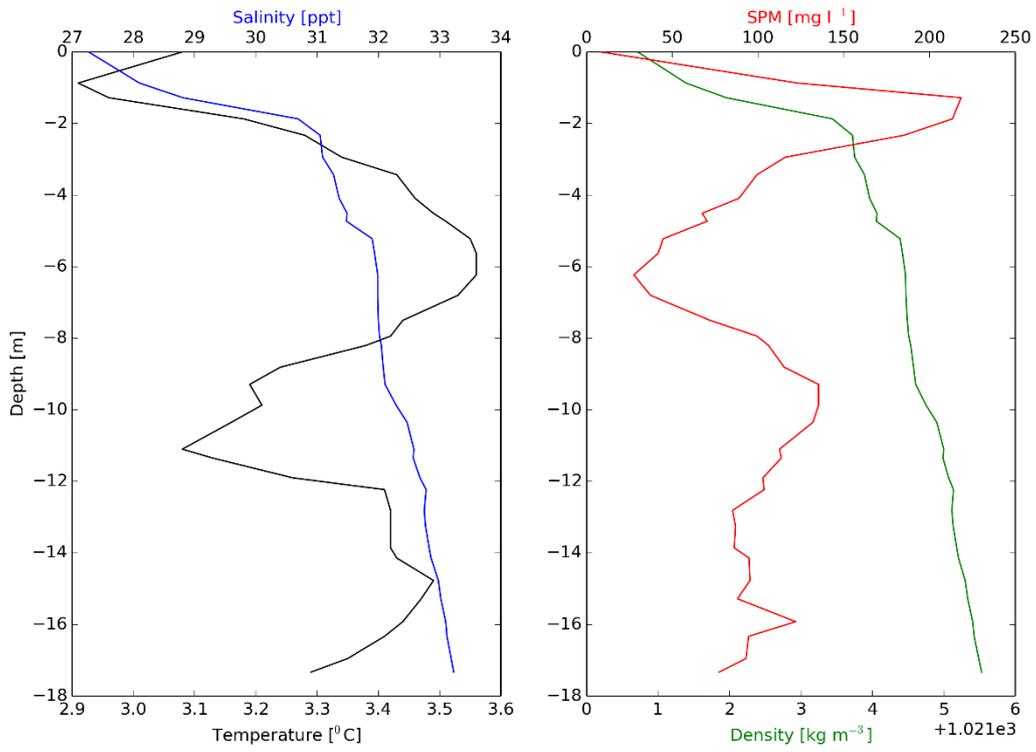
### Temperature time series at 20m in Kongsfjord (4 – 7 August) [minutes x 2]



