

Report from the SMHI monitoring cruise with R/V Aranda



Survey period: 2018-12-04 - 2018-12-11
Principal: Swedish Meteorological and Hydrological Institute (SMHI),
Swedish Agency for Marine and Water Management (SwAM).
Cooperation partners: Finnish Environment Institute (SYKE)

SUMMARY

During the cruise, which is part of the Swedish national marine monitoring programme, stations in the Skagerrak, the Kattegat, the Sound and the Baltic Proper were visited. Two scientists from the Finnish Environment Institute, SYKE, participated during the cruise in order to make an intercalibration between SMHI and SYKE.

In large parts of the Baltic Proper, the oxygen concentration in the deep water was close to zero. Anoxic conditions, when hydrogen sulphide can form, were found at all stations sampled in the Western and Eastern Gotland Basin. The depths where hydrogen sulphide were first detected at the visited stations varied between 85-125 meters. In the Bornholm Basin, the Bight of Hanö and at the station BCSIII-10 in the south eastern part of the Baltic Proper, acute hypoxia (oxygen < 2ml/l) was found from about 70 meters depth.

The measured nutrients in the surface water of the Skagerrak and the Kattegat were generally below normal levels for the season, except for silicate concentrations in the Kattegat, where levels were normal. In the northern part of the Baltic Proper the concentrations of silicate and dissolved inorganic phosphorus (DIP) were above normal levels in the surface water, in the southern part the levels were normal. The surface concentration of dissolved inorganic nitrogen (DIN) was normal for the season at most stations in the Baltic Proper.

The sea surface temperature was normal for the season at almost all stations in the visited sea areas. The salinity in the sea surface water was above normal in both the Eastern and the Western Gotland Basin and generally normal at the other visited stations.

The next cruise is planned to start the 10th of January. The winter pool of nutrients will be mapped in the Kattegat and the Sound during that cruise.

RESULTS

The cruise was conducted aboard the Finnish research vessel Aranda. It started in Helsinki the 4th of December and ended in Rauma the 11th. In the beginning of the cruise the winds were brisk and increasing to strong and shortly before reaching BY29 in the northern Baltic Proper, the wind speed in the gusts were 20 m/s, after that the wind settled some. Going south after the stop in Lysekil, the winds increased to strong again. During the last part of the cruise, the winds were moderate from the north.

Two scientists from the Finnish Environment Institute, SYKE participated during the cruise. The purpose was to do the yearly intercalibration between SMHI and SYKE. This was last conducted in March 2017.

This report is based on data that have passed a first quality control. When data are published at the National Oceanographic Data Centre some values might have changed after further quality controls have been performed. Data from this cruise will be published as soon as possible on the data center's webpage, normally within a week after the cruise.

Downloadable data can be found here: <http://www.smhi.se/klimatdata/oceanografi/havsmiljodata> (only available in Swedish).

The Skagerrak

The sea surface temperature was normal for the season at all visited stations, and varied between 6.6-8.1°C, warmest at open sea, and coldest by the coast. The salinity was 27 psu at Släggö and about 33 psu for the stations further west. This was above normal for the season at both P2 and Å13, and normal for the other stations. Thermocline and halocline coincided at a depth of about 10-15 meters.

The surface water concentrations of dissolved inorganic nitrogen (the sum of nitrate, nitrite and ammonia) DIN were below normal levels for the stations at open sea, and varied between 3.0-3.6 µmol/l. Near the coast, the levels were normal for the season in the surface water and were measured to 3.6 µmol/l. In the deep water the concentrations were normal or slightly below normal for the season at all stations. Dissolved inorganic phosphorus, DIP (only in the form of phosphate), were below normal for the season at all visited stations, about 0.3 µmol/l. In the deep water the levels were normal or below normal. Silicate concentrations were below normal levels down to about 100 meters, except at Släggö, where concentrations from the surface down to about 20 meters were normal. The concentrations in the surface waters varied between 1.8-5.2 µmol/l.

Oxygen conditions in deep water were good and oxygen concentrations at the bottom were between 5.1-6.2 ml/l.

Fluorescence measurements by the CTD indicated some phytoplankton activity from the surface down to the thermocline.

The Kattegat and the Sound

The surface water temperature was for the season normal in both the Kattegat and the Sound and varied between 6.5 and 7.0°C. The surface salinity was normal for the season and was measured to 21.4 psu in the Sound, and between 22 and 25 psu in the Kattegat. The surface salinity was slightly above normal for the season at N14 Falkenberg, normal at the other stations. The water in the Kattegat was stratified, both thermocline and halocline coincided at 15-20 meters depth. In the Sound the stratification was less clear.

Nutrients in the form of DIN were below normal levels for the season in the surface water of the Kattegat and at normal levels in the Sound. The concentrations were 1.1-1.9 $\mu\text{mol/l}$ in the Kattegat and about 3.5 $\mu\text{mol/l}$ in the Sound. The concentrations of DIP were below normal levels for the season in the surface waters of the Kattegat, and normal in the Sound. The silicate concentrations were normal for the season at all stations, between 4.6-6.2 $\mu\text{mol/l}$ in the Kattegat and slightly above 10 $\mu\text{mol/l}$ in the Sound.

The deep water was well oxygenated at all stations in the Kattegat and the Sound with normal levels for the season. Closest to the bottom, the concentration was about 5.5 ml/l in the Kattegat, and slightly lower in the Sound.

Fluorescence measurements indicated phytoplankton activity from the surface down to the halocline in the Kattegat. In the Sound a fluorescence maxima was located at about 10 meters depth.

The Baltic Proper

The sea surface temperature was normal for the season, except at BCSIII-10 in the south eastern Baltic Proper and at BY2 in the Arkona Basin, where it was higher than normal. The temperature varied between 5.2 and 7.8°C. The salinity in the surface water was above normal at all station in the Western Gotland Basin, and normal at all other visited stations. Measured values ranged from 6.8 to 8.6 psu, lowest in the Eastern Gotland Basin, and the highest in the Arkona Basin. The surface layer was mixed down to 50-60 meters depth.

Nutrients in the form of DIN were normal for the season in the surface water at all stations except at BY29 in the Northern Gotland Basin, where it were above normal. Measured concentrations varied between 1.1 and 3.6 $\mu\text{mol/l}$. The concentrations of DIP in the surface water were generally above normal for the season in the northern parts of the Baltic Proper, around 0.6 $\mu\text{mol/l}$. At the other stations the concentrations were normal for the season, except at BCSIII-10 in the south eastern Baltic Proper and at BY5 in the Bornholm Basin, where it were below normal. For the southern parts of the Baltic Proper the concentrations in the surface water at open sea were 0.3-0.5 $\mu\text{mol/l}$, and for the coastal station Ref M1V1 it was 0.7 $\mu\text{mol/l}$. The silicate concentrations in the surface waters were above normal for the season in both the Eastern and the Western Gotland Basin, between 13-20 $\mu\text{mol/l}$. At the other stations the concentrations were normal, from 8 to 13 $\mu\text{mol/l}$ at open sea and around 17 $\mu\text{mol/l}$ at Ref M1V1.

Large parts of the deep water in the Baltic Proper had oxygen concentrations close to zero. In both the Eastern and the Western Gotland Basin acute hypoxia were found at 70-80 meters. Hydrogen sulphide was present in both basins at varying depths. At BY38, BY32 and BY31 hydrogen sulphide was measured from 80,90 and 125 meters depth respectively. For the stations in the Eastern Gotland Basin, the depth where concentrations of hydrogen sulphide were larger than 4 $\mu\text{mol/l}$ (i.e. reporting limit) varied between 85 and 125 meters. At BCSIII-10 in the south eastern Baltic Proper and in the Bornholm Basin and the Bight of Hanö acute hypoxia was found from 70 meters depth. At BY5 the lowest concentration of oxygen was 0.16 ml/l closest to the bottom at 89 meters depth. In the Arkona Basin the oxygen conditions were better. The lowest concentration was 2.7 ml/l, found at 46 meters depth at BY2.

Fluorescence measurements indicated low phytoplankton activity at all stations in the area.

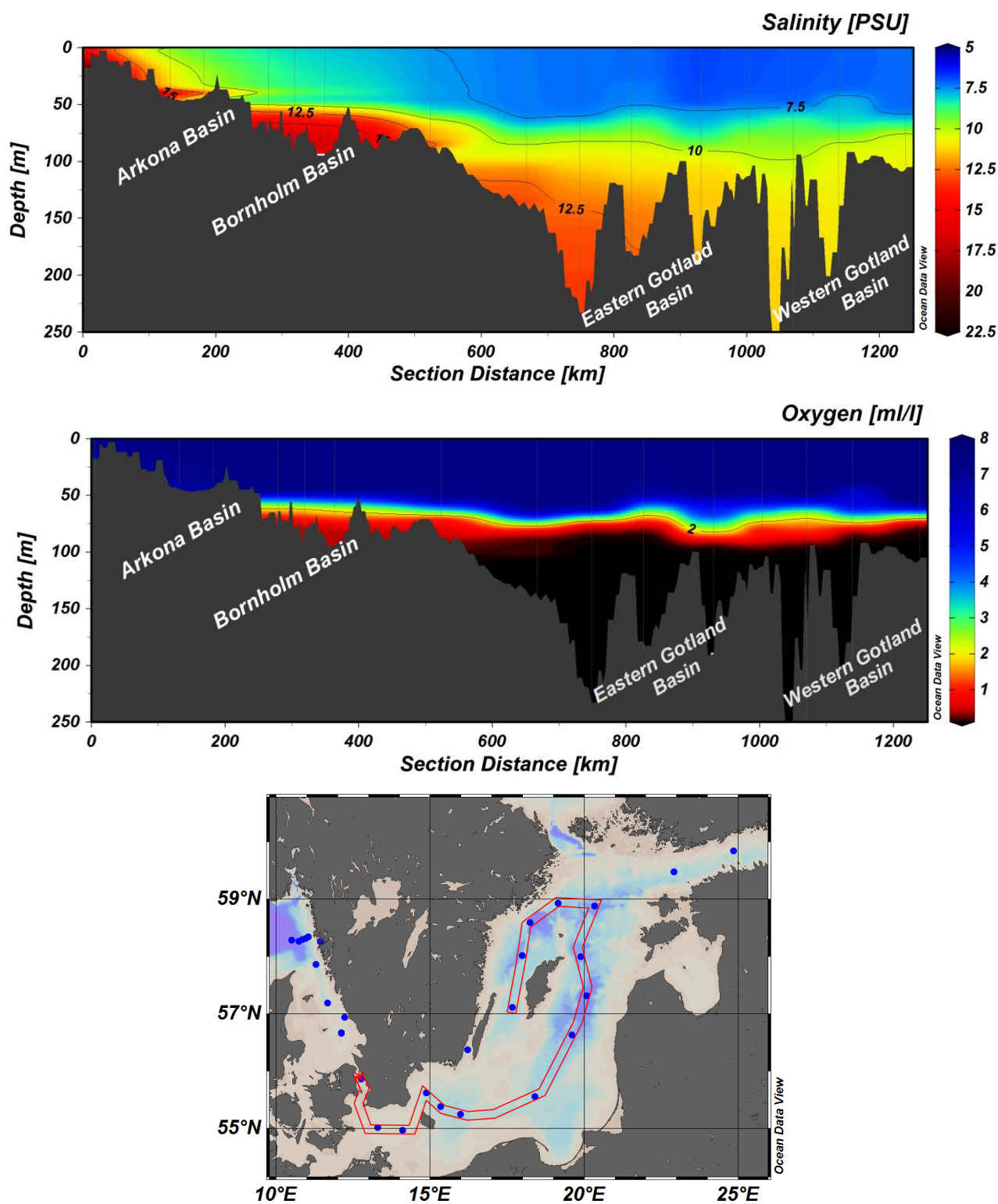


Figure 1. Transect showing dissolved oxygen and salinity from the Sound, through the Baltic Proper, to the Western Gotland Basin.

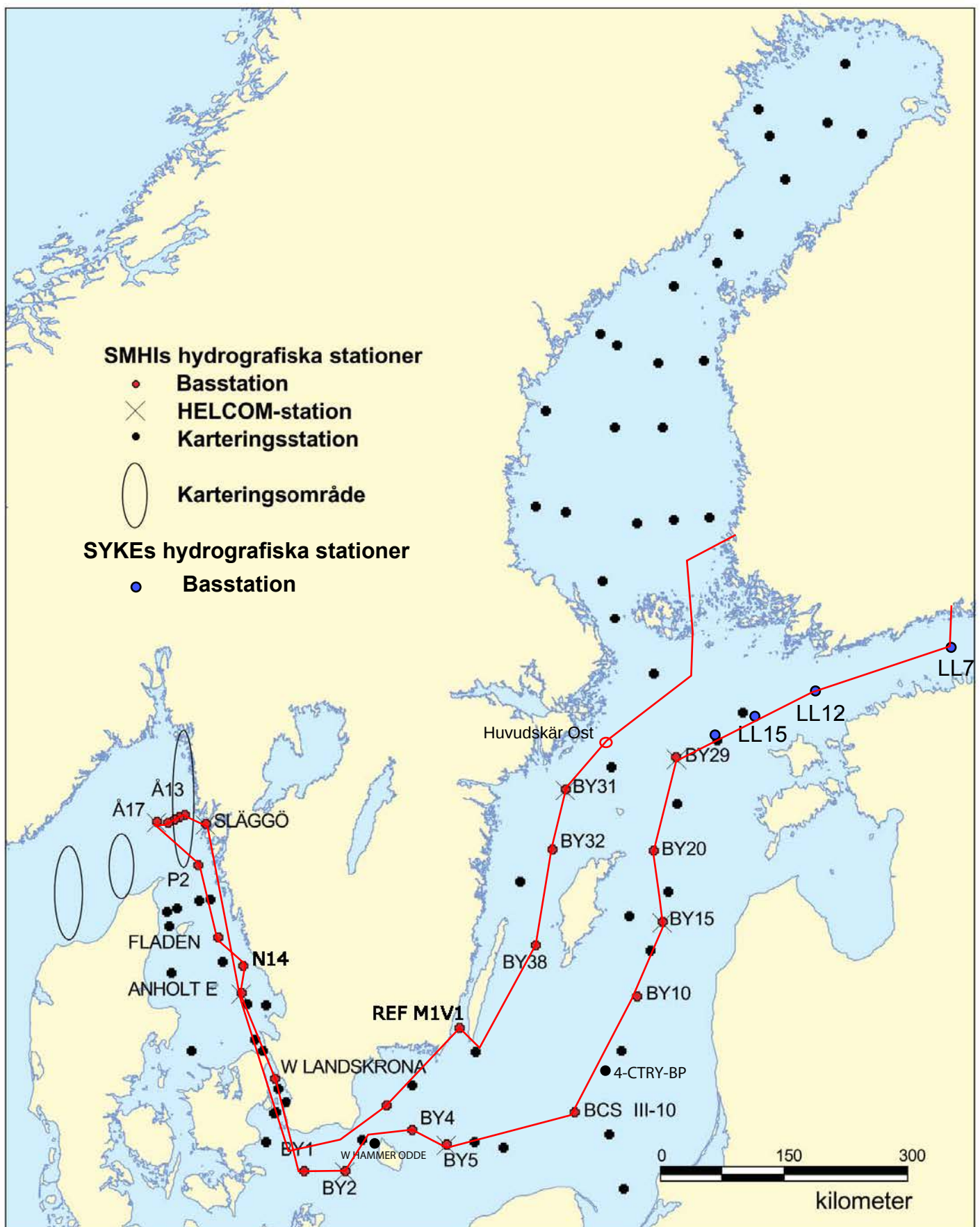
PARTICIPANTS

Name		From
Johan Kronsell, Chief Scientist		SMHI
Lena Viktorson	Helsingfors-Lysekil	SMHI
Ann-Turi Skjevik	Helsingfors-Lysekil	SMHI
Madeleine Nilsson		SMHI
Kristin Andreasson		SMHI
Sara Johansson	Lysekil-Rauma	SMHI
Örjan Bäck	Lysekil-Rauma	SMHI
Ilkka Lastumäki		SYKE
Pia Varmanen		SYKE

APPENDICES

- Track chart
- Table over stations, sampled parameters and number of sampling depths
- Map showing bottom oxygen concentrations
- Vertical profiles for regular monitoring stations
- Monthly average surface water plots for regular monitoring stations

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 Date: 20181204-20181211
 Series: 0149-0179



Time: 15:28

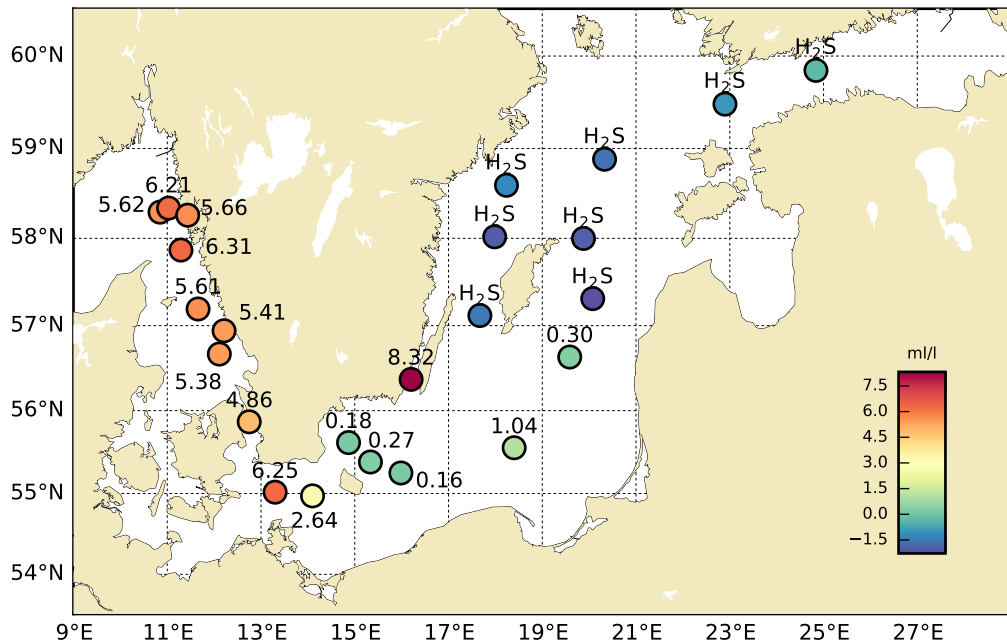
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Bottom water oxygen concentration (ml/l)

Ship: Aranda

Date: 20181204-20181211

Series: 0149-0179



STATION BY29 / LL19 SURFACE WATER (0-10 m)

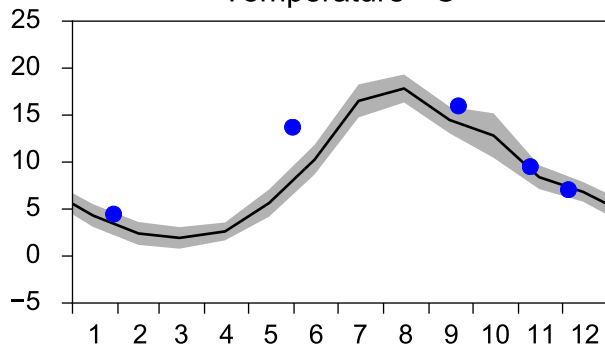
Annual Cycles

— Mean 2001-2015

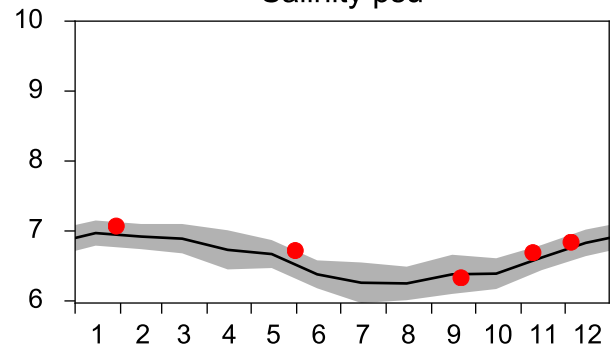
■ St.Dev.