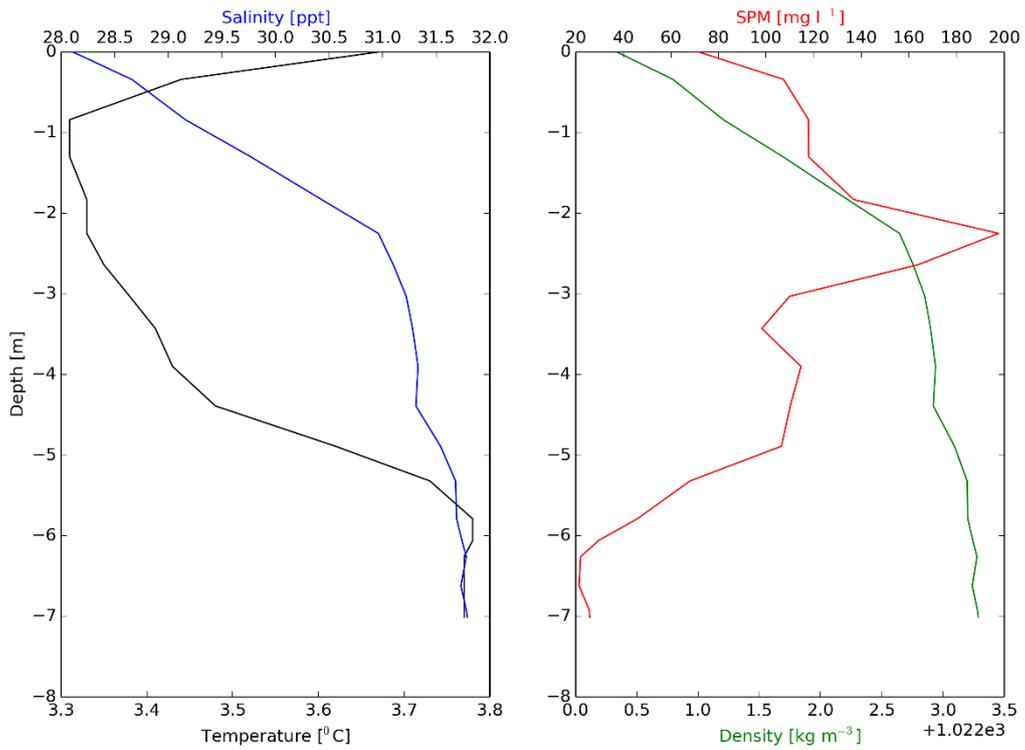
APPENDIX C 1



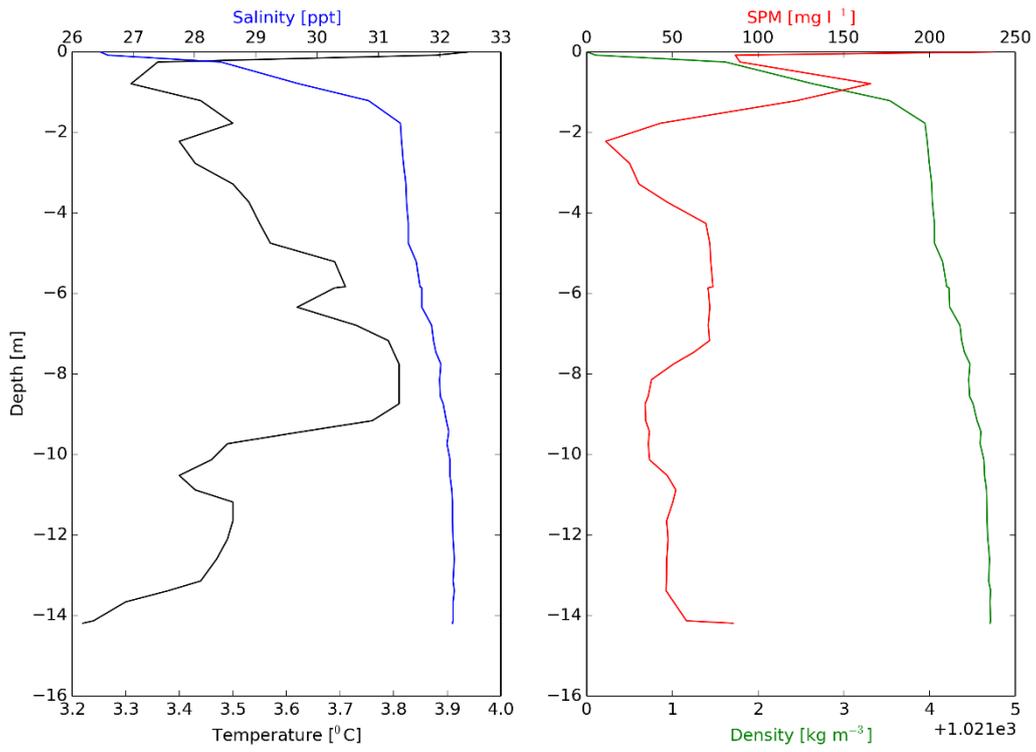
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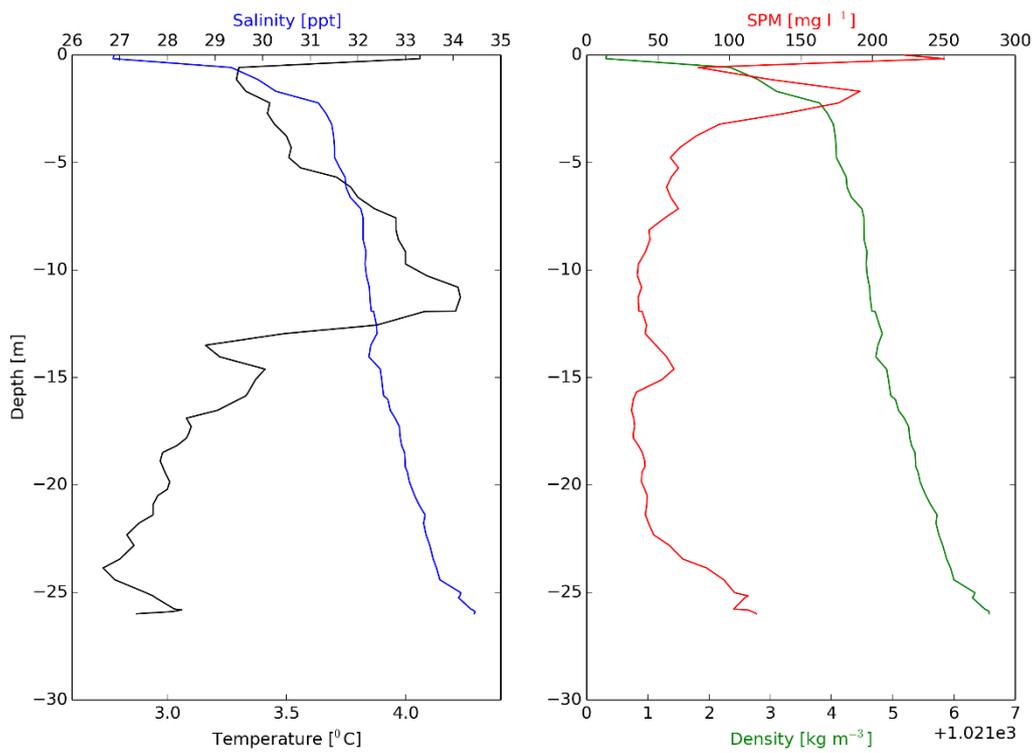
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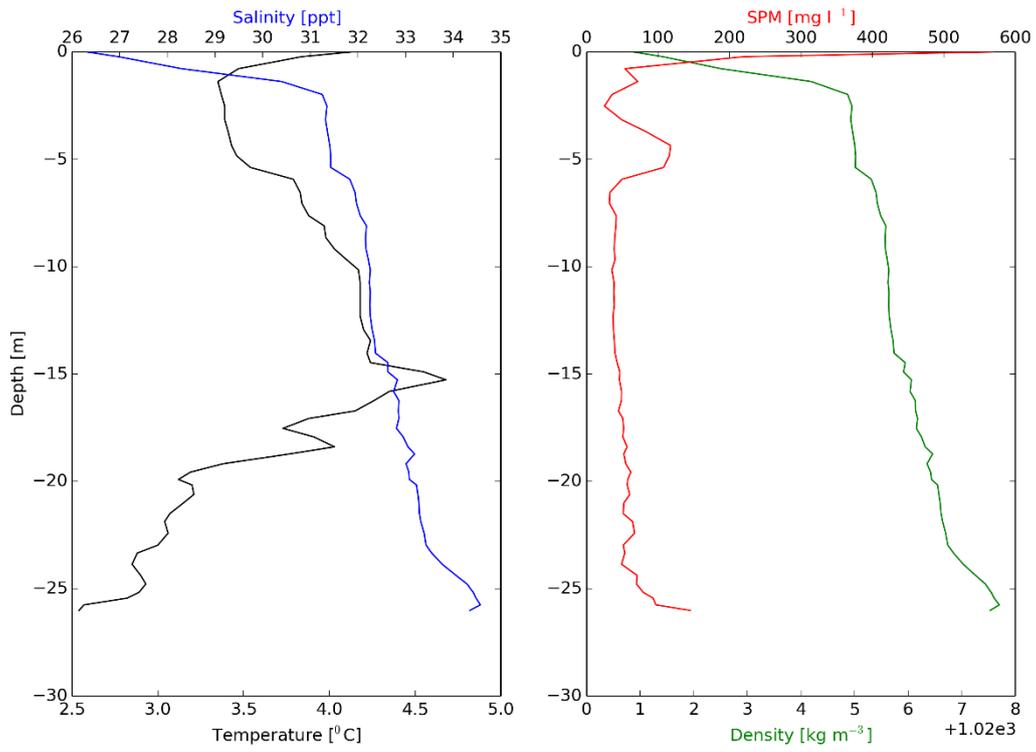
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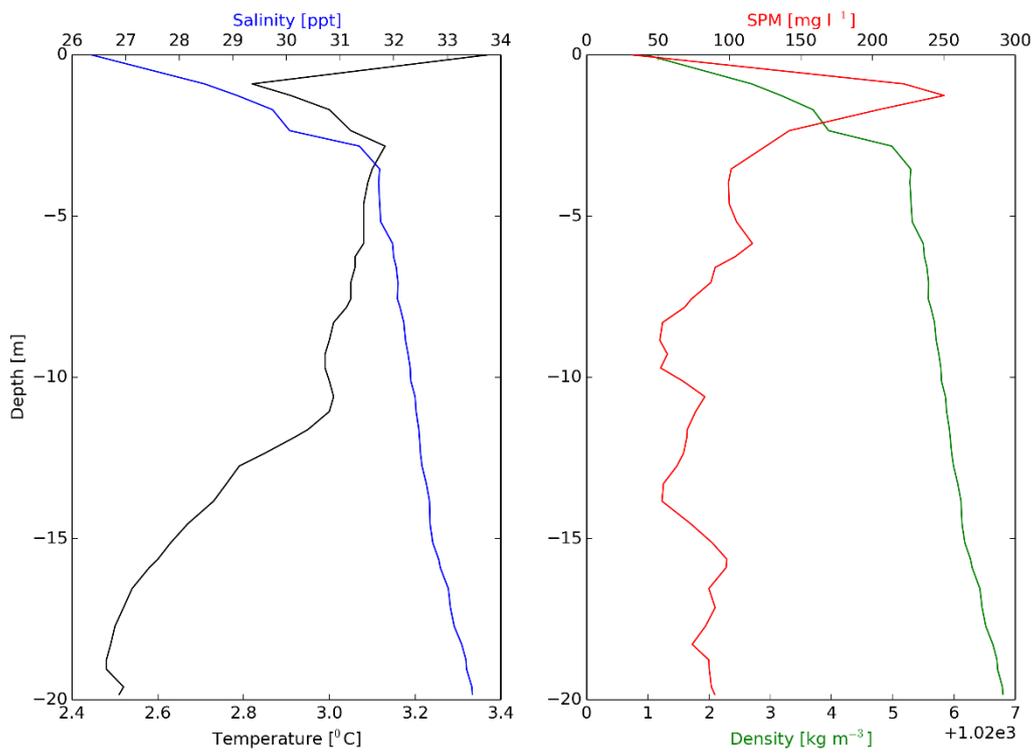
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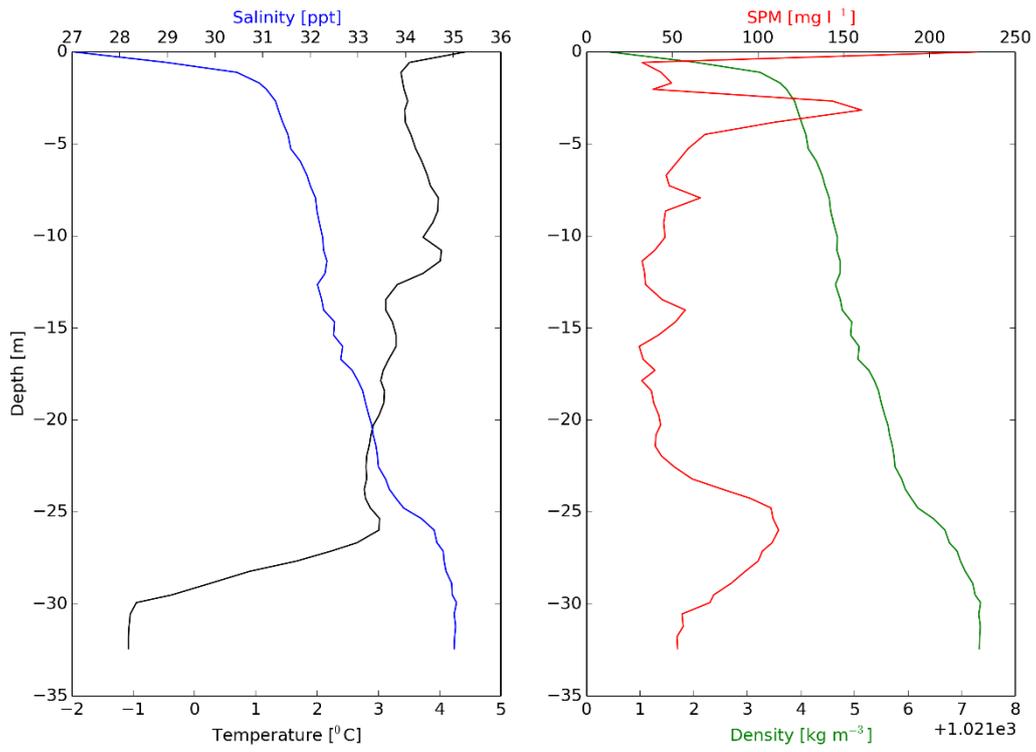
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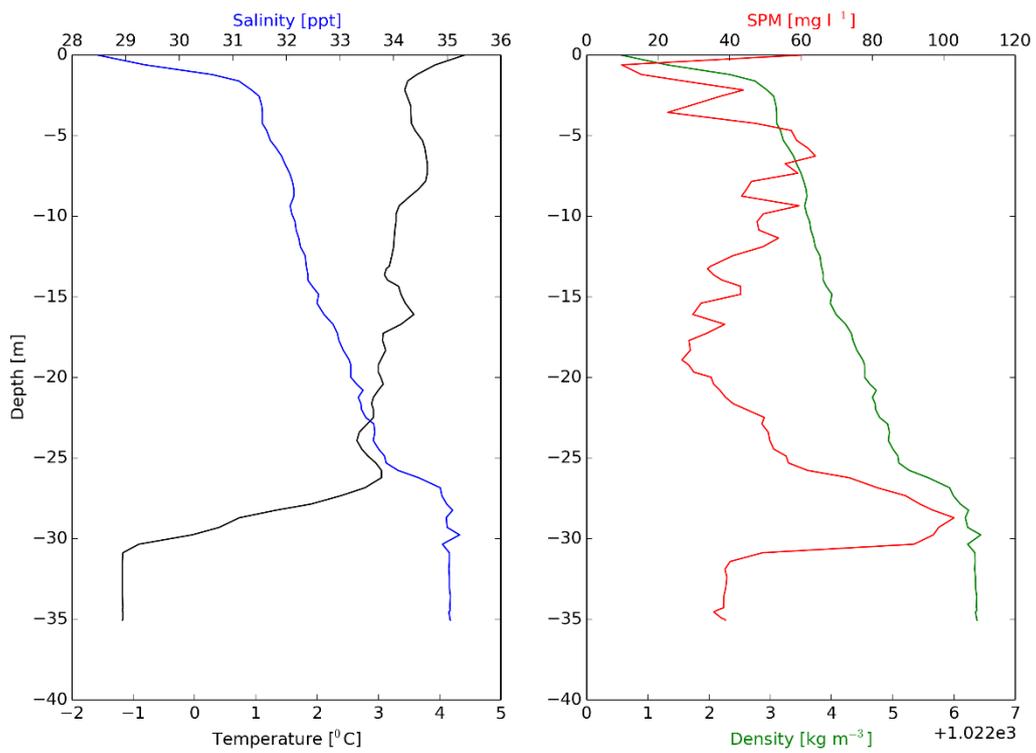
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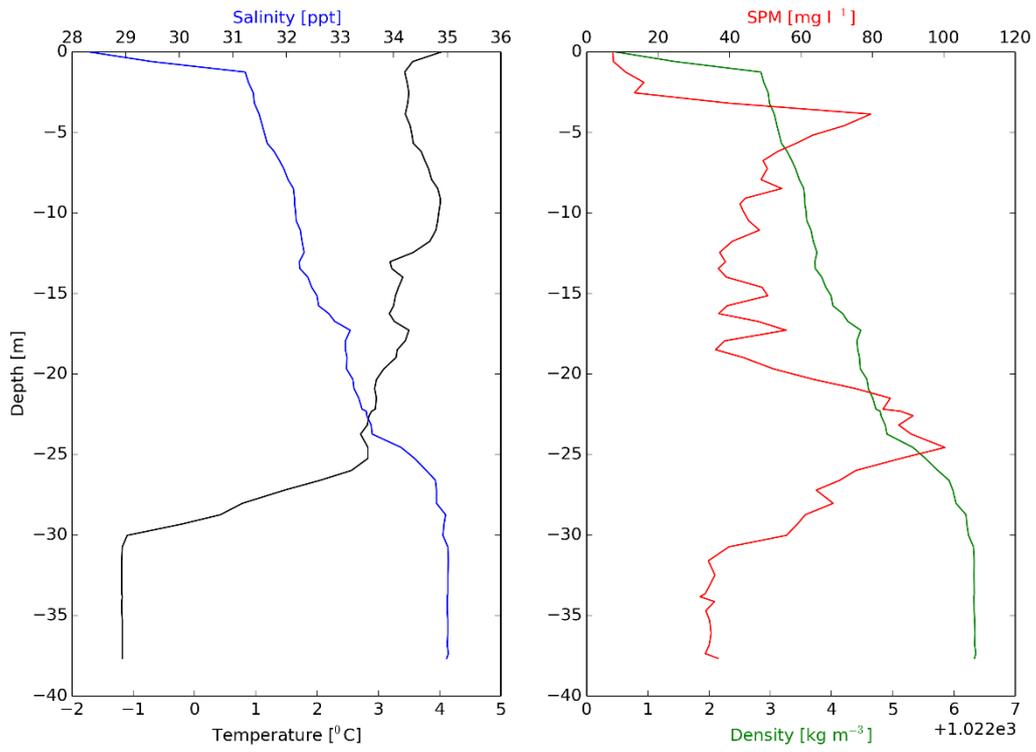
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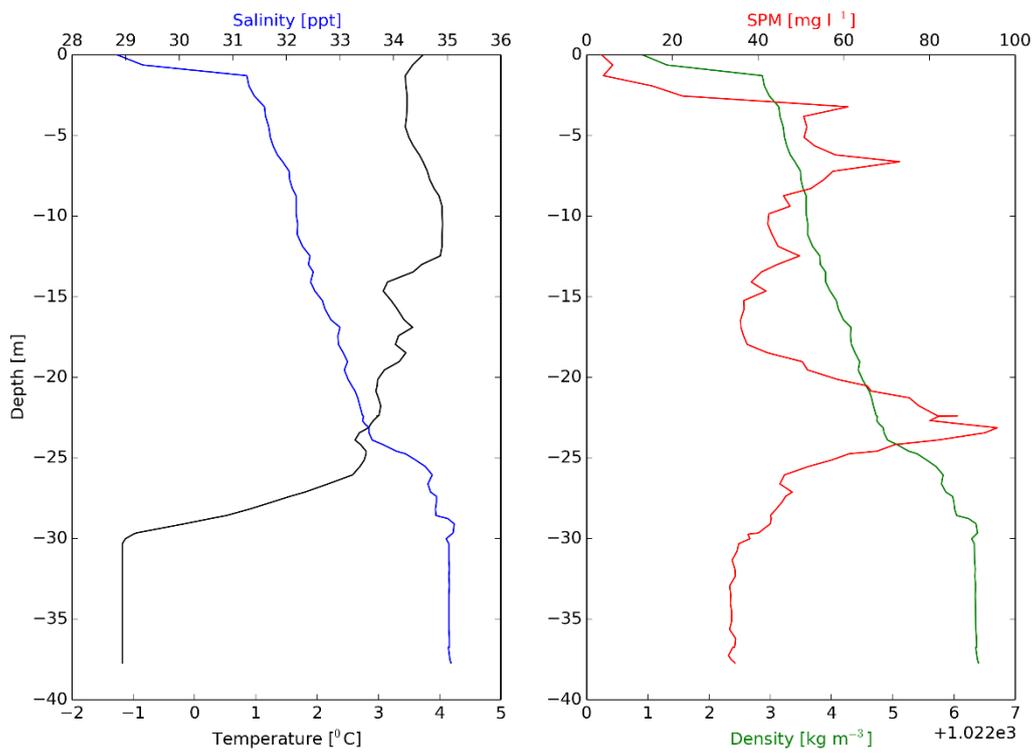
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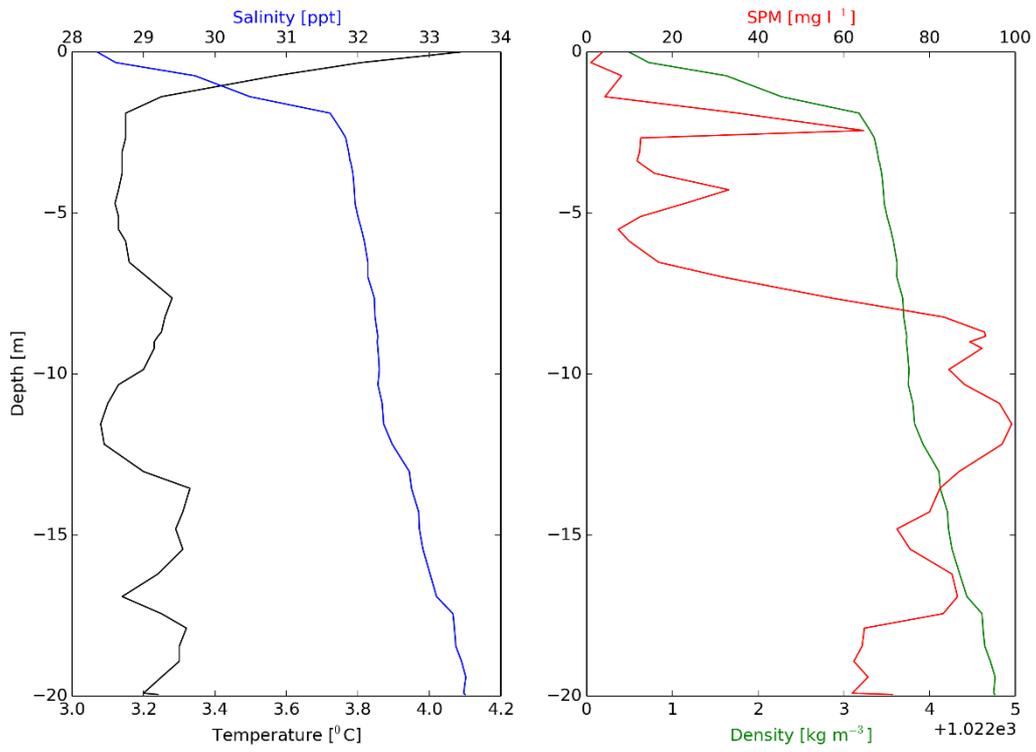
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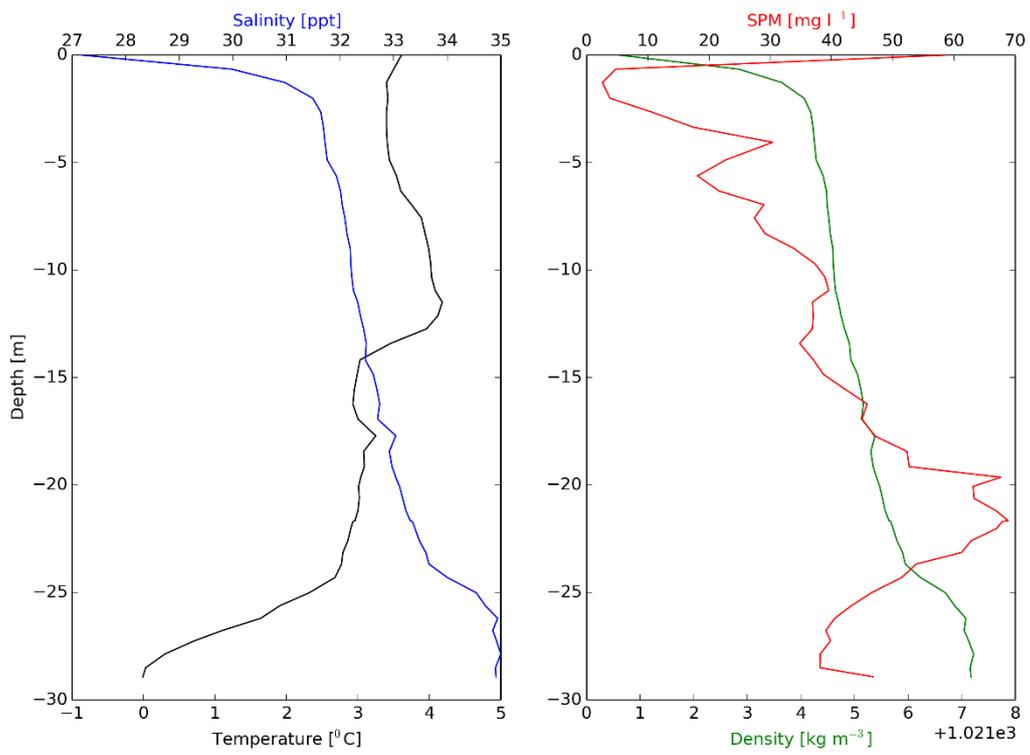
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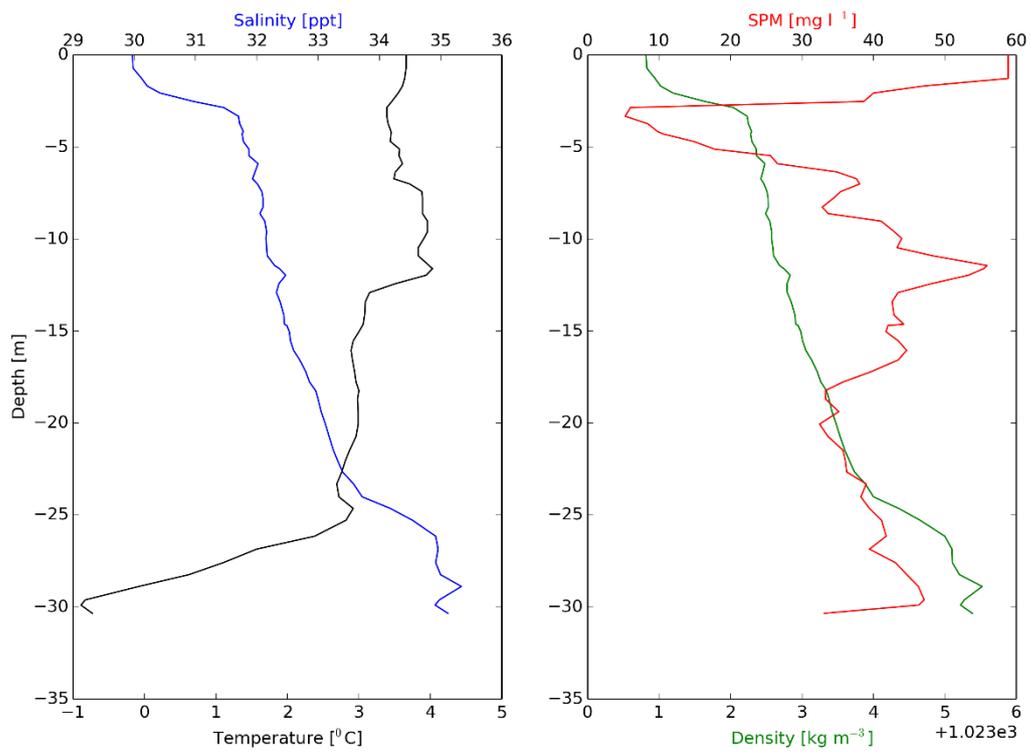
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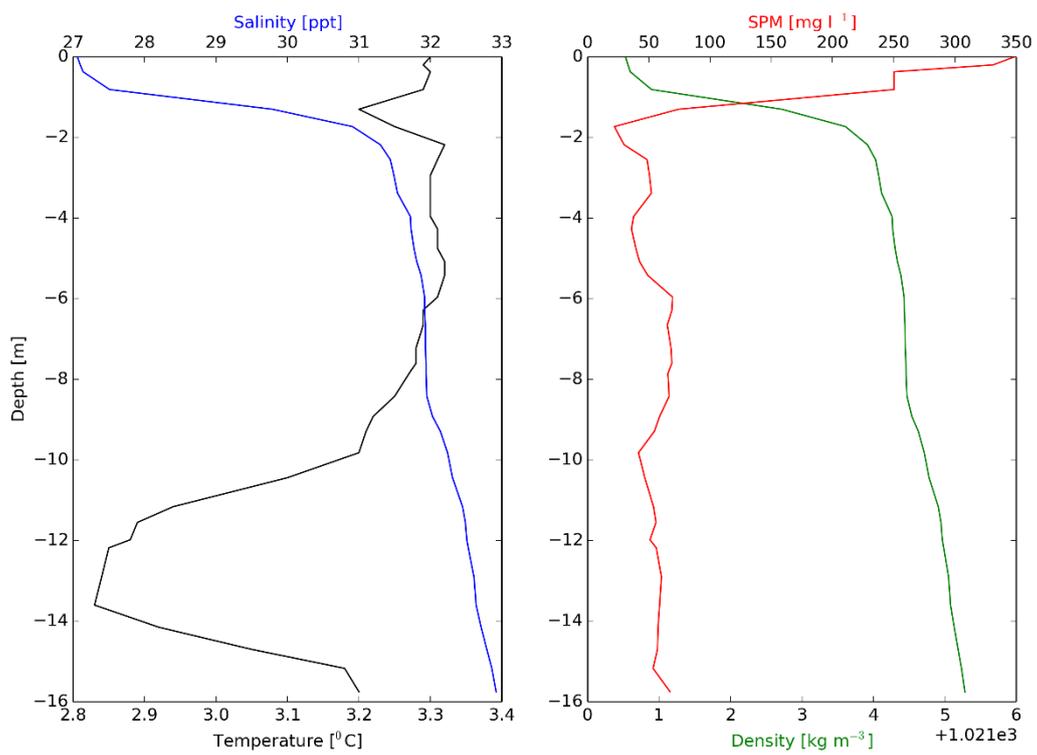
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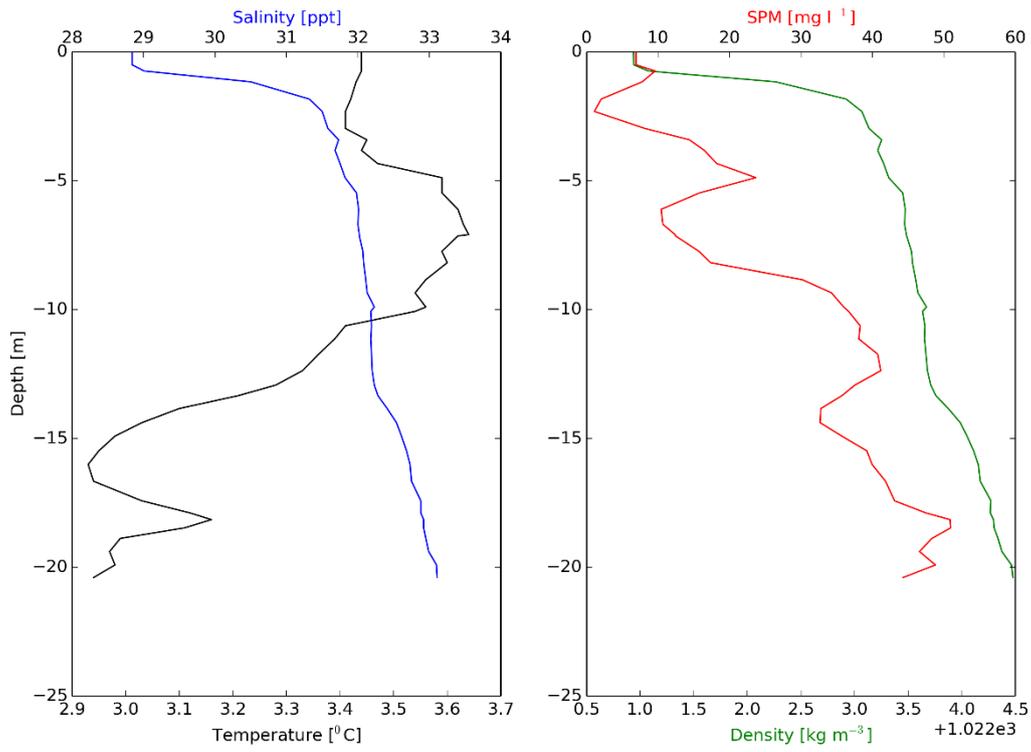
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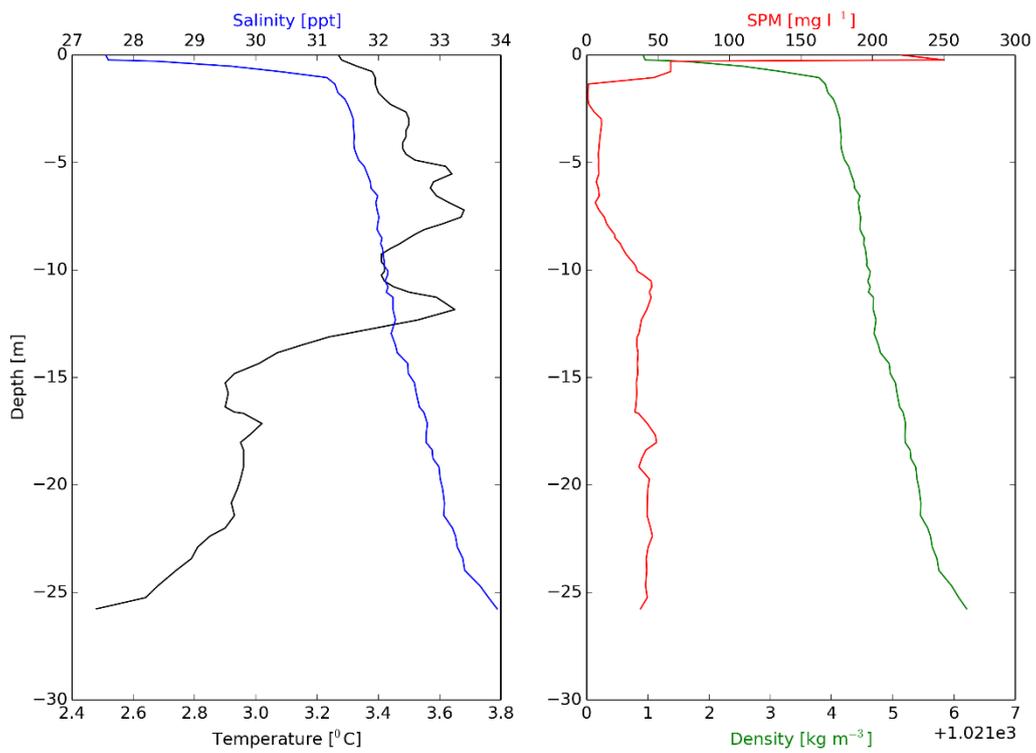
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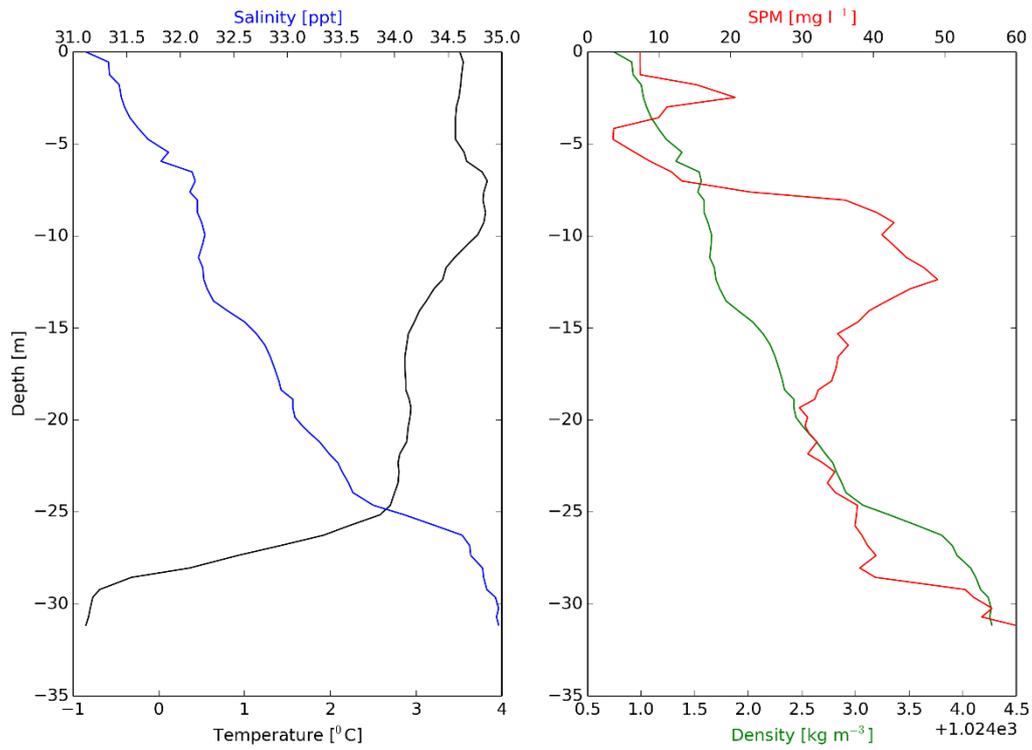
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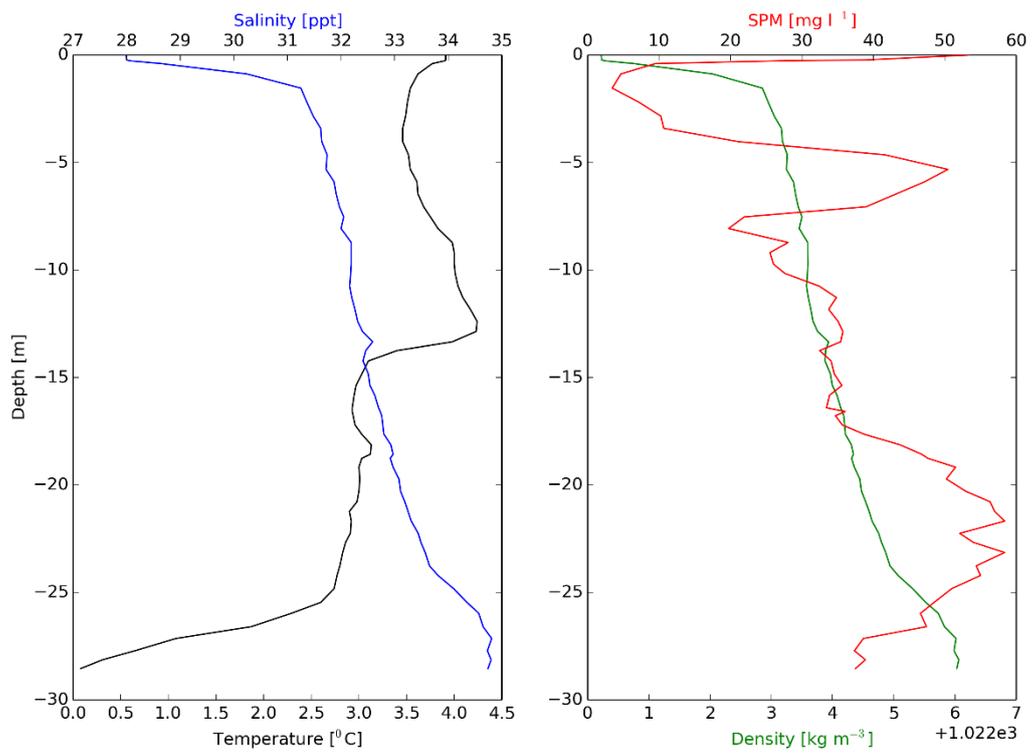
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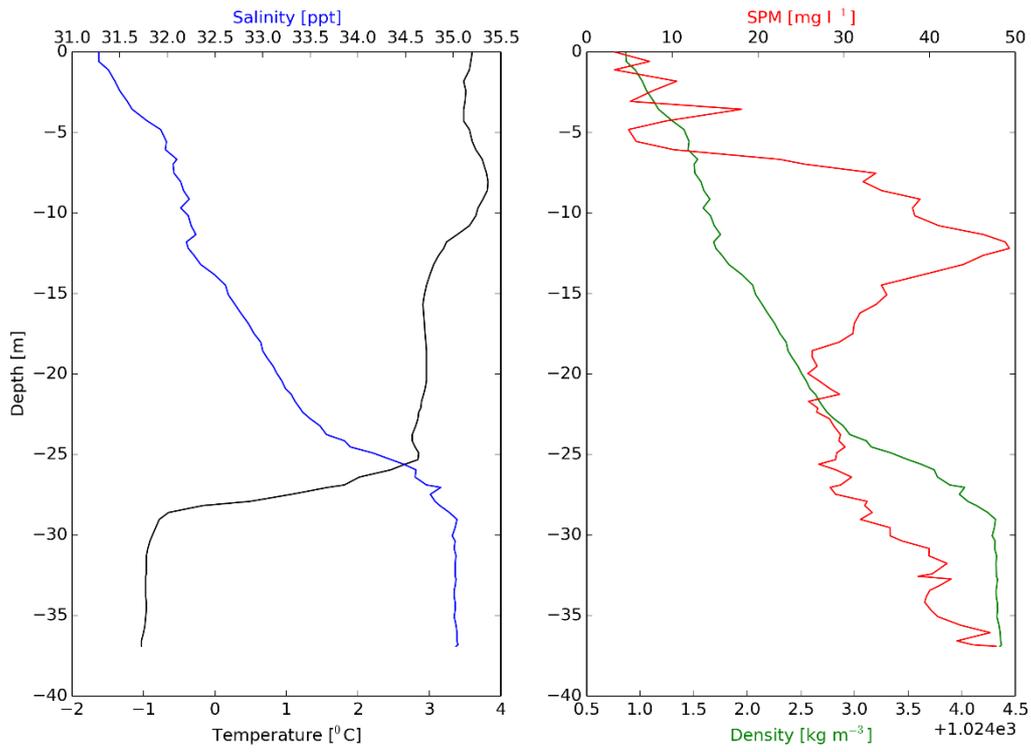
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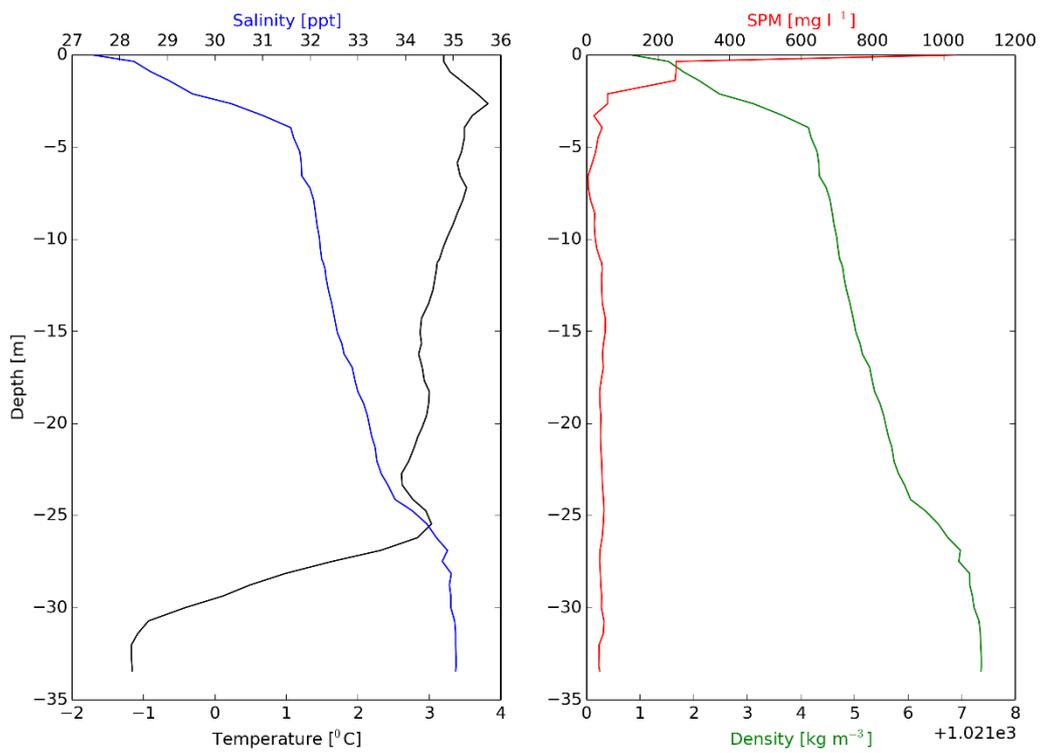
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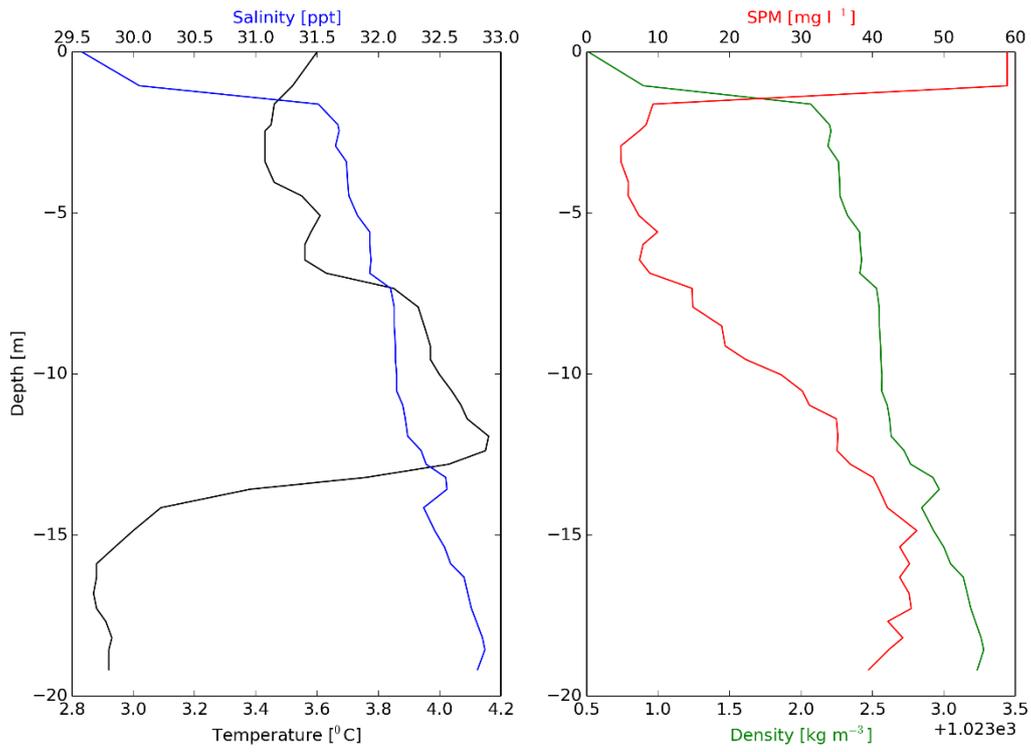
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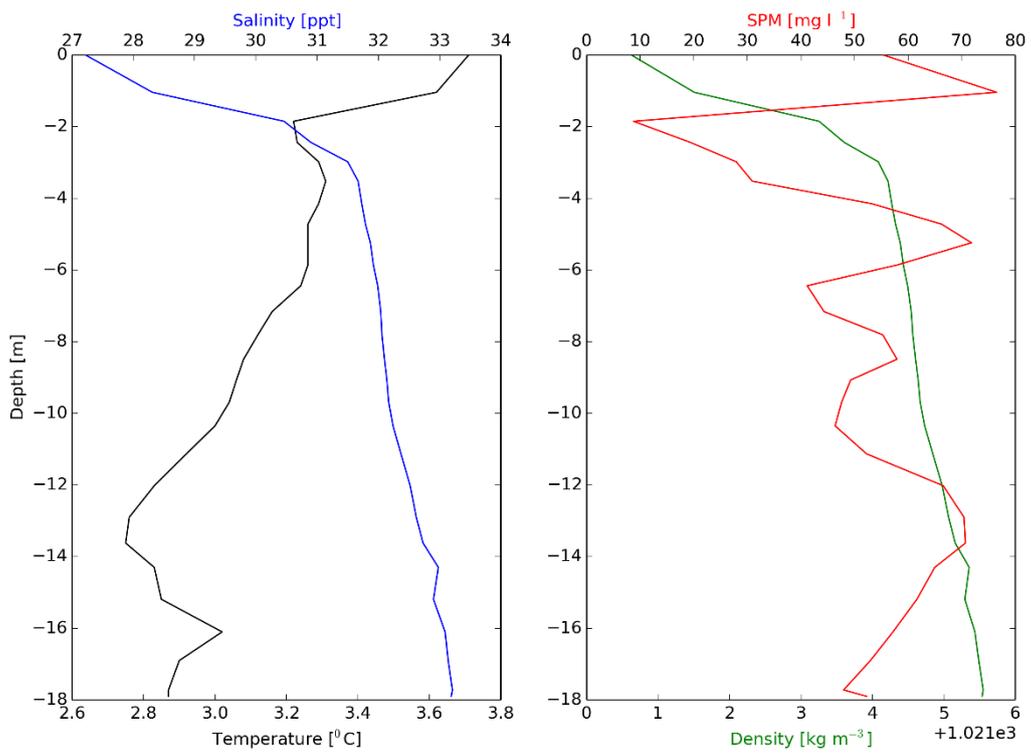
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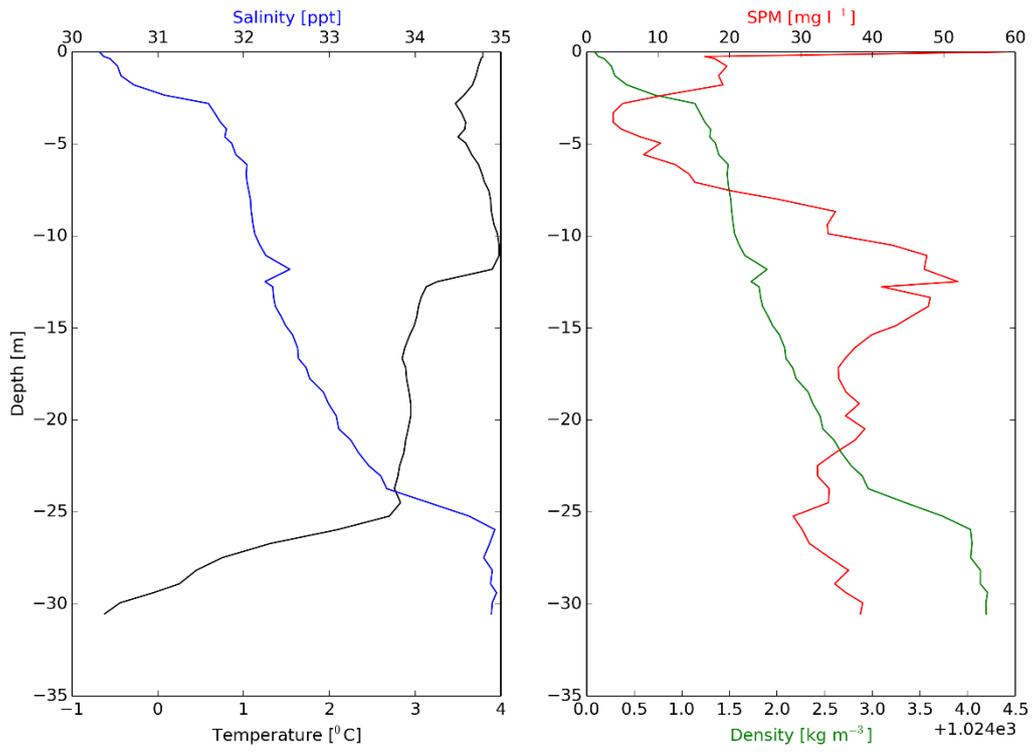
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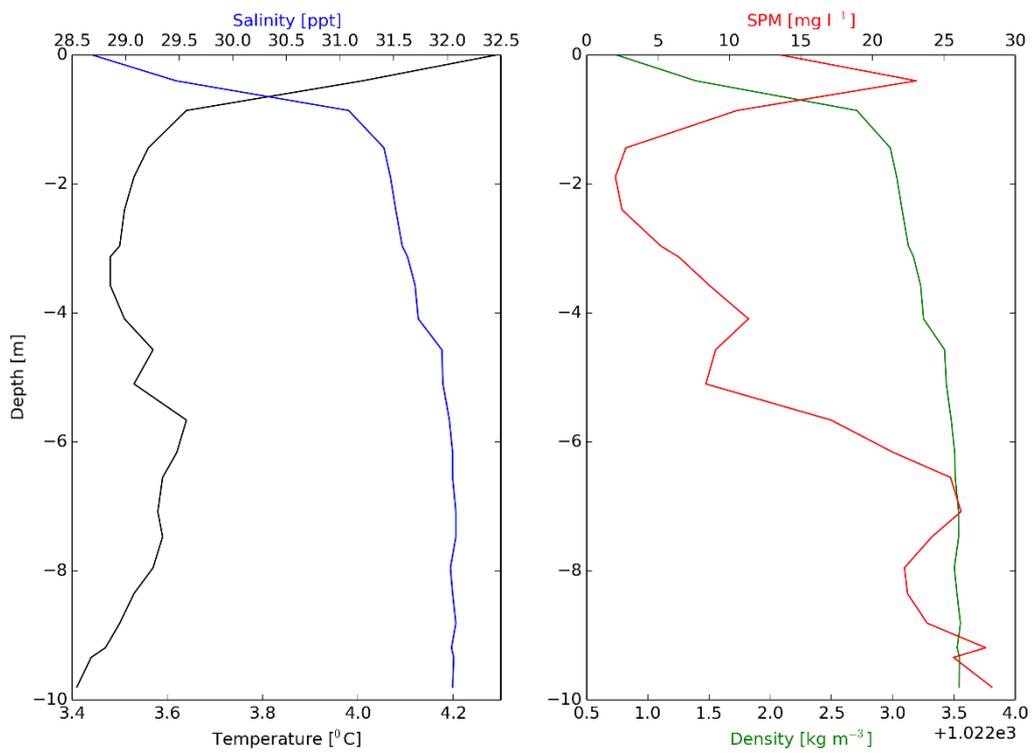
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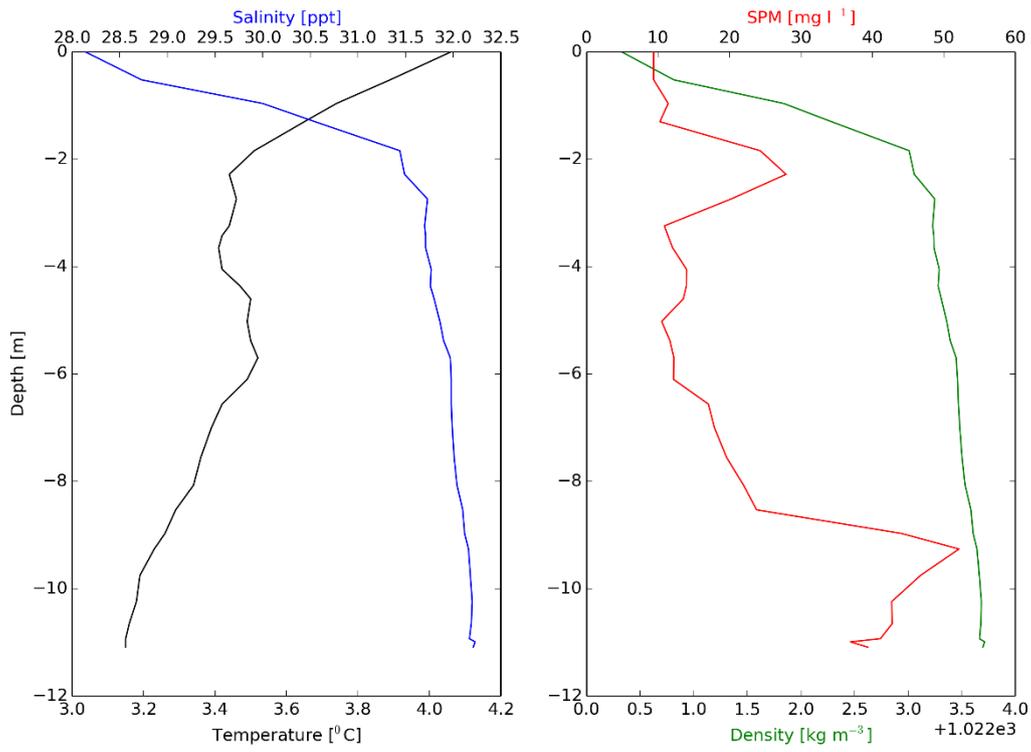
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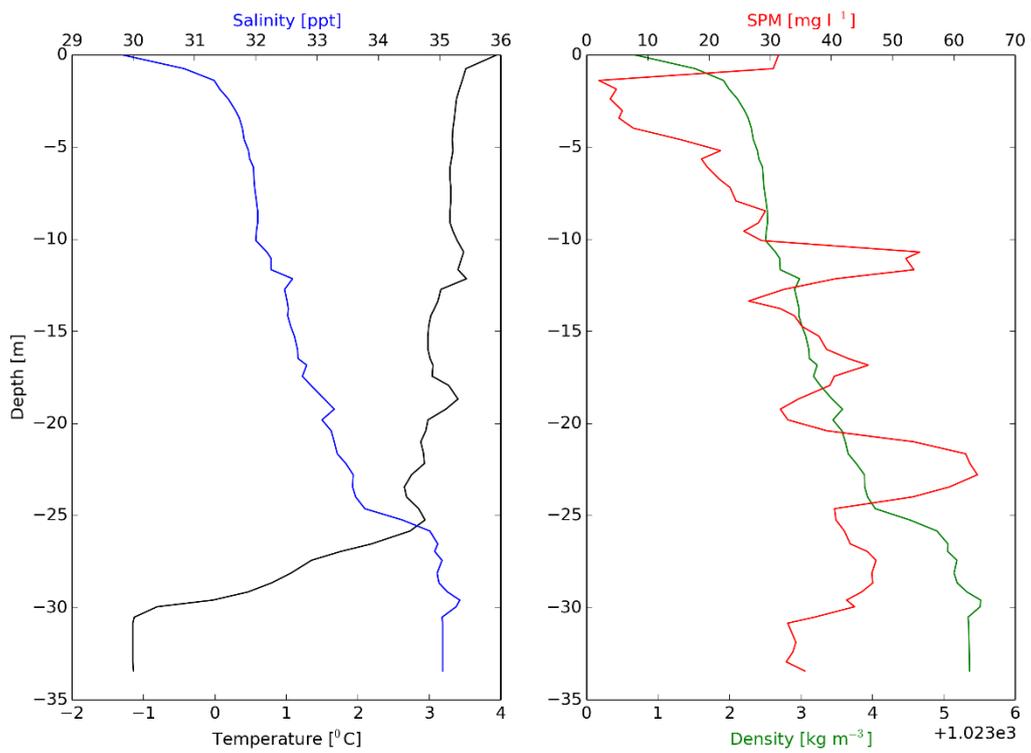
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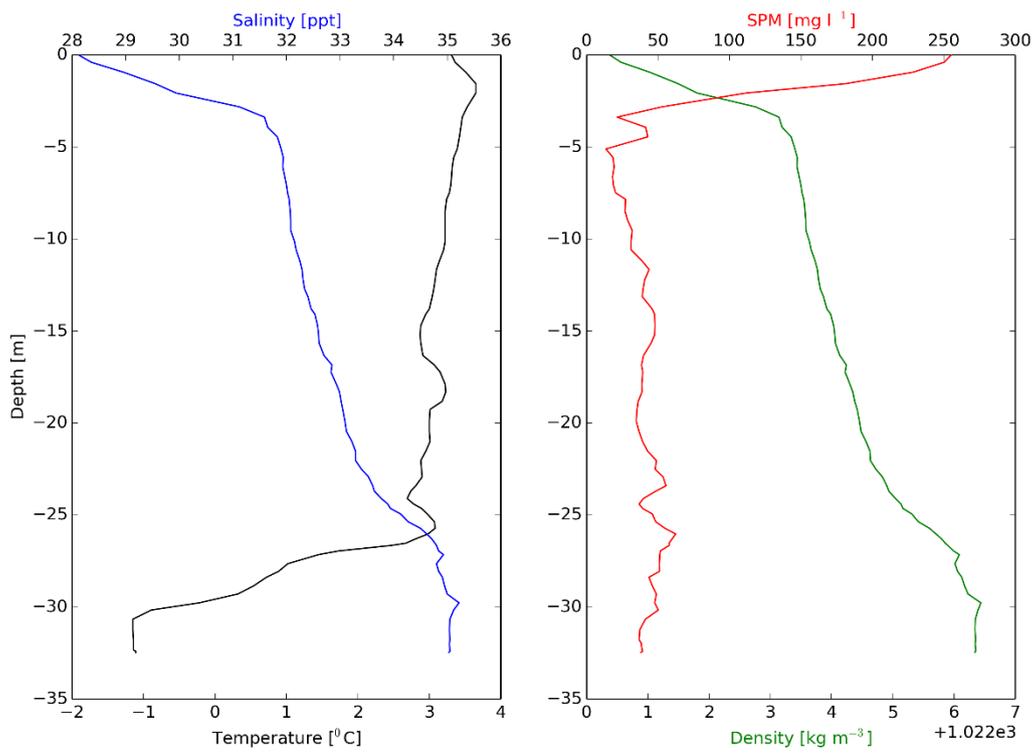
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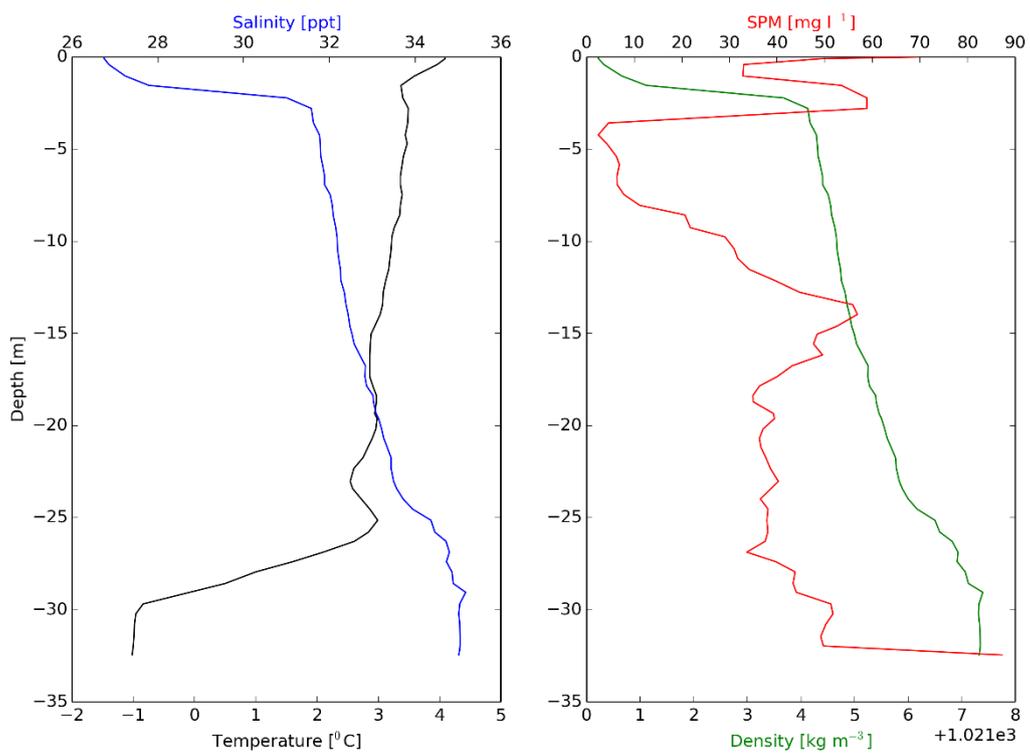
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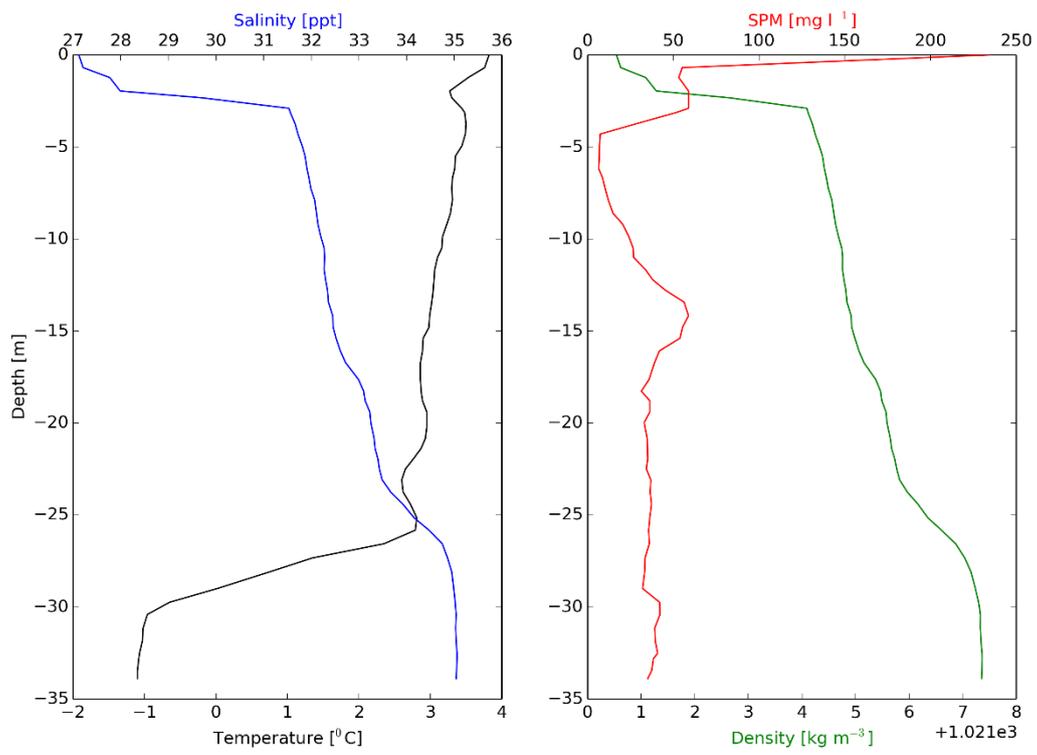
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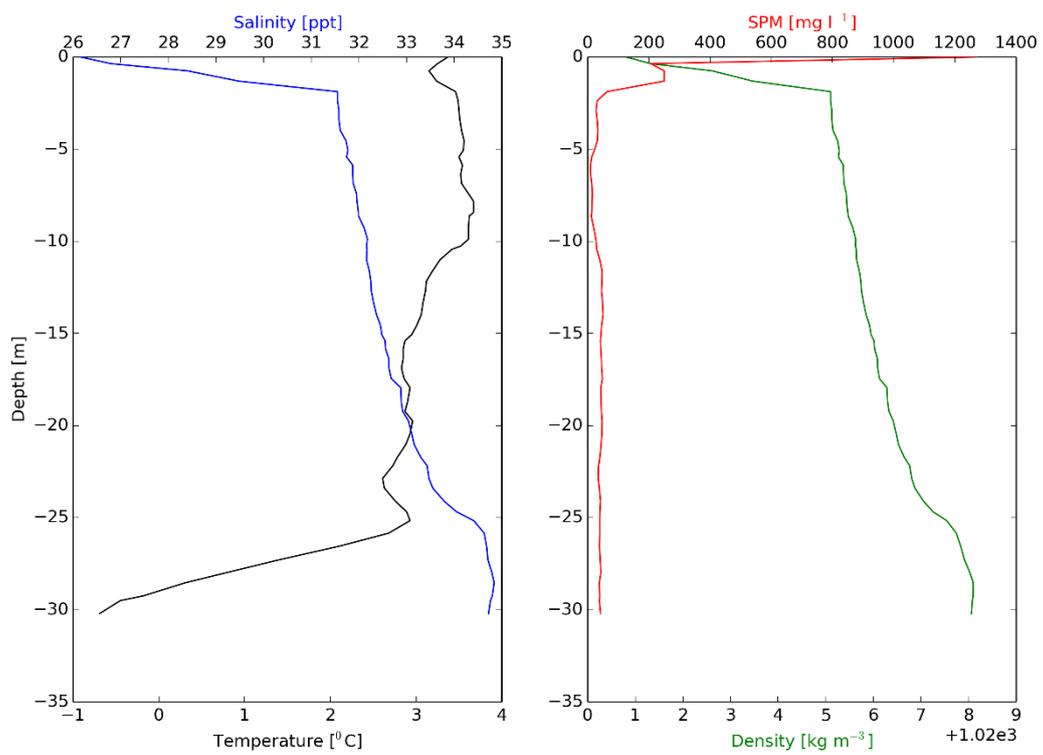
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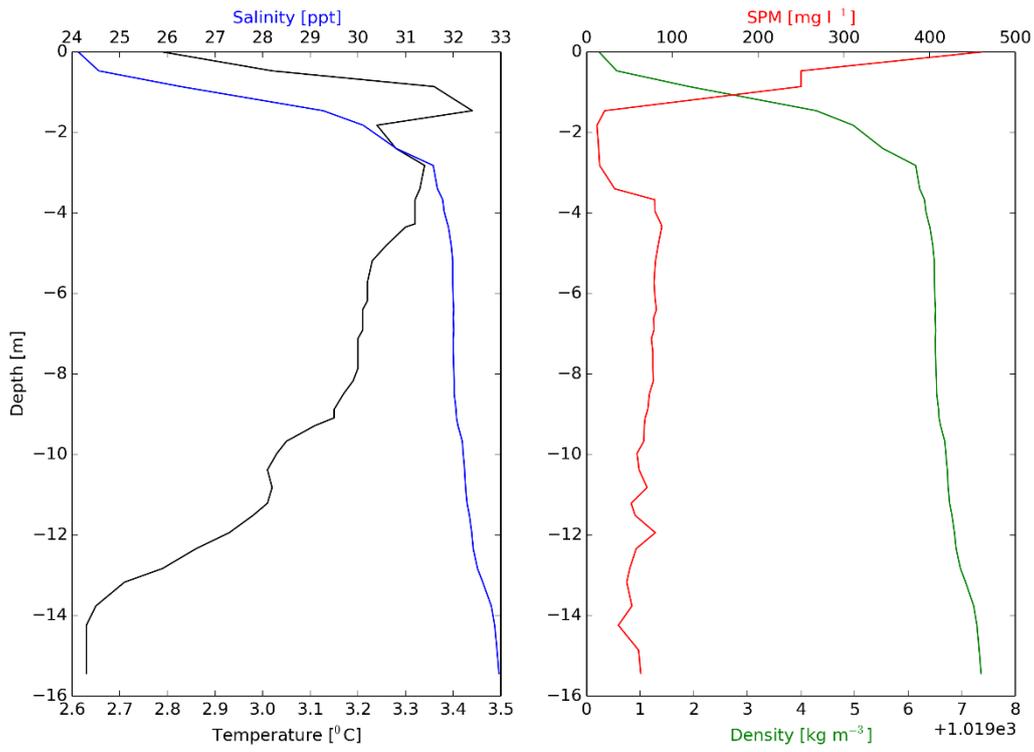
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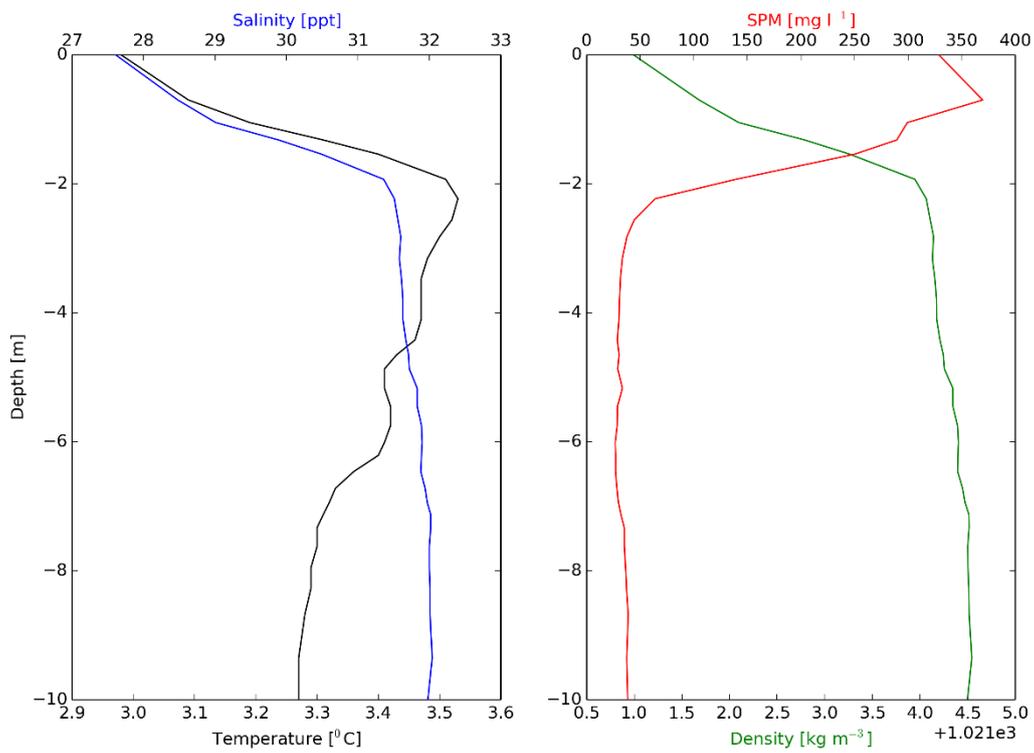
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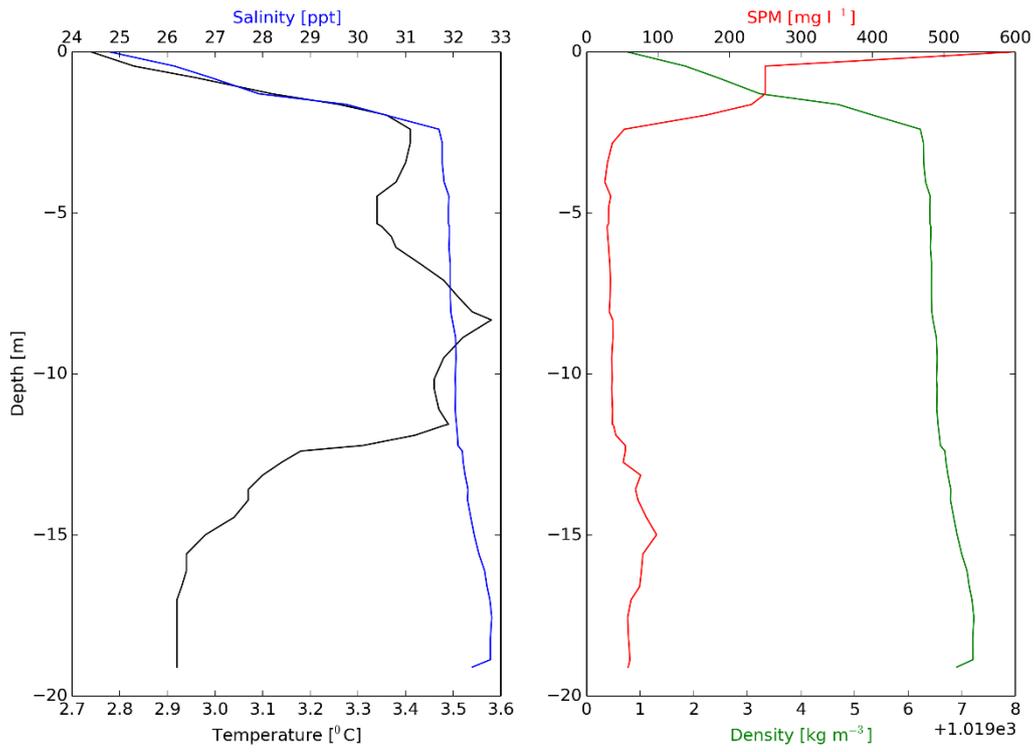
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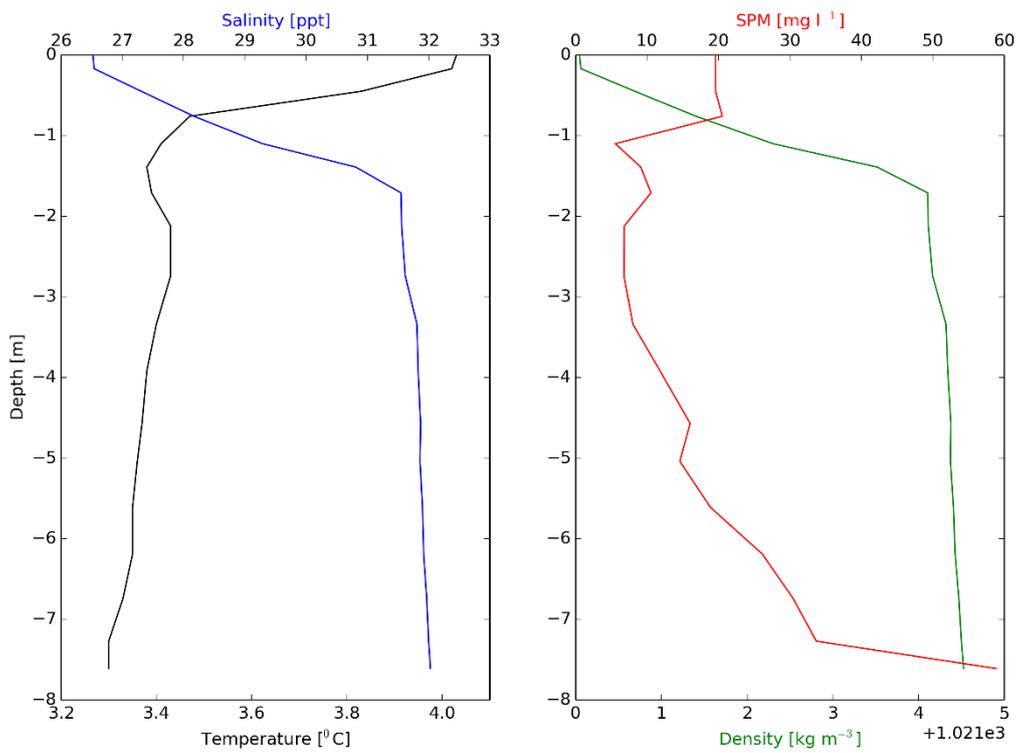
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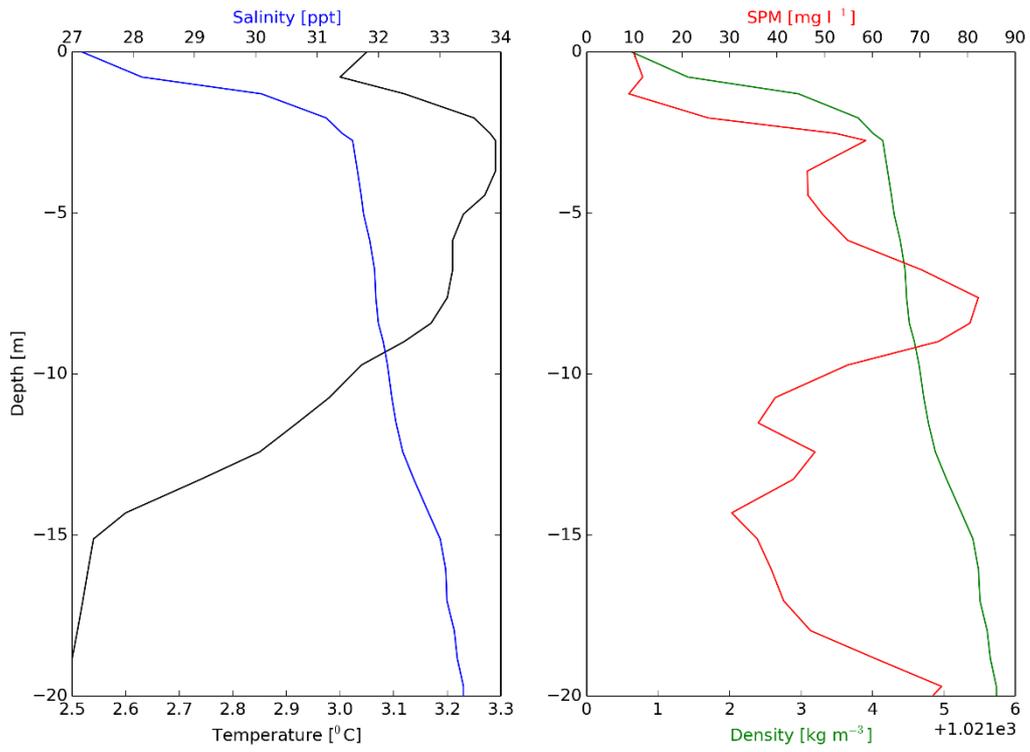
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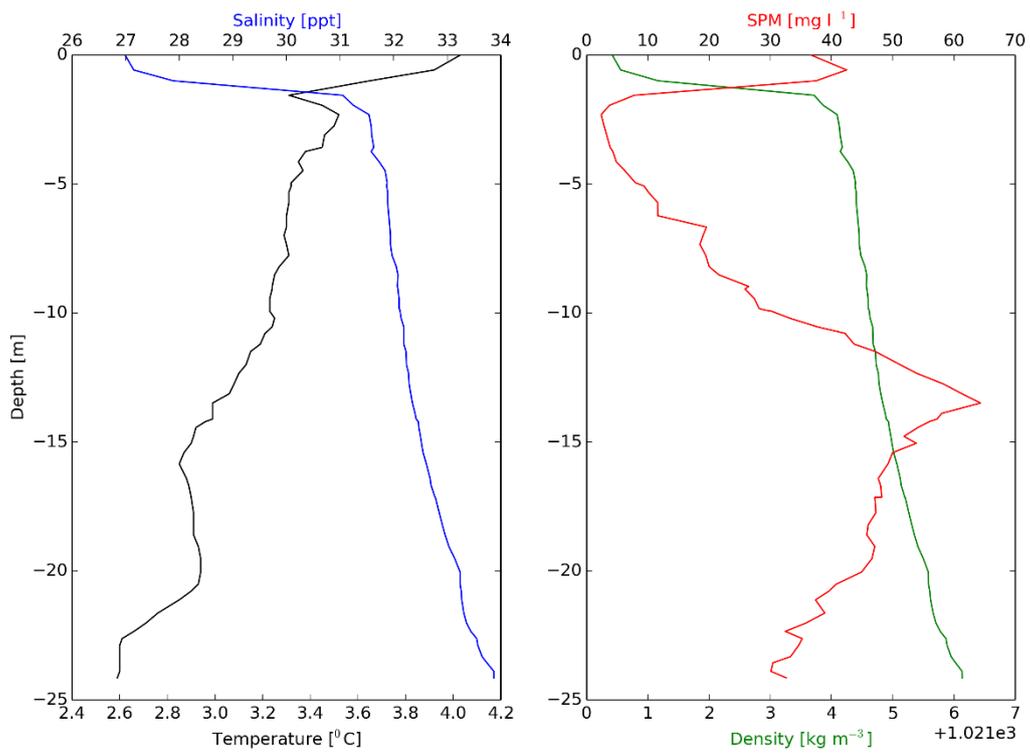
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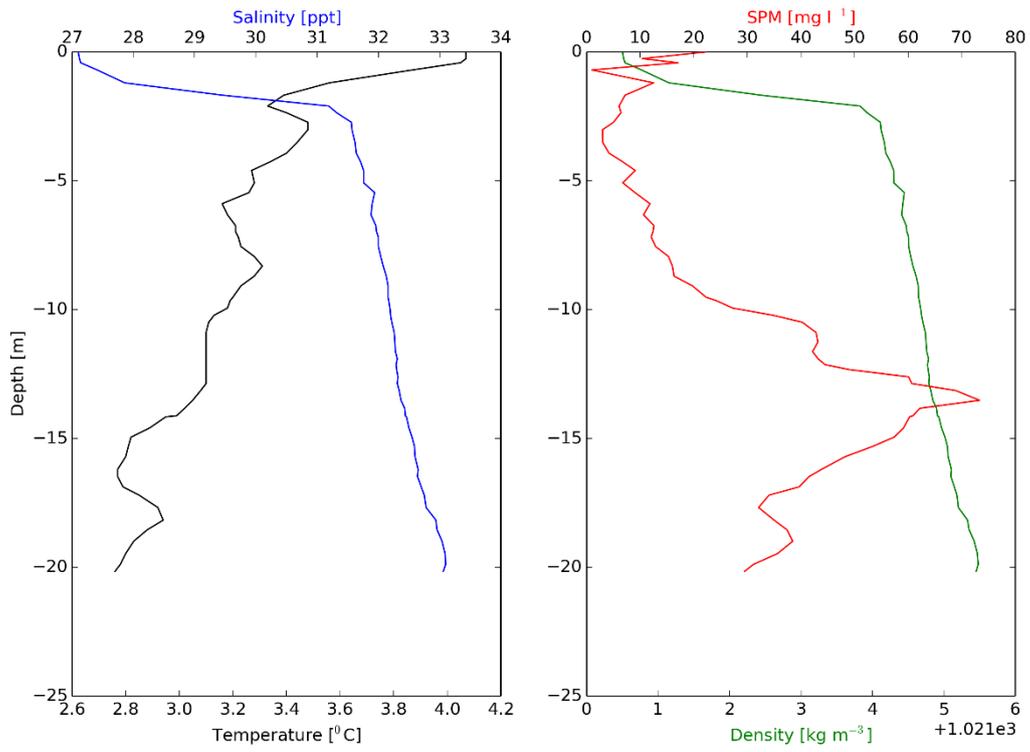
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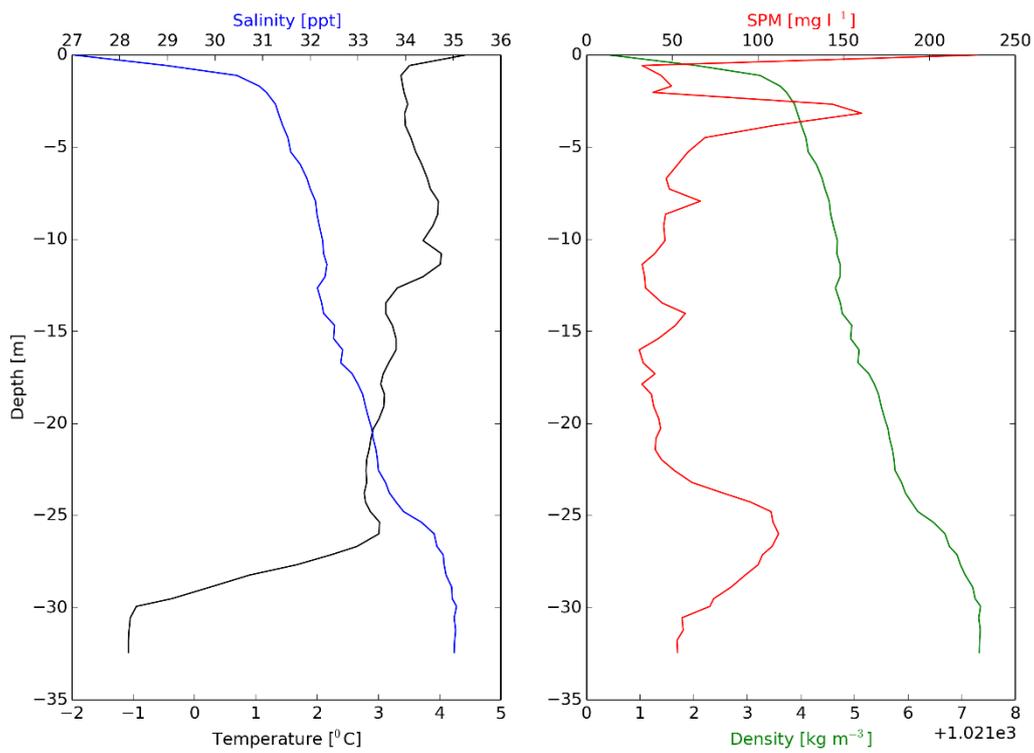
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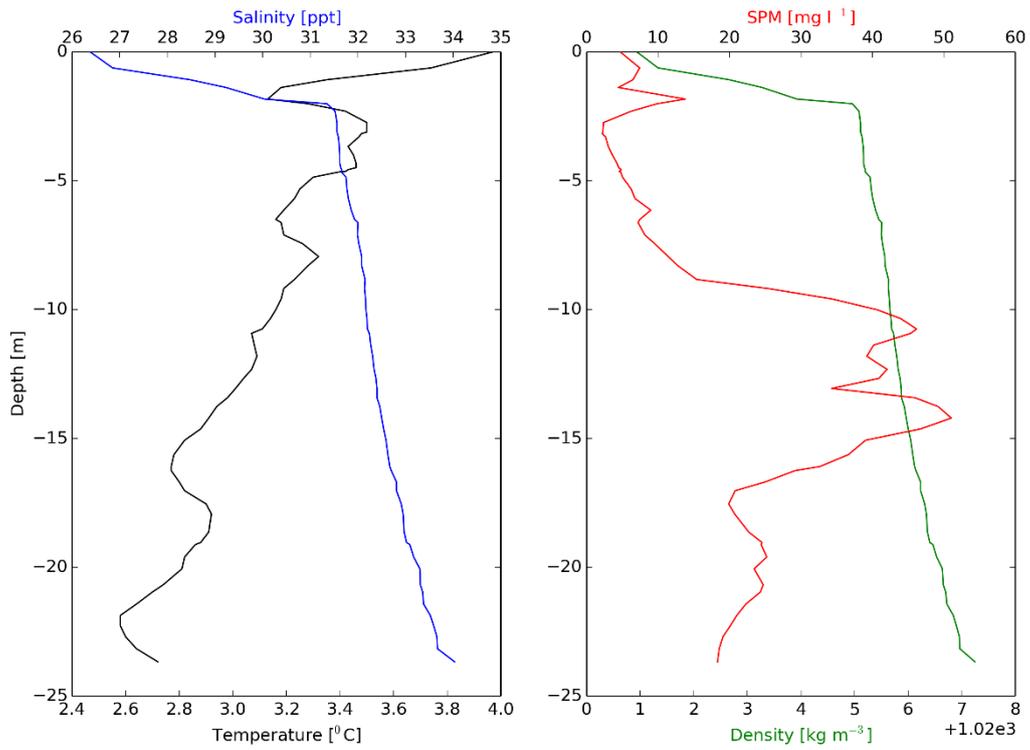
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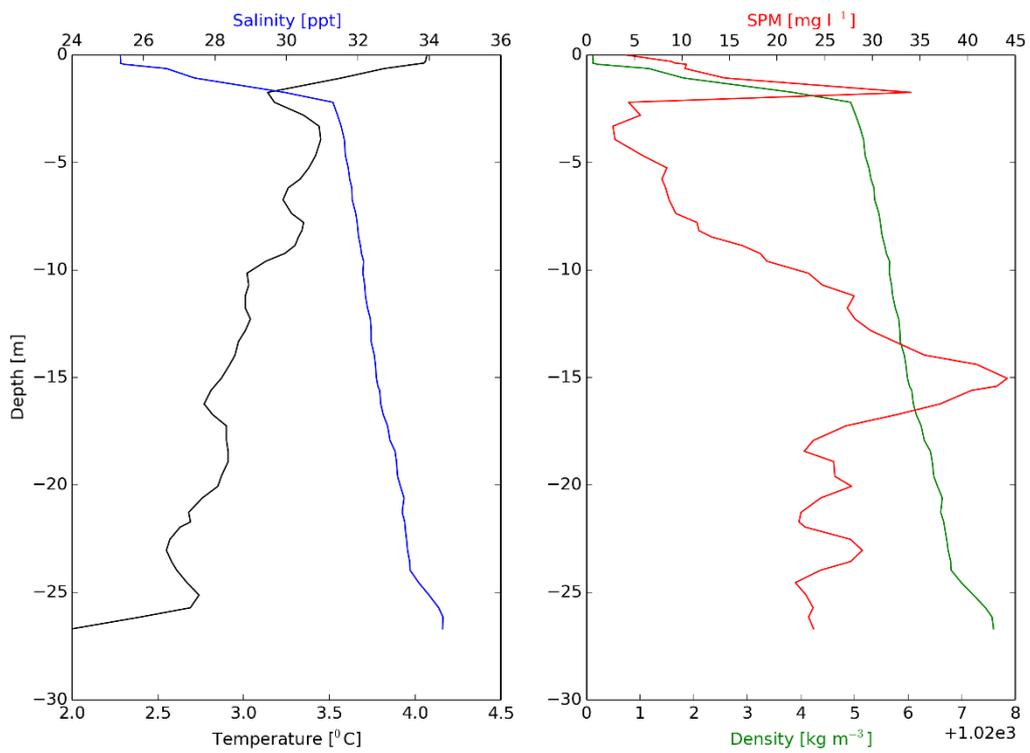
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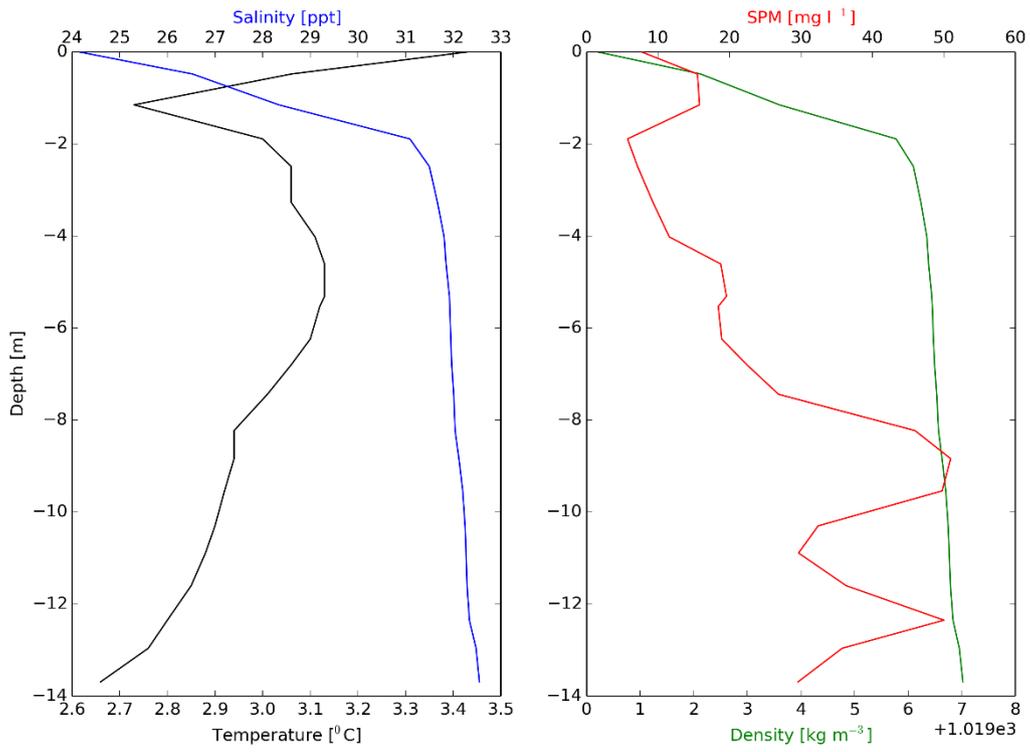
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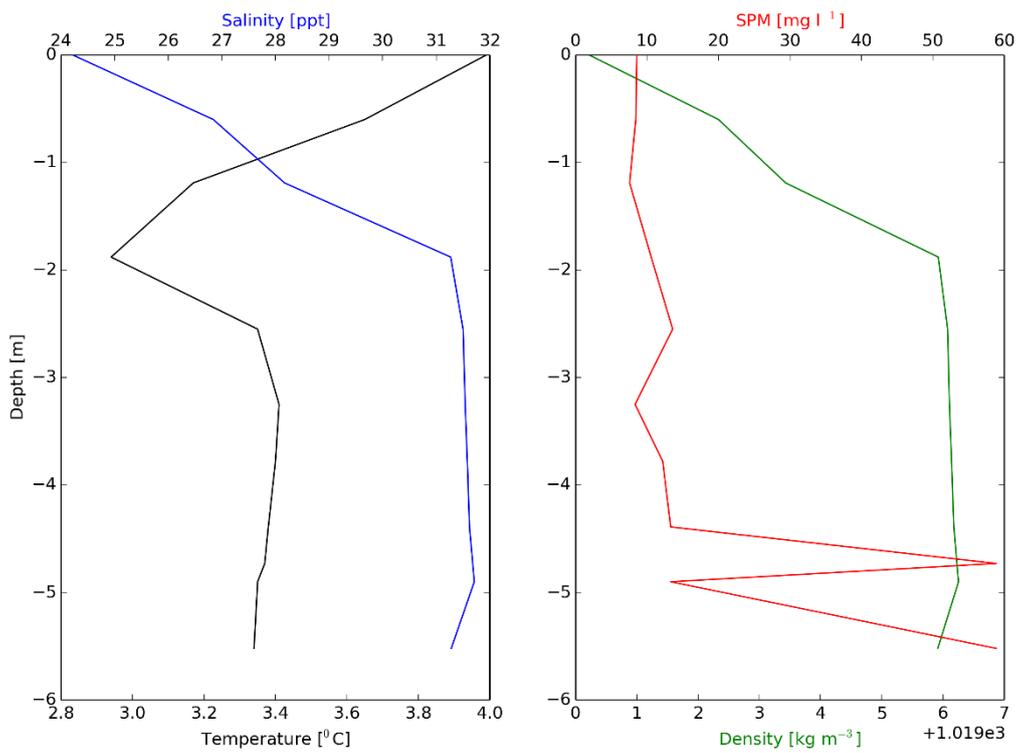
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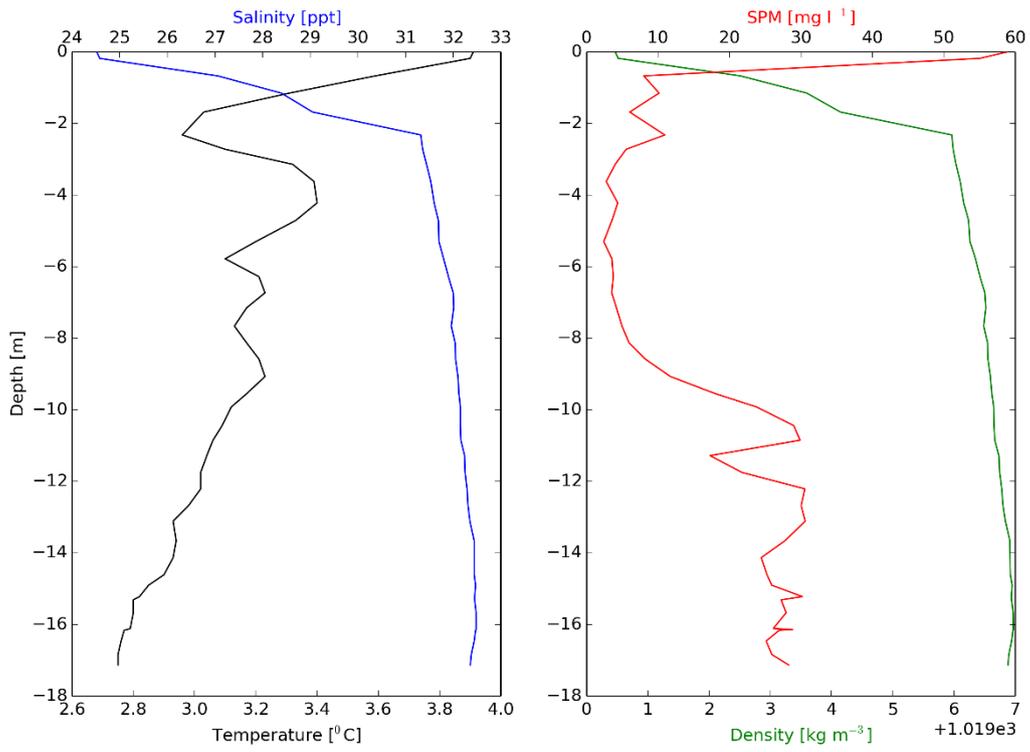
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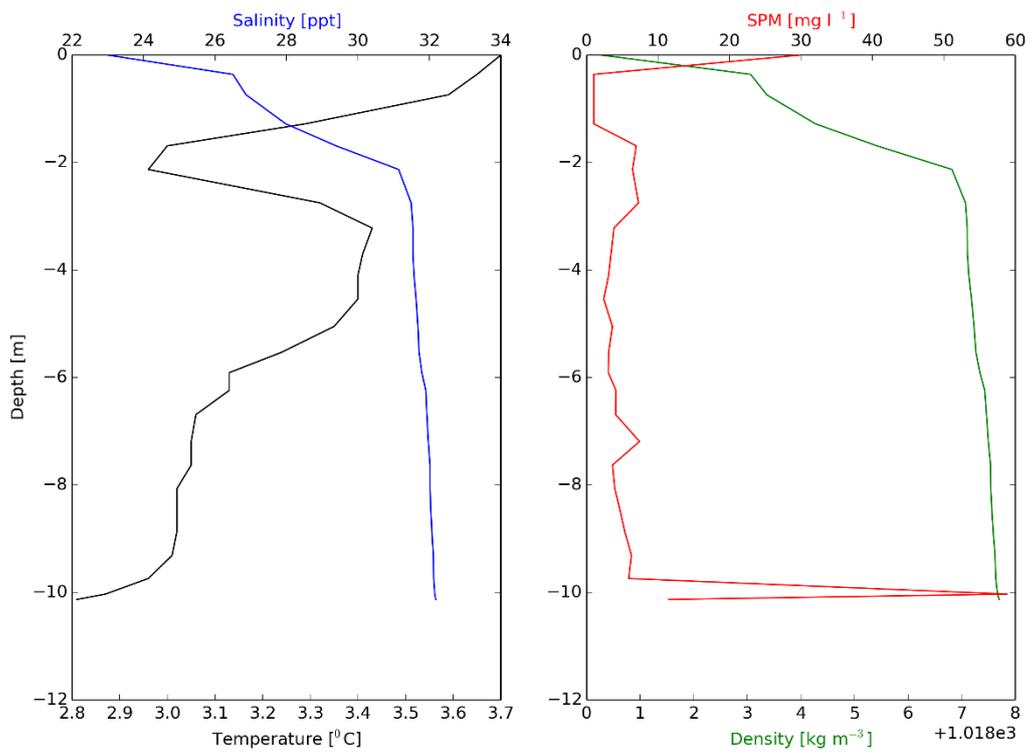
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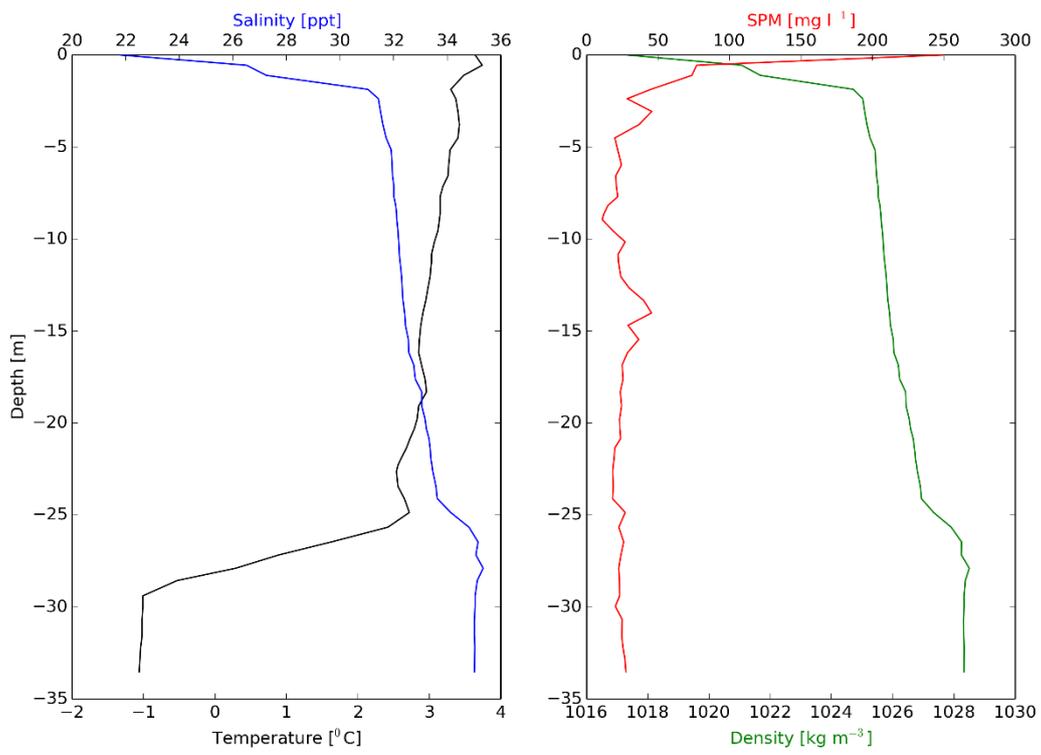
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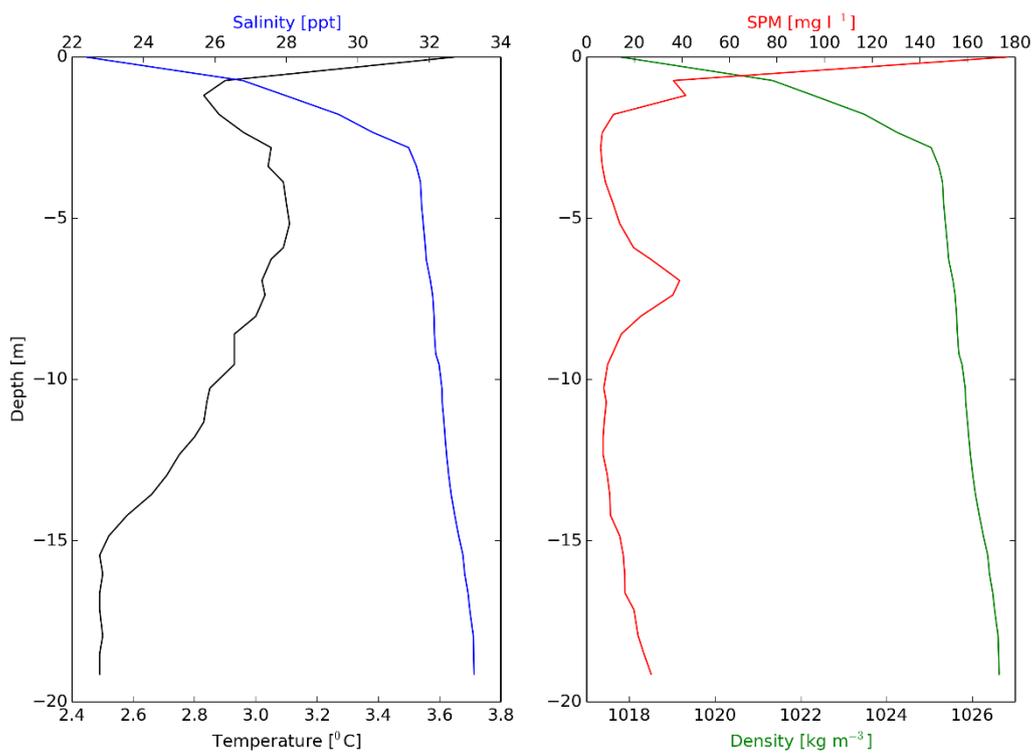
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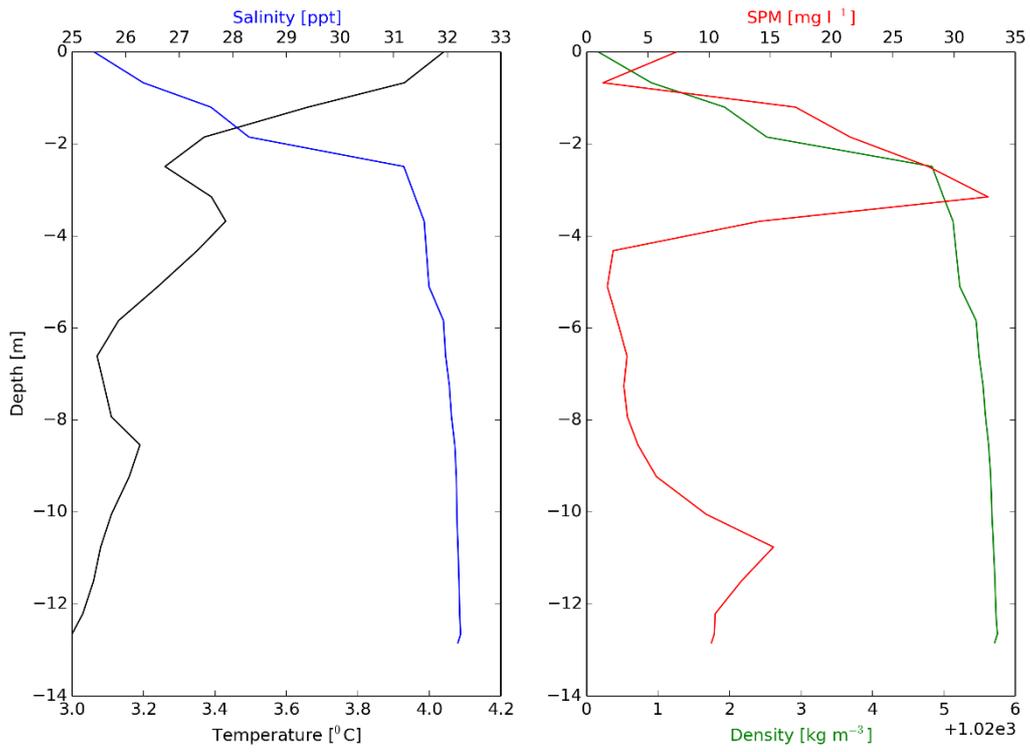
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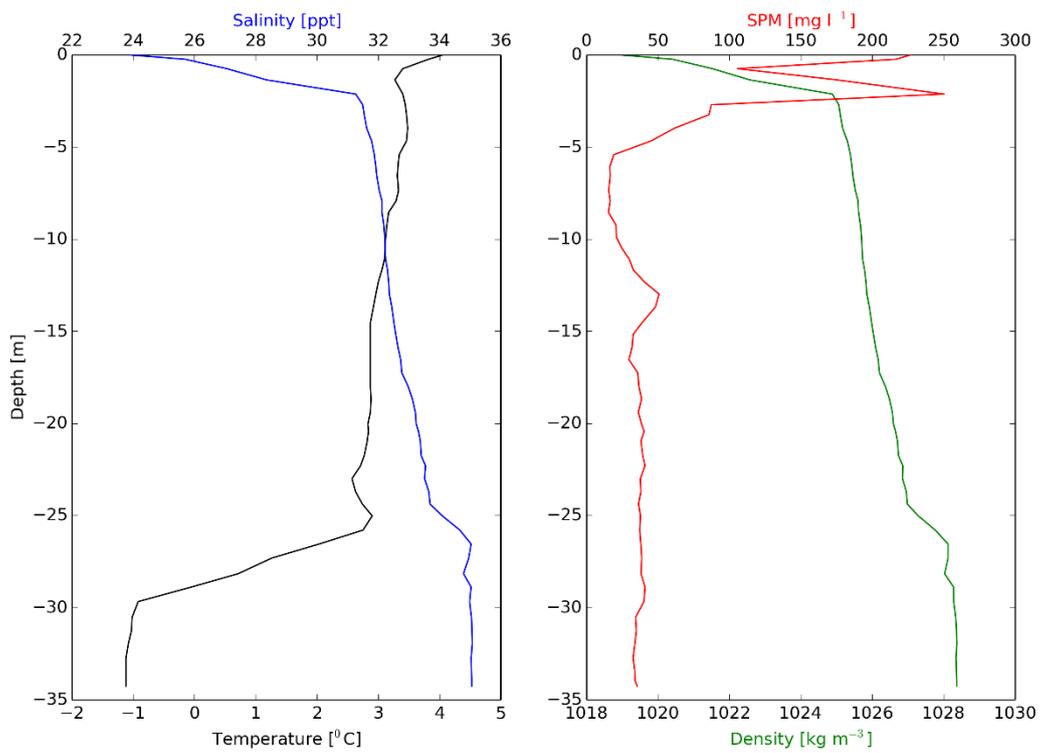
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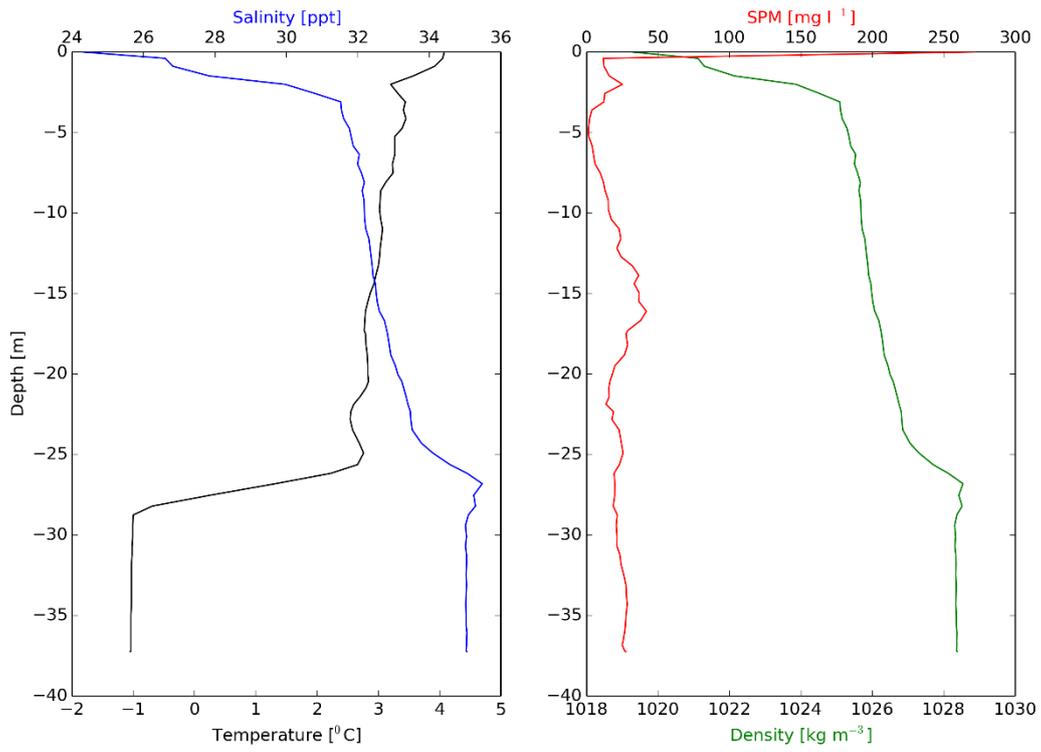
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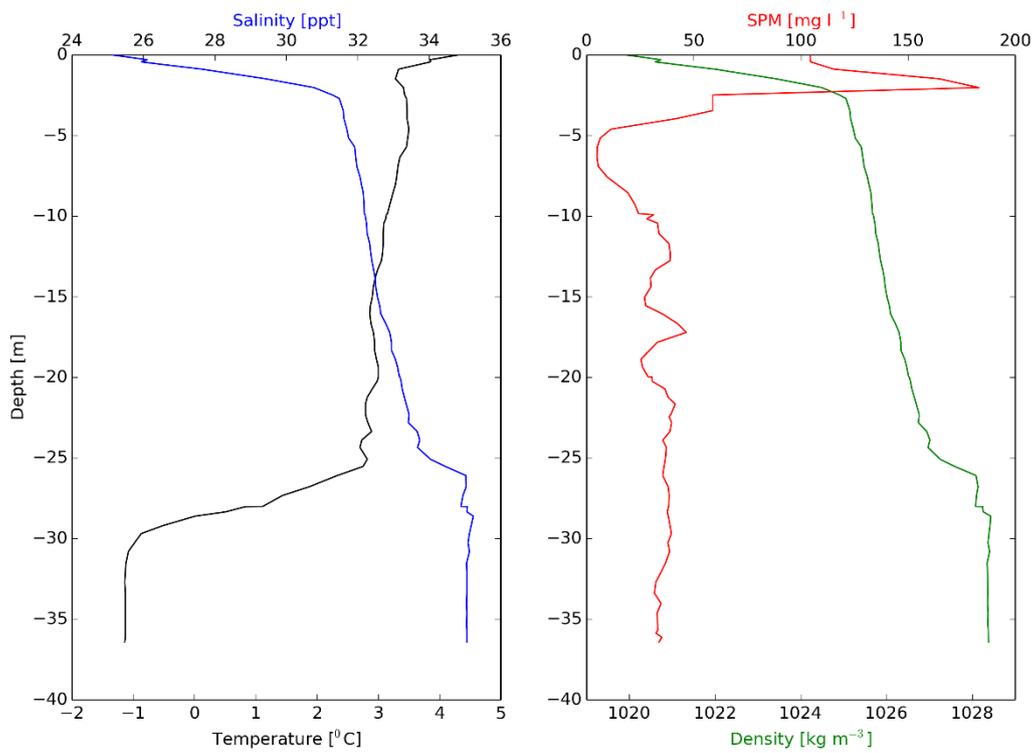
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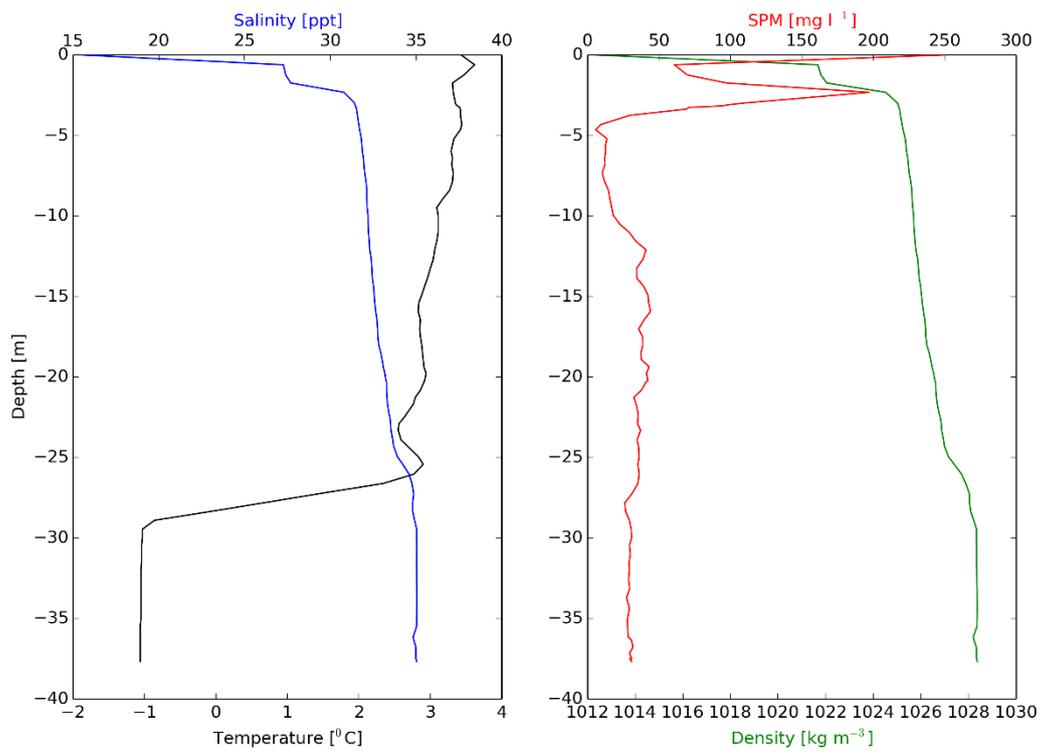
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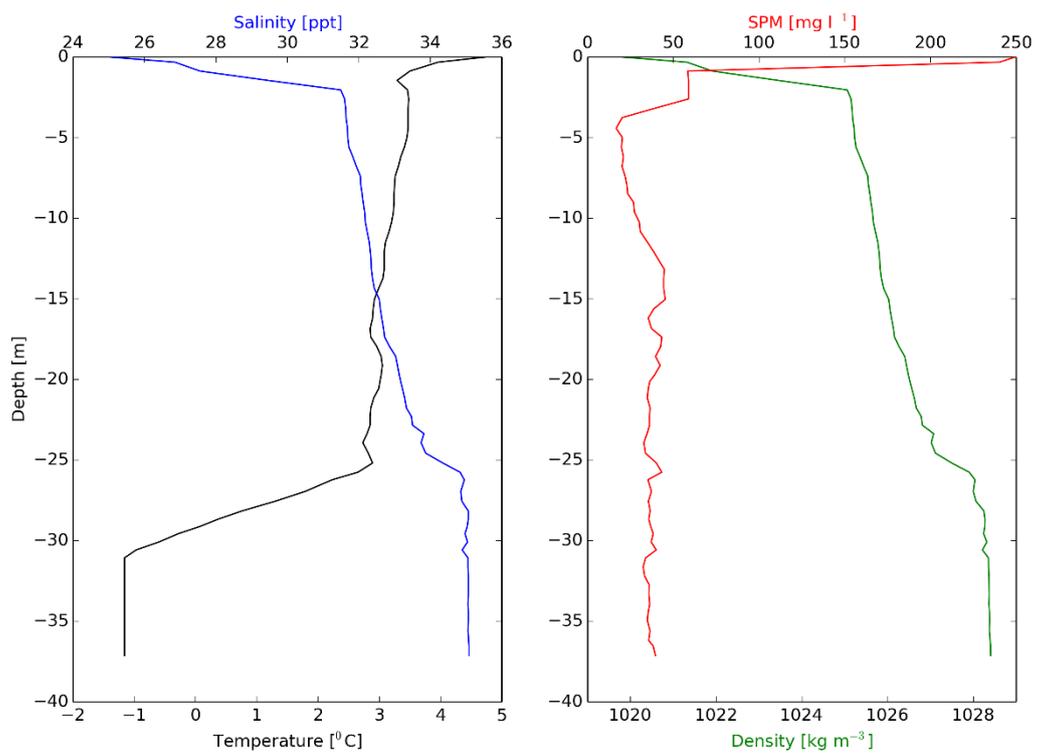
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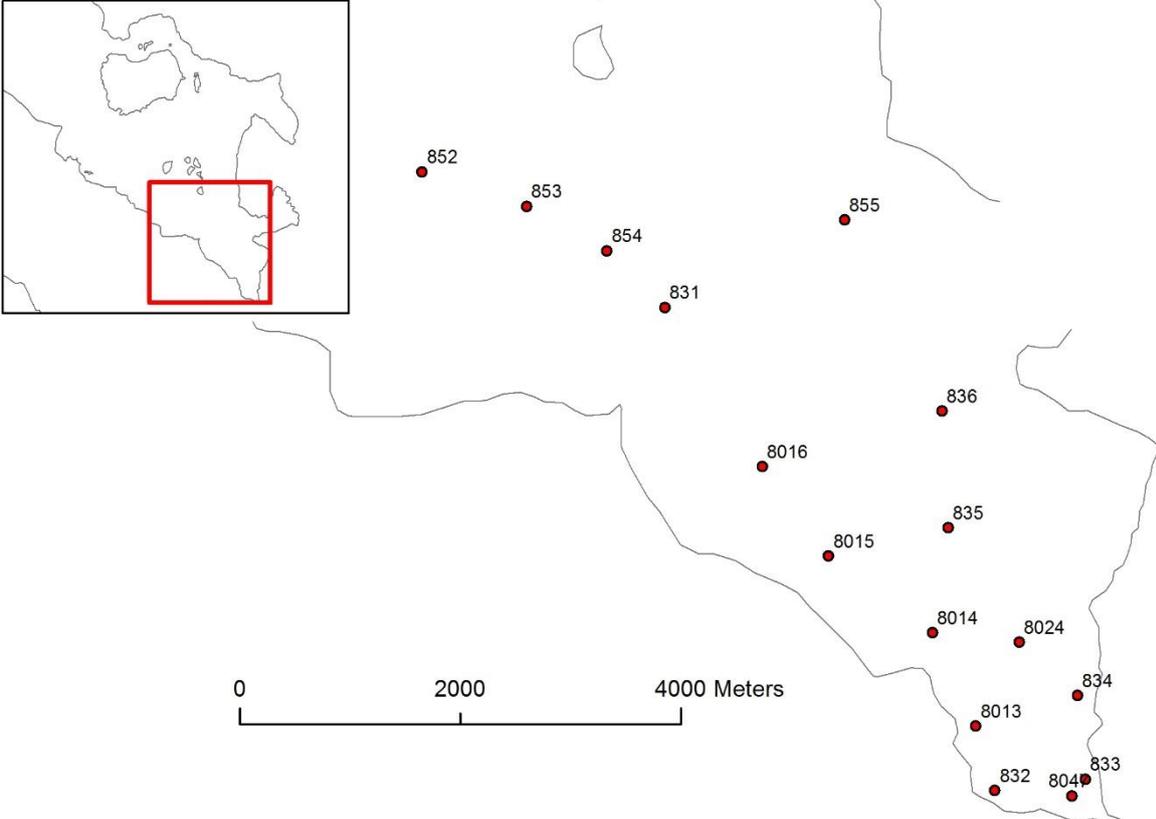
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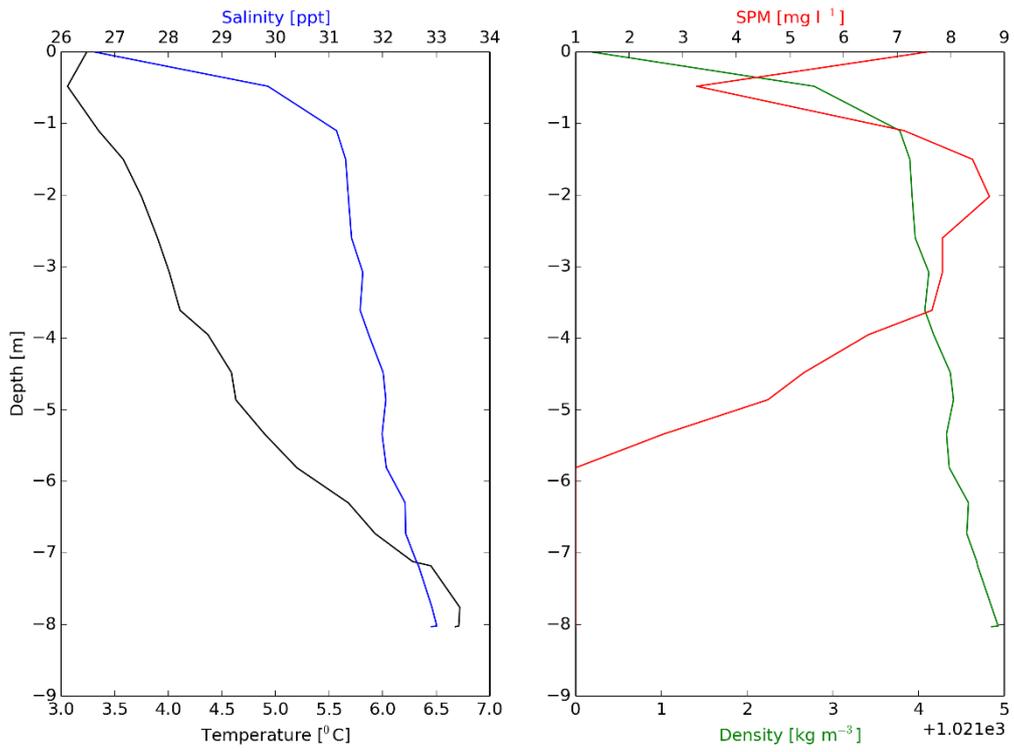
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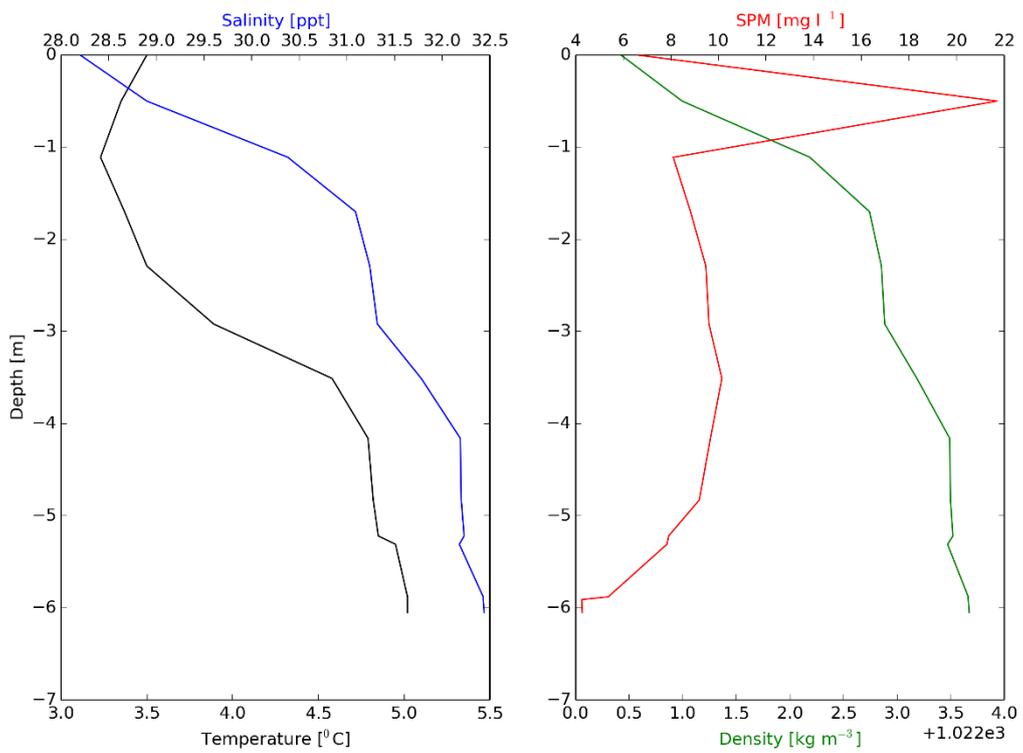
APPENDIX C 2



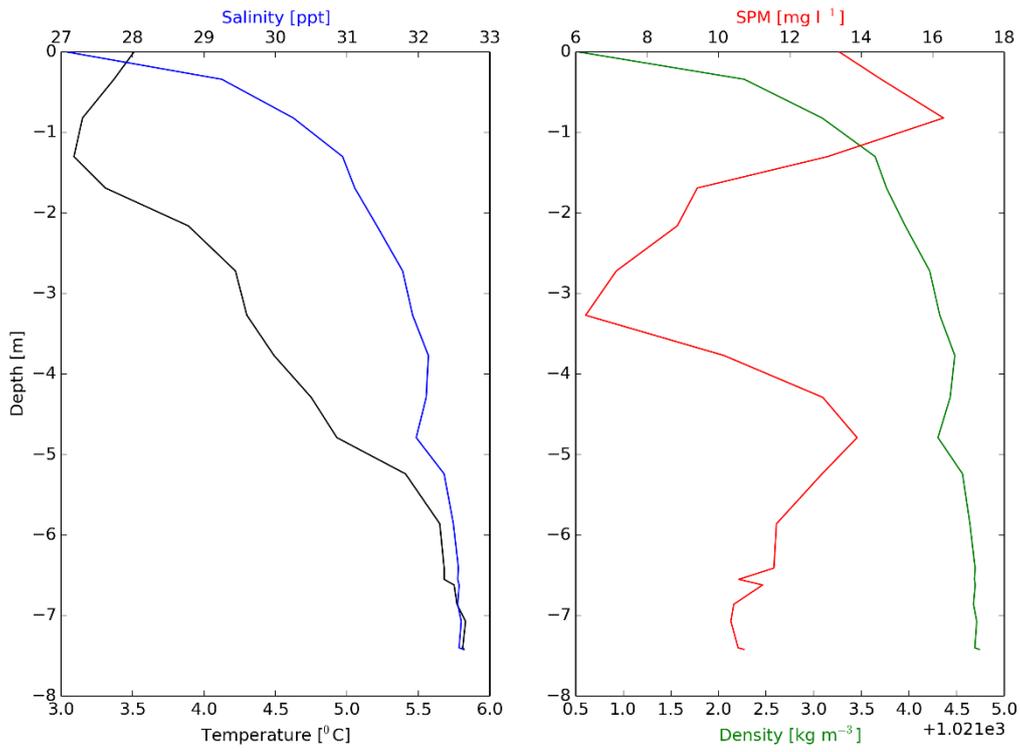
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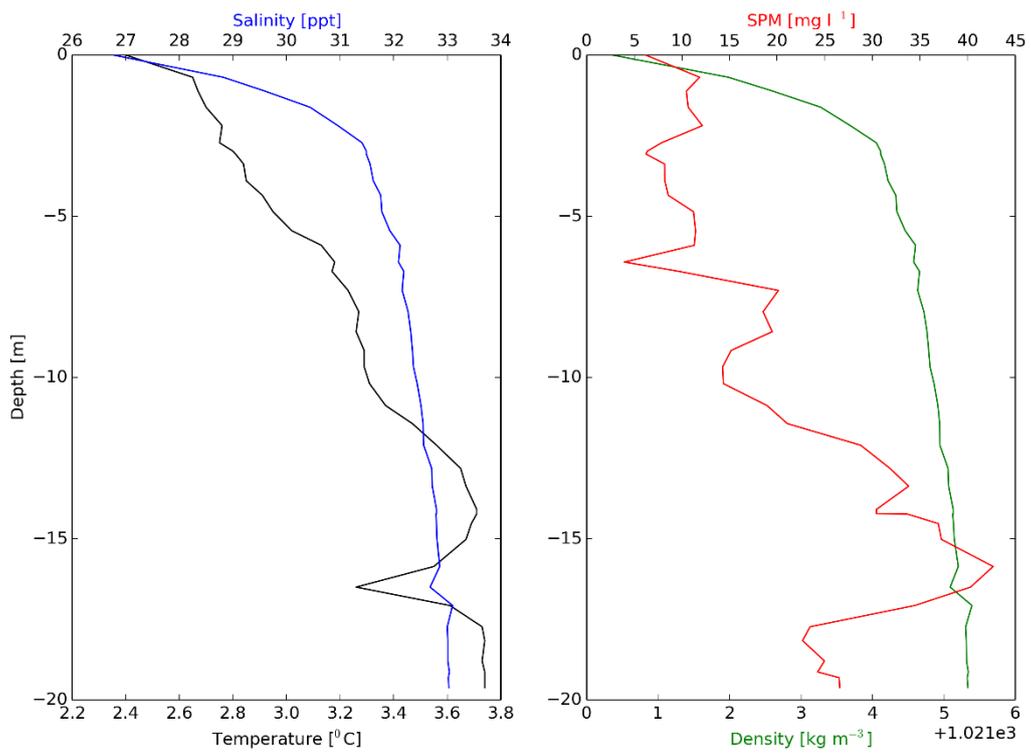
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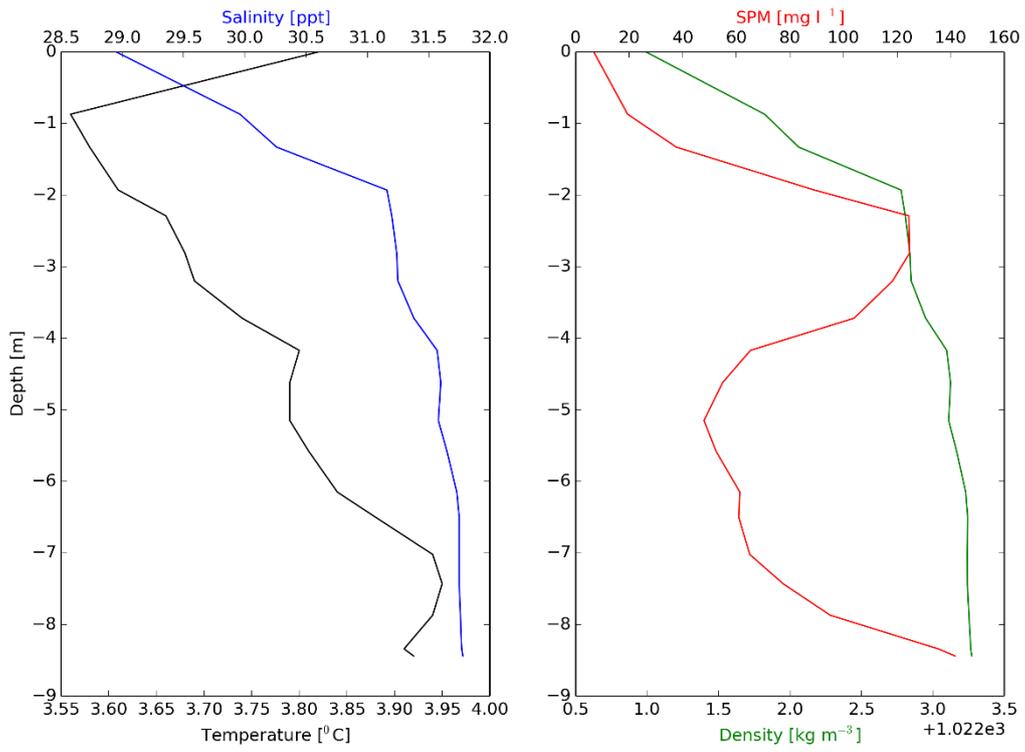
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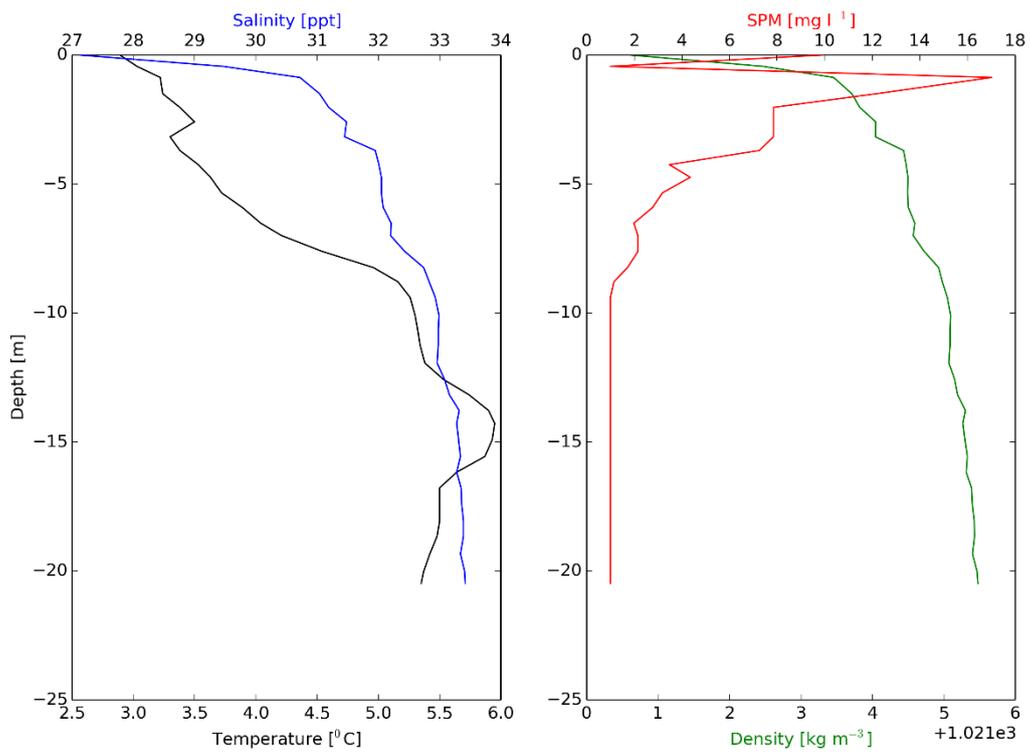
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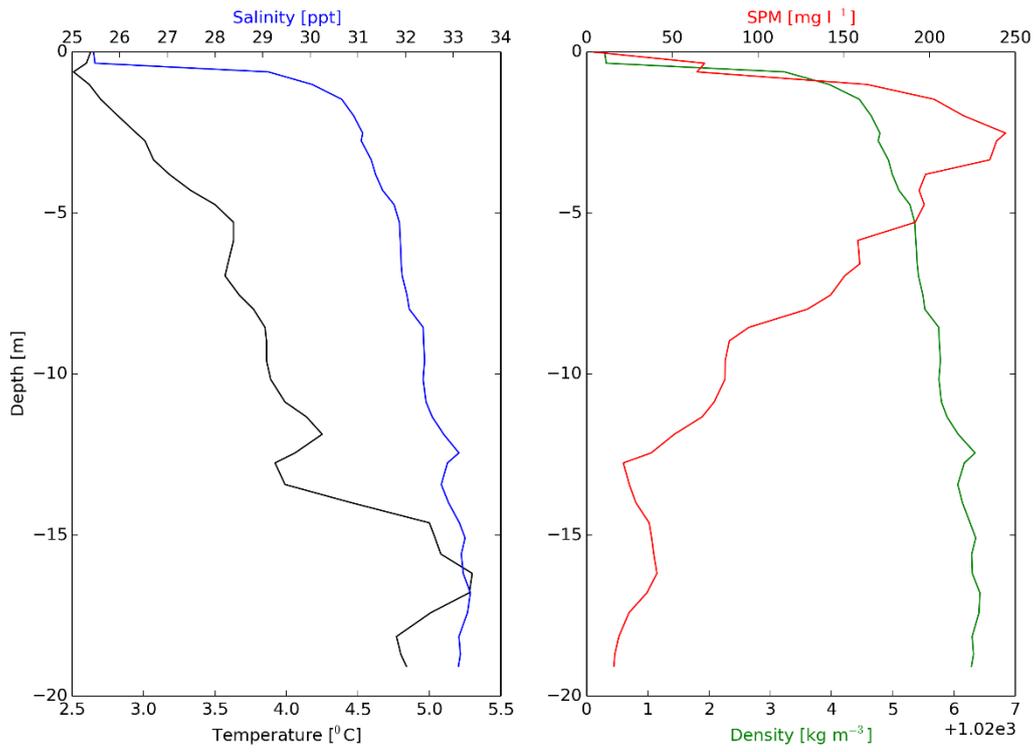
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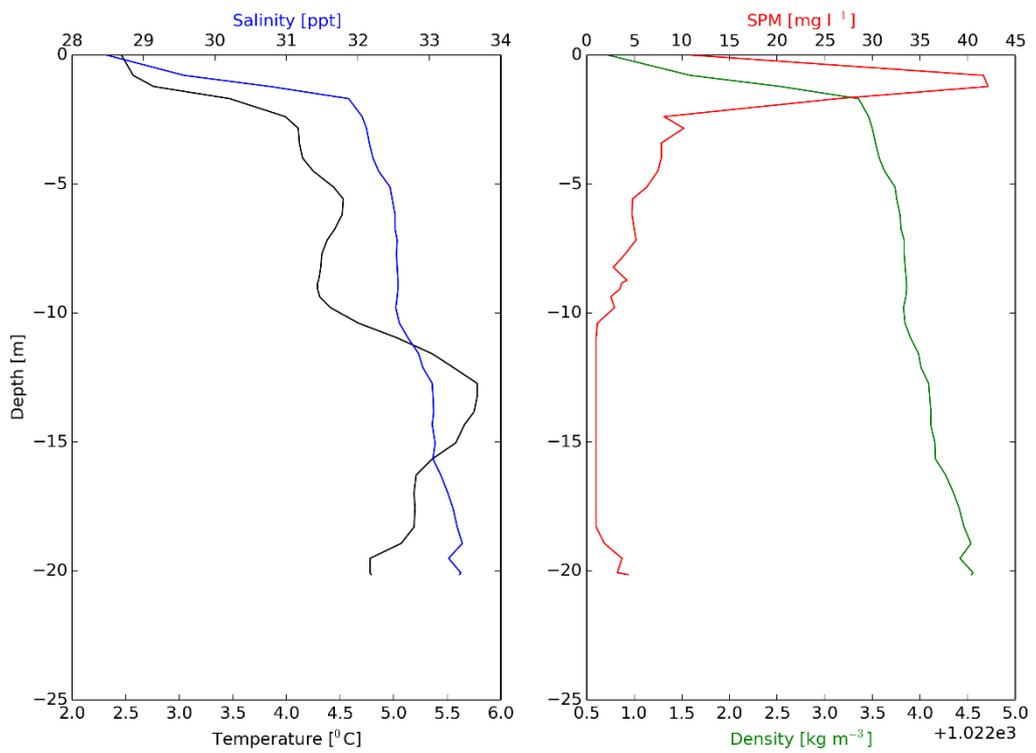
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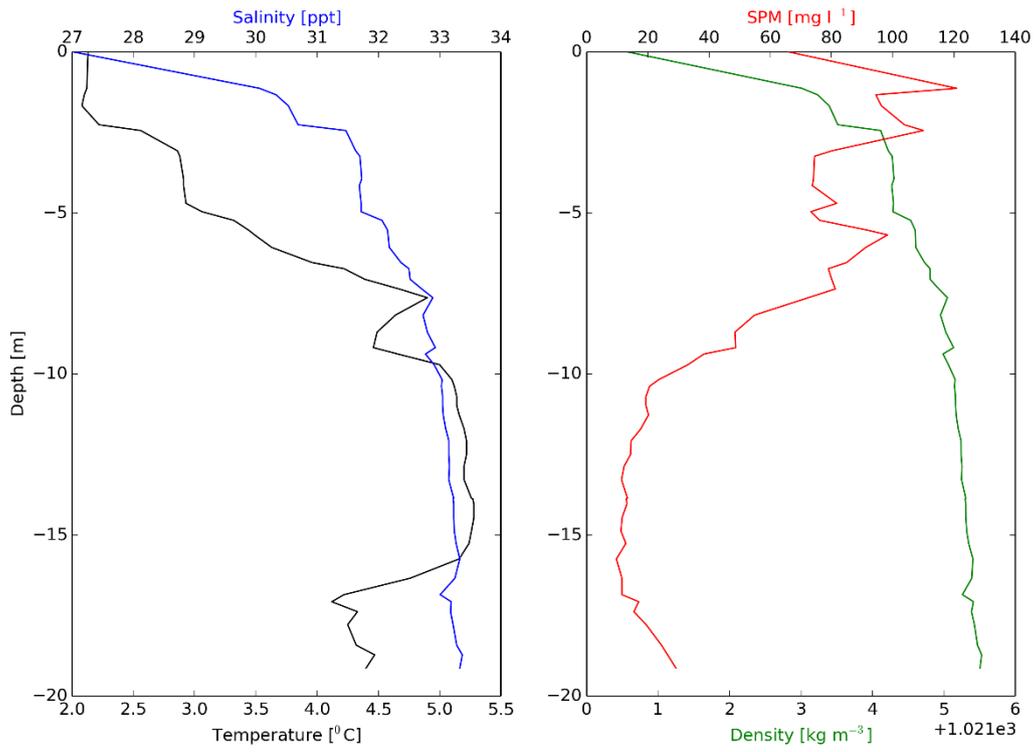
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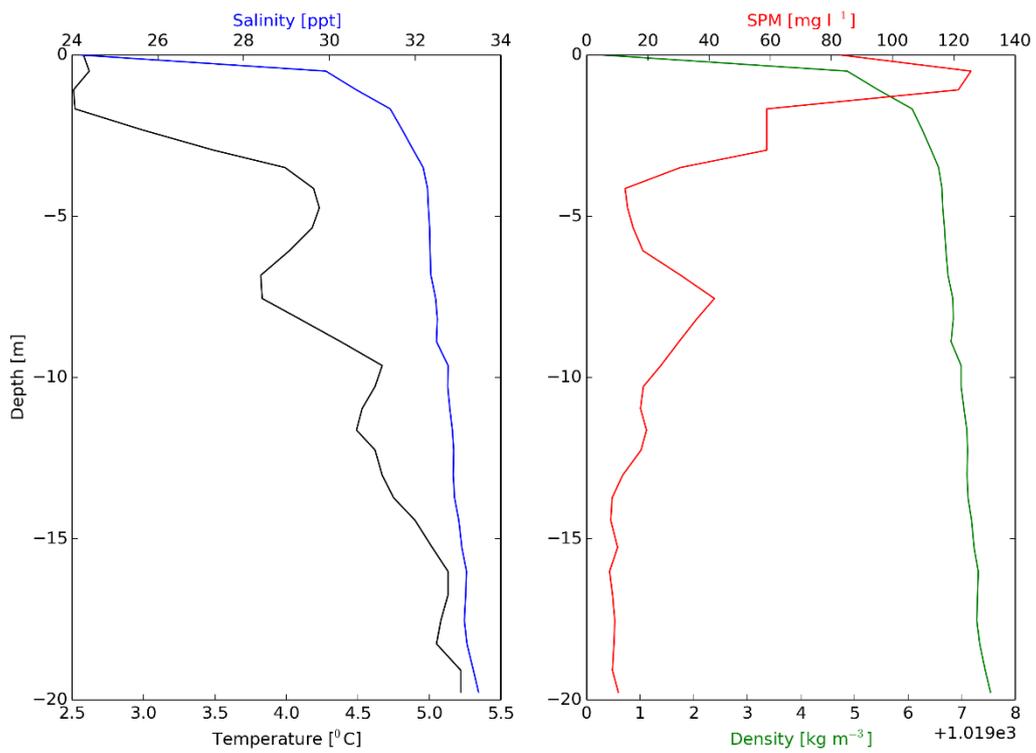
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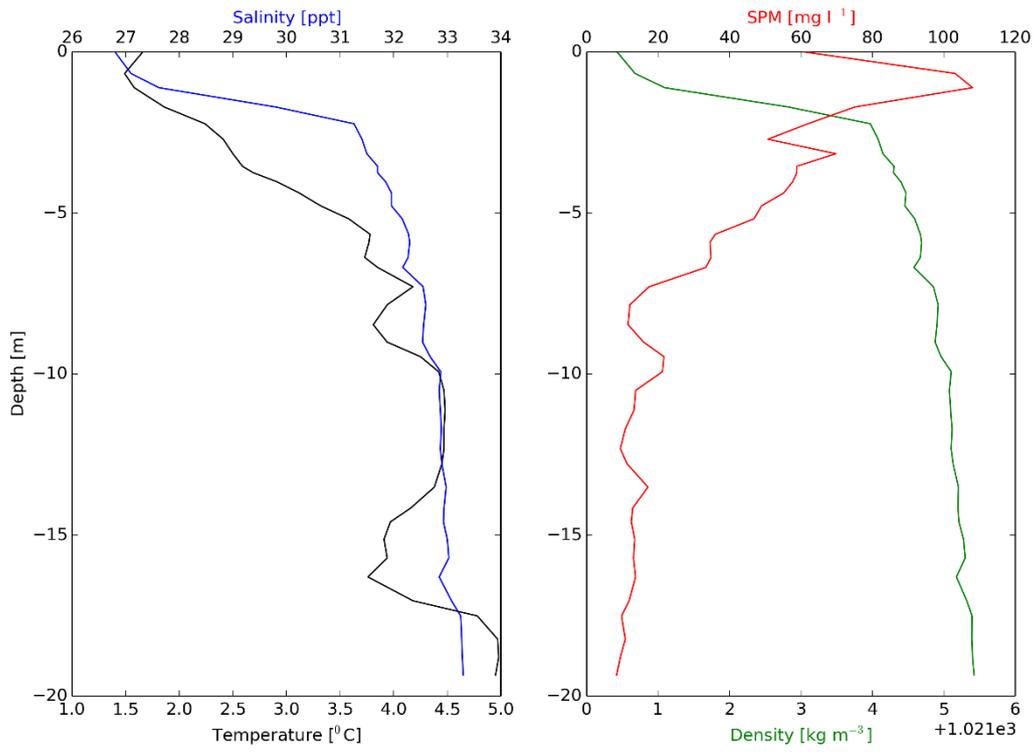
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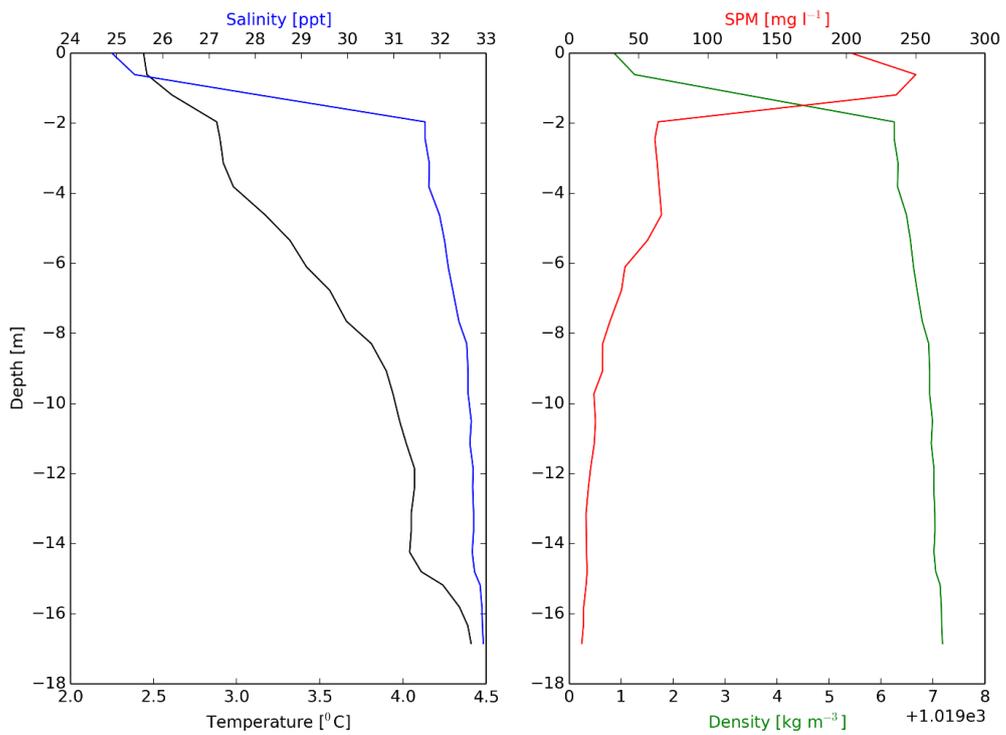
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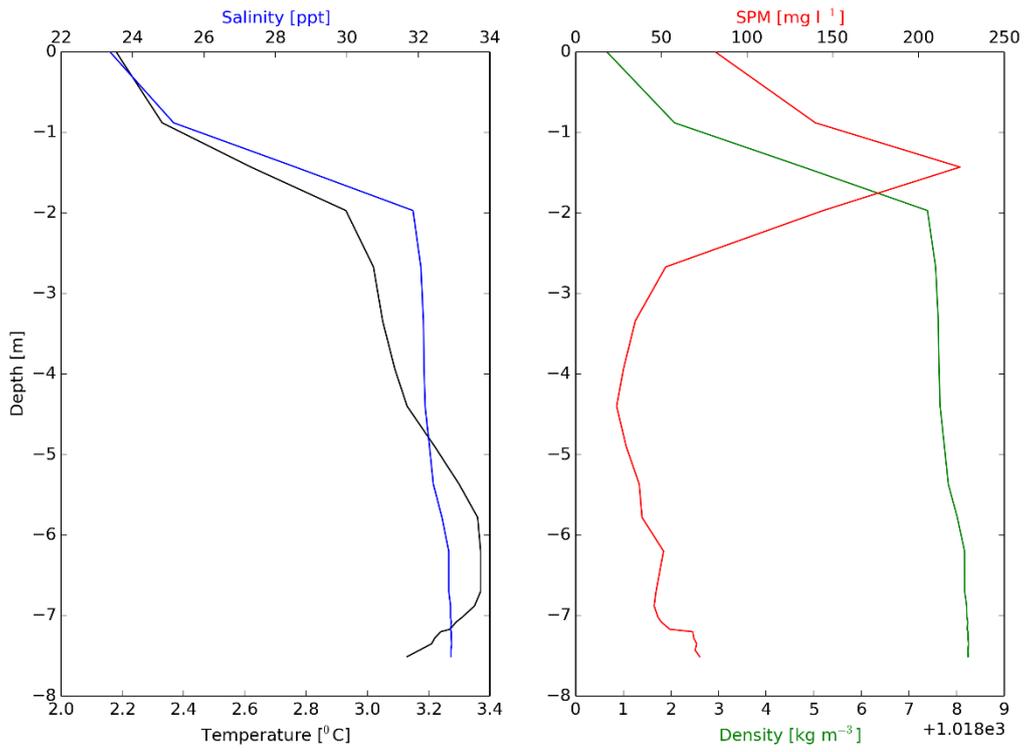
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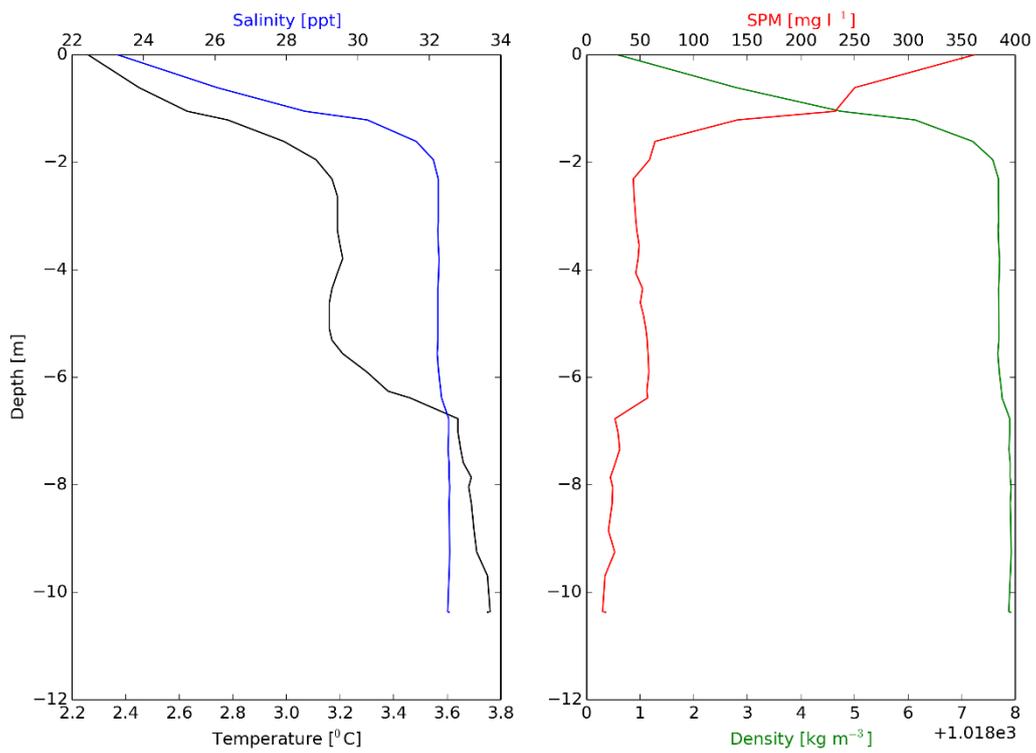
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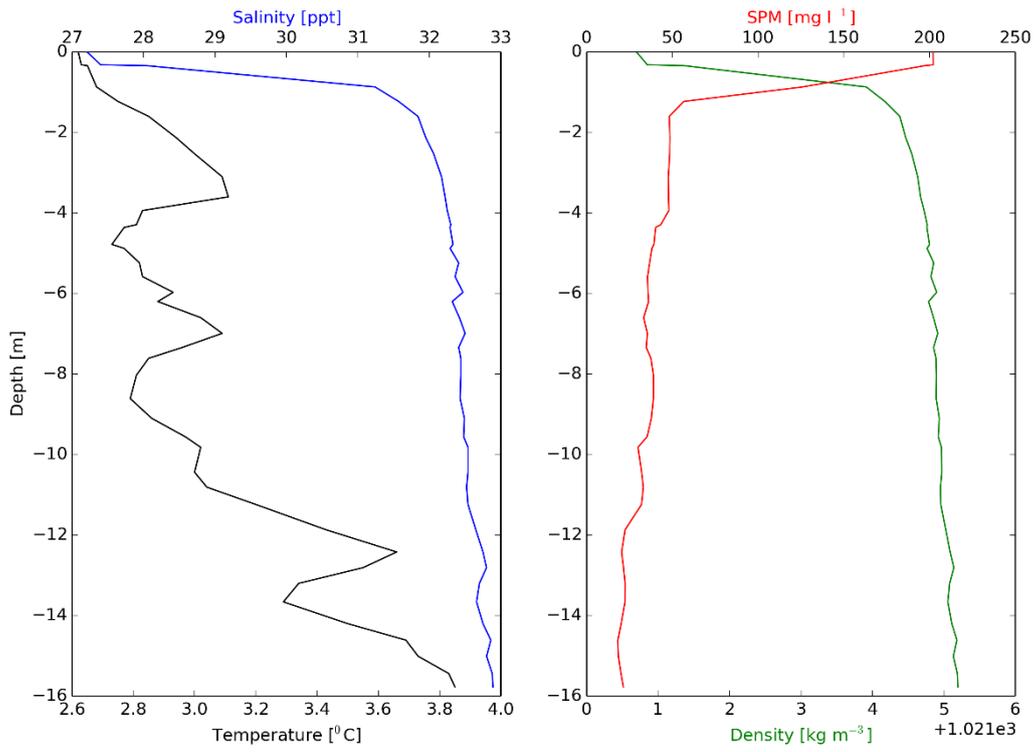
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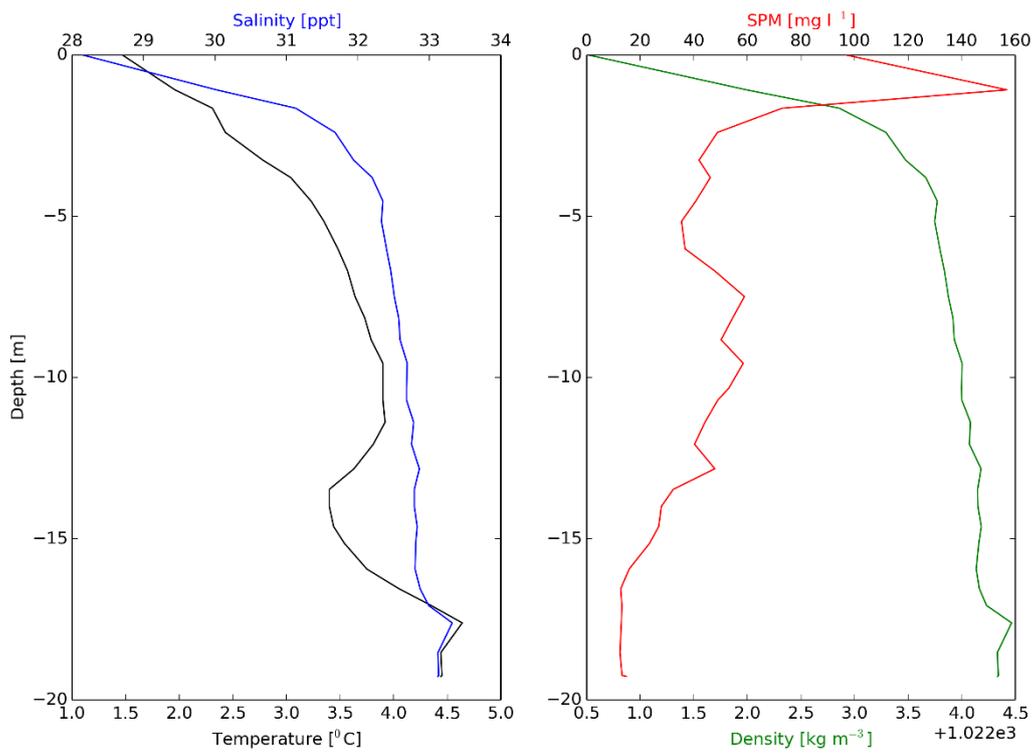
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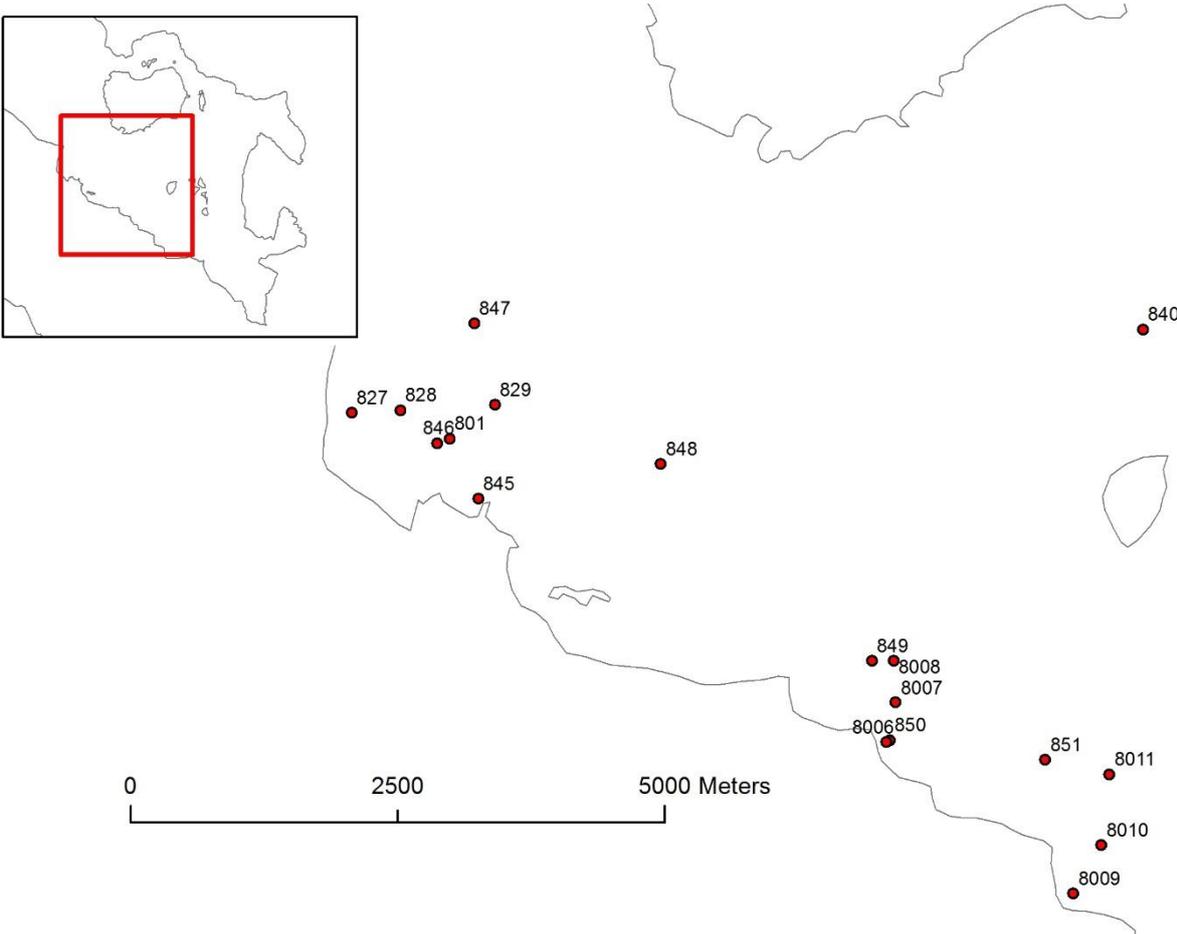
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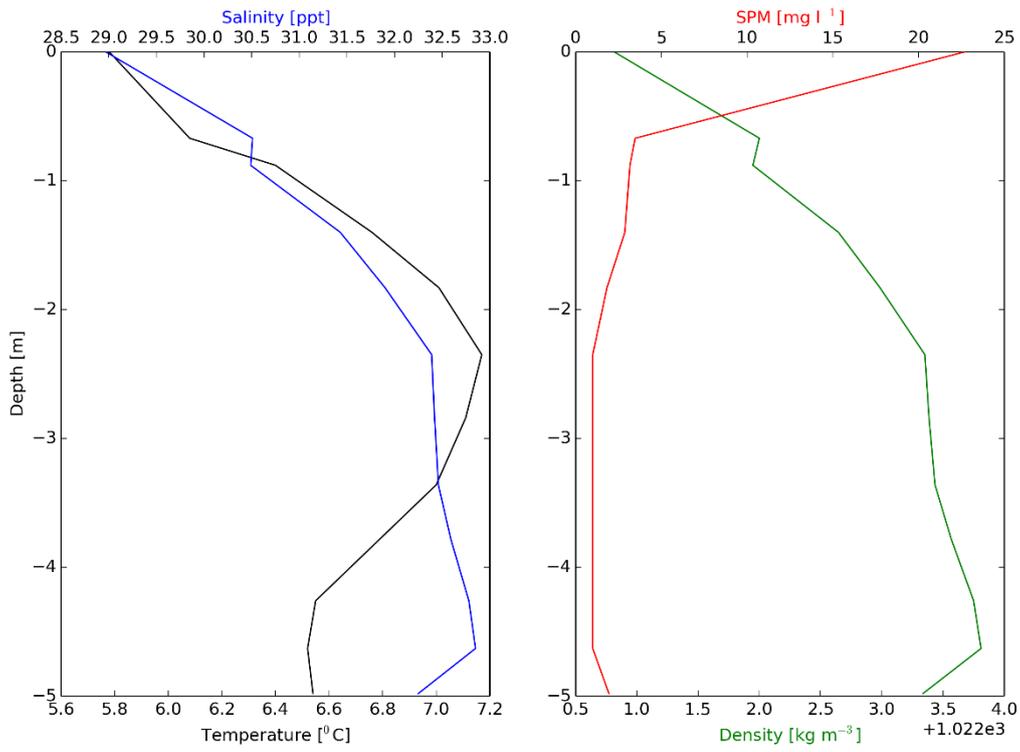
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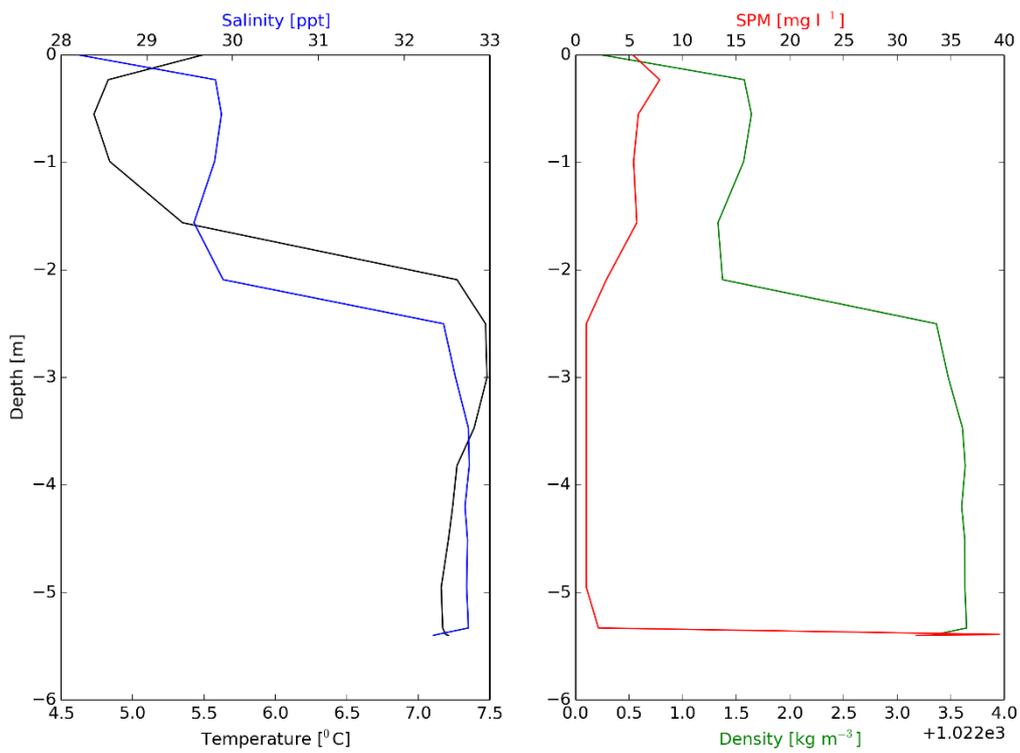
APPENDIX C 3