● 2018

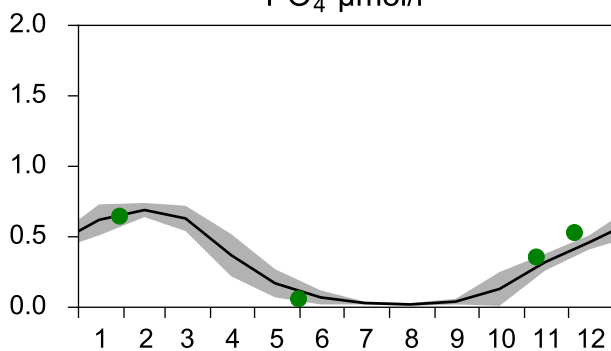
Temperature °C



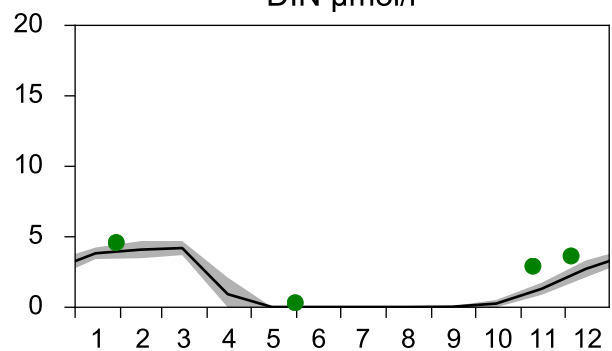
Salinity psu



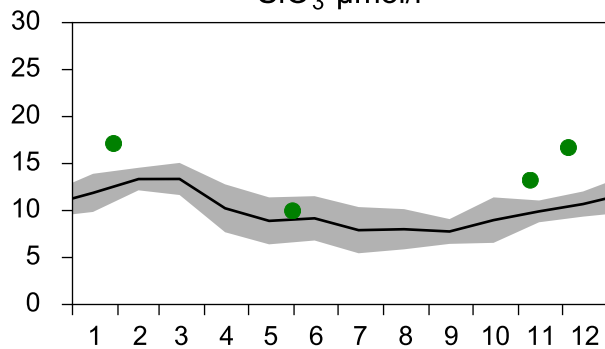
PO₄ µmol/l



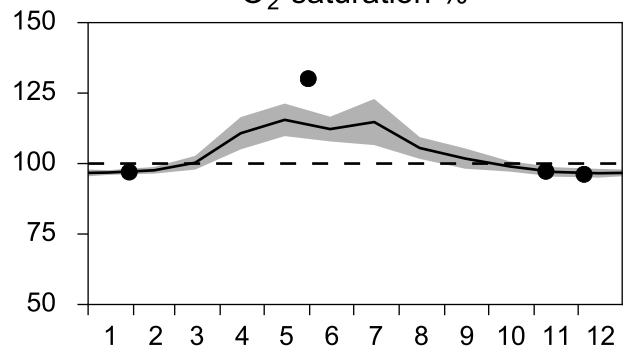
DIN µmol/l



SiO₃ µmol/l

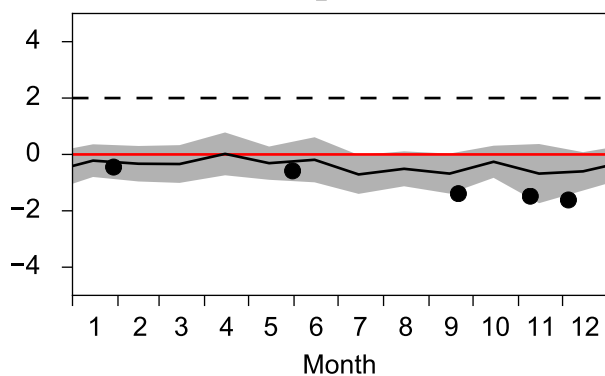


O₂ saturation %

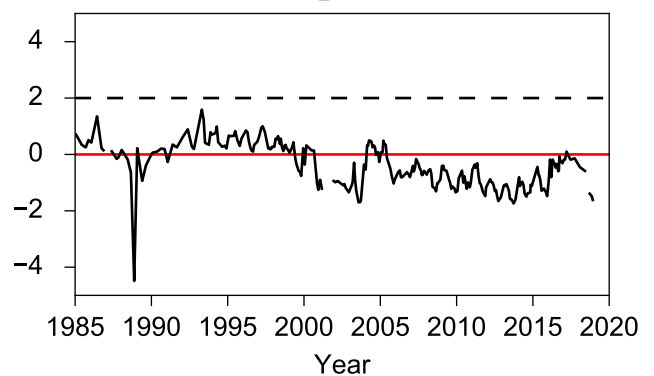


OXYGEN IN BOTTOM WATER (depth >= 150 m)

O₂ ml/l

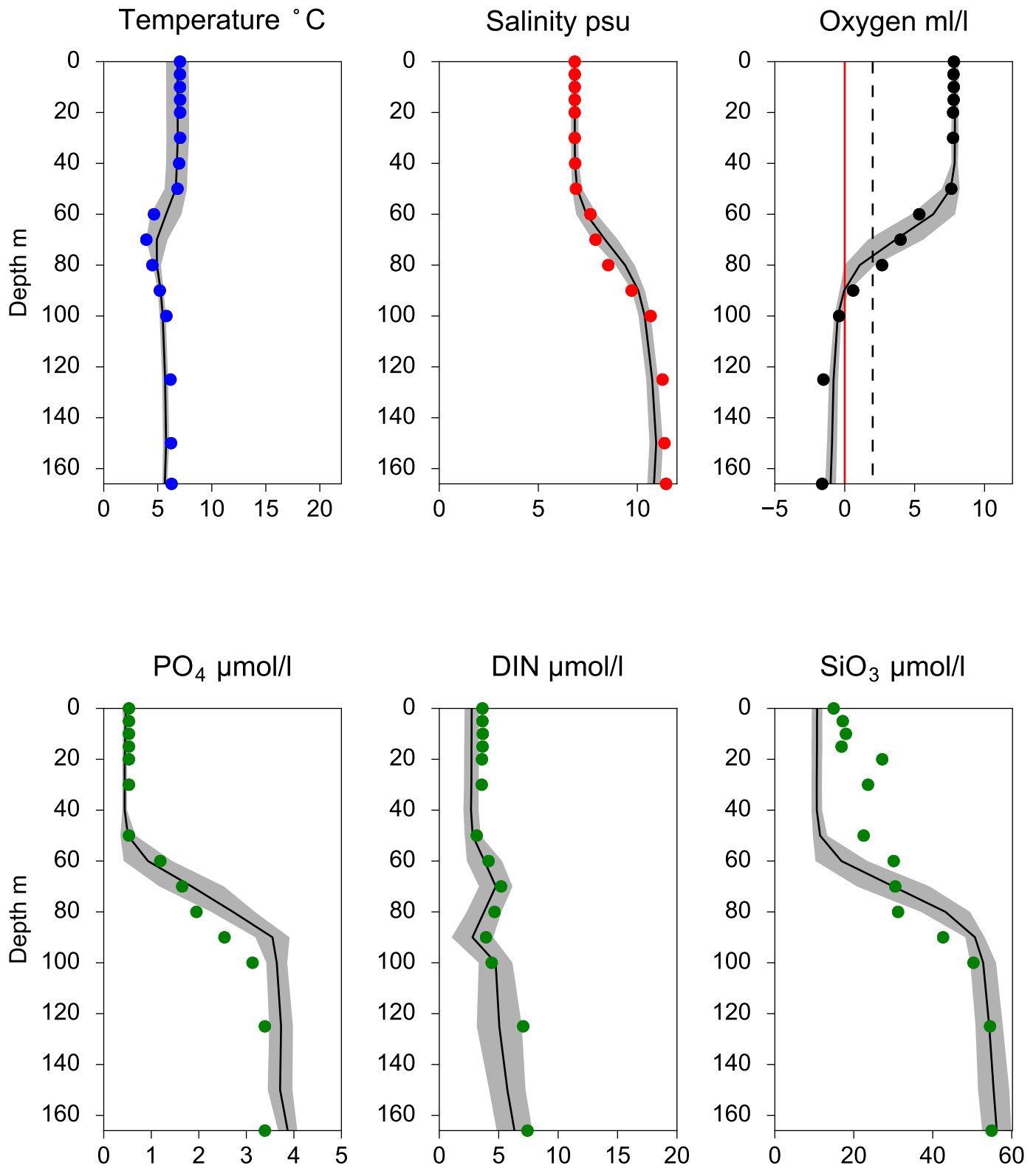


O₂ ml/l



Vertical profiles BY29 / LL19 December

— Mean 2001-2015 St.Dev. • 2018-12-05



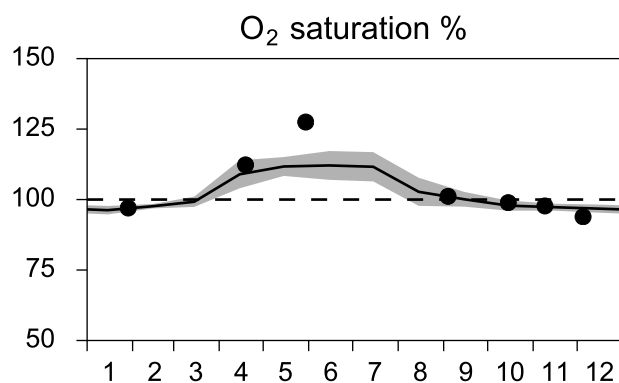
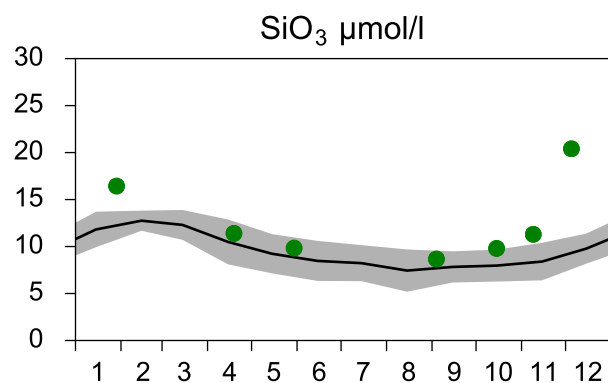
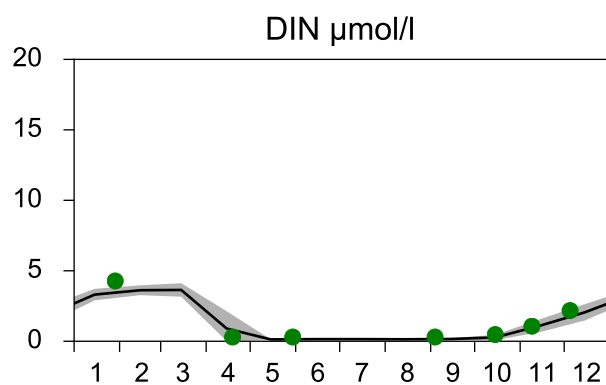
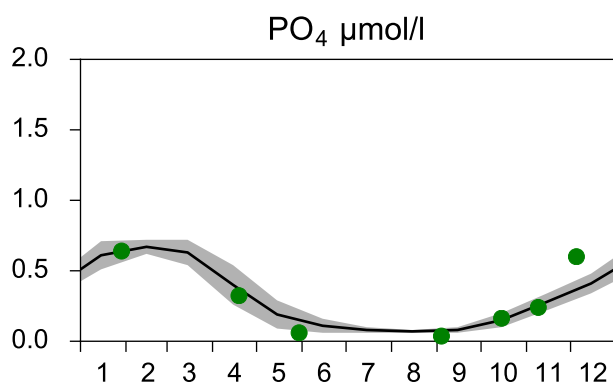
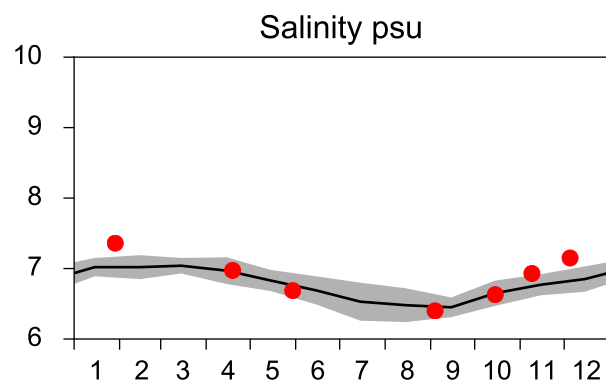
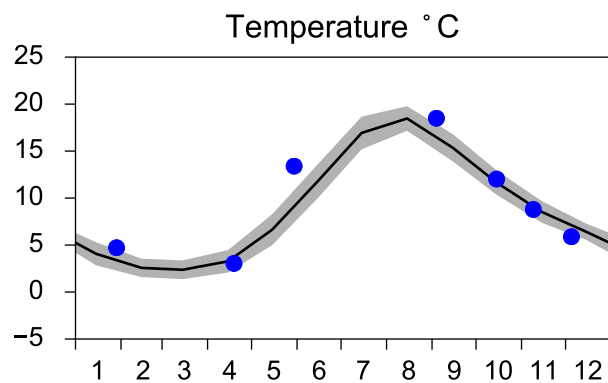
STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

Annual Cycles

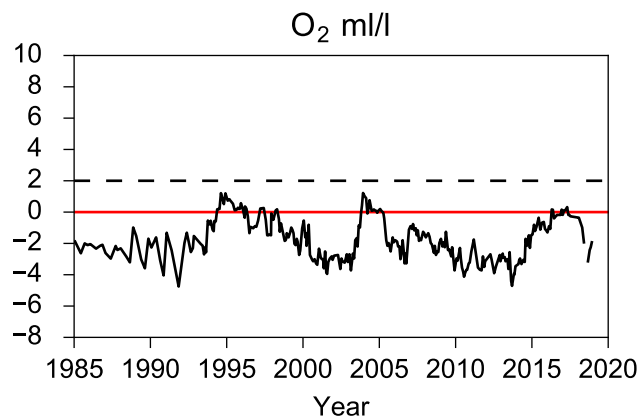
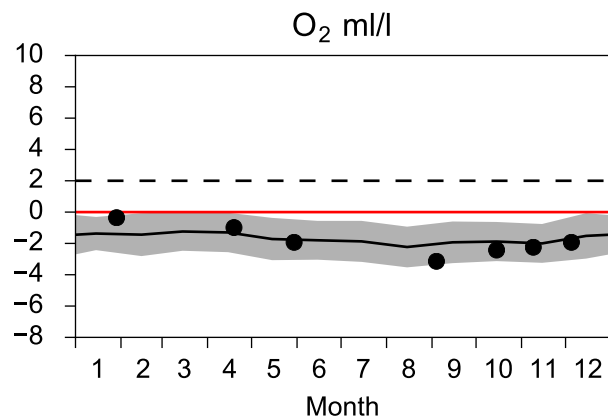
— Mean 2001-2015

■ St.Dev.