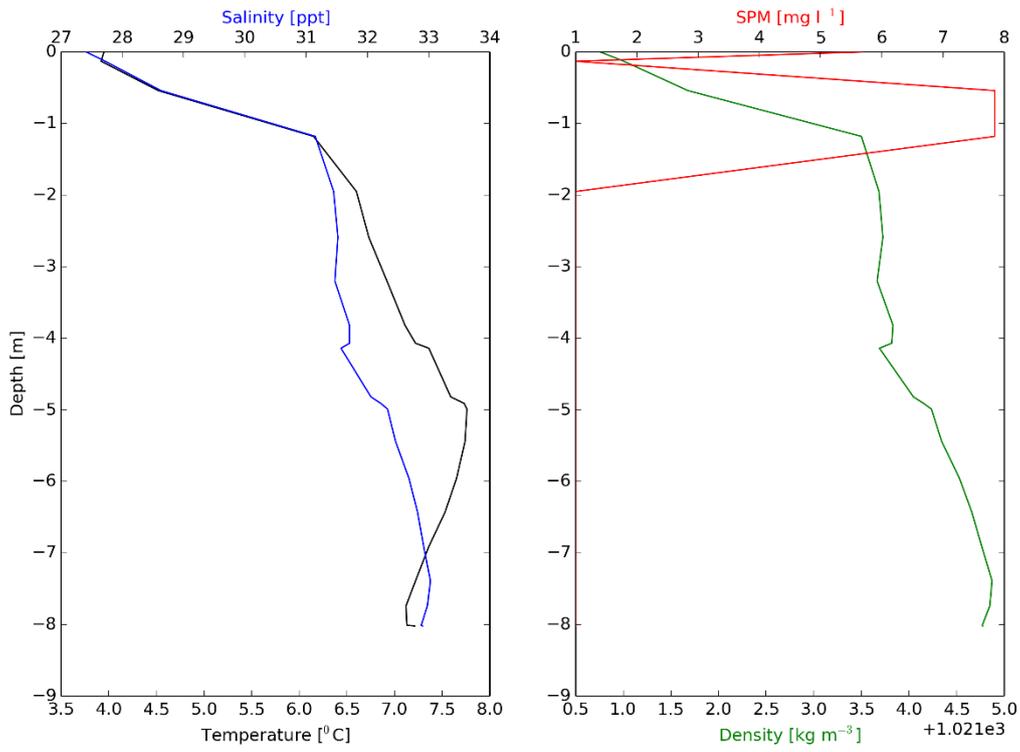
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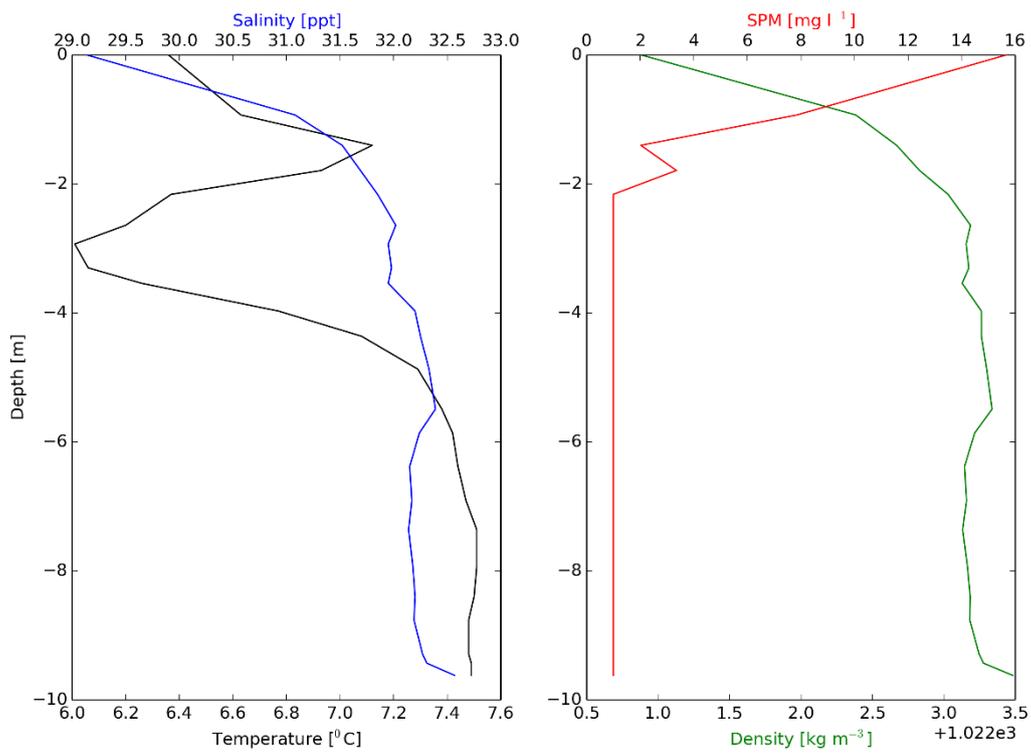
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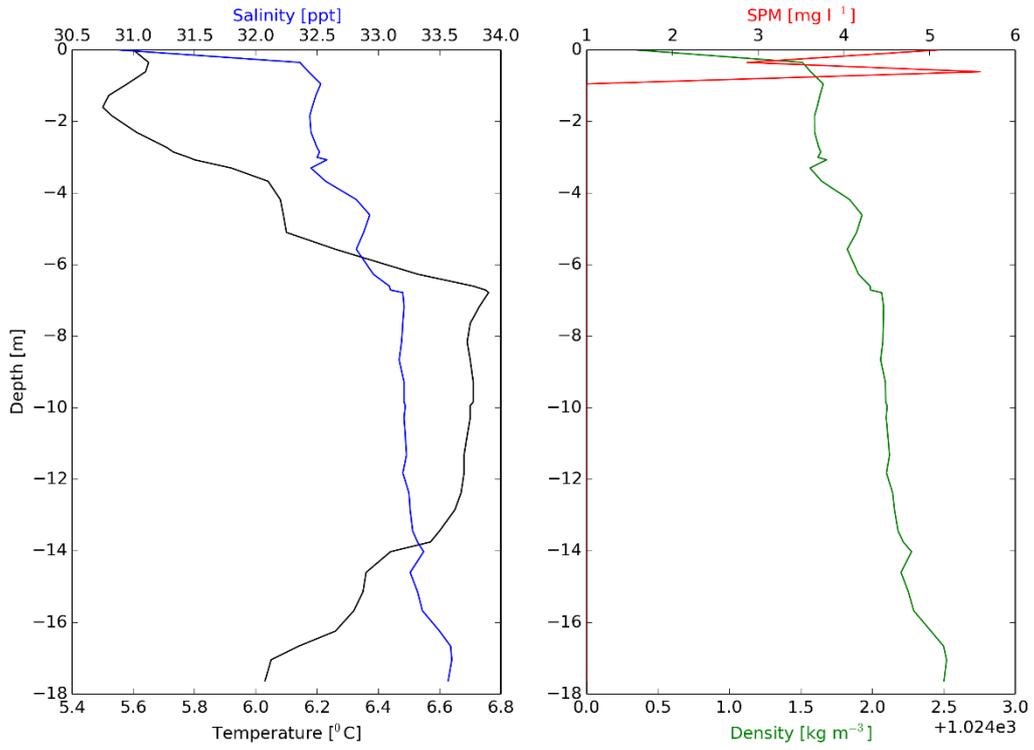
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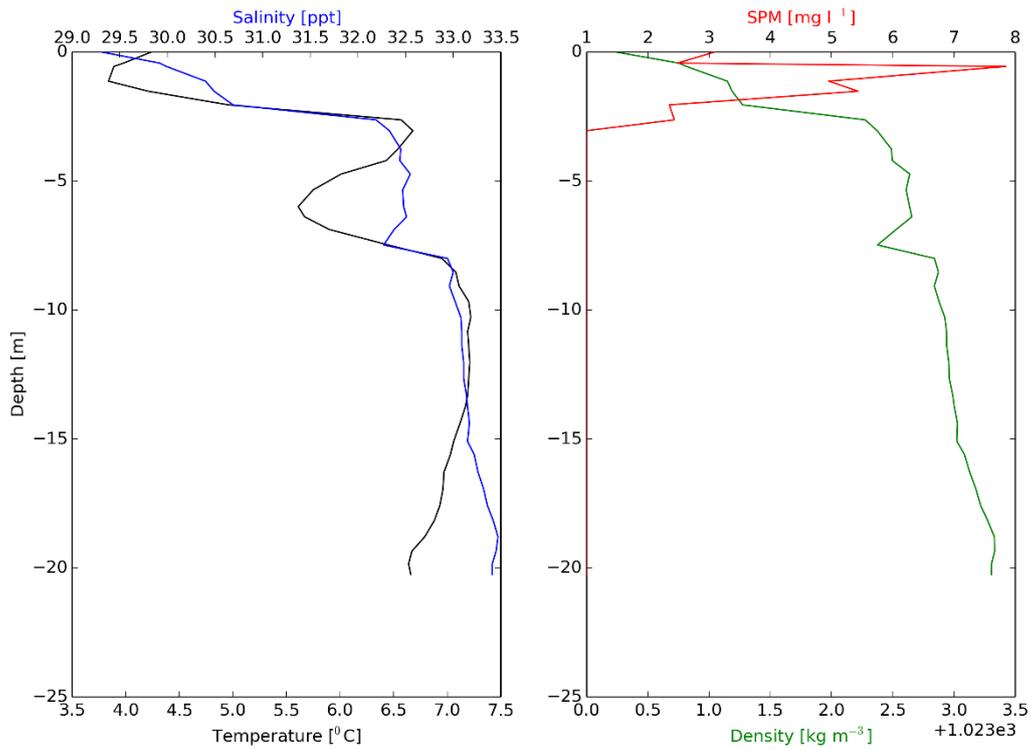
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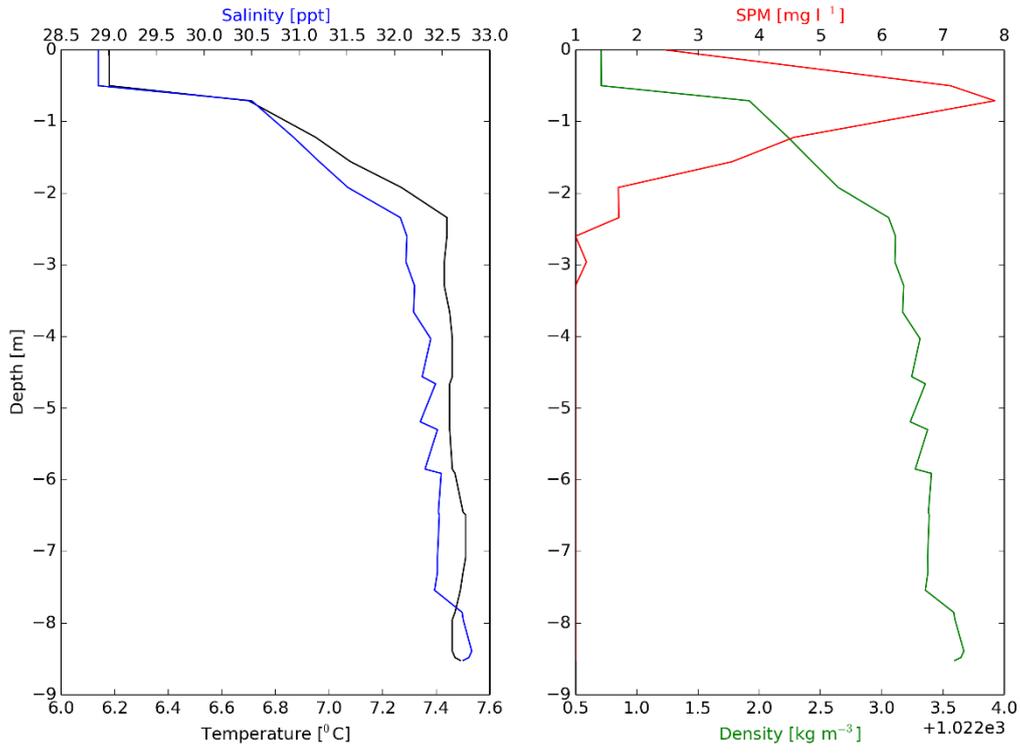
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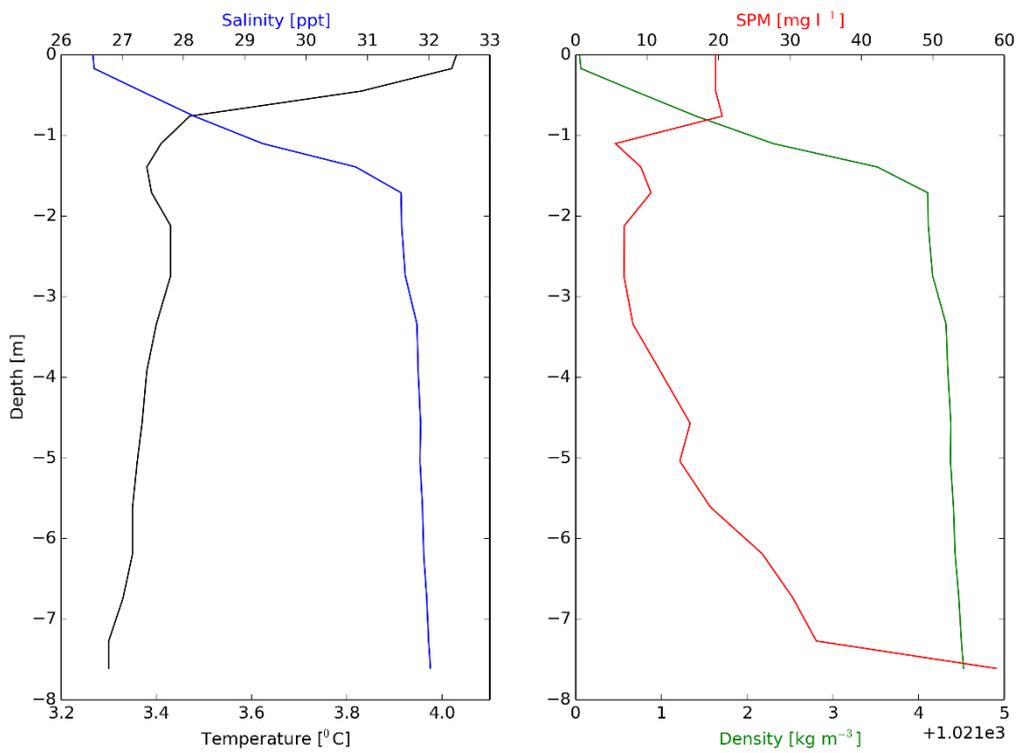
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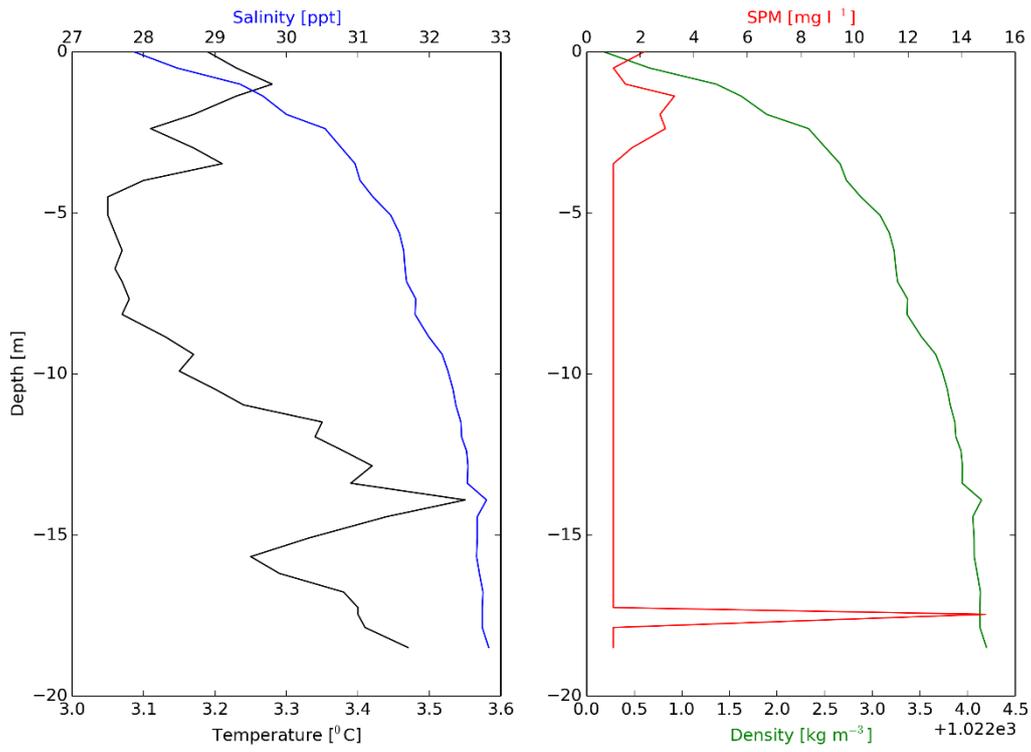
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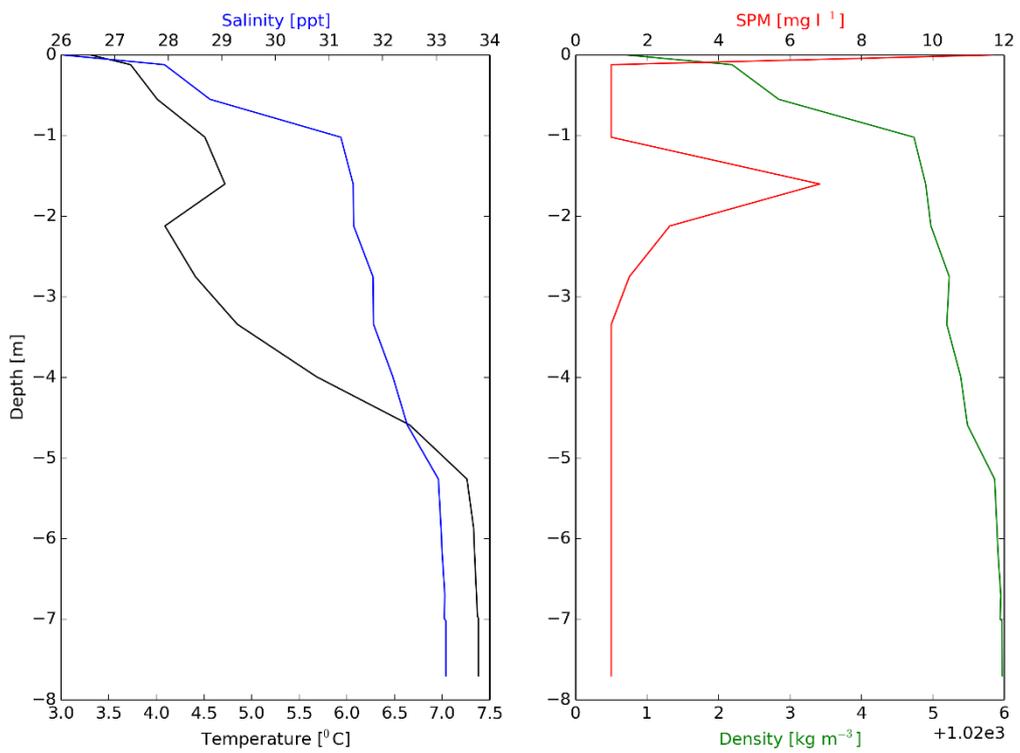
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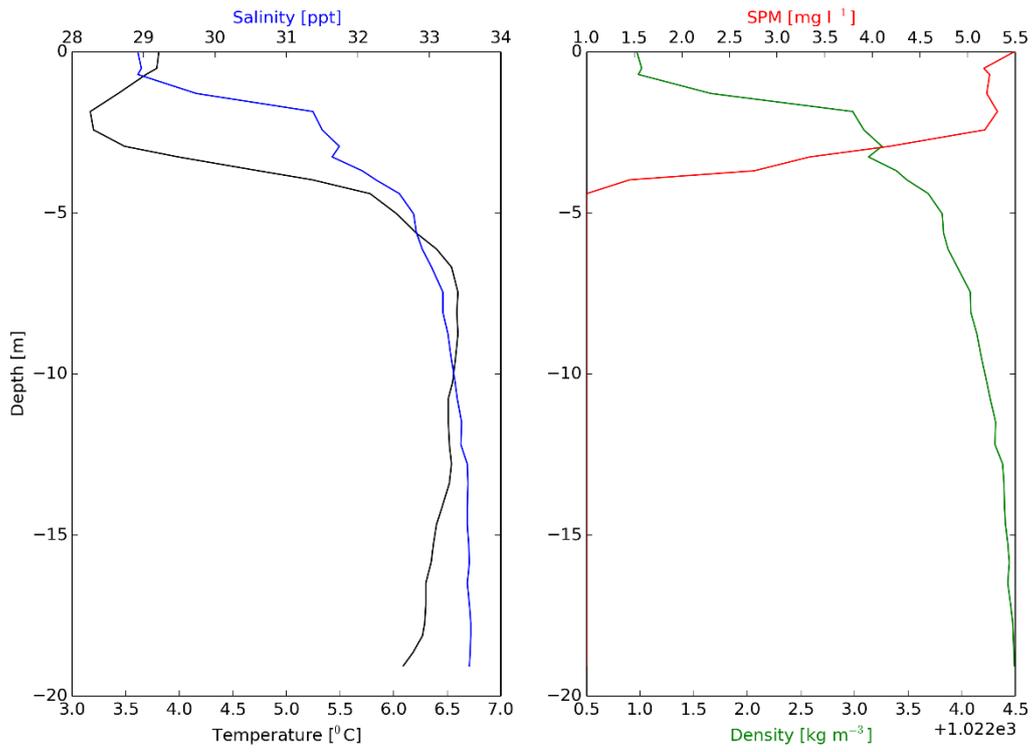
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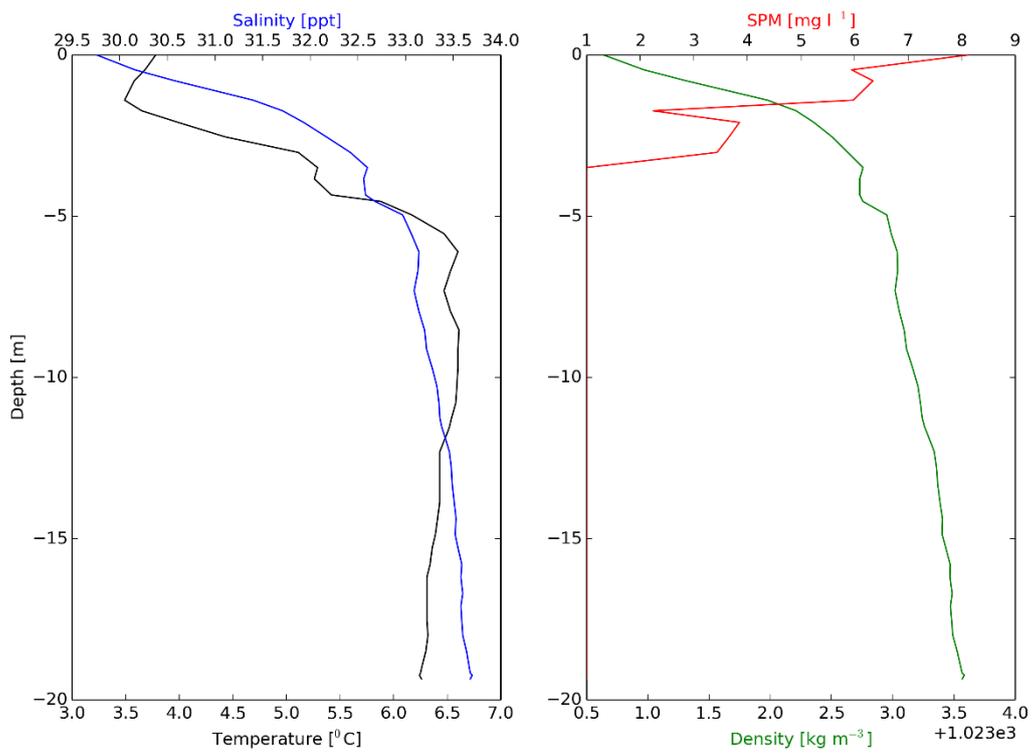
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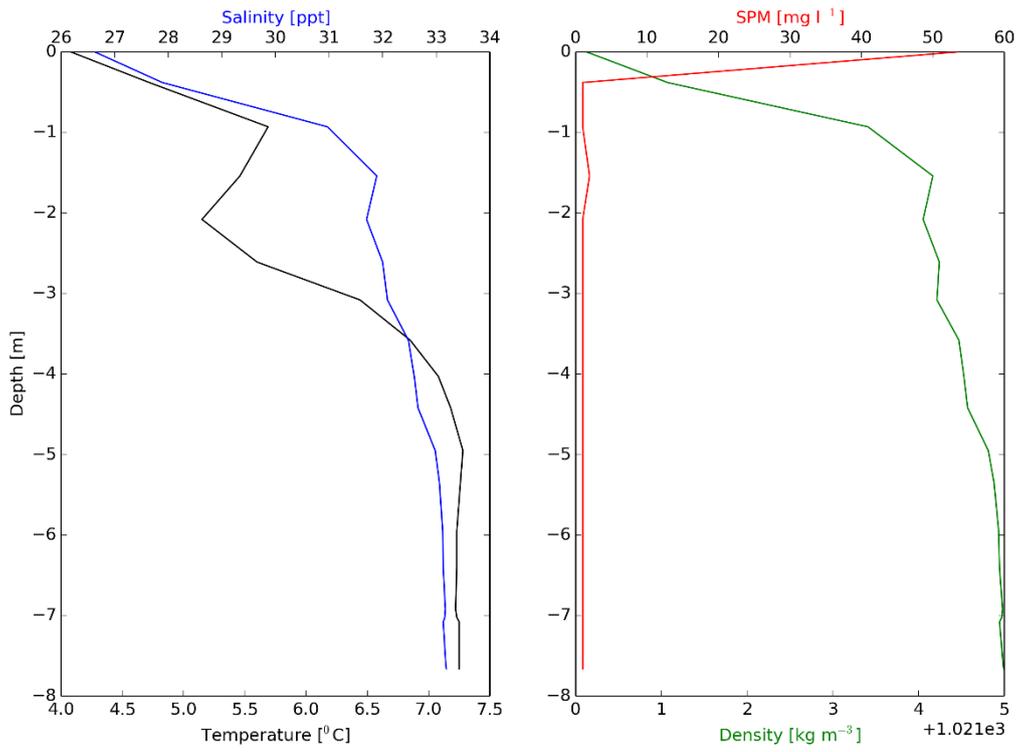
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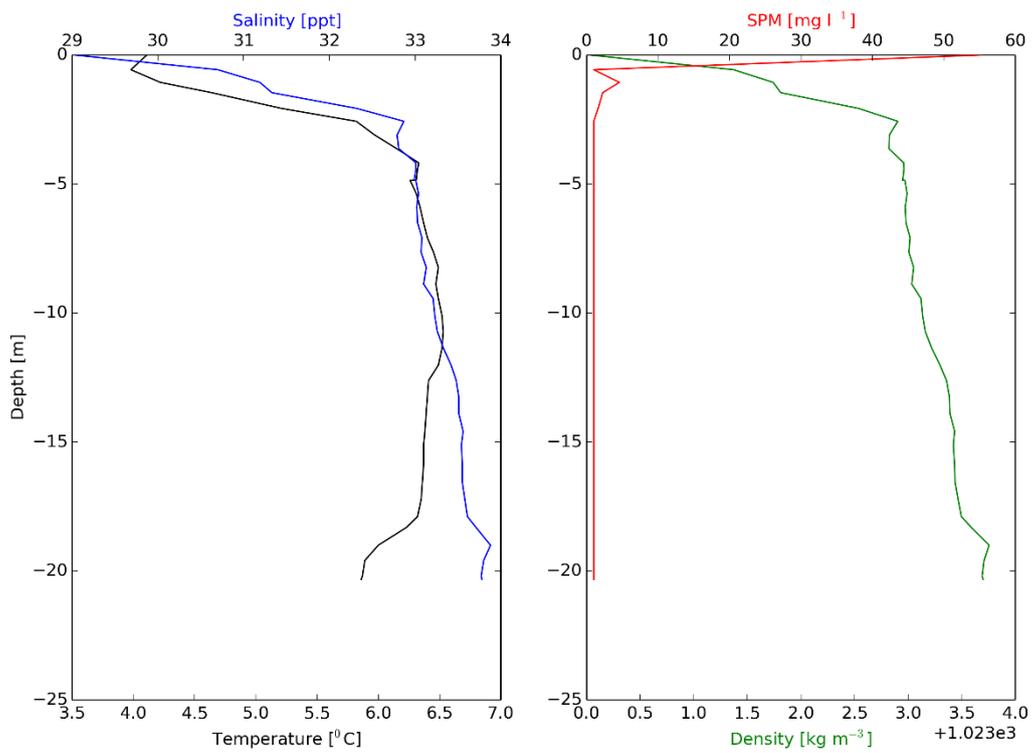
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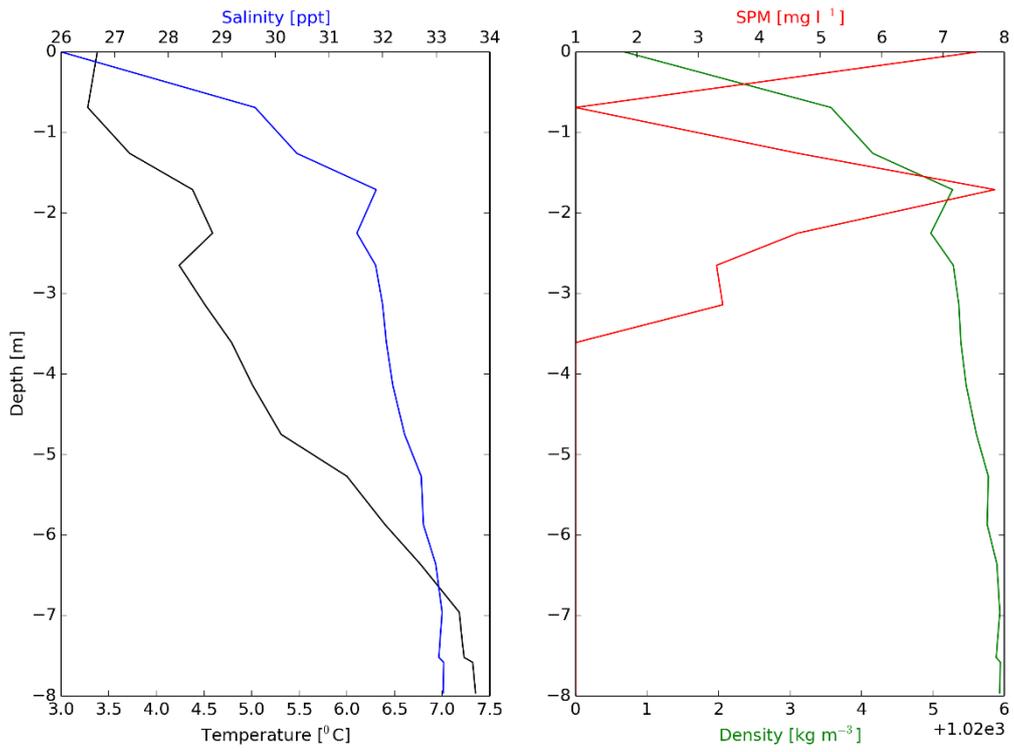
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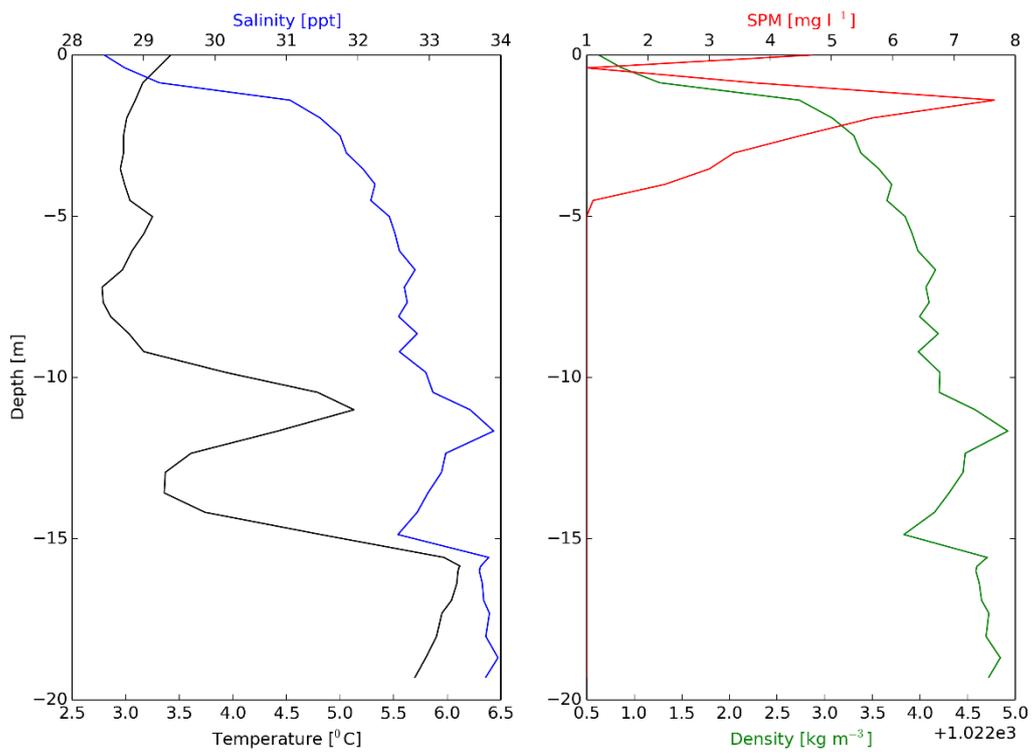
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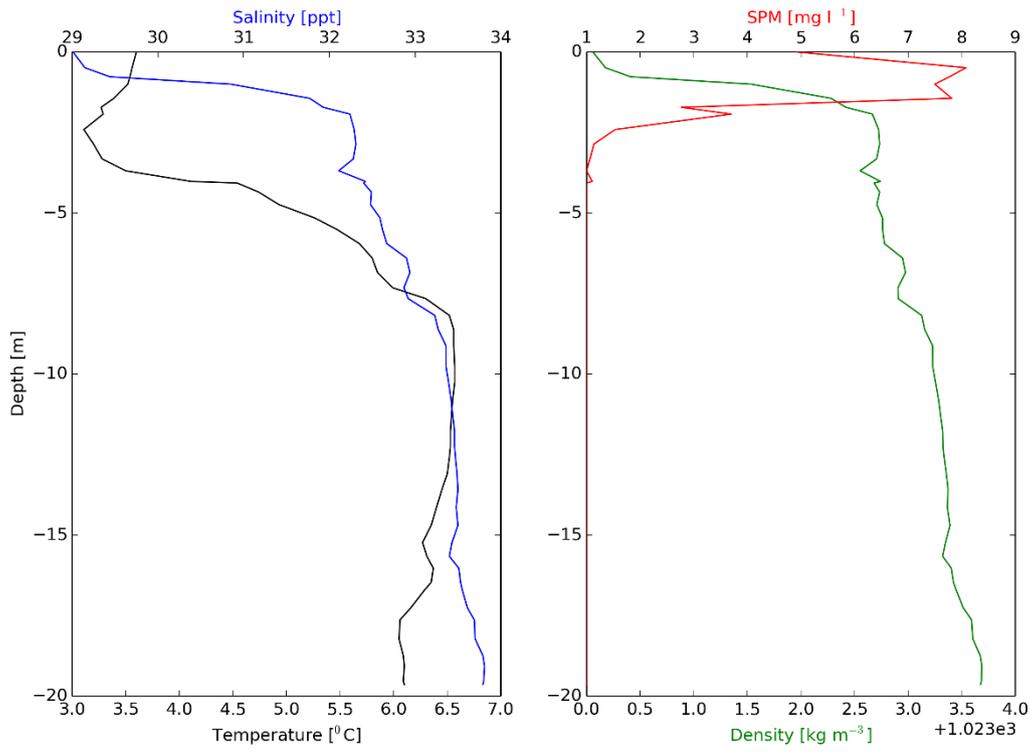
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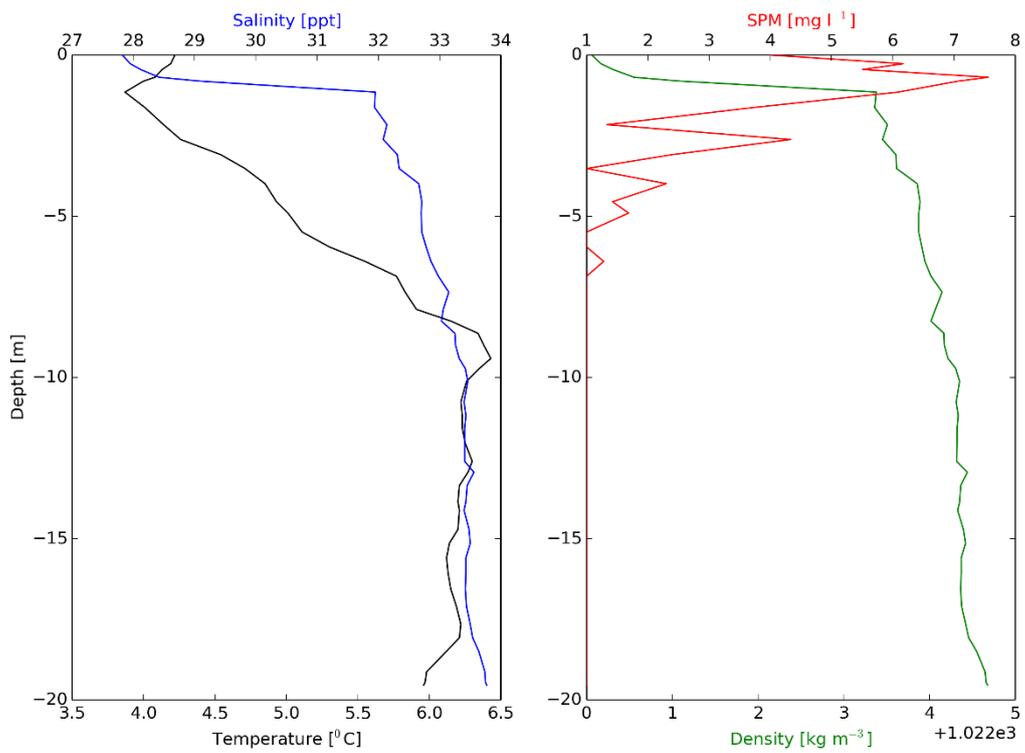
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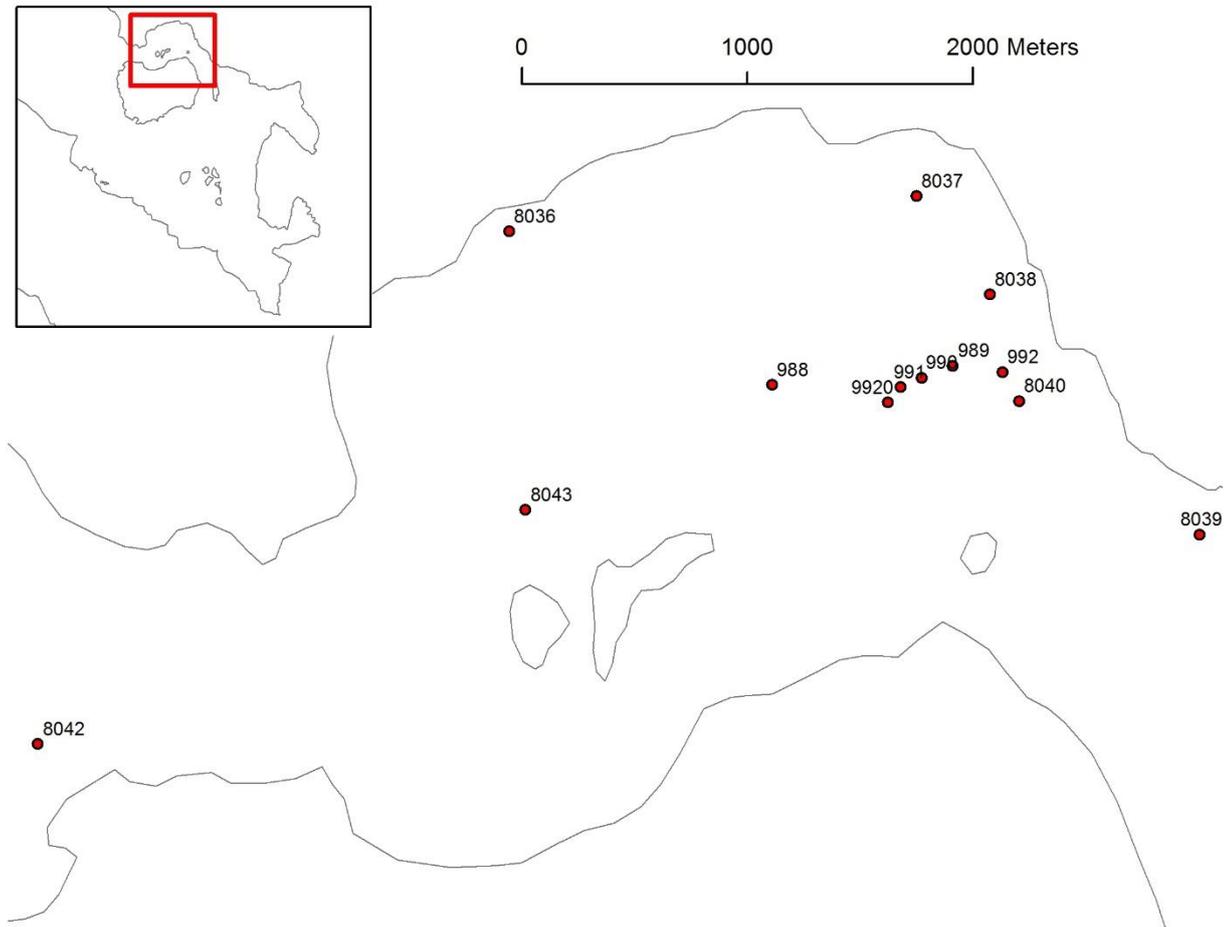
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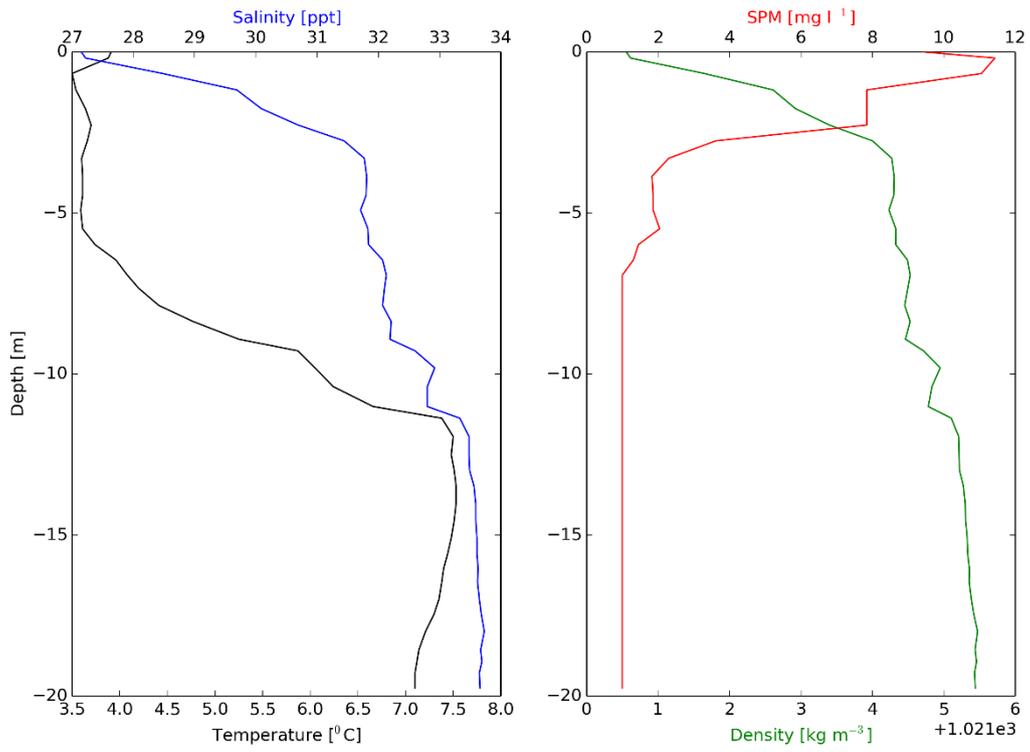
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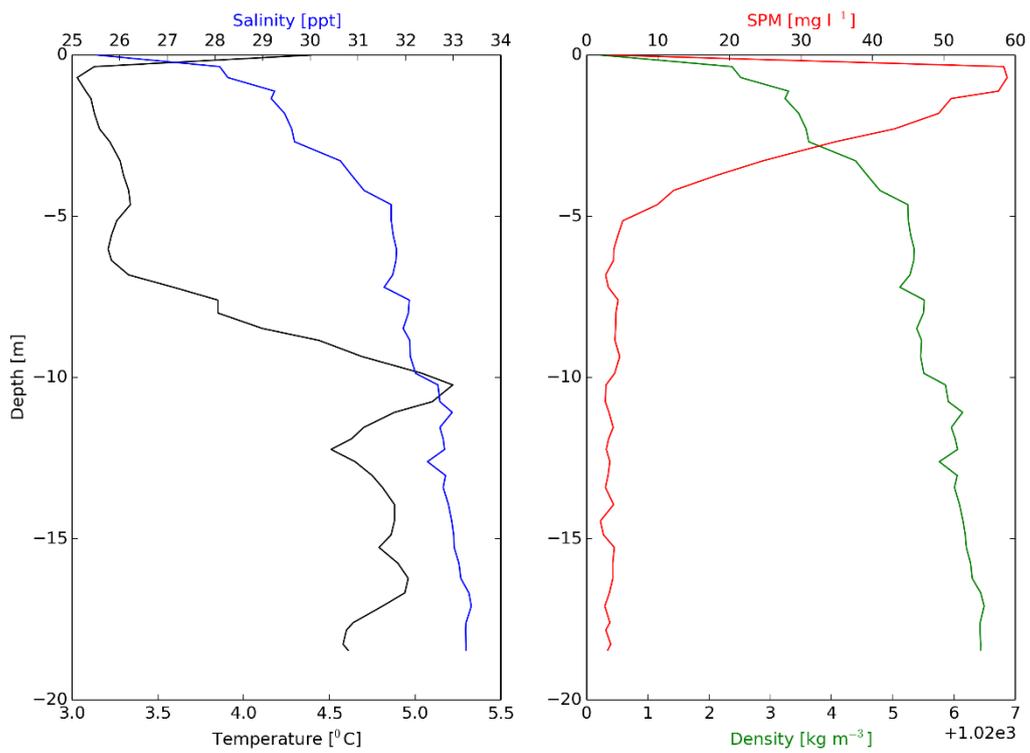
APPENDIX C 4