● 2018

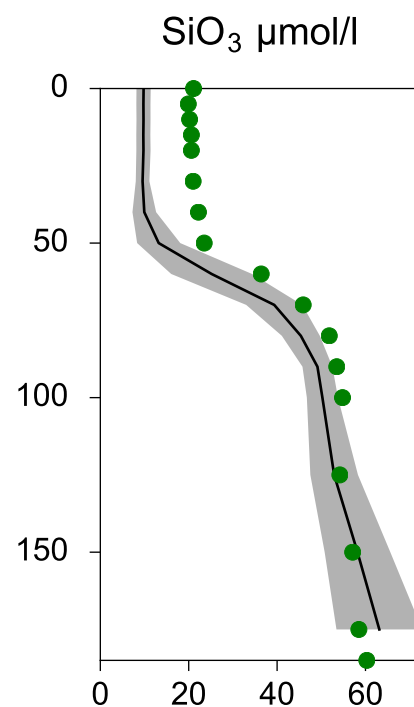
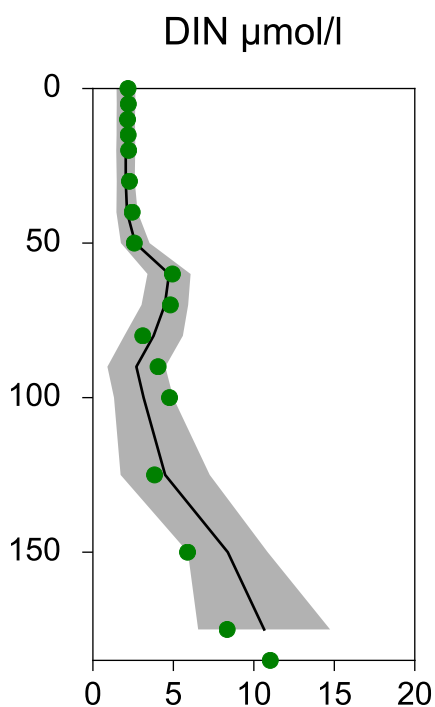
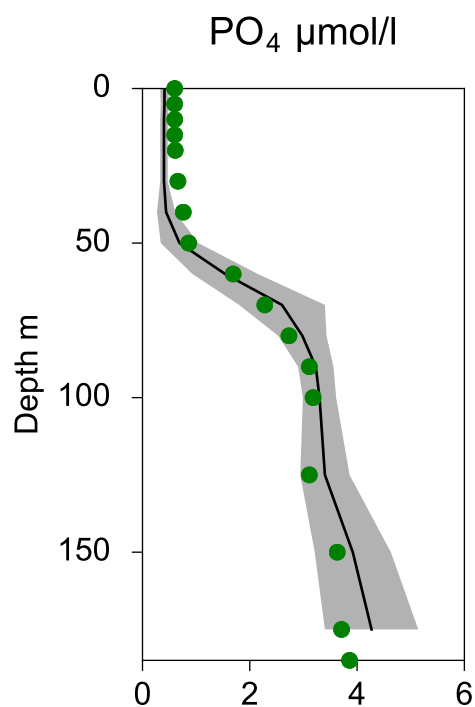
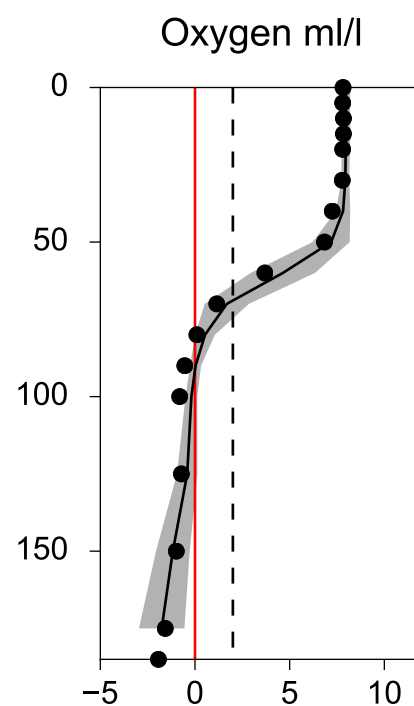
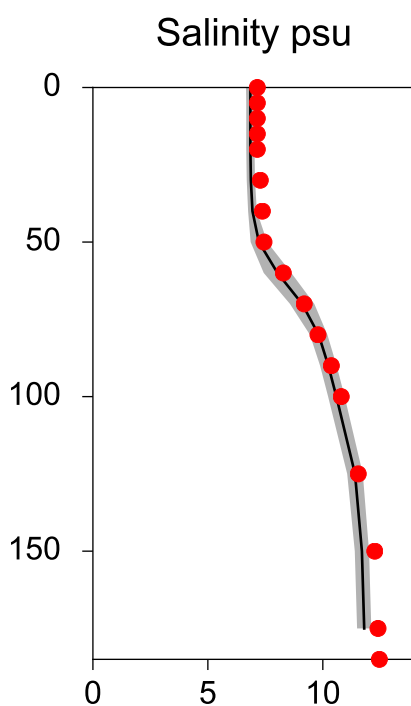
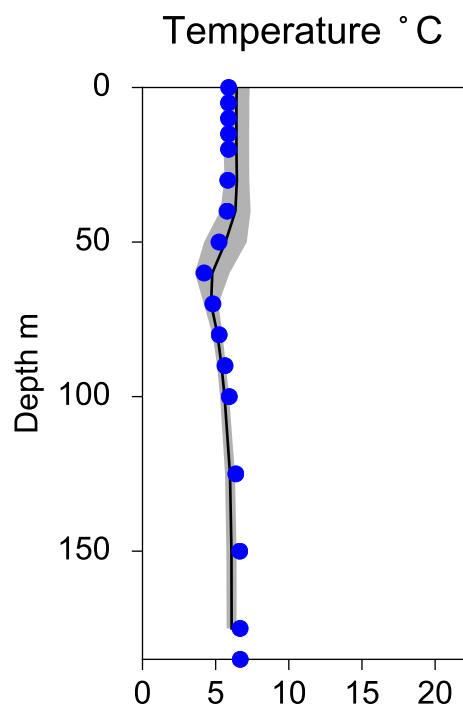


OXYGEN IN BOTTOM WATER (depth >= 175 m)



Vertical profiles BY20 FÅRÖDJ December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-05



STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

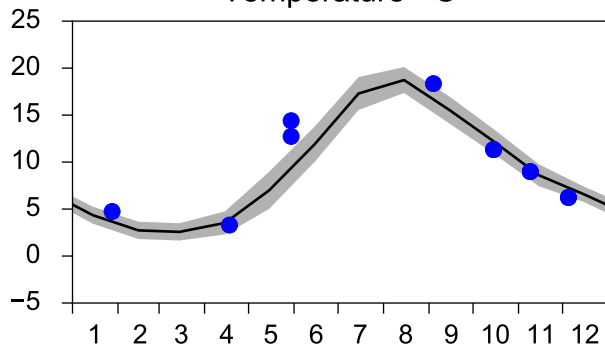
Annual Cycles

— Mean 2001-2015

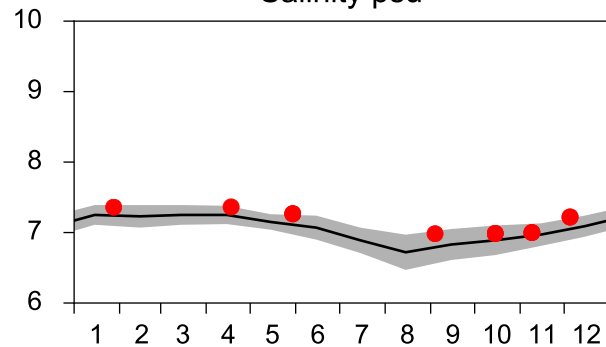
■ St.Dev.

● 2018

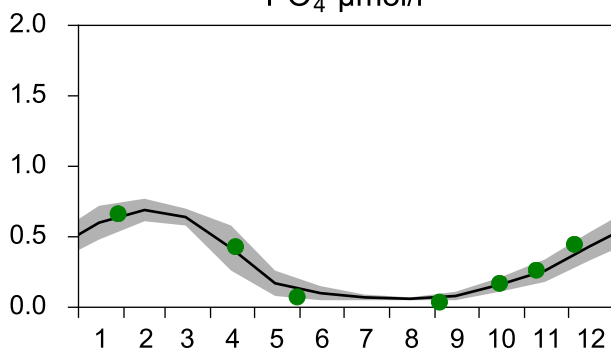
Temperature °C



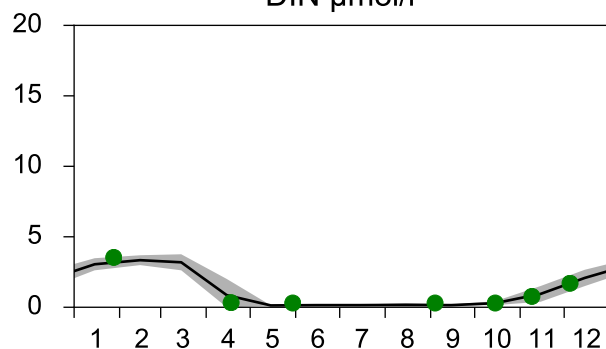
Salinity psu



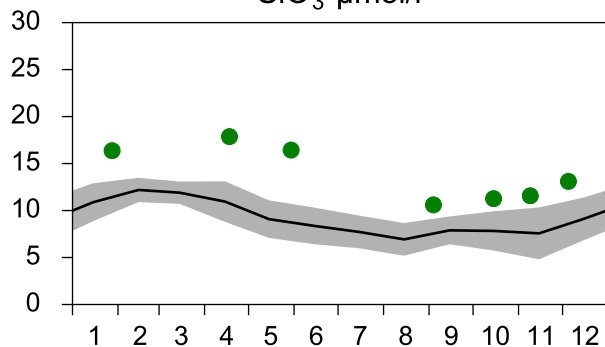
PO₄ µmol/l



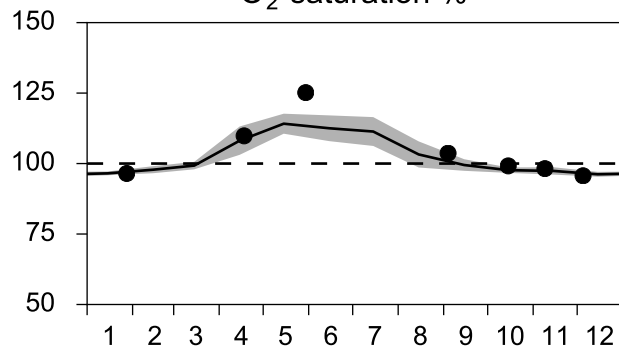
DIN µmol/l



SiO₃ µmol/l

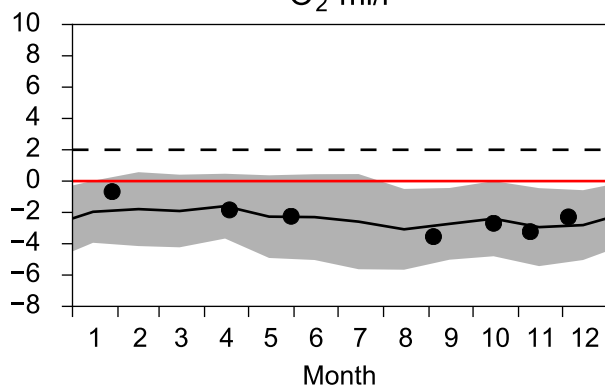


O₂ saturation %

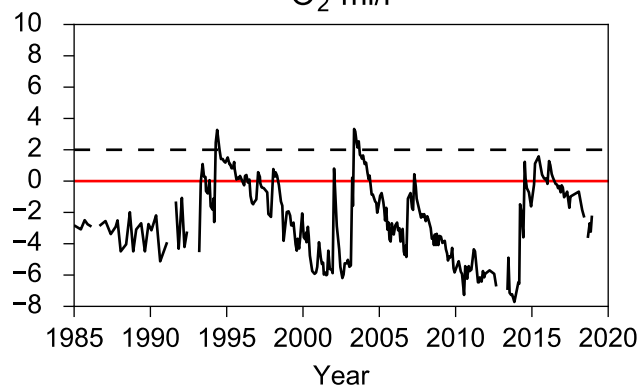


OXYGEN IN BOTTOM WATER (depth >= 225 m)

O₂ ml/l

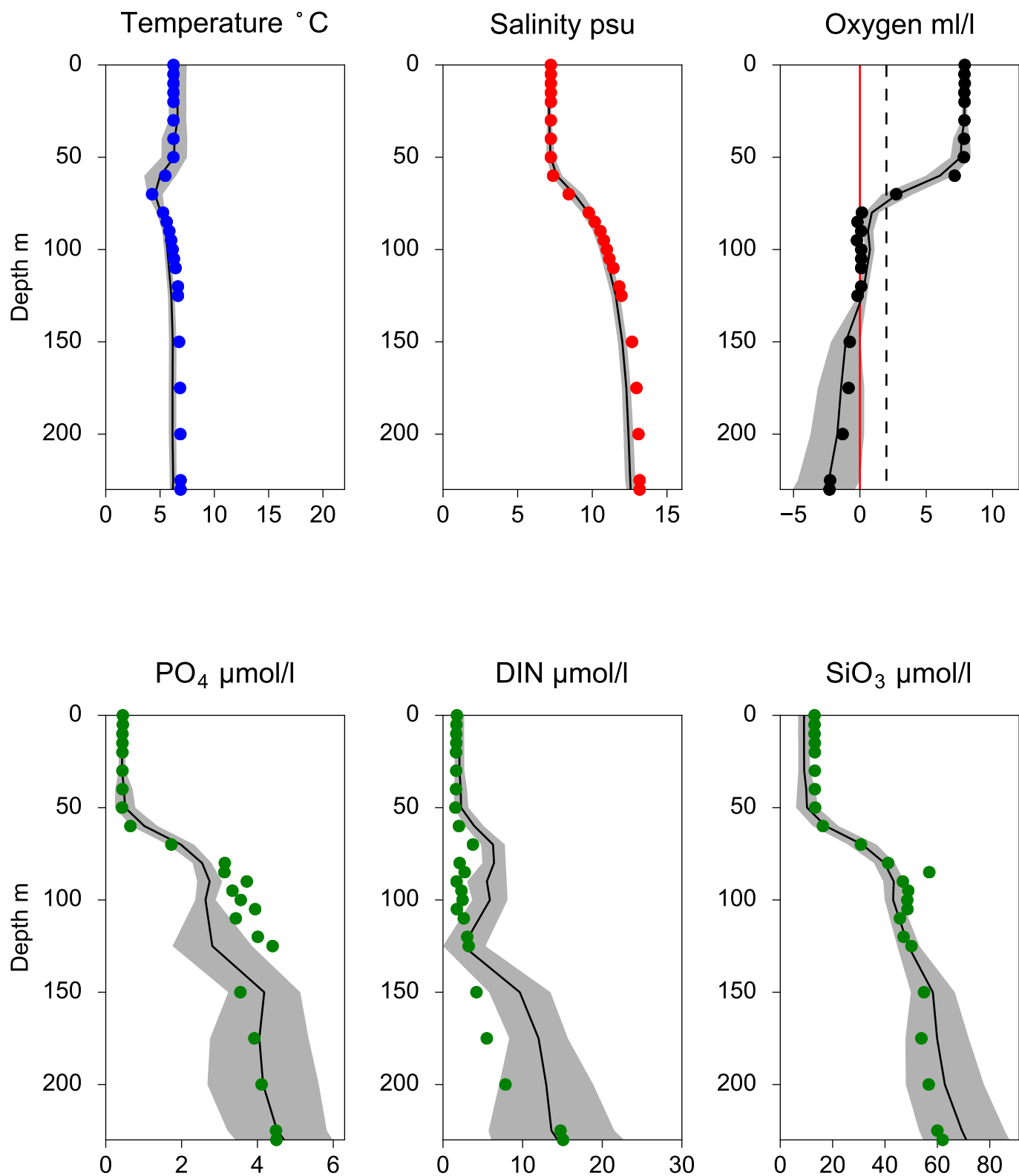


O₂ ml/l



Vertical profiles BY15 GOTLANDSDJ December

— Mean 2001-2015 St.Dev. • 2018-12-05



STATION BY10 SURFACE WATER (0-10 m)

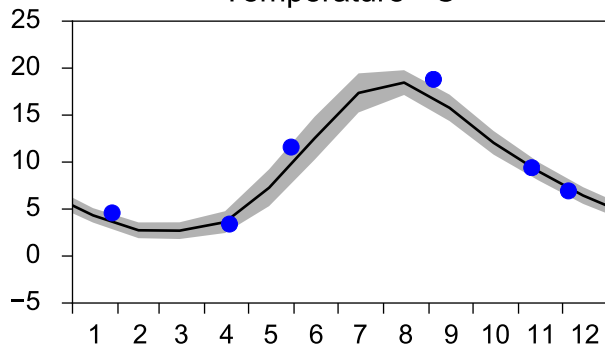
Annual Cycles

— Mean 2001-2015

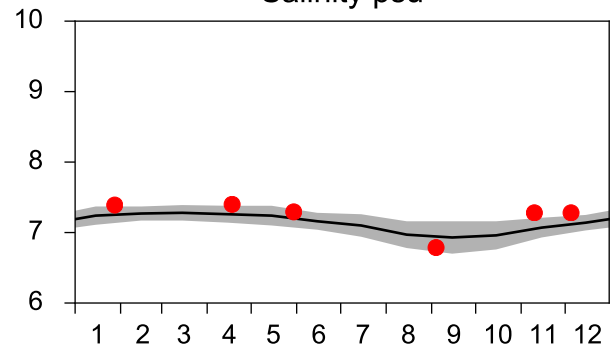
■ St.Dev.