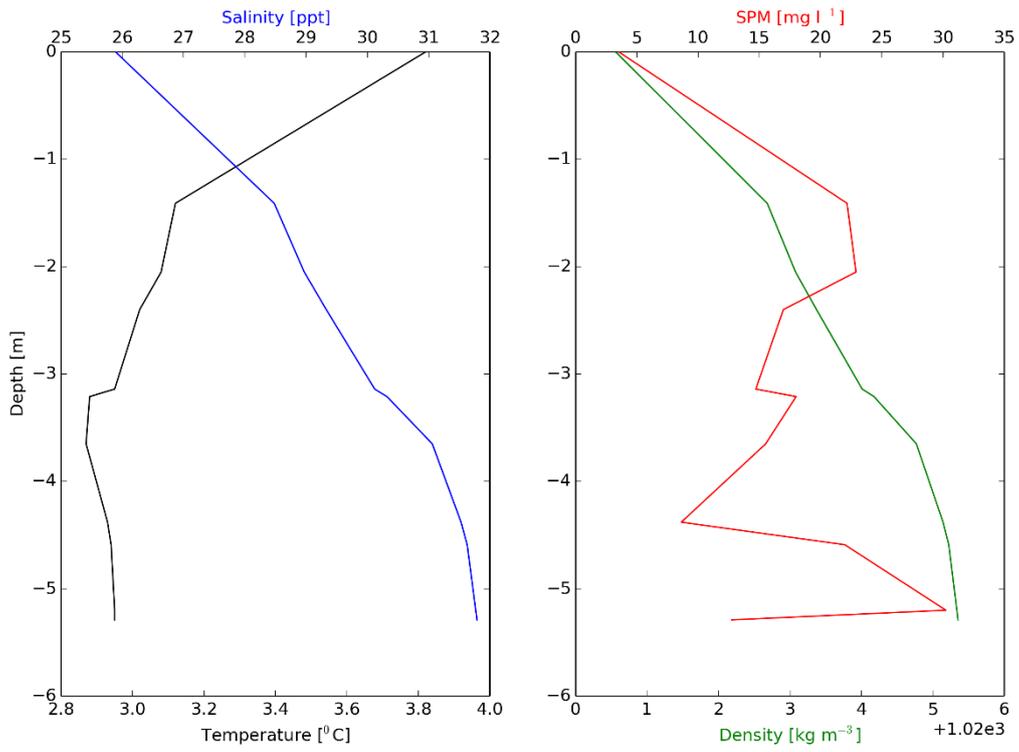
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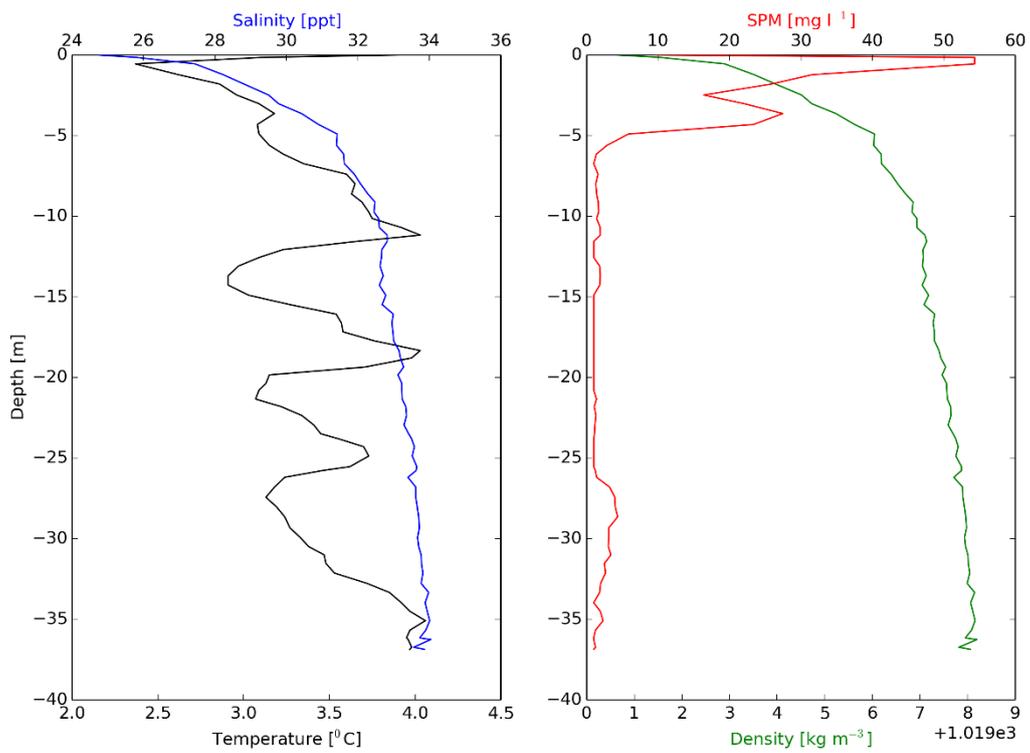
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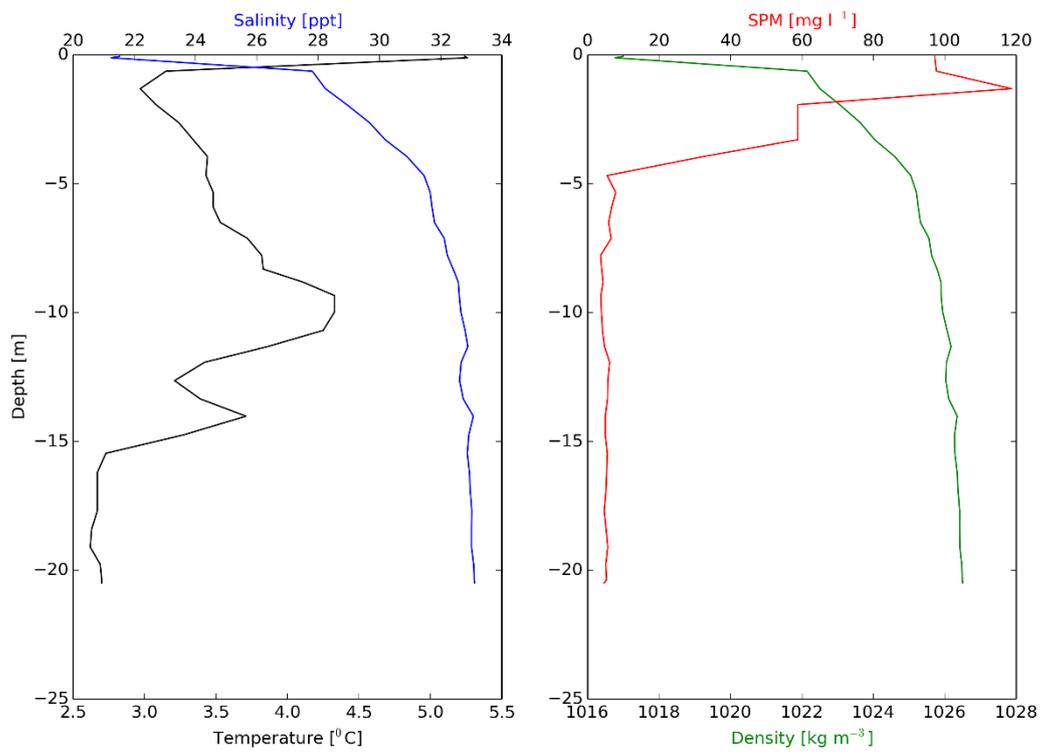
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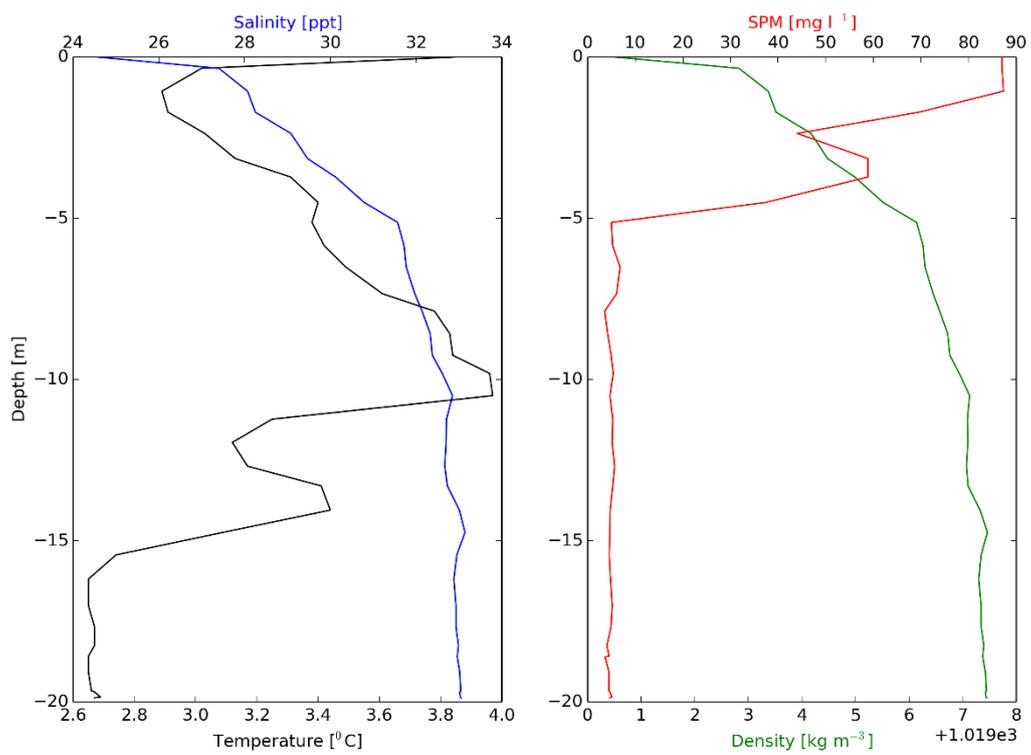
988