● 2018

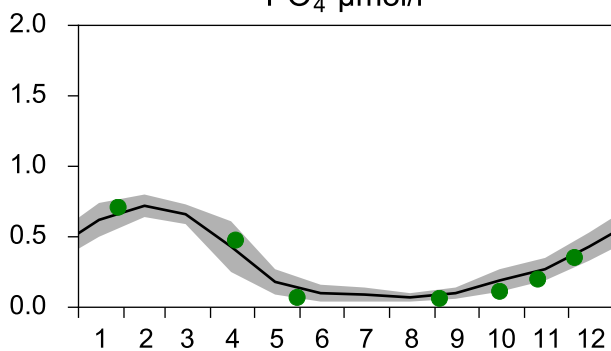
Temperature °C



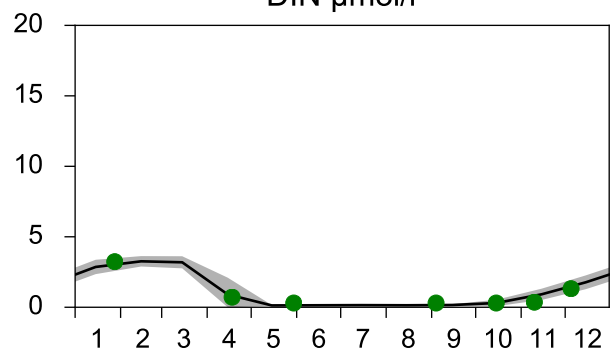
Salinity psu



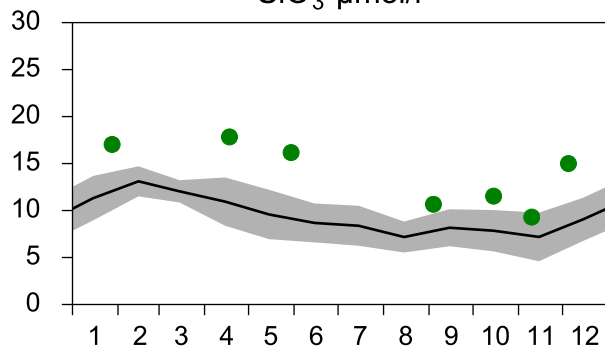
PO₄ µmol/l



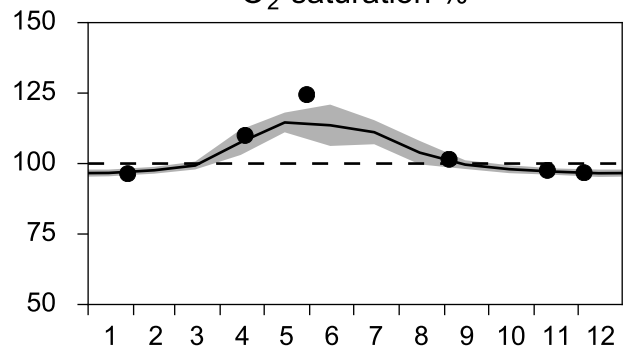
DIN µmol/l



SiO₃ µmol/l

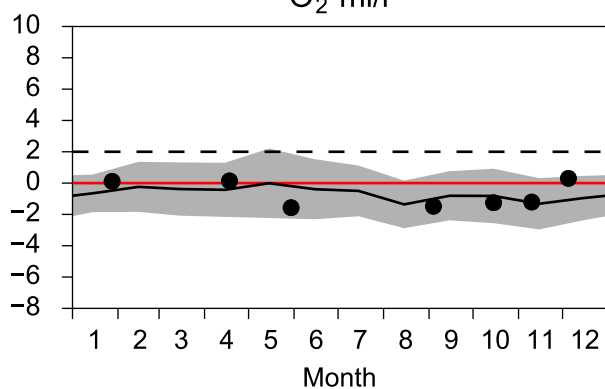


O₂ saturation %

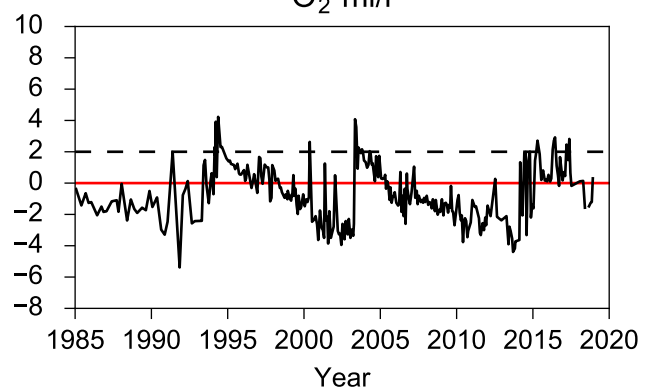


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

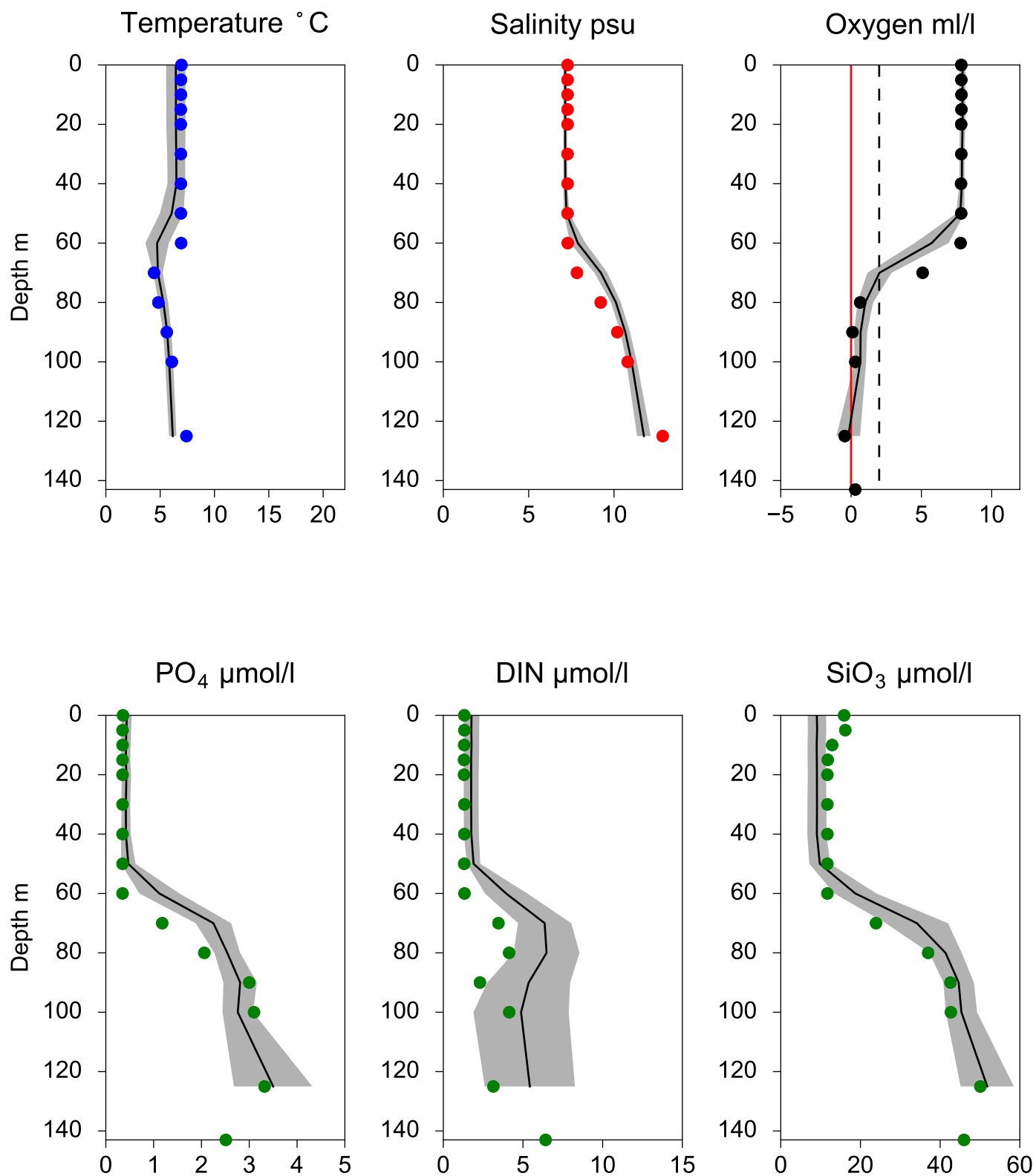


O₂ ml/l



Vertical profiles BY10 December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-05



STATION BCS III-10 SURFACE WATER (0-10 m)

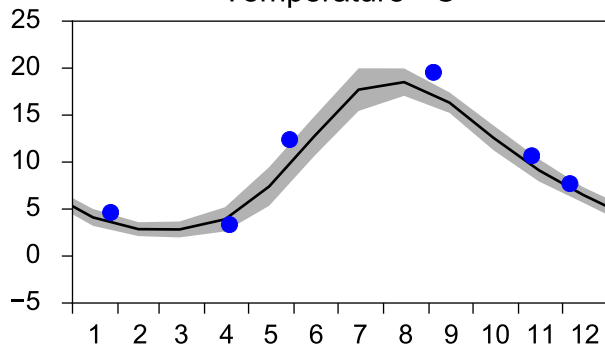
Annual Cycles

— Mean 2001-2015

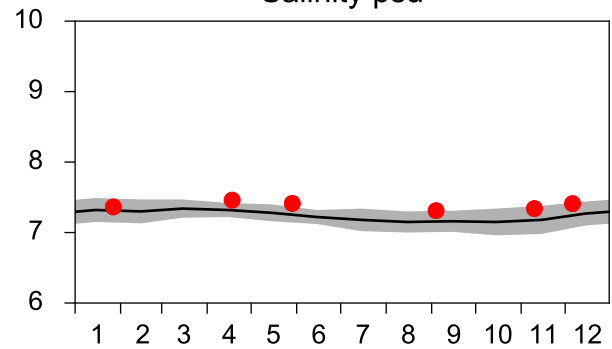
■ St.Dev.

● 2018

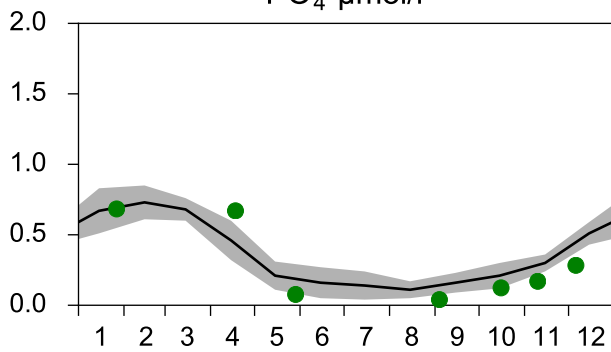
Temperature °C



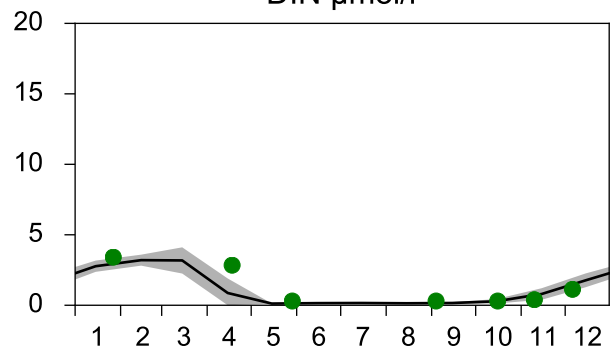
Salinity psu



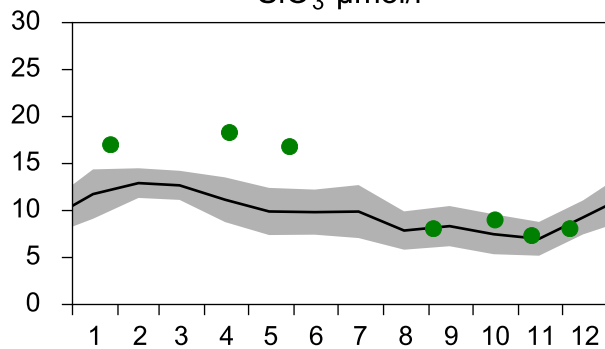
PO₄ µmol/l



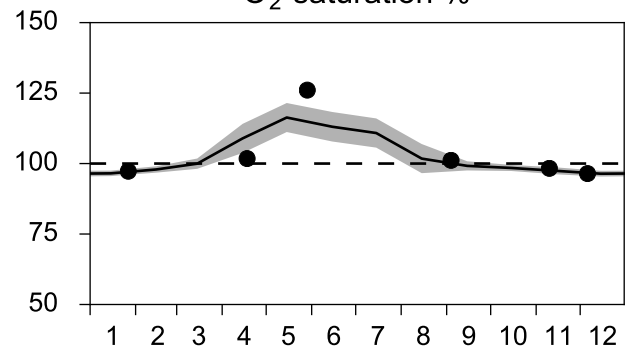
DIN µmol/l



SiO₃ µmol/l

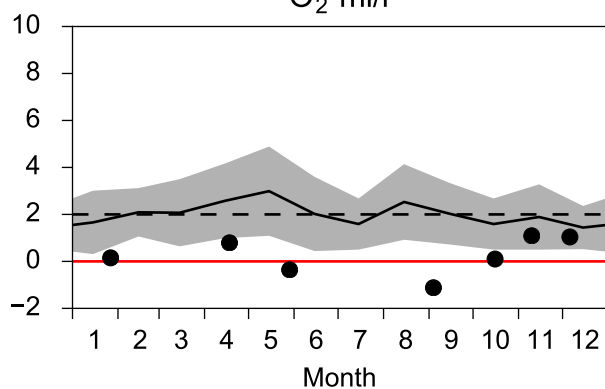


O₂ saturation %

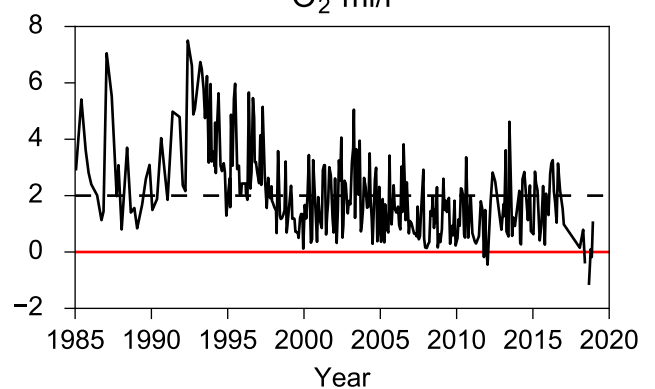


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

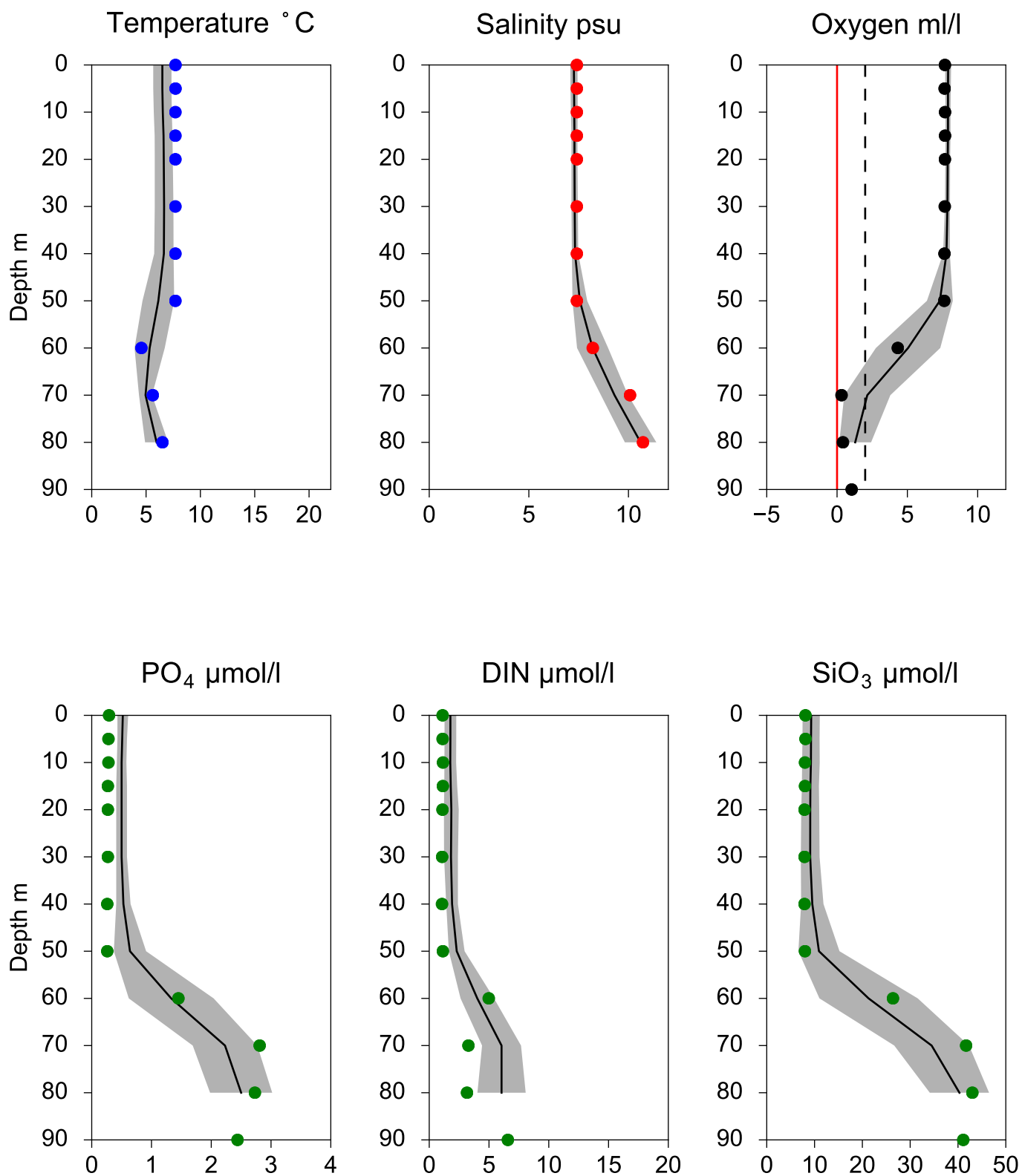


O₂ ml/l



Vertical profiles BCS III-10 December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-06



STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

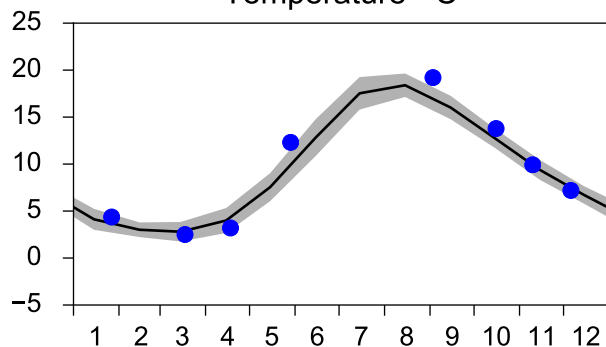
Annual Cycles

— Mean 2001-2015

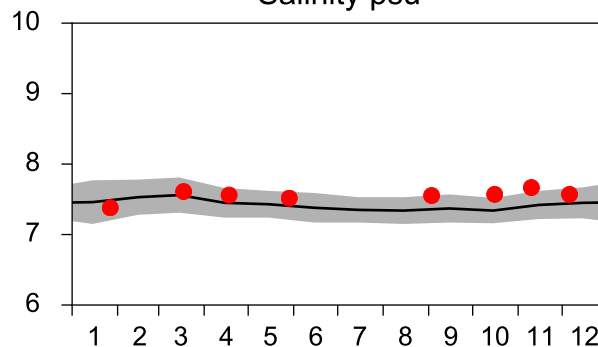
■ St.Dev.