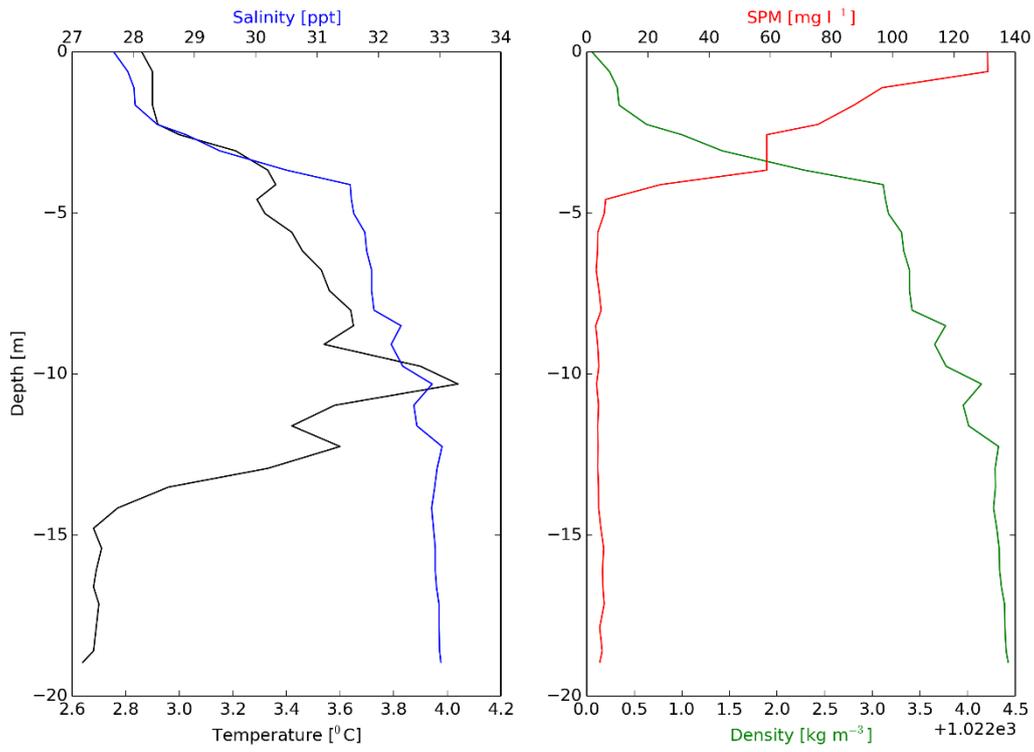
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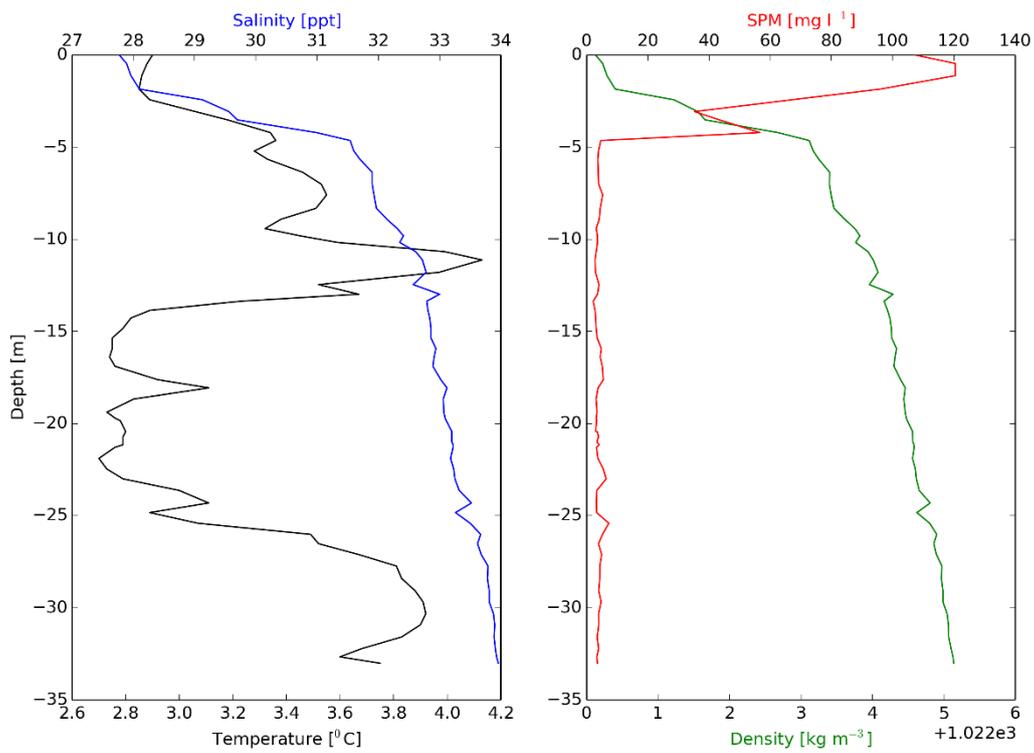
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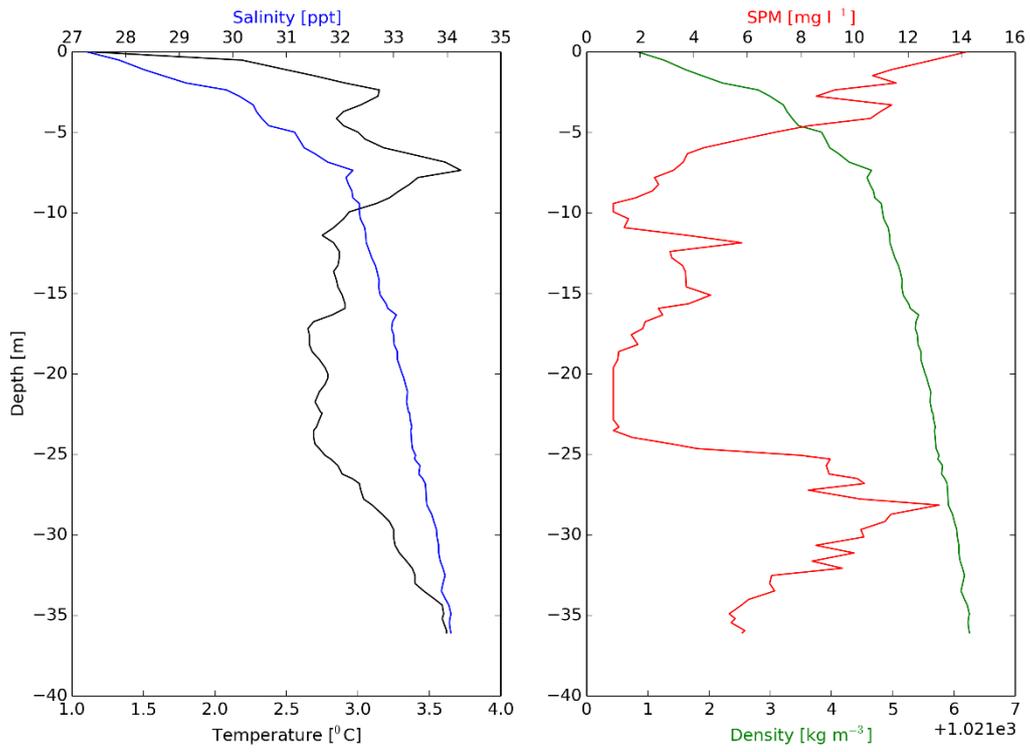
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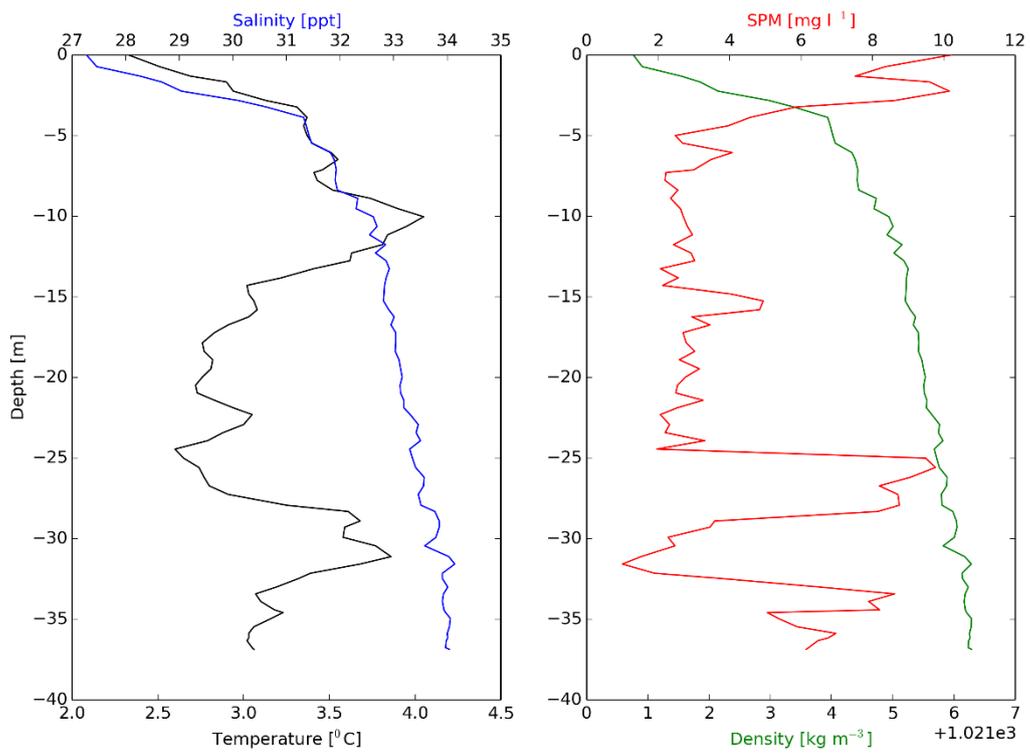
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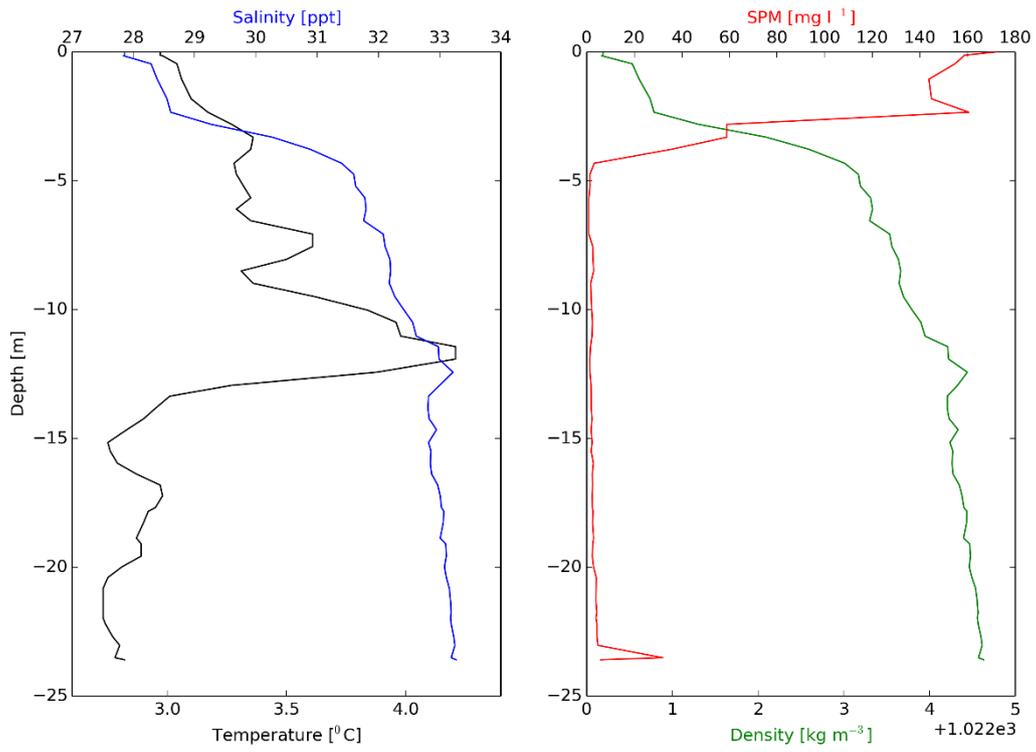
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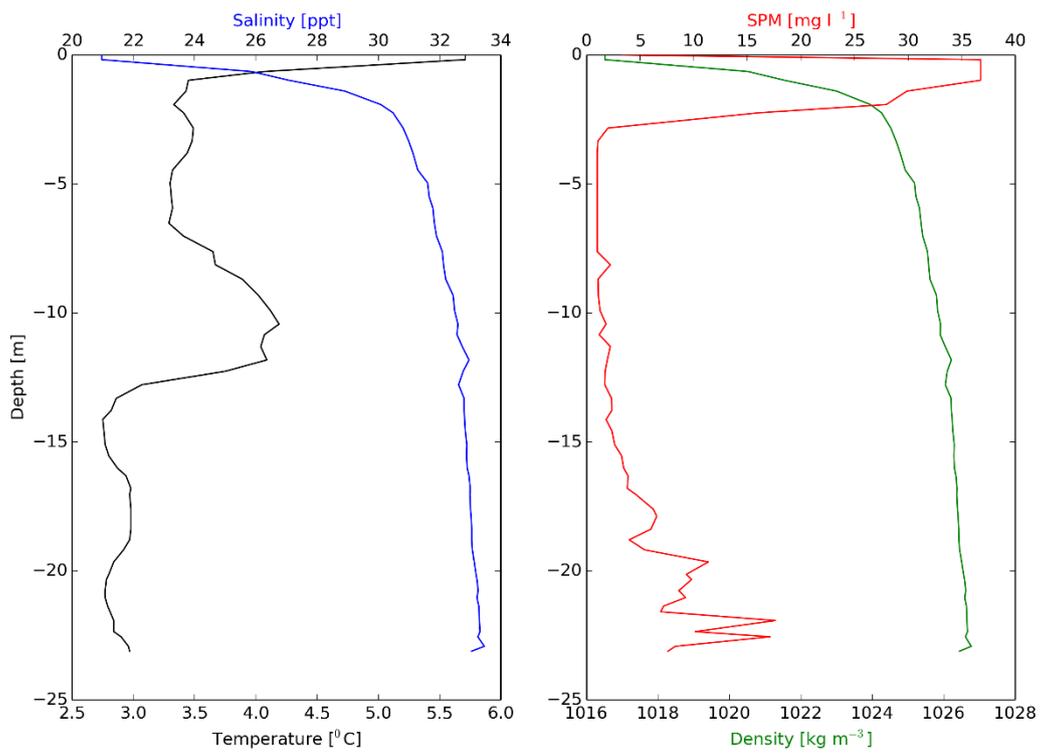
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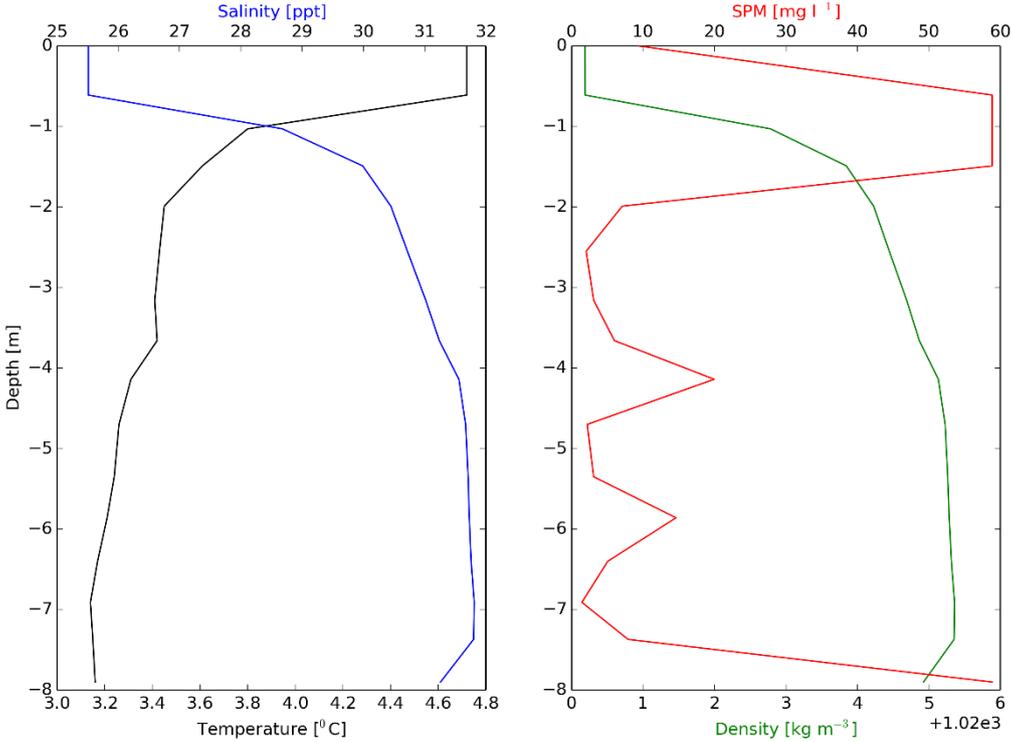