● 2018

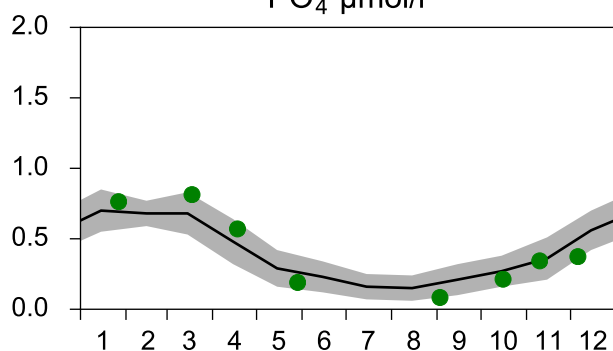
Temperature °C



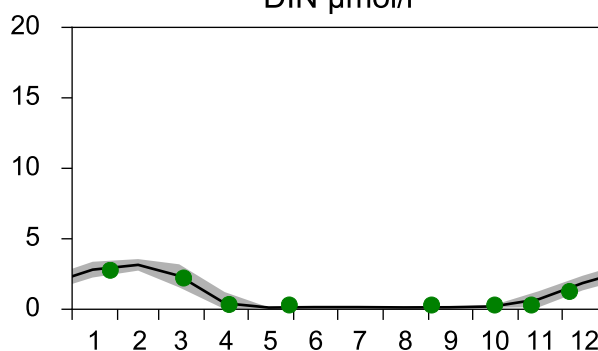
Salinity psu



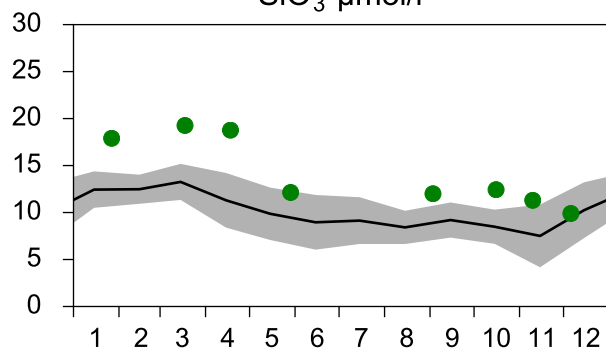
PO₄ µmol/l



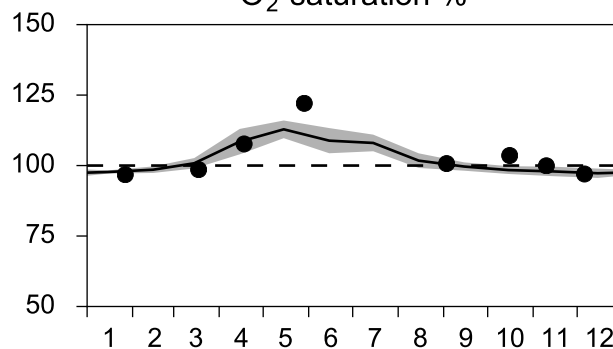
DIN µmol/l



SiO₃ µmol/l

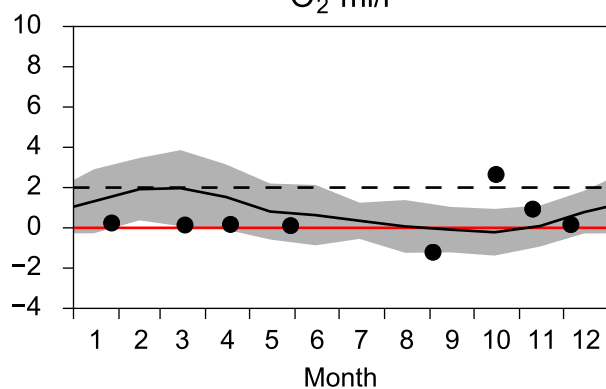


O₂ saturation %

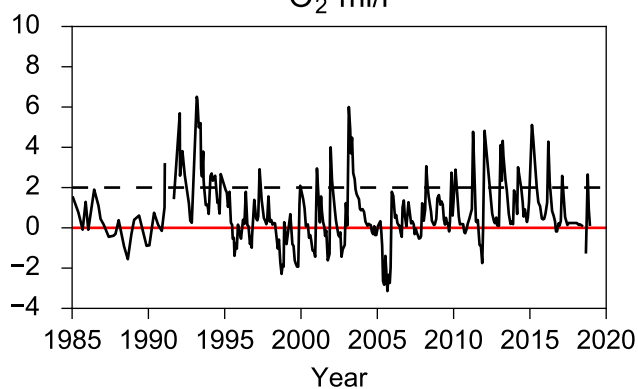


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

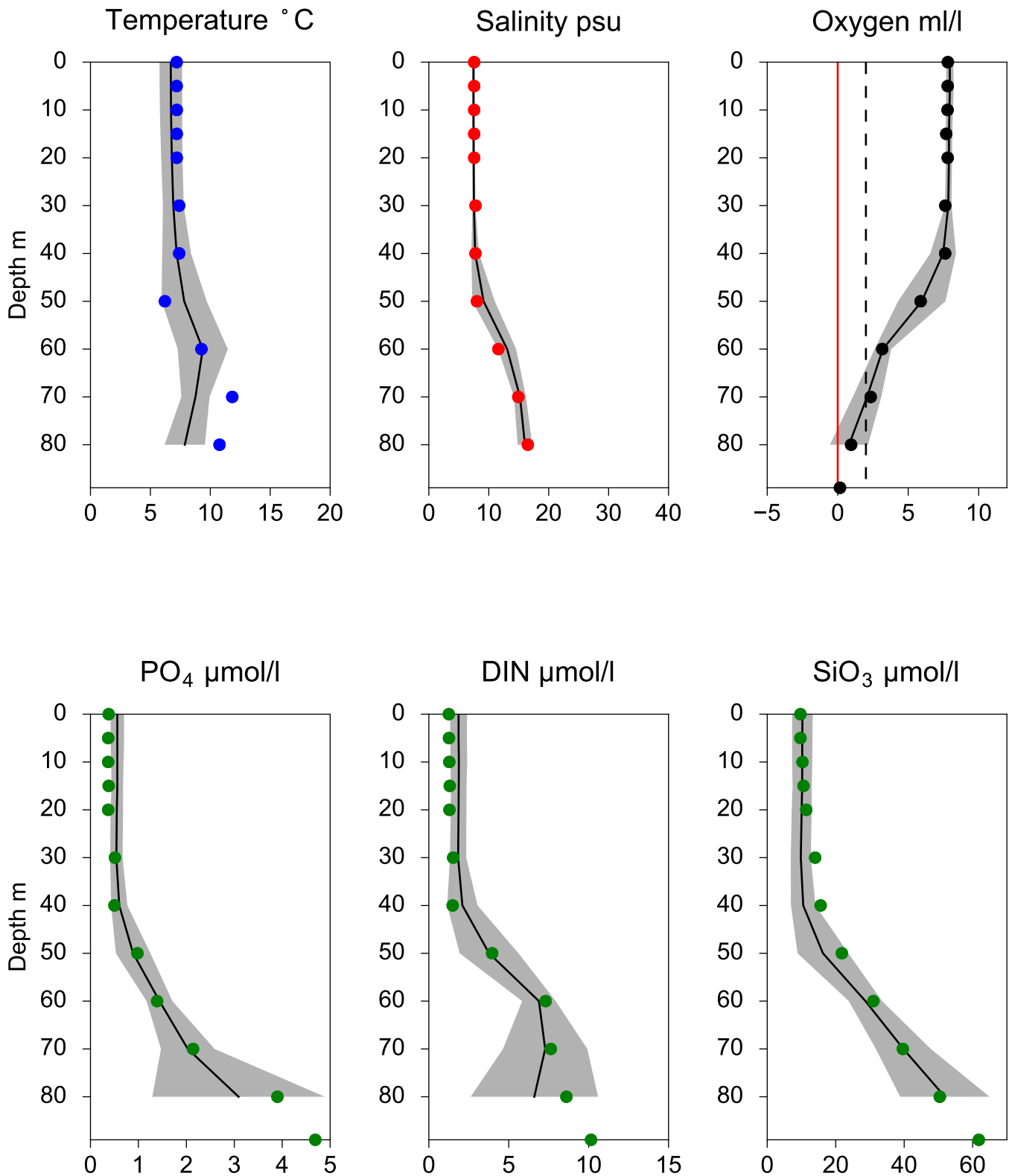


O₂ ml/l



Vertical profiles BY5 BORNHOLMSDJ December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-06



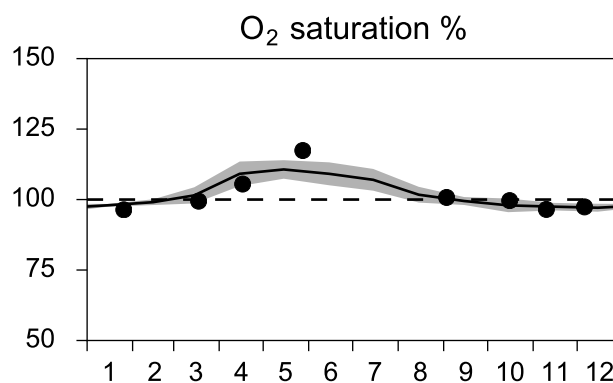
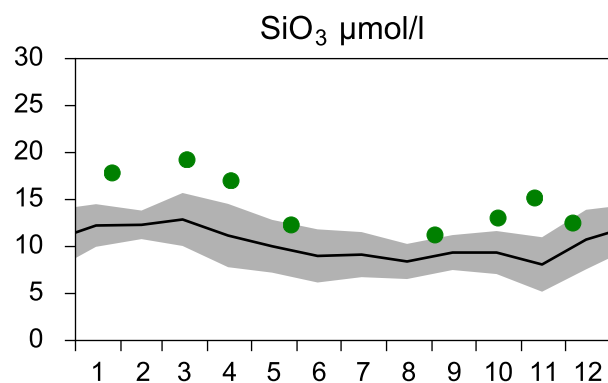
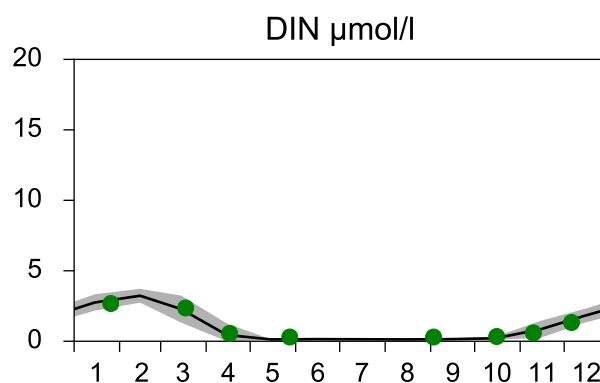
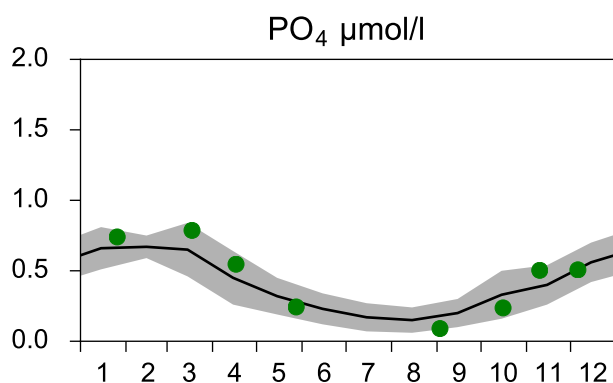
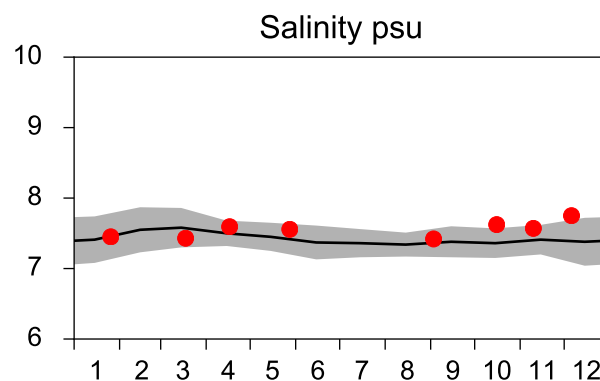
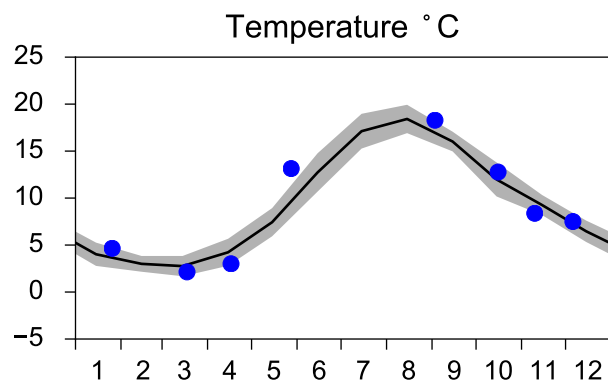
STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

Annual Cycles

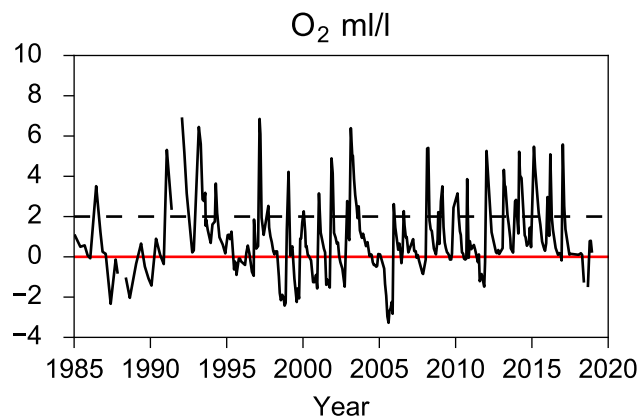
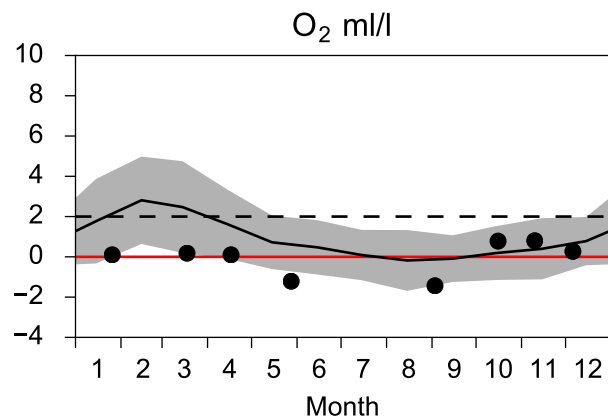
— Mean 2001-2015

■ St.Dev.

● 2018



OXYGEN IN BOTTOM WATER (depth >= 80 m)

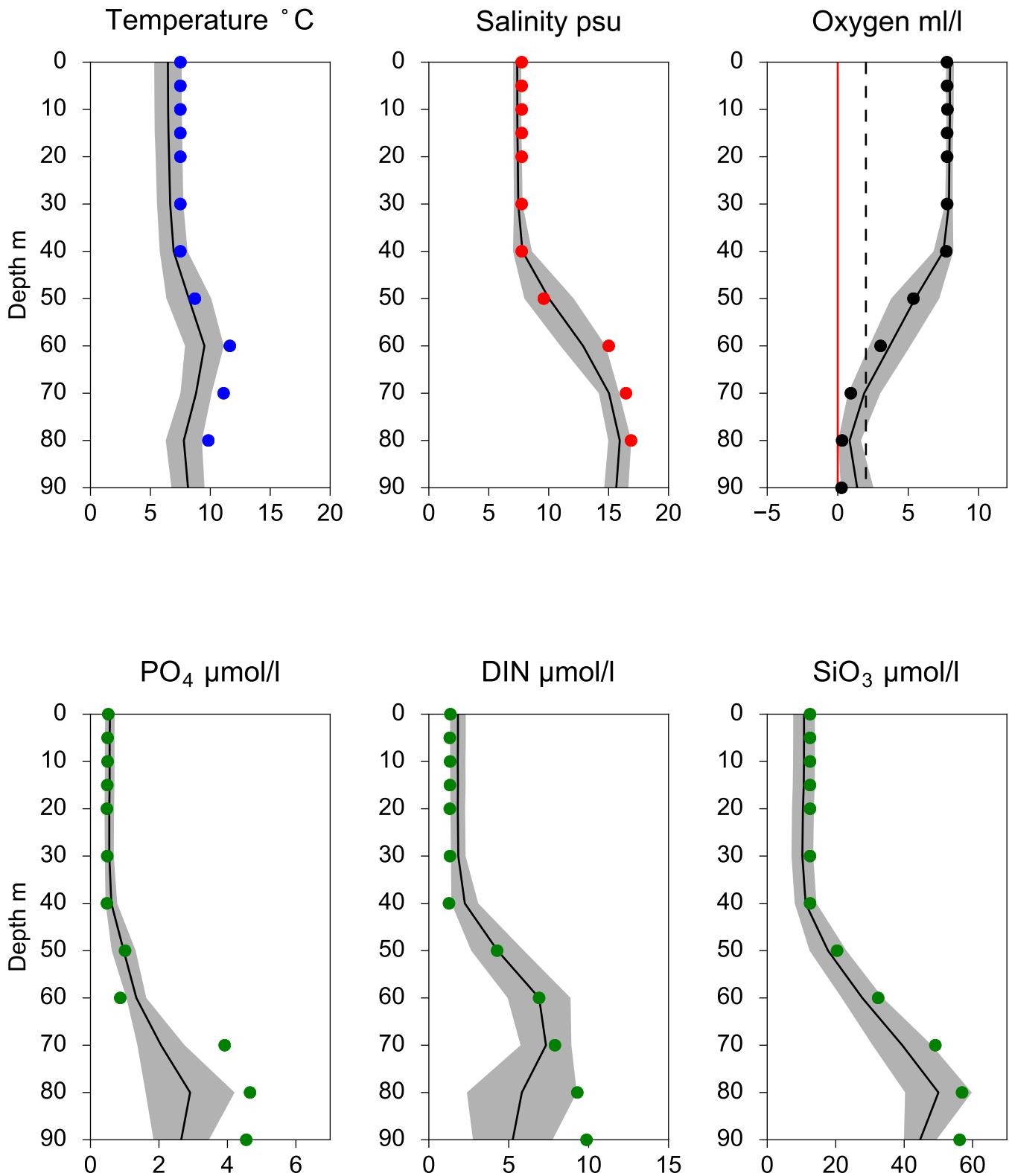


Vertical profiles BY4 CHRISTIANSÖ December

— Mean 2001-2015

■ St.Dev.

● 2018-12-06



STATION BY2 ARKONA SURFACE WATER (0-10 m)

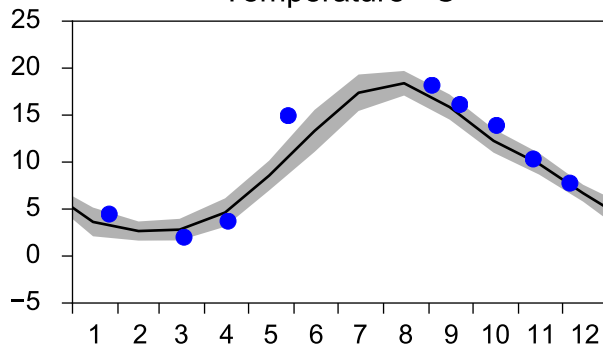
Annual Cycles

— Mean 2001-2015

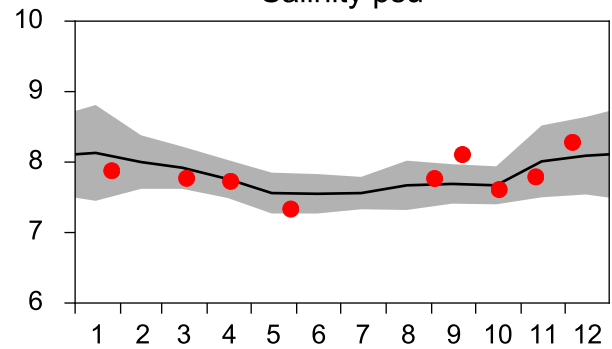
■ St.Dev.

● 2018

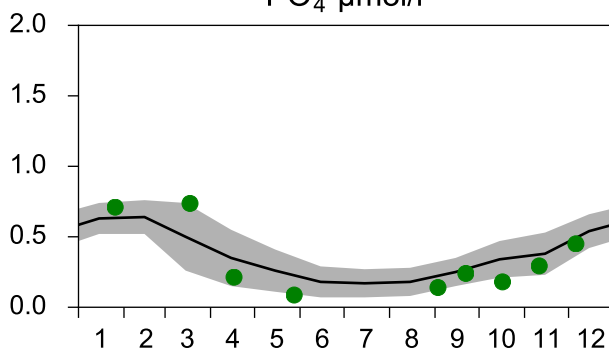
Temperature °C



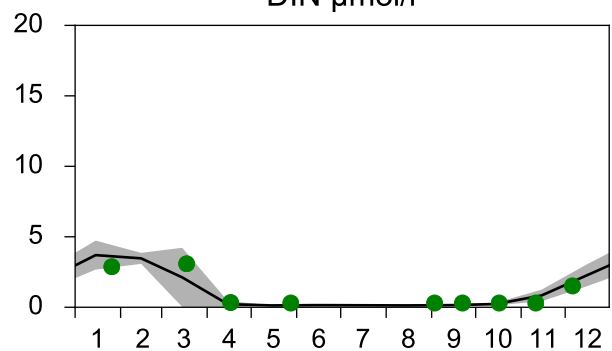
Salinity psu



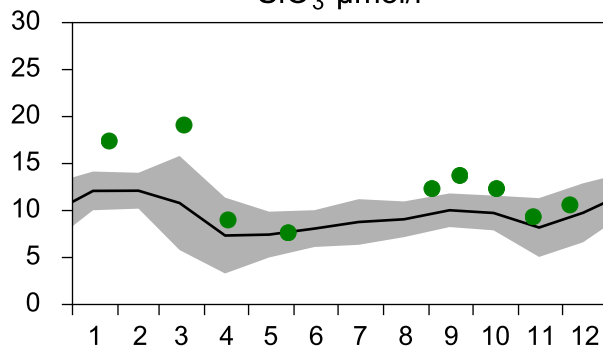
PO₄ µmol/l



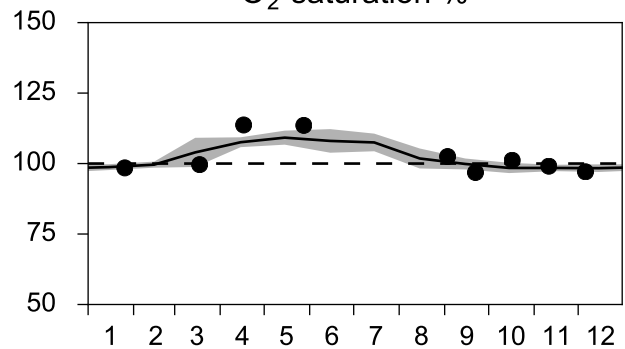
DIN µmol/l



SiO₃ µmol/l

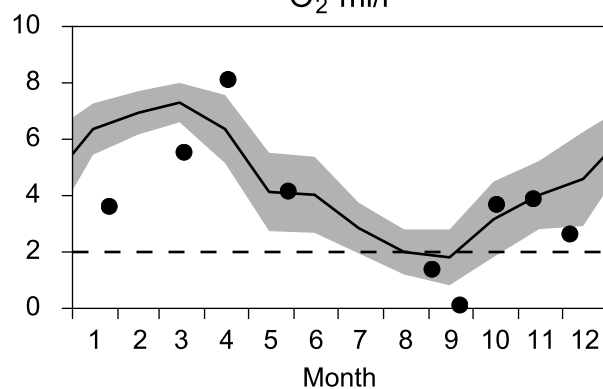


O₂ saturation %

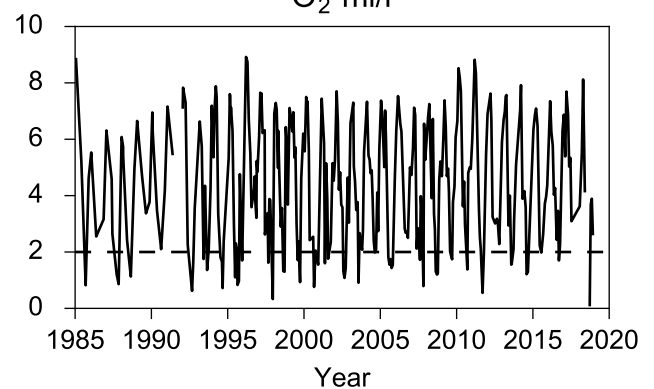


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

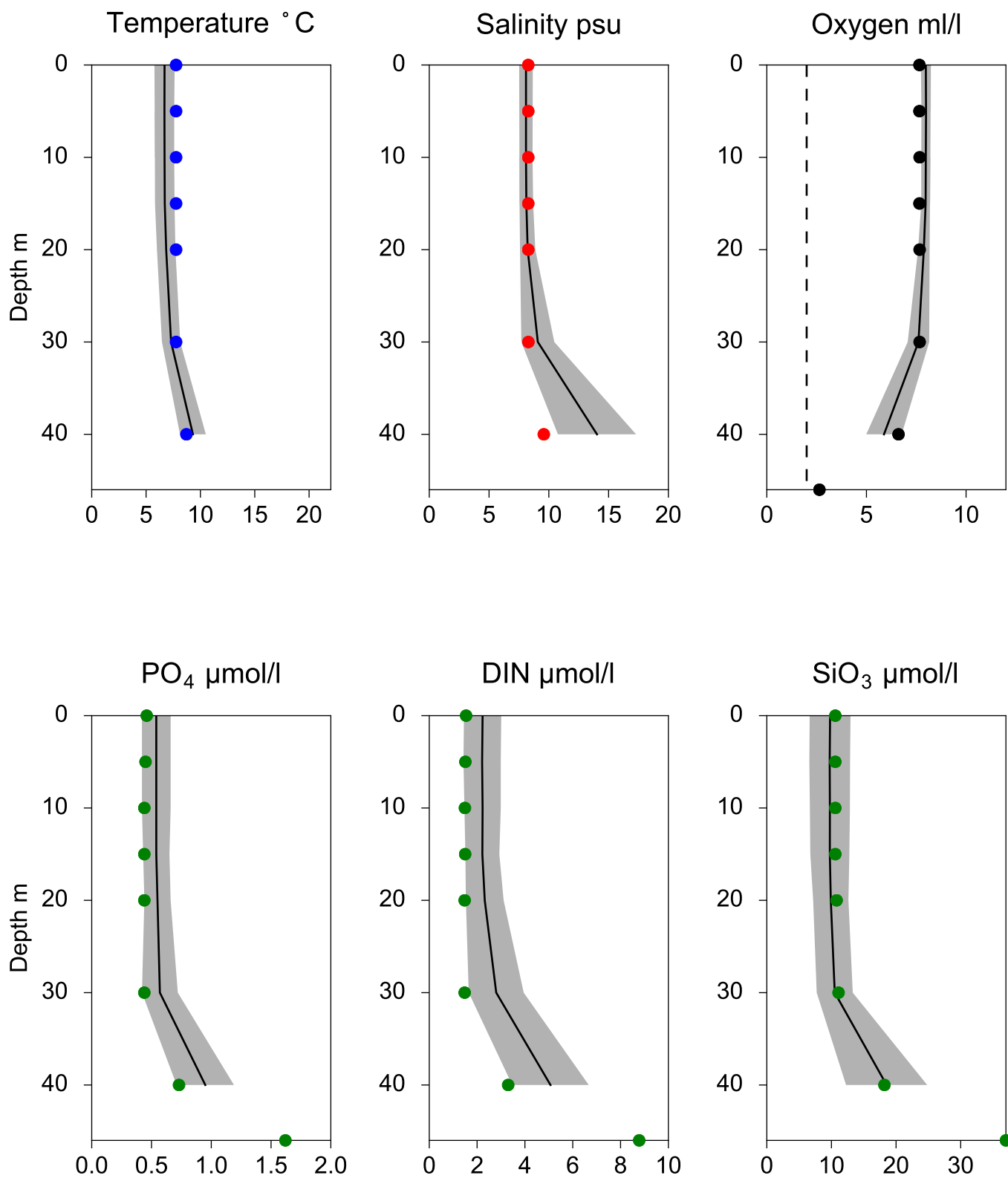


O₂ ml/l



Vertical profiles BY2 ARKONA December

— Mean 2001-2015 St.Dev. • 2018-12-06



STATION BY1 SURFACE WATER (0-10 m)

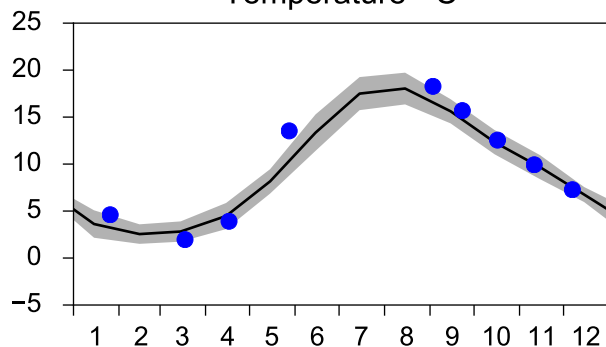
Annual Cycles

— Mean 2001-2015

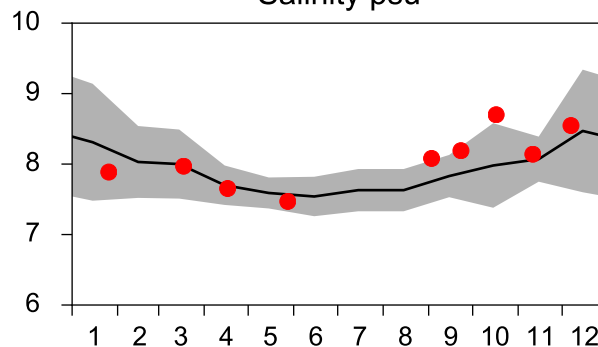
■ St.Dev.

● 2018

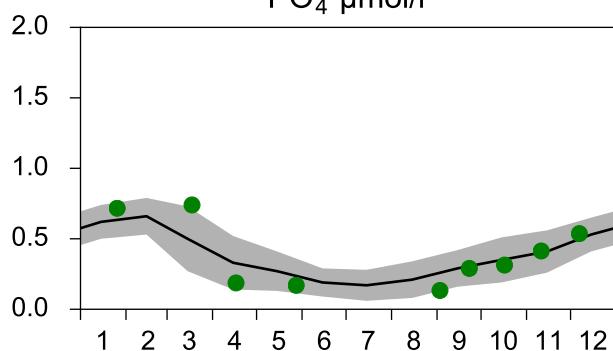
Temperature °C



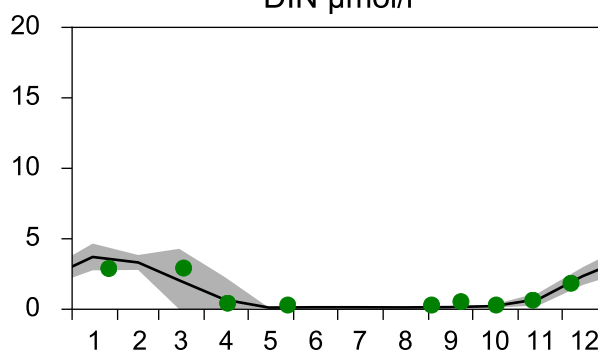
Salinity psu



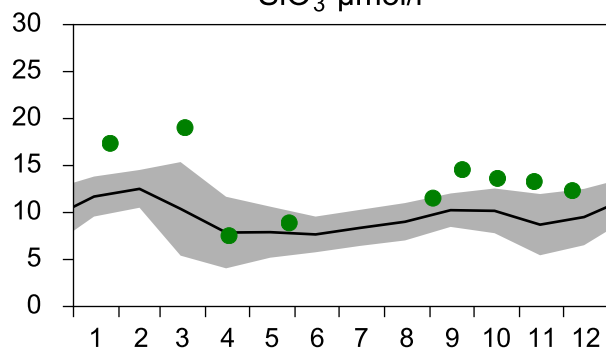
PO₄ µmol/l



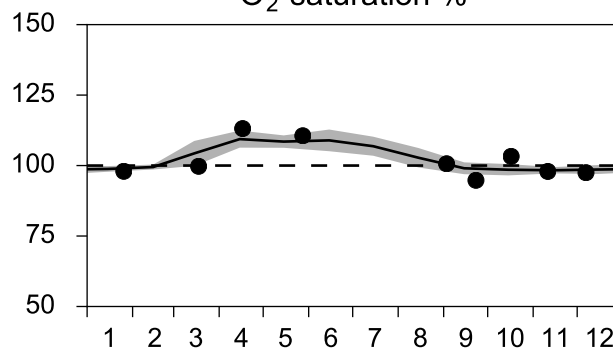
DIN µmol/l



SiO₃ µmol/l

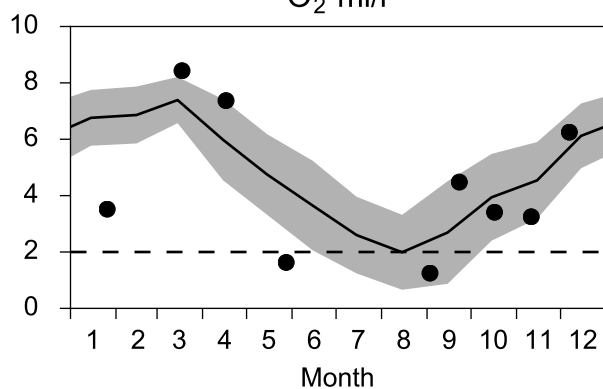


O₂ saturation %

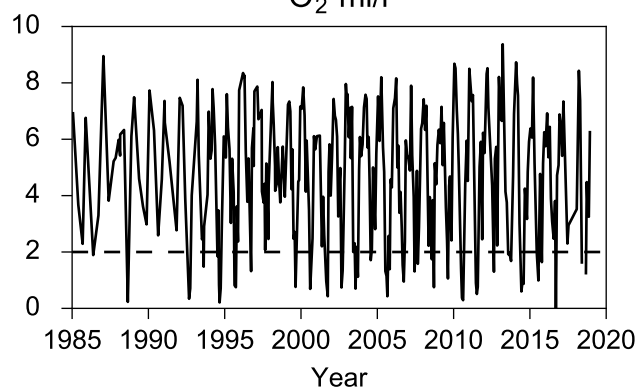


OXOGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

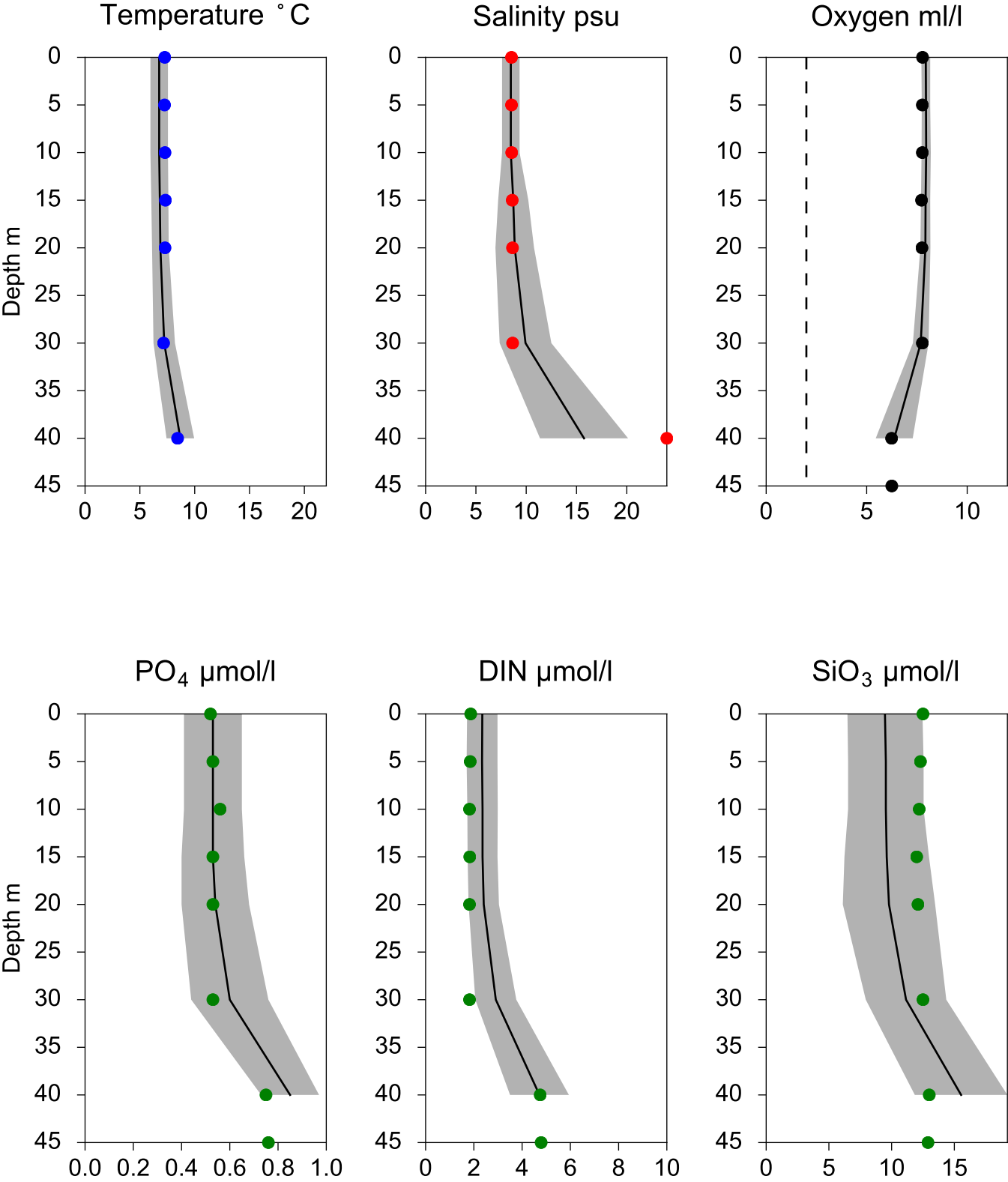


O₂ ml/l



Vertical profiles BY1
December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-07



STATION W LANDSKRONA SURFACE WATER (0-10 m)

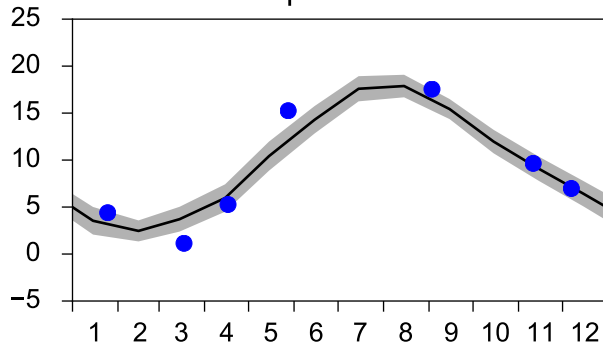
Annual Cycles

— Mean 2001-2015

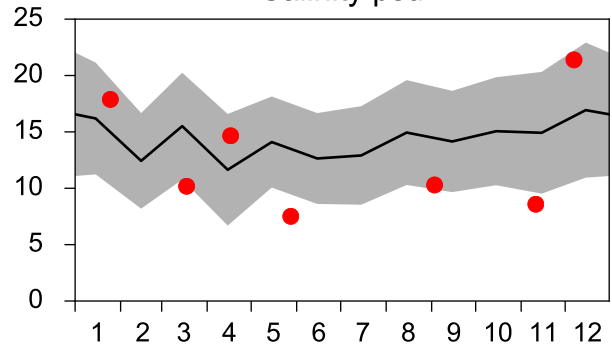
■ St.Dev.