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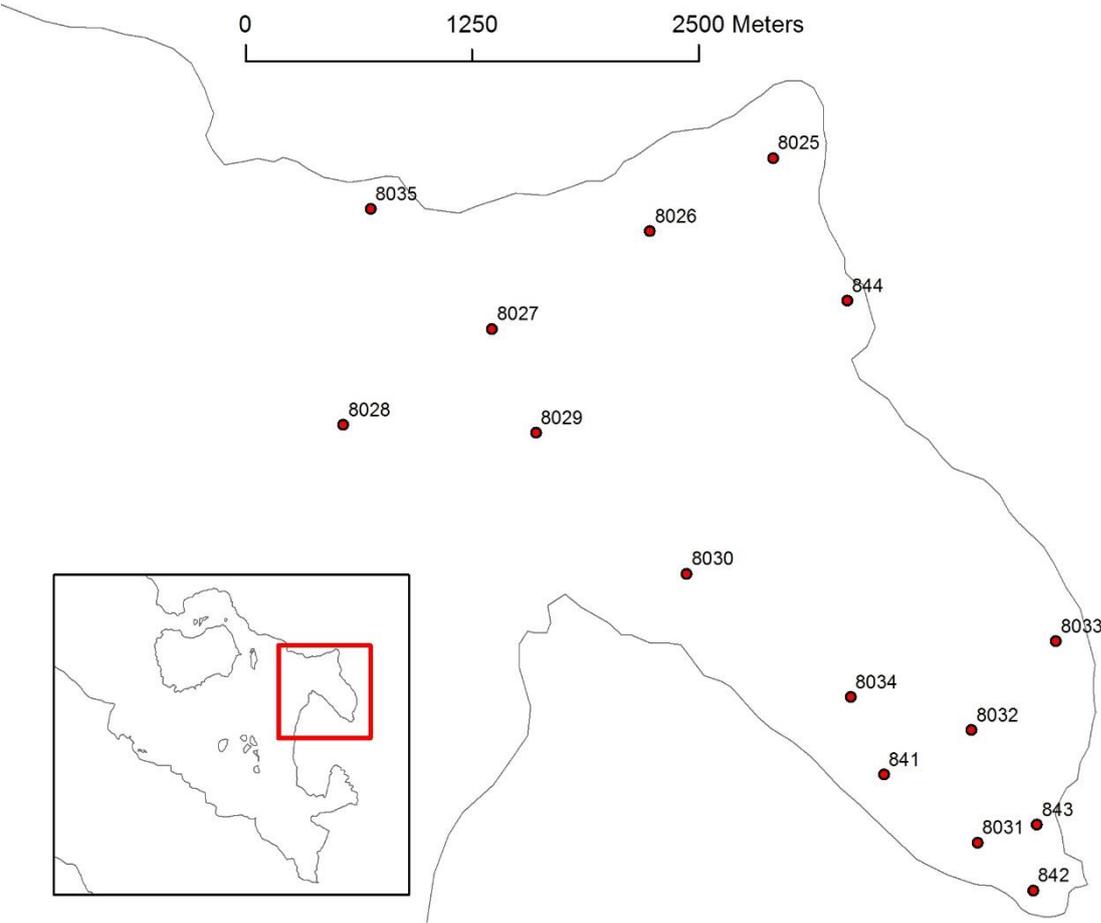


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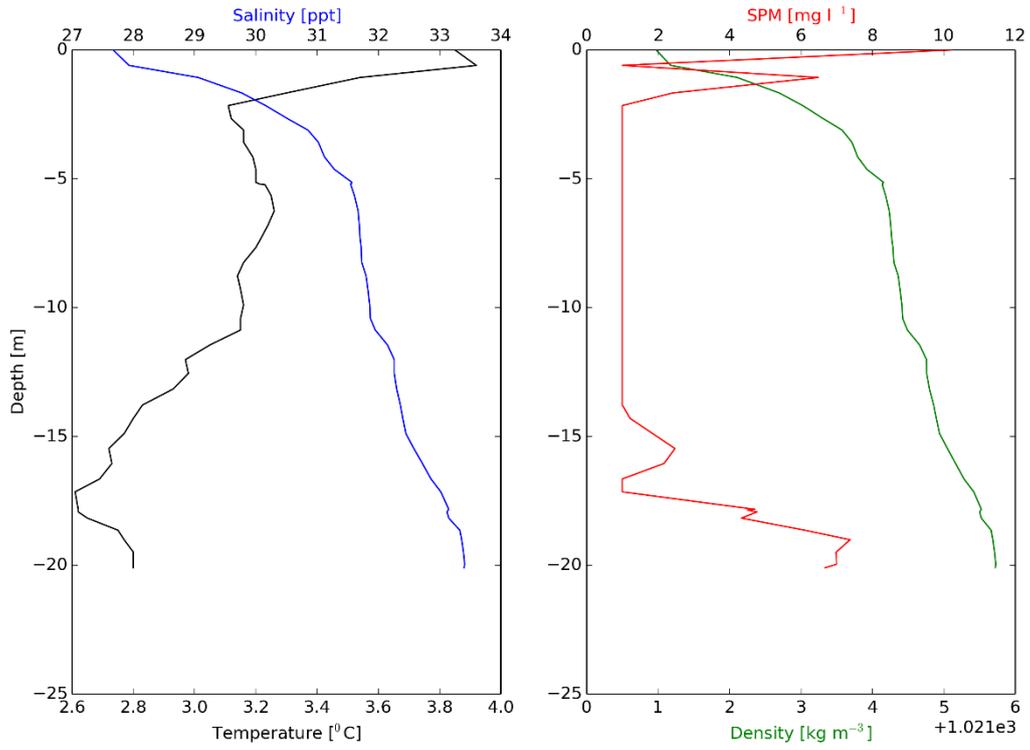