● 2018

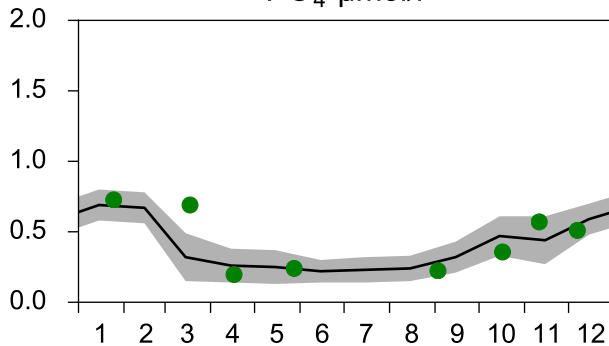
Temperature °C



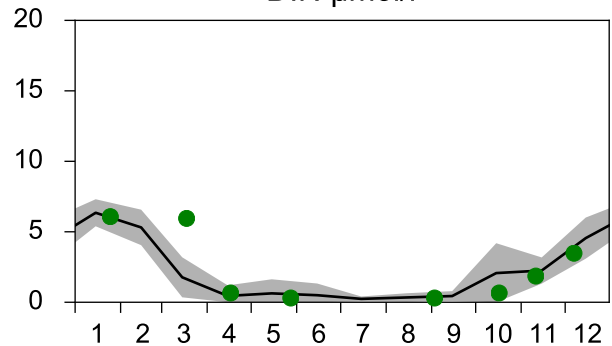
Salinity psu



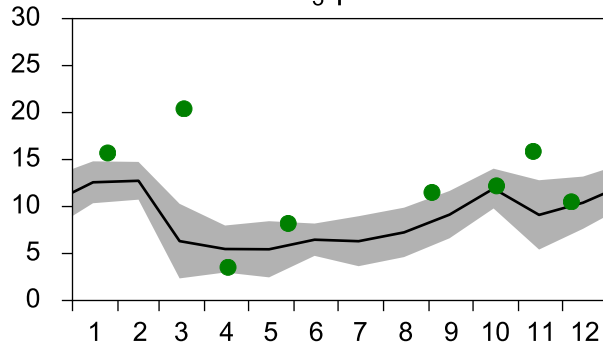
PO₄ µmol/l



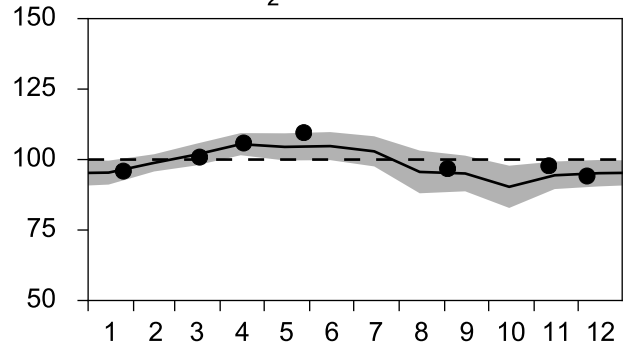
DIN µmol/l



SiO₃ µmol/l

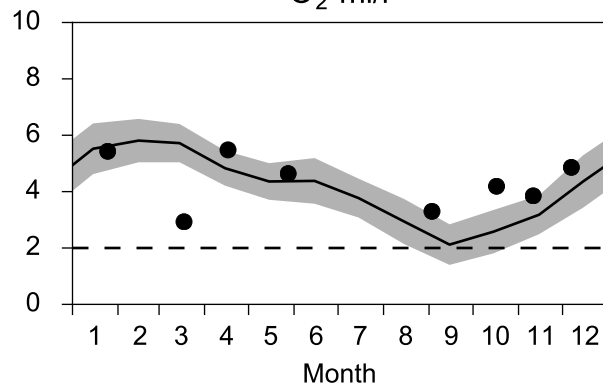


O₂ saturation %

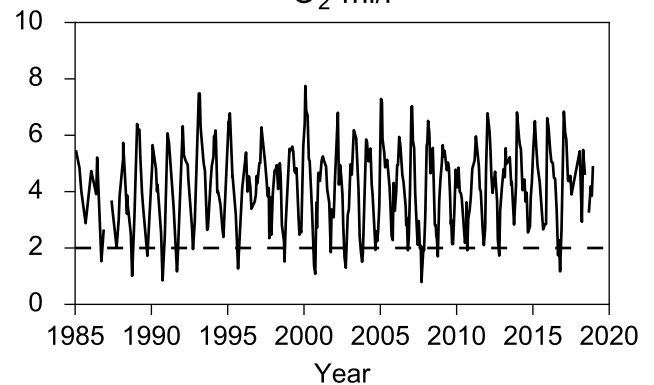


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

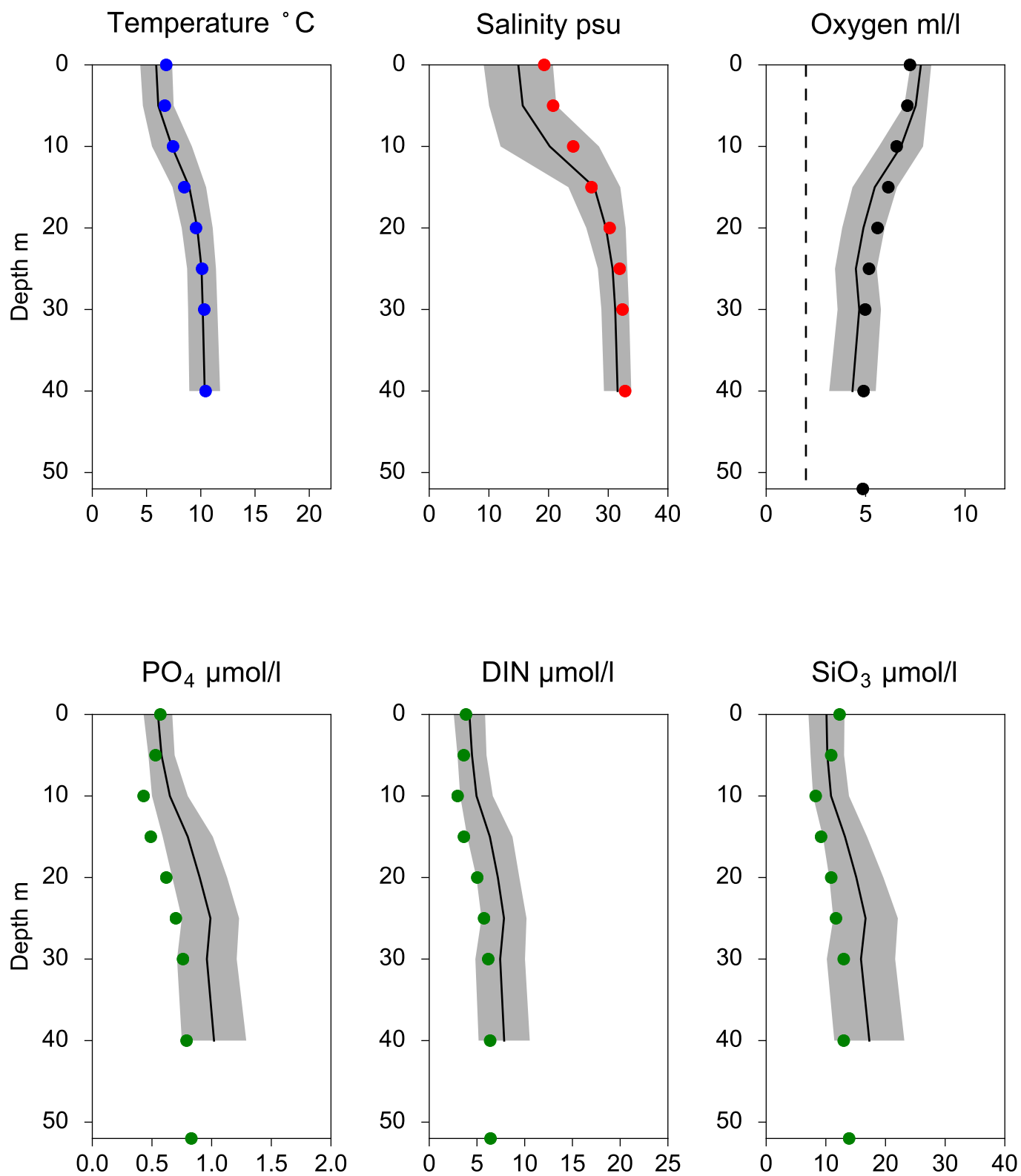


O₂ ml/l



Vertical profiles W LANDSKRONA December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-07



STATION ANHOLT E SURFACE WATER (0-10 m)

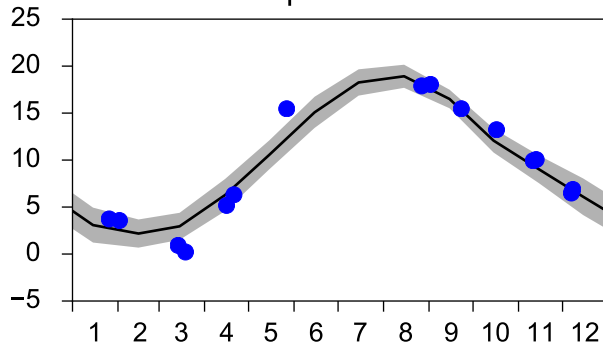
Annual Cycles

— Mean 2001-2015

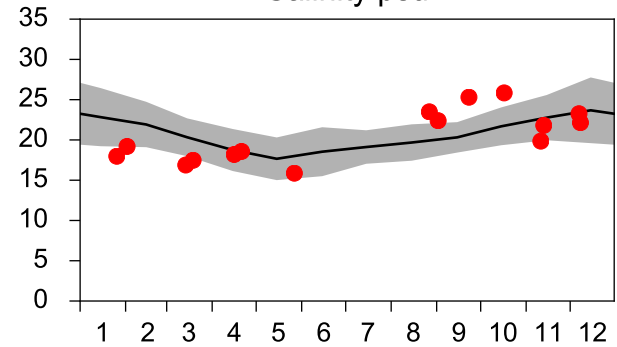
■ St.Dev.

● 2018

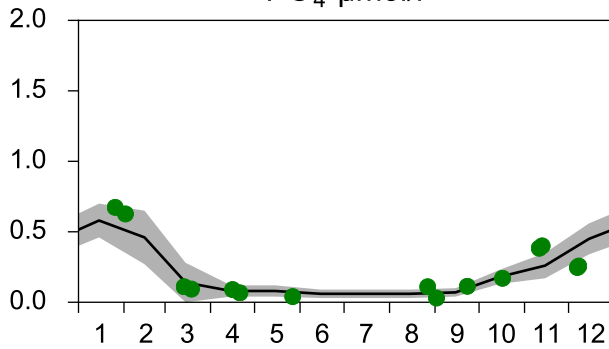
Temperature °C



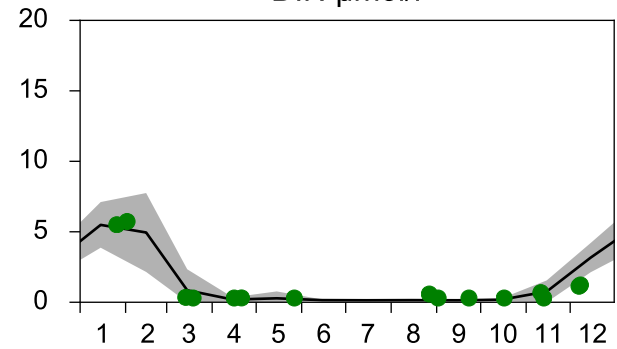
Salinity psu



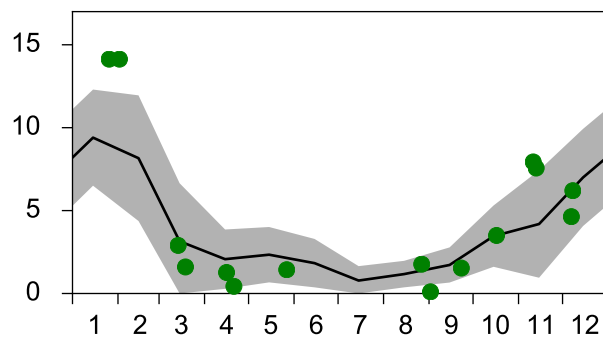
PO₄ µmol/l



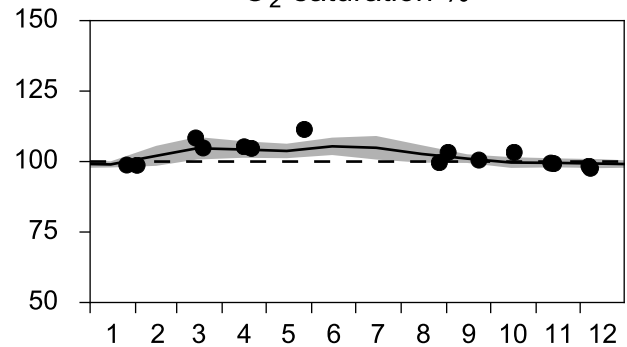
DIN µmol/l



SiO₃ µmol/l

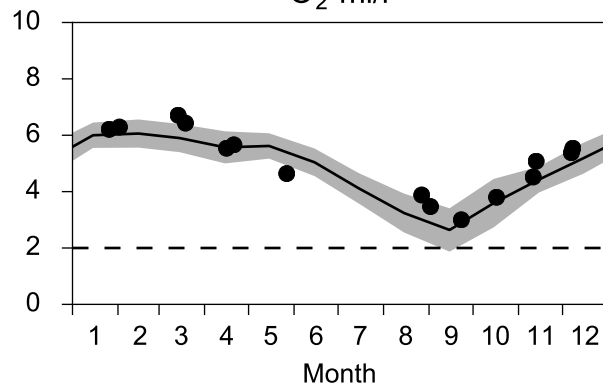


O₂ saturation %

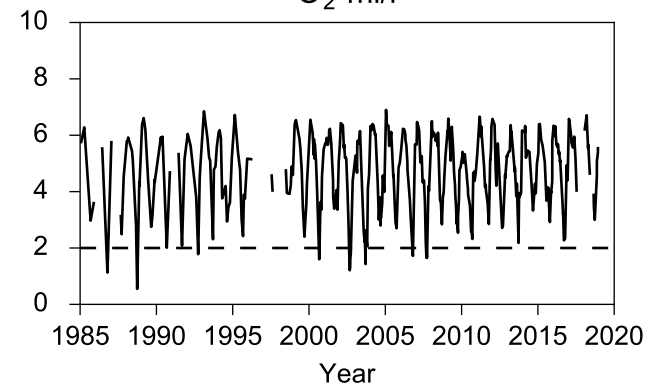


OXYGEN IN BOTTOM WATER (depth >= 52 m)