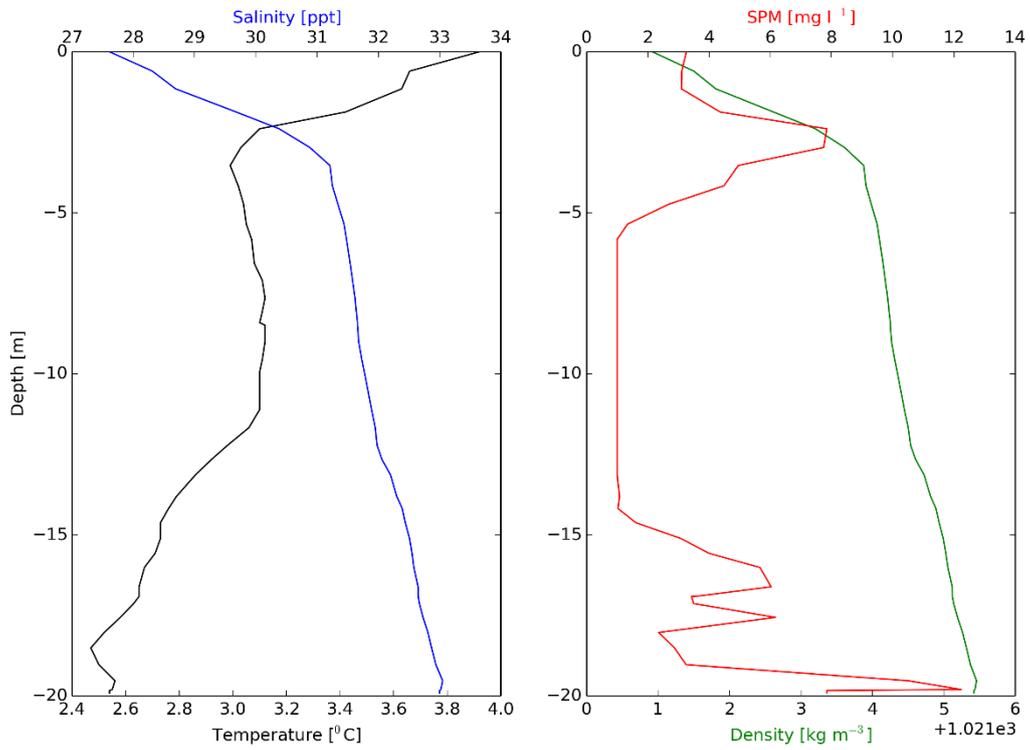
APPENDIX C 5



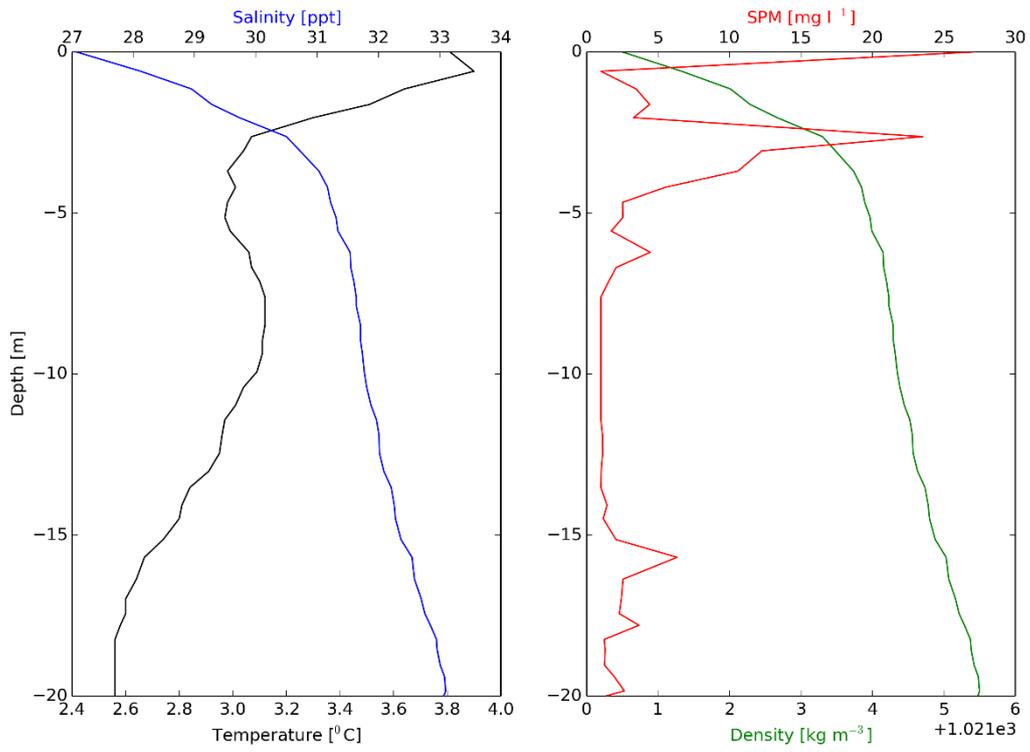
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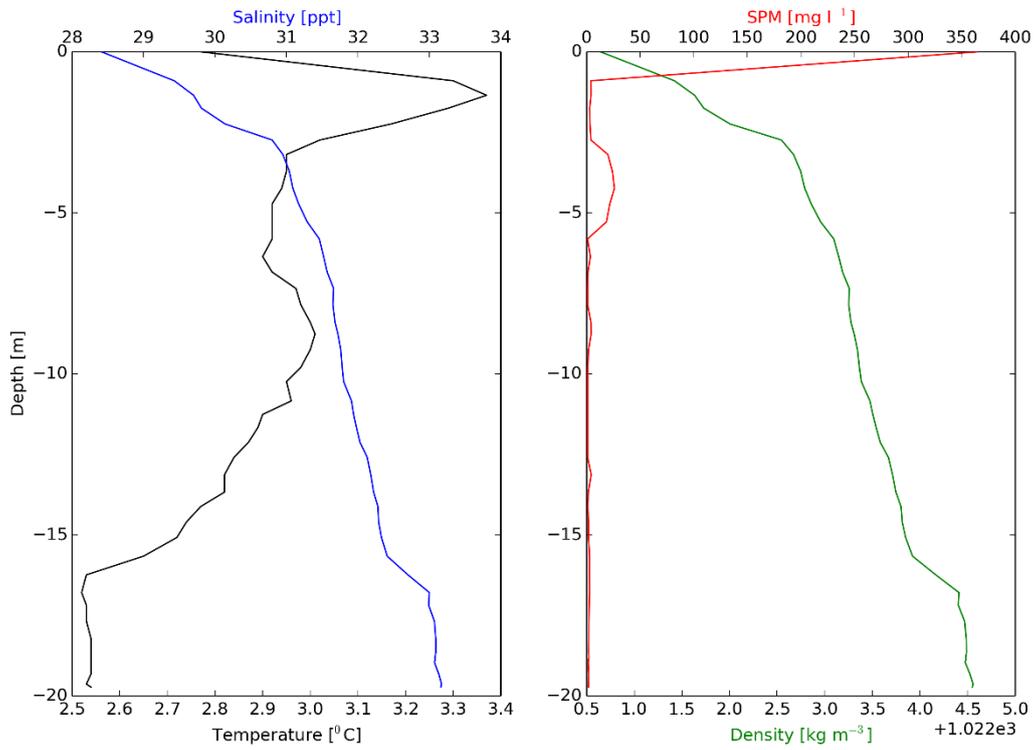
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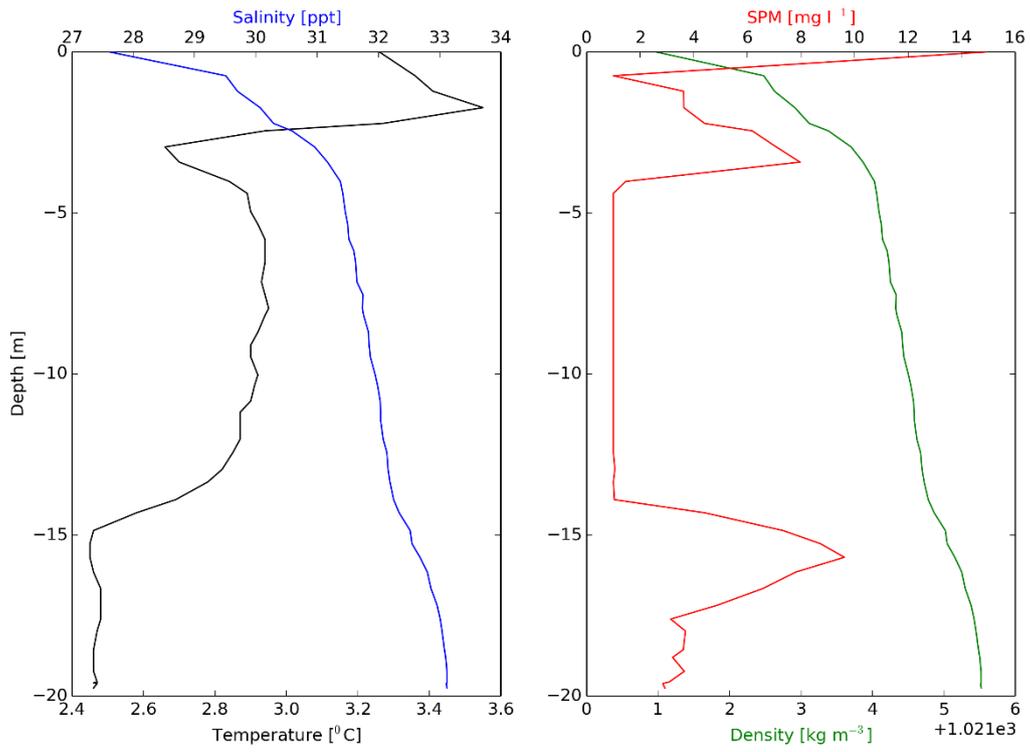
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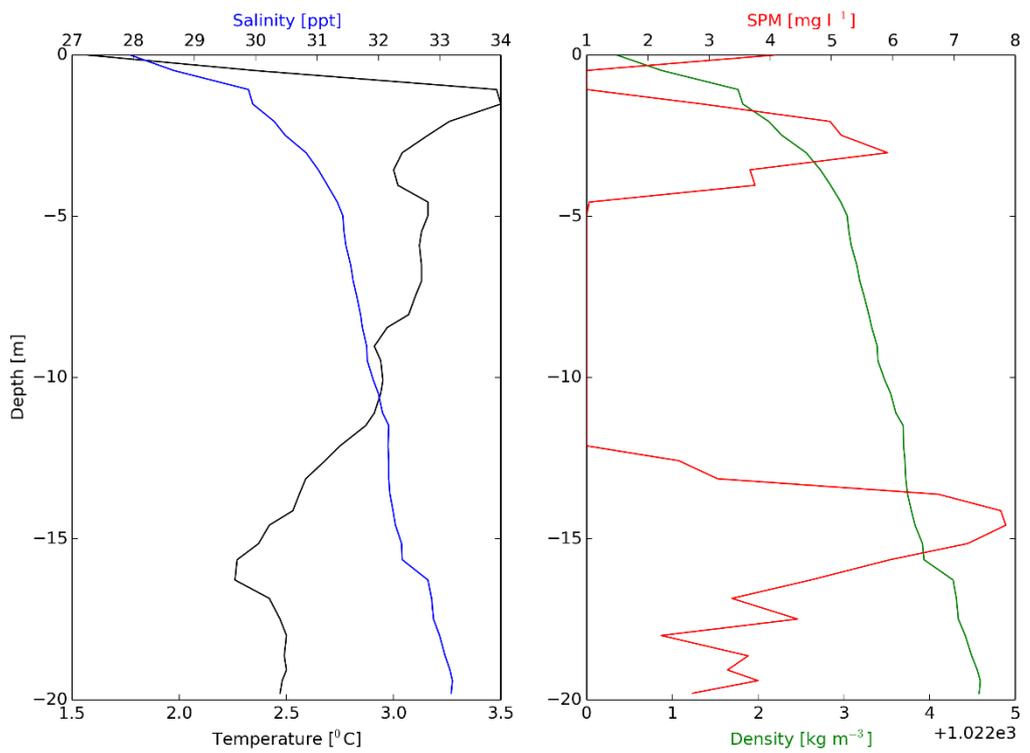
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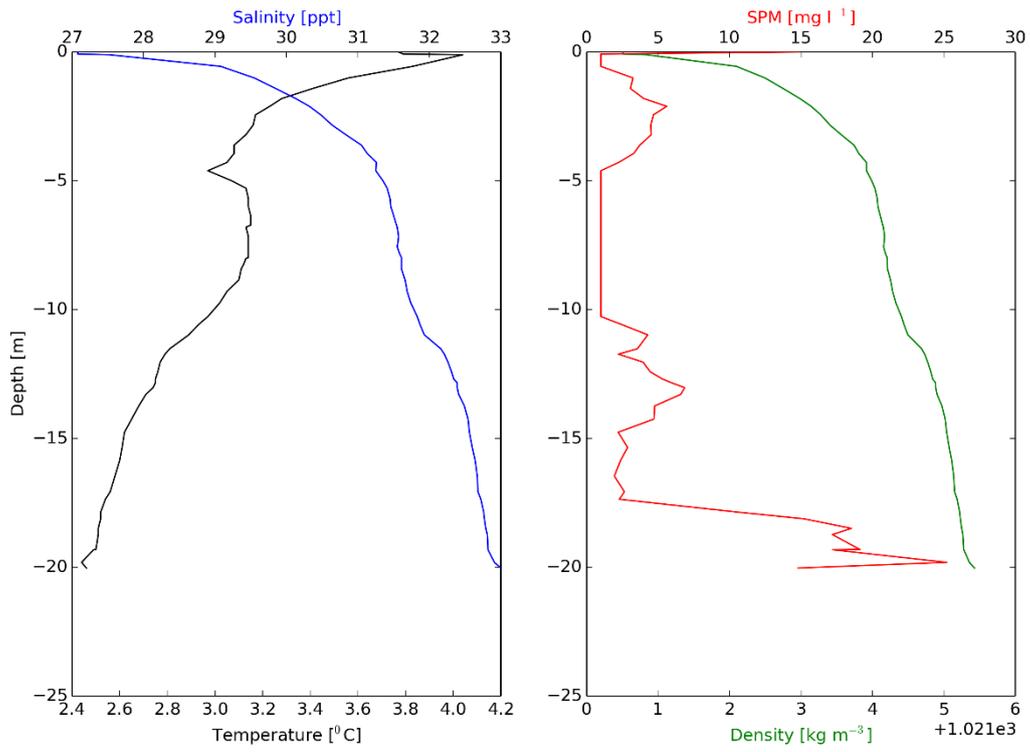
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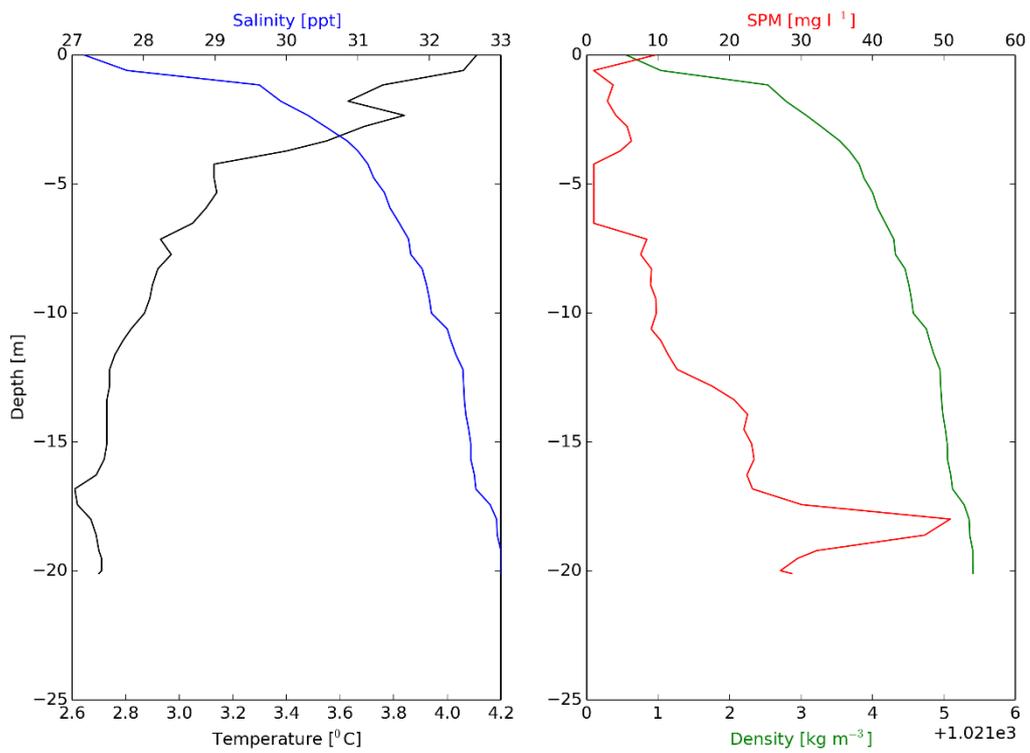
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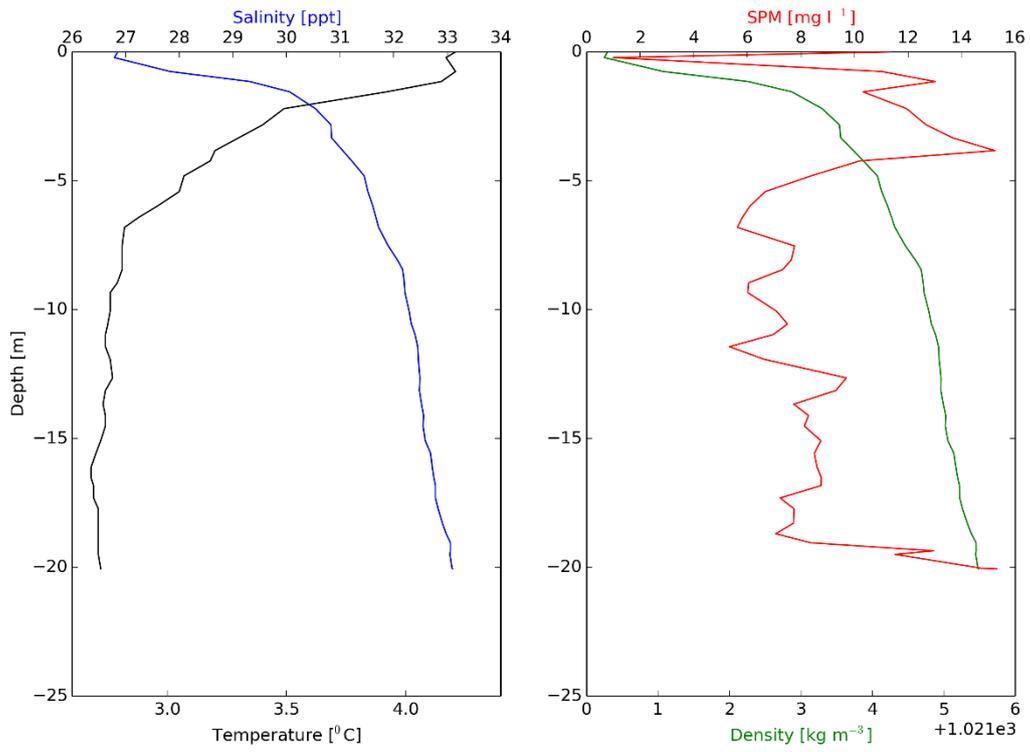
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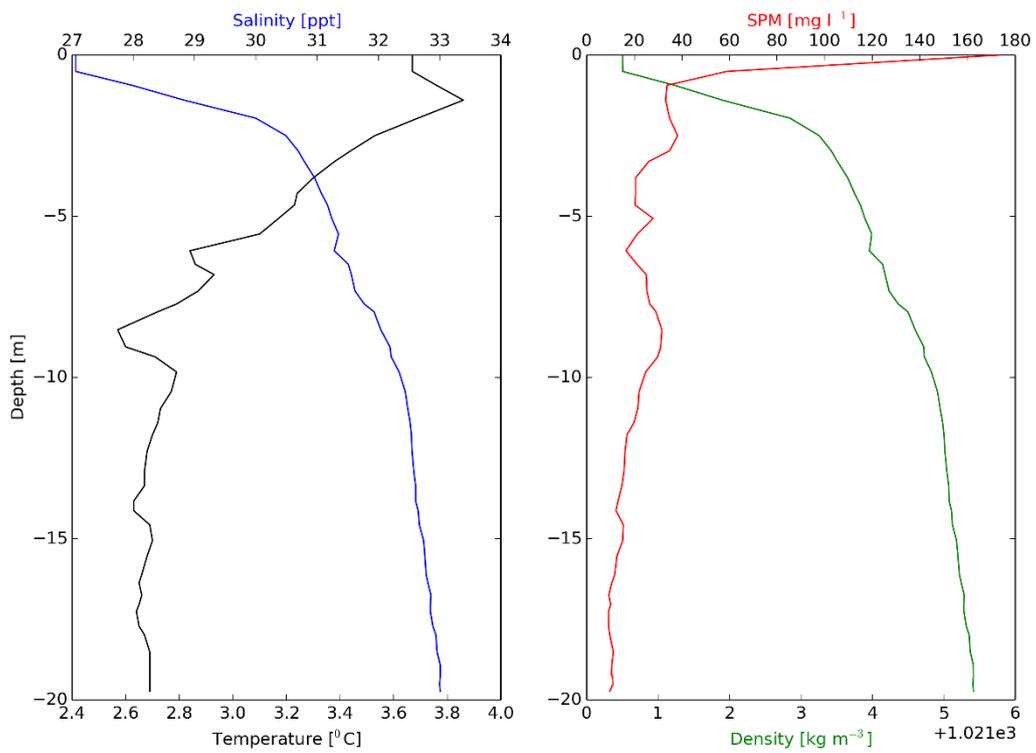
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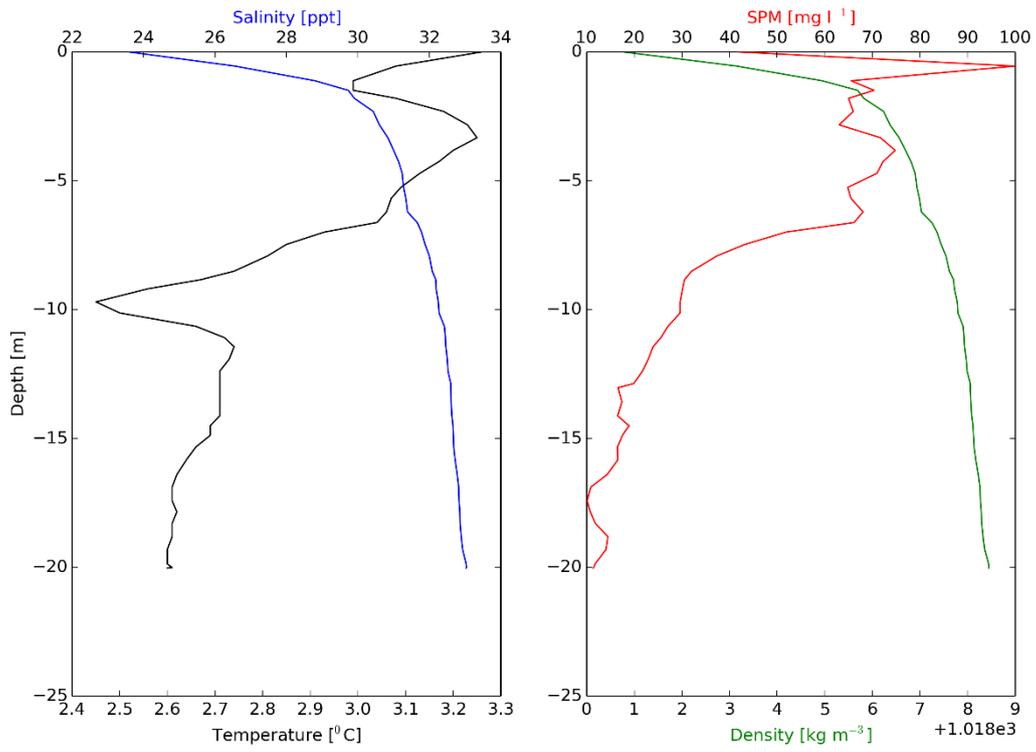
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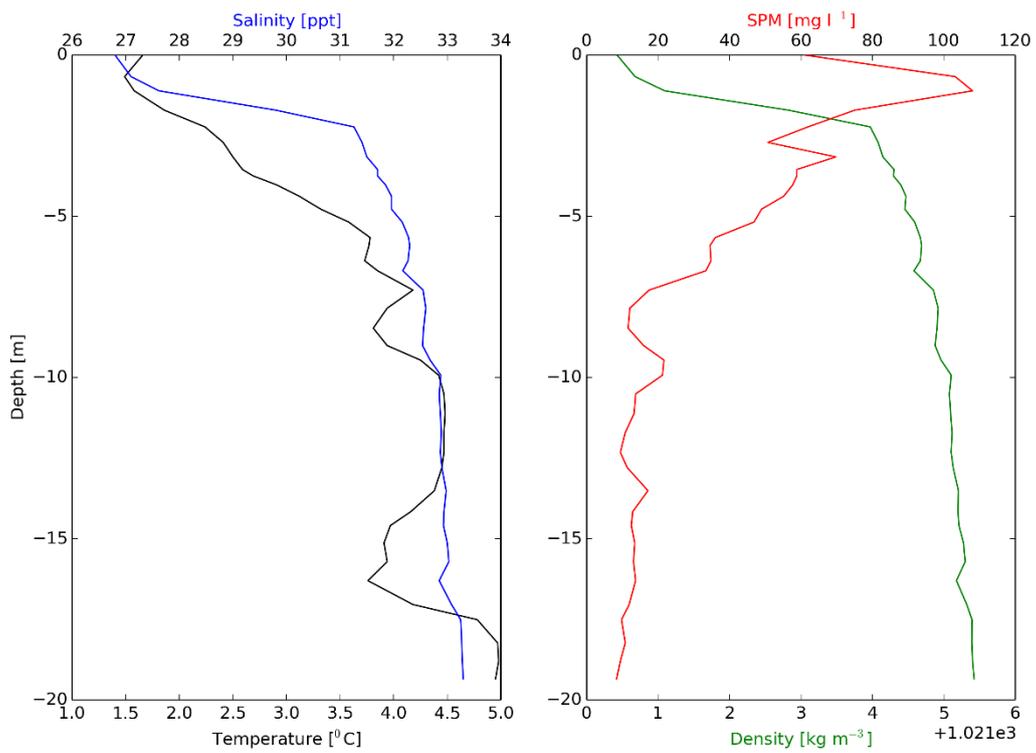
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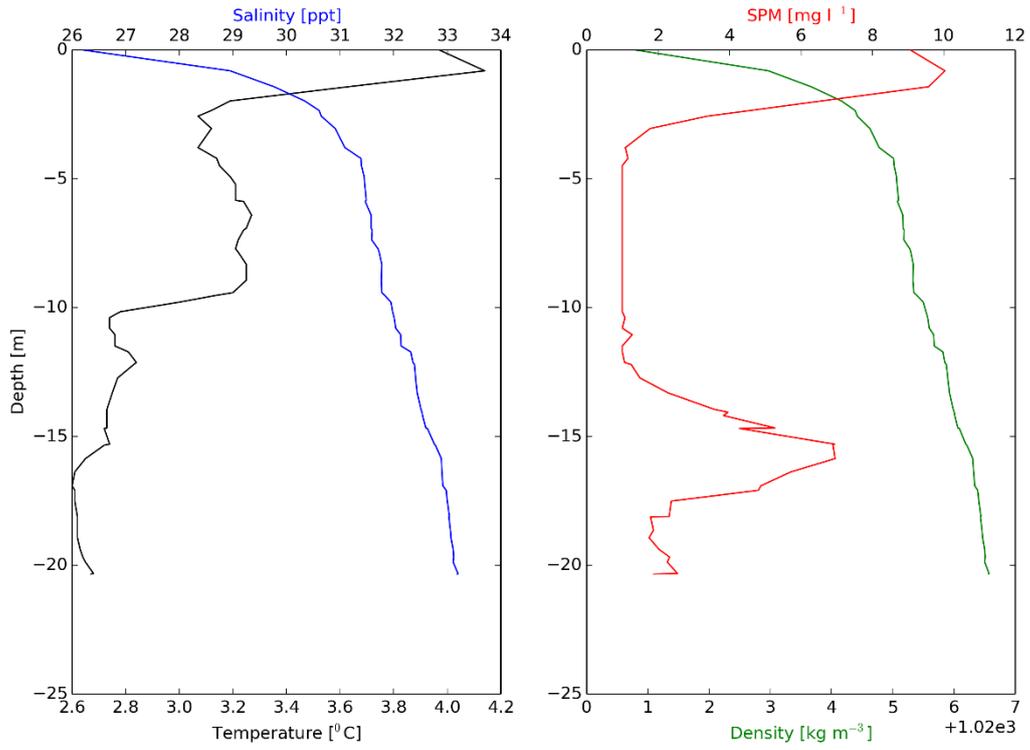
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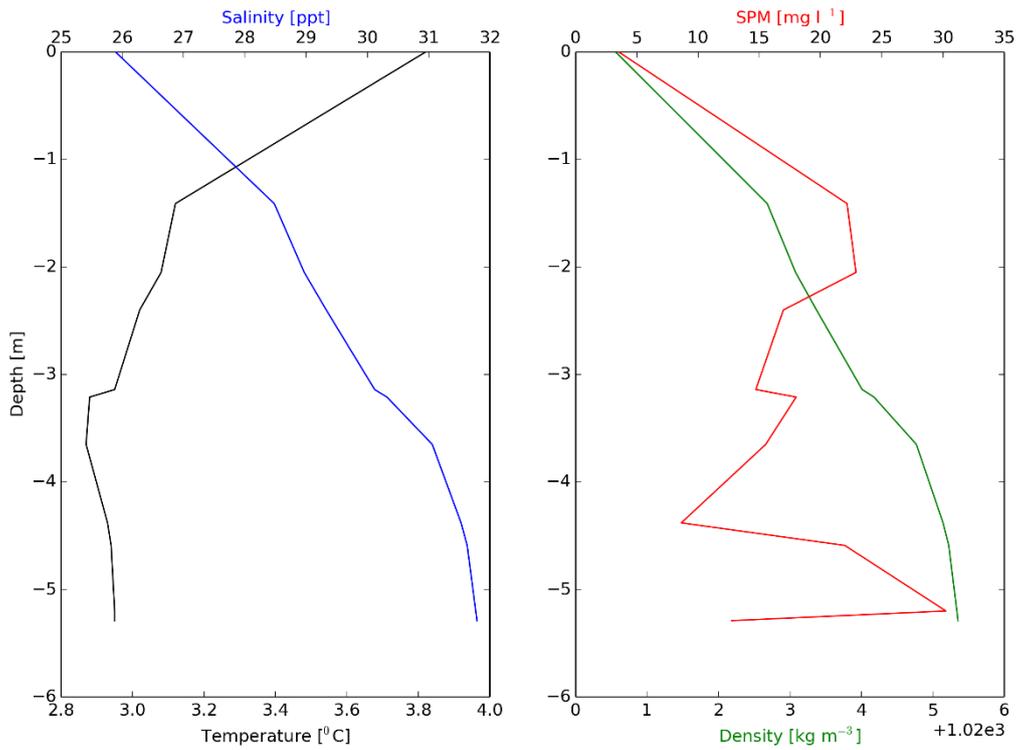
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## Appendix D – phytoplankton , NPOC

### Phytoplankton

Śliwińska Sylwia, Institute of Oceanography, University of Gdansk, 81-378 Gdynia, Poland

### Material and methods

Samples were collected using the plastic bottles. The taxonomic composition and number of phytoplankton were analyzed under an Nikon eclipse 80i microscope at a magnification of 10 and 100x. Phytoplankton organisms were identified to the species level or, if this was impossible, they were only assigned to a genus. Taxons were identified using keys and world literature (Drebes, 1974; Cox, 1996; Huber-pestalozzi, 1950; Komarek and Anagnostidis, 1999; Komarek and Fott, 1983; Lind and Brook, 1980; Popovski and Pfiester, 1990; Hindák, 2001).

### Results

Thirty six cyanobacteria and microalgae species belonging to 19 genera were distinguished during this study, but more than 80% of the total number of cyanobacterial and microalgal cells counted was contributed to by only the 11 most abundant taxa (9 genera) (Table 1). Some of the diatom and cyanobacteria specimens found present problems in their taxonomic identification (in particular forms belonging to *Navicula* and *Nitzschia* genera). In these cases, the dubious taxa are indicated by a “cf.” or designated as “sp.1” and “sp.2” (if the specimen could not be matched with any described taxon), still each name stands for a single separate species. A more detailed taxonomic analysis of the material is in progress. Amongst the recorded taxa, two species exceeded 10% of the total count: *Porphyridium purpureum* (Bory) K.M.Drew & R.Ross (30.1%) and *Chlorella vulgaris* Beyerinck [Beijerinck] (16.2%). Another nineteen species counted for over 1%. Fifteen taxa were noted in less than 1% of samples.

Location of samples:

Hornsund:

1S	77.016177 N	15.849753 E
2S	77.015431 N	15.873244 E
3S	77.0141161N	15.871974E
4S	77.07738N	15.77695E

Kongsfjord:

5S	78.921143N	12.605092E
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**Table 2.** Summary of observations (photographs in data base catalogs foto)

Location	Photography	Description of place	Description of results
S1	photo. Hornsund_cgis_4	patch of snow or ice (2 km W from Gnaloden along the coast)	Bloom of a single-celled red algae organisms <i>Porphyridium purpureum</i> (Rhodophyta). These organisms constituted 79,9% of the sample and were not present in any other sample
S2	photo. Hornsund_cgis_5	spring on the coast of Gnaloden	There was not many of phytoplankton species but a lot of organic matter. Dominant species were diatoms of <i>Navicula</i> i <i>Nitzschia</i> (Chrysophyta)
S3	photo. Hornsund_cgis_6	tide pool at Gnaloden	Consisted the highest species diversity. Dominant species were picoplankton cyanobacteria (Cyanophyta) and diatoms, mainly of <i>Amphora</i> sp., that composed the sample in 19.3% and 11.1% respectively
S4	photo. Hornsund_cgis_1	water outflow from rocky wall at western coast of Vestre Burgerbukta	Single-celled chlorophytes - <i>Chlorella</i> (Chlorophyta) were dominant organisms contributing 77.9% of the sample. The second most abundant organisms were picoplankton cyanobacteria with 14.9%
S5	photo. Kongsfjord_cgis_2	solitary rock near ice face of Kongsbreen glacier in Raudvika	Dominant species were diatoms of <i>Licmophora</i> , composing 69.0% of the sample and were not present in any other sample

**Table 2.** List of taxa present in the studied samples, percentage of total abundance, percentage of samples in which taxa occurred, and sites where they were present.

Group Species	% of total abundance	% of samples					locations
		1s	2s	3s	4s	5s	
<b>Cyanophyta</b>							
<i>Aphanocapsa</i> cf. <i>delicatissima</i>	1.3	-	-	5.3	-	-	3s
<i>Aphanothece</i> sp.	1.9	-	-	7.9	-	-	3s
<i>Chroococcus turgidus</i> (Kützing) Nägeli	2.1	-	-	8.5	-	-	3s
<i>Lyngbya limnetica</i> Lemmermann	3.7	7.4	-	3.6	-	-	1s, 3s
<i>Nostoc</i> cf. <i>microscopicum</i>	0.4	-	-	1.6	-	-	3s
<i>Phormidium splendidum</i> (Greville ex Gomont) Anagnostidis & Komárek	0.6	-	-	1.0	1.3	-	3s, 4s
<i>Planktolynbya</i> sp.	1.8	1.7	-	3.9	0.7	-	1s, 3s, 4s
<i>Pseudanabaena limnetica</i> (Lemmermann) Komárek	1.0	0.2	-	0.6	2.9	-	1s, 3s, 4s
<i>Pseudanabaena</i> sp.	0.2	0.5	-	-	-	-	1s
picocyanobacteria	8.4	-	-	19.3	14.8	-	3s, 4s
<b>Chlorophyta</b>							
<i>Chlorella vulgaris</i> Beyerinck [Beijerinck]	16.2	0.8	-	3.6	61.2	-	1s, 3s, 4s
<i>Chlorella minutissima</i> Fott & Nováková	1.6	-	-	-	6.4	-	4s
<i>Chlorella</i> sp.	5.7	4.4	-	6.2	10.4	-	1s, 3s, 4s
<i>Chlorococcum infusionum</i> (Schrank) Meneghini	0.6	1.1	-	0.7	-	-	1s, 3s
<i>Chlorococcum</i> sp.	2.6	-	12.3	5.3	2.3	2.7	2s, 3s, 4s, 5s
<i>Coelastrum</i> sp.	0.2	-	-	1.0	-	-	3s
<b>Chrysophyta</b>							
<i>Achnanthes</i> cf. <i>brevipes</i>	0.3	-	7.0	-	-	-	2s
<i>Amphora</i> cf. <i>coffeaeformis</i>	1.5	-	-	6.2	-	-	3s

<i>Amphora</i> sp.	2.7	-	-	11.1	-	-	3s
<i>Licmophora</i> cf. <i>abbreviata</i>	0.8	-	-	-	-	9.6	5s
<i>Licmophora</i> cf. <i>communis</i>	4.5	-	-	-	-	49.6	5s
<i>Licmophora</i> cf. <i>ehrenbergii</i>	0.2	-	-	-	-	2.7	5s
<i>Licmophora</i> cf. <i>gracilis</i>	0.2	-	-	-	-	1.8	5s
<i>Licmophora</i> sp.	0.5	-	-	-	-	5.2	5s
<i>Navicula</i> cf. <i>gelida</i>	0.3	-	1.8	1.0	-	-	2s, 3s
<i>Navicula</i> cf. <i>glaciei</i>	0.6	-	3.5	2.3	-	-	2s, 3s
<i>Navicula</i> cf. <i>goersii</i>	0.2	-	-	-	-	2.7	5s
<i>Navicula</i> cf. <i>perminuta</i>	2.5	-	29.8	2.0	-	8.0	2s, 3s, 5s
<i>Navicula</i> sp.1	2.1	2.5	-	0.7	-	10.6	1s, 3s, 5s
<i>Navicula</i> sp.2	1.1	1.5	-	-	-	6.2	1s, 5s
<i>Navicula</i> sp.3	1.0	-	22.8	-	-	-	2s
<i>Navicula</i> sp.4	0.4	-	8.8	-	-	-	2s
<i>Nitzschia</i> cf. <i>dissipata</i>	1.4	-	-	5.6	-	-	3s
<i>Nitzschia</i> sp.1	1.0	-	14.0	1.3	-	-	2s, 3s
Unknown	0.3	-	-	1.3	-	0.9	3s, 5s
<b>Rhodophyta</b>							
<i>Porphyridium purpureum</i> (Bory) K.M.Drew & R.Ross	30.1	79.9	-	-	-	-	1s

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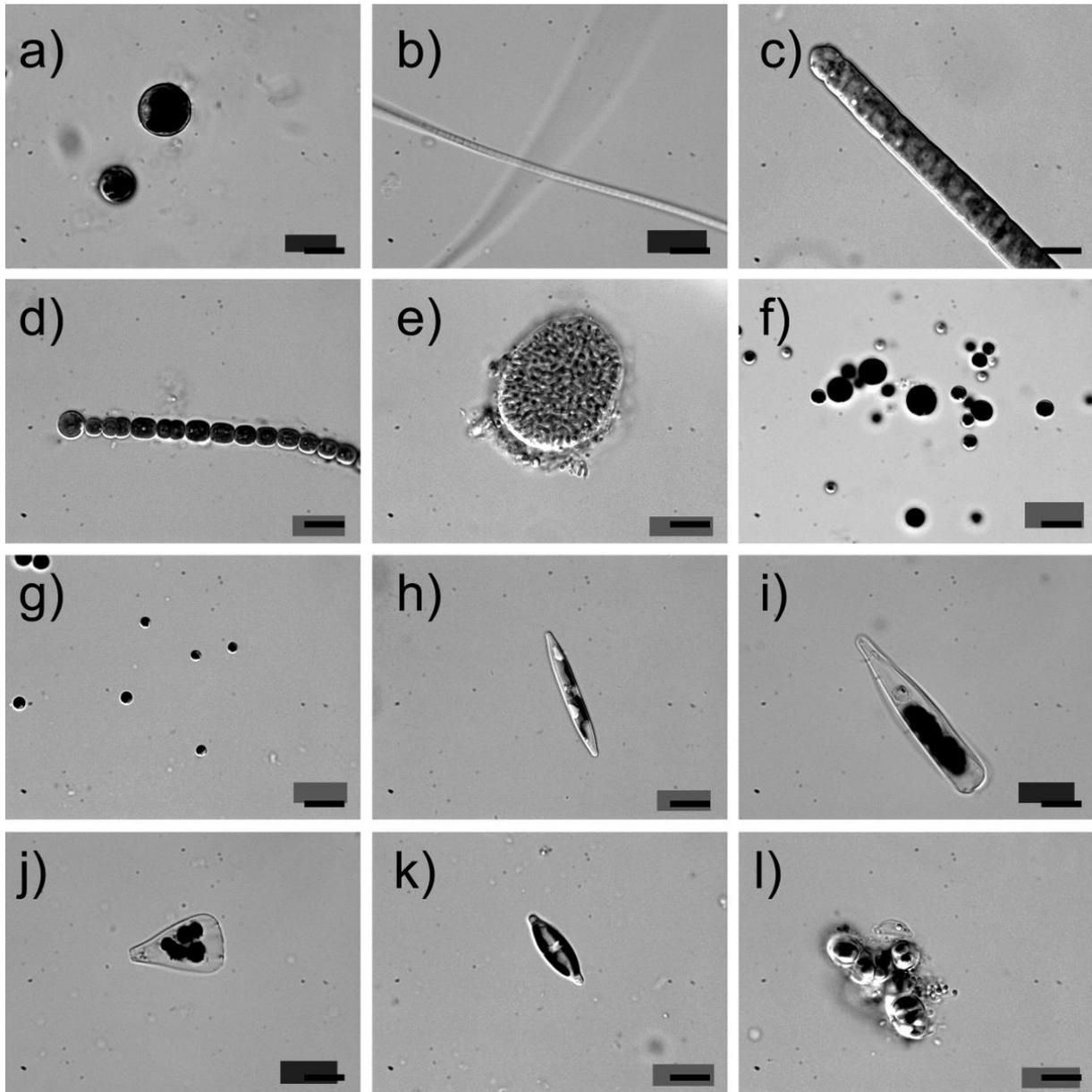


Fig. 1. Dominant phytoplankton species from Hornsund and Kongsfjord, Svalbard: a) *Porphyridium purpureum*, b) *Planktolyngbya* sp., c) *Lyngbya limnetica*, d) *Nostoc* cf. *microscopicum*, e) *Aphanothece* sp., f) *Chlorella vulgaris*, g) *Chlorella minutissima*, h) *Nitzschia* cf. *dissipata*, i) *Licmophora* cf. *communis*, j) *Licmophora* sp., k) *Navicula* sp., l) *Amphora* sp. Scale bars = 10  $\mu$ m.

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### **Non-purgable organic carbon**

Łukawska-Matuszewska Katarzyna, Institute of Oceanography, University of Gdansk, 81-378 Gdynia, Poland

For concentrations of non-purgable organic carbon, water from surface was collected in a plastic bottles, transferred to the laboratory within 2 days and filtered at low pressure through pre-combusted (450°C, 24 h) MN GF-5 filters (0.4 µm pore size). The samples were acidified to pH<2 with concentrated HCl and stored in a refrigerator until analysis. Concentration of non-

purgable organic carbon (NPOC) was measured with the high temperature catalytic oxidation (HTCO) technique using Vario TOC Cube analyzer (Elementar Analysensysteme GmbH). Each sample was analysed twice and mean value was calculated.

Tab. 1. Concentration of non-purgable organic carbon (NPOC) [mg/l]

NPOC [mg/l]	All samples	Kongsfjord	Hornsund
<u>Min. – Max.</u>	<u>0.39 – 1.93</u>	<u>0.39 – 1.93</u>	<u>0.57 – 1.21</u>
Average $\pm$ SD	0.84 $\pm$ 0.34	0.81 $\pm$ 0.42	0.89 $\pm$ 0.20
<u>Median</u>	<u>0.76</u>	<u>0.69</u>	<u>0.91</u>
Q <sub>1</sub> – Q <sub>3</sub>	0.66 – 0.95	0.62 – 0.85	0.81 – 0.98
n	19	11	8

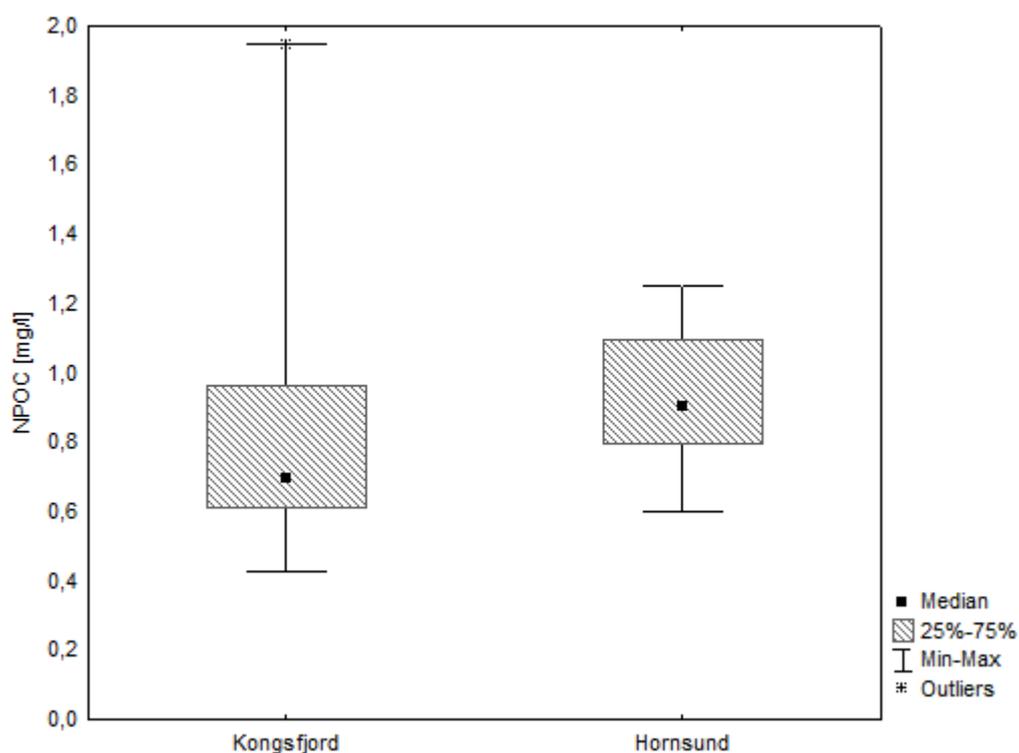


Fig. 1. Concentration of non-purgable organic carbon (NPOC) [mg/l] in Kogsfjord and Hornsund