O₂ ml/l

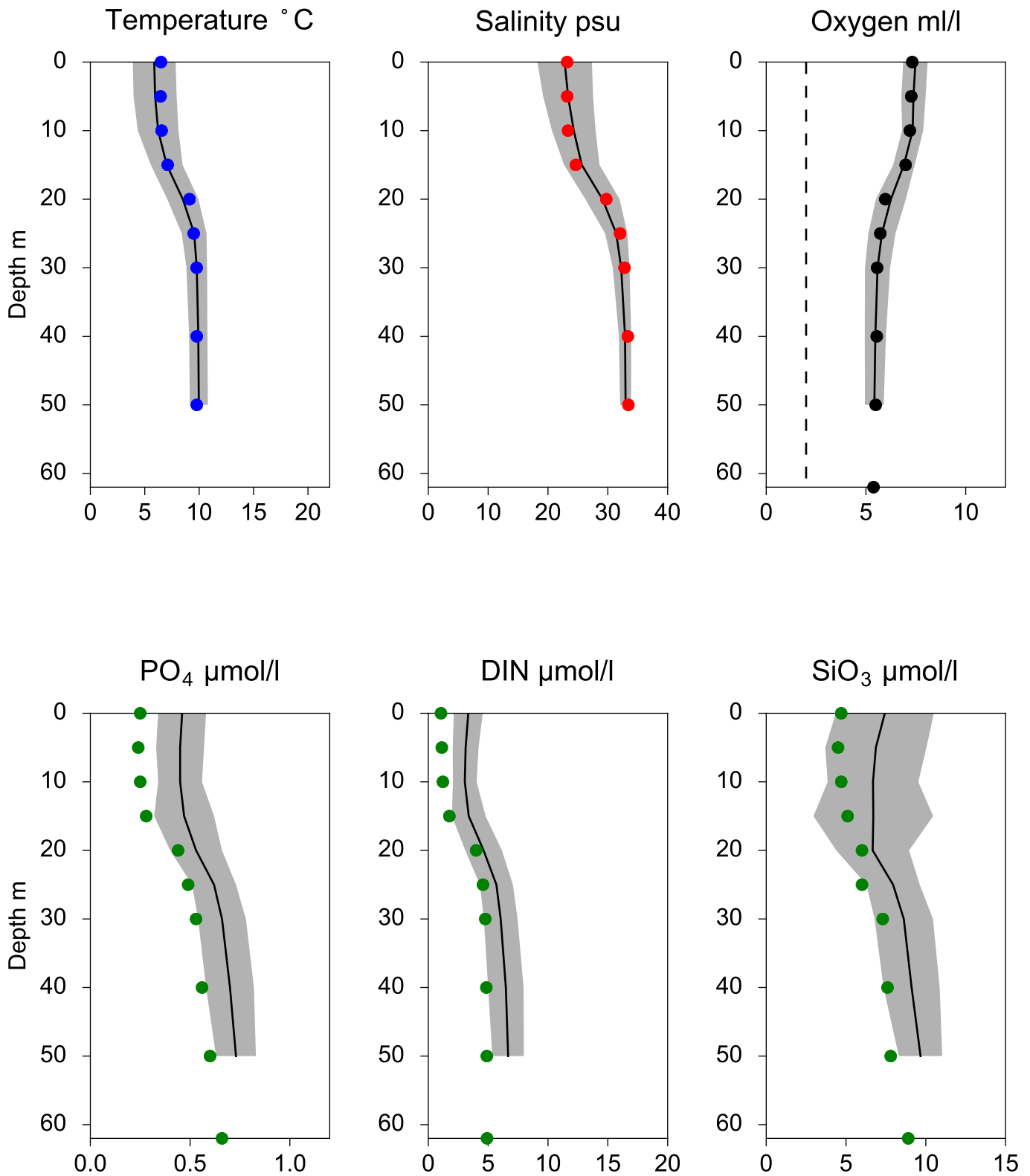


O₂ ml/l



Vertical profiles ANHOLT E December

— Mean 2001-2015 St.Dev. • 2018-12-07



STATION FLADEN SURFACE WATER (0-10 m)

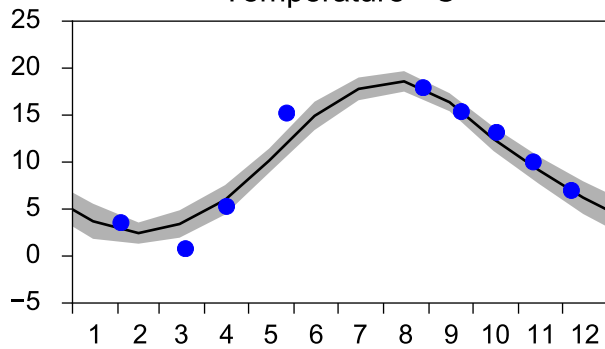
Annual Cycles

— Mean 2001-2015

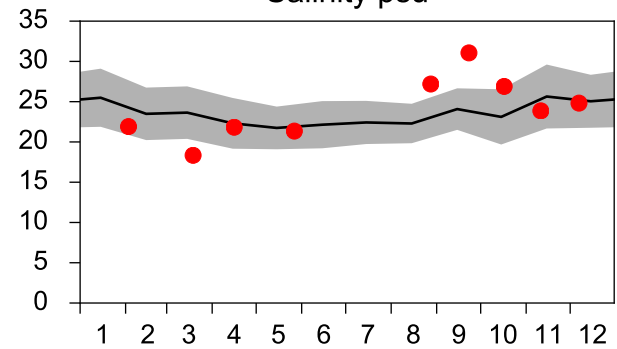
■ St.Dev.

● 2018

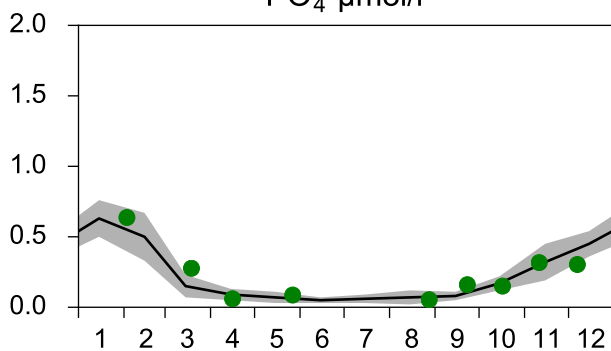
Temperature °C



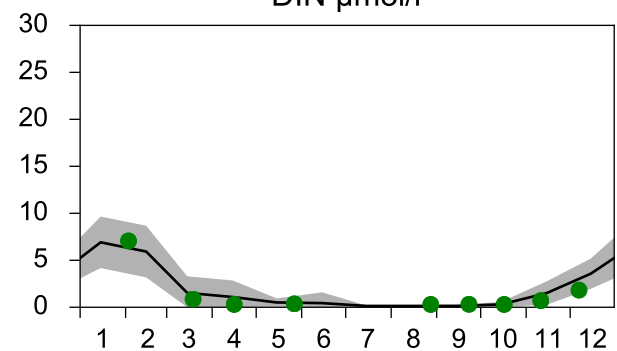
Salinity psu



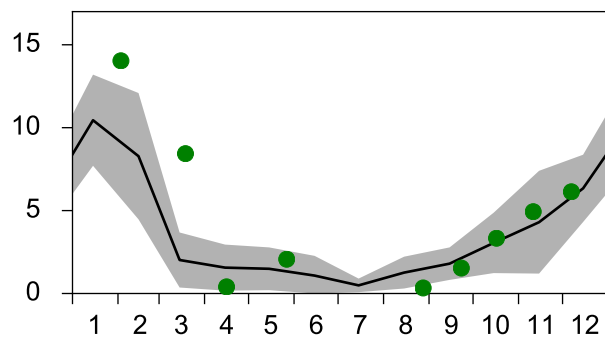
PO₄ µmol/l



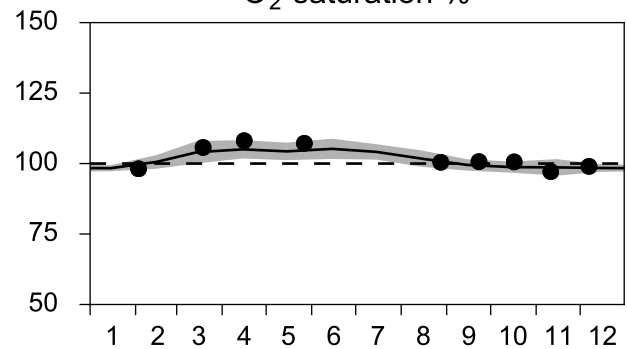
DIN µmol/l



SiO₃ µmol/l

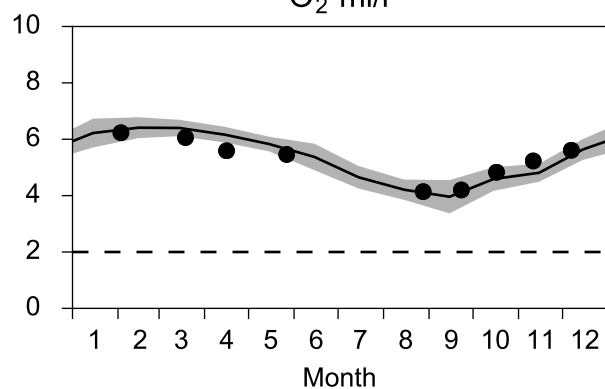


O₂ saturation %

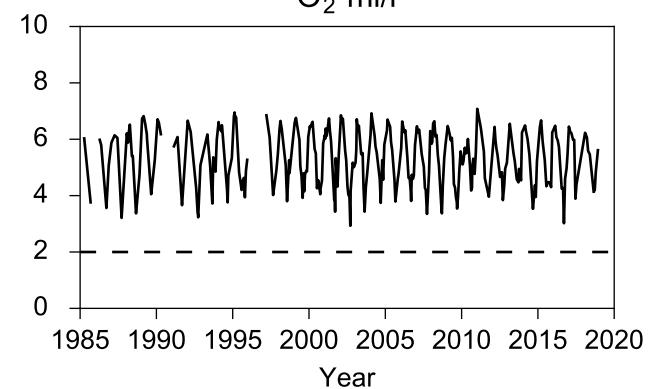


OXOGEN IN BOTTOM WATER (depth >= 74 m)

O₂ ml/l

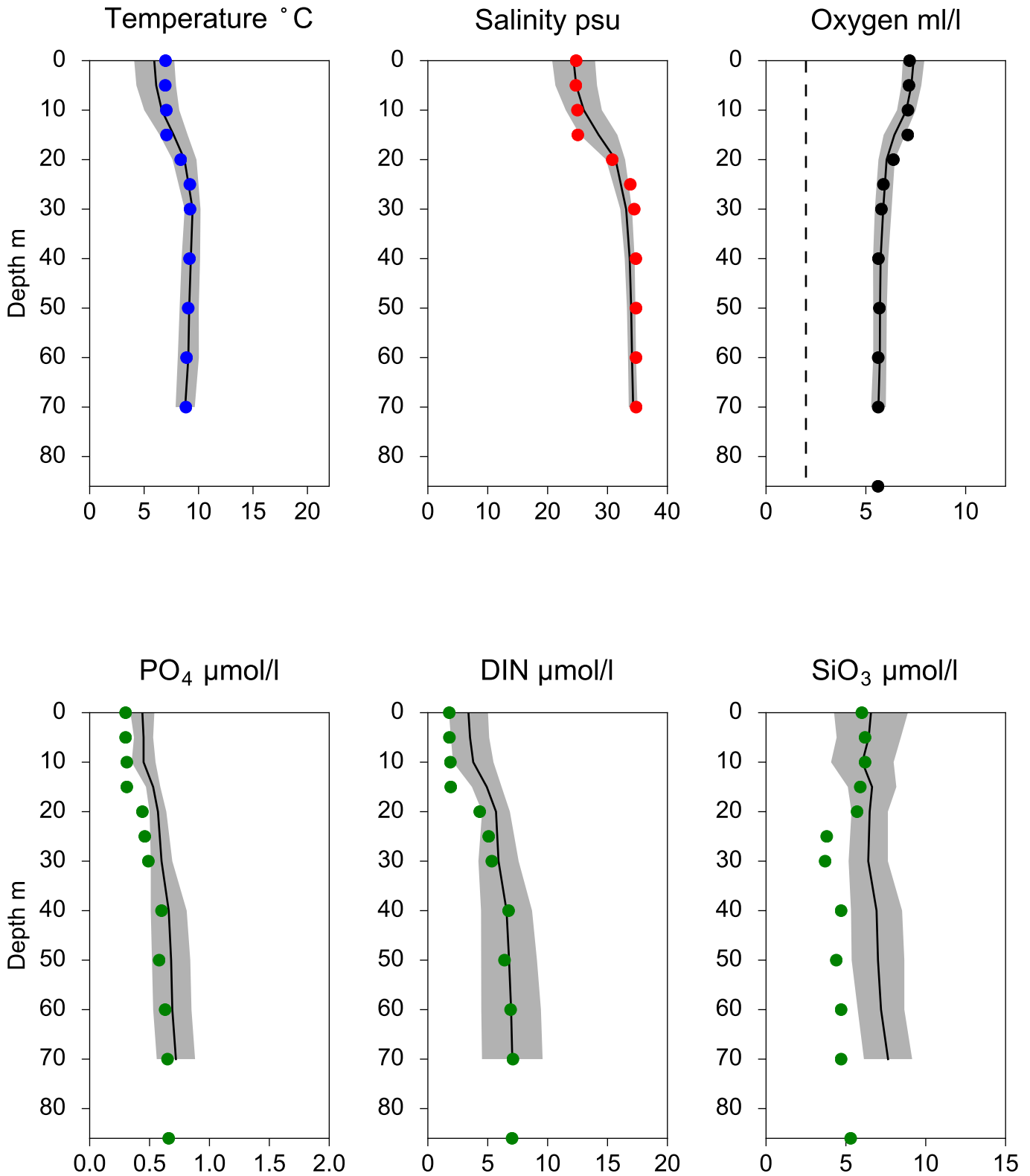


O₂ ml/l



Vertical profiles FLADEN December

— Mean 2001-2015 St.Dev. • 2018-12-07



STATION P2 SURFACE WATER (0-10 m)

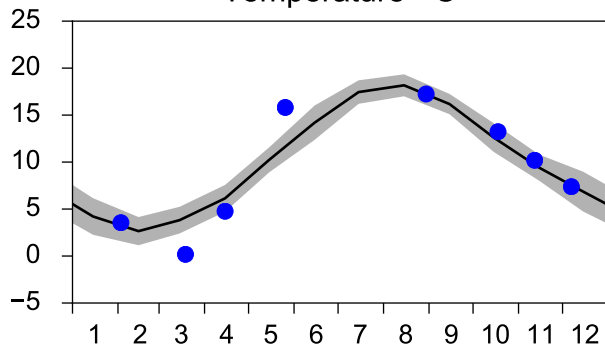
Annual Cycles

— Mean 2001-2015

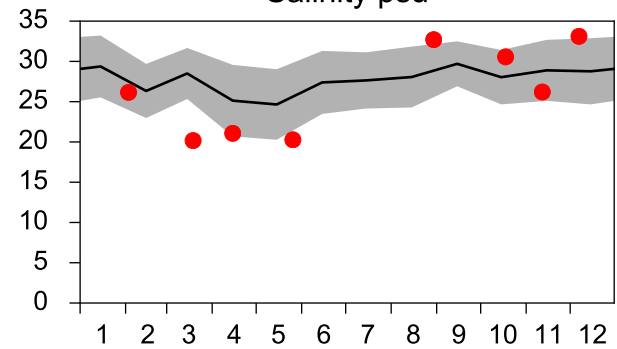
■ St.Dev.

● 2018

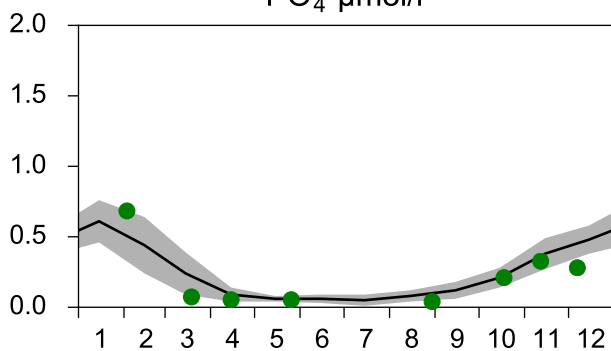
Temperature °C



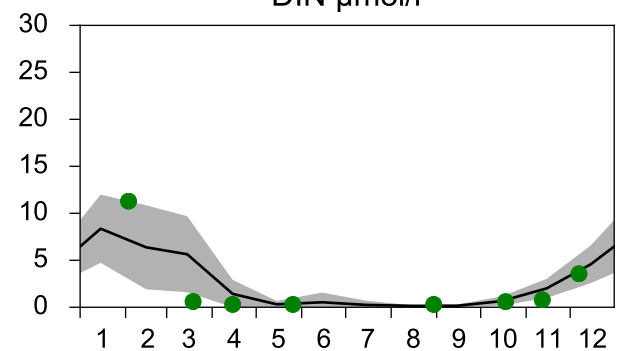
Salinity psu



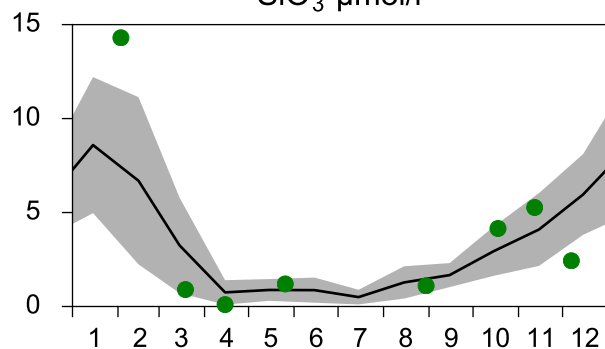
PO₄ µmol/l



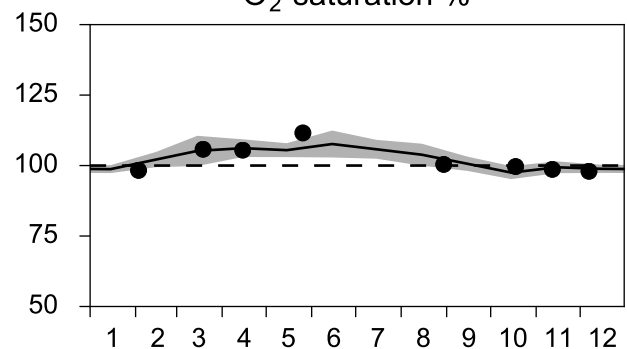
DIN µmol/l



SiO₃ µmol/l

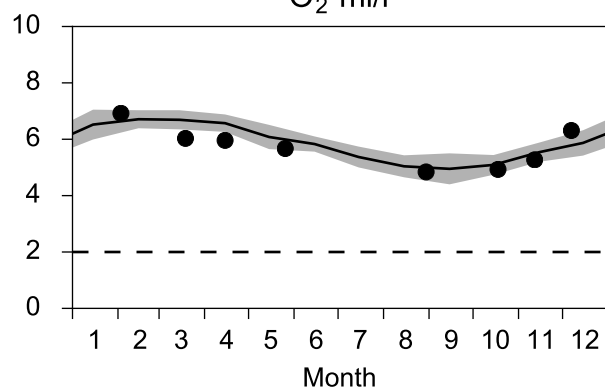


O₂ saturation %

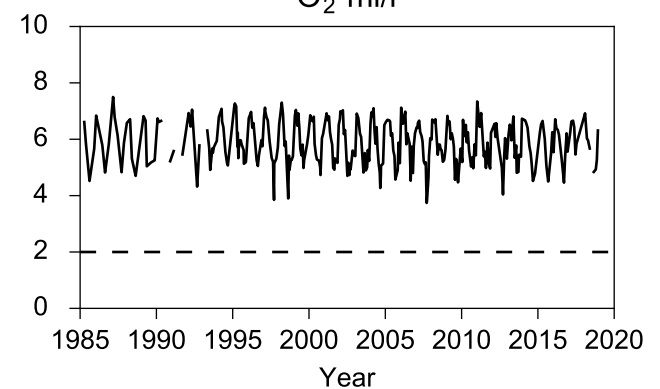


OXYGEN IN BOTTOM WATER (depth >= 75 m)

O₂ ml/l



O₂ ml/l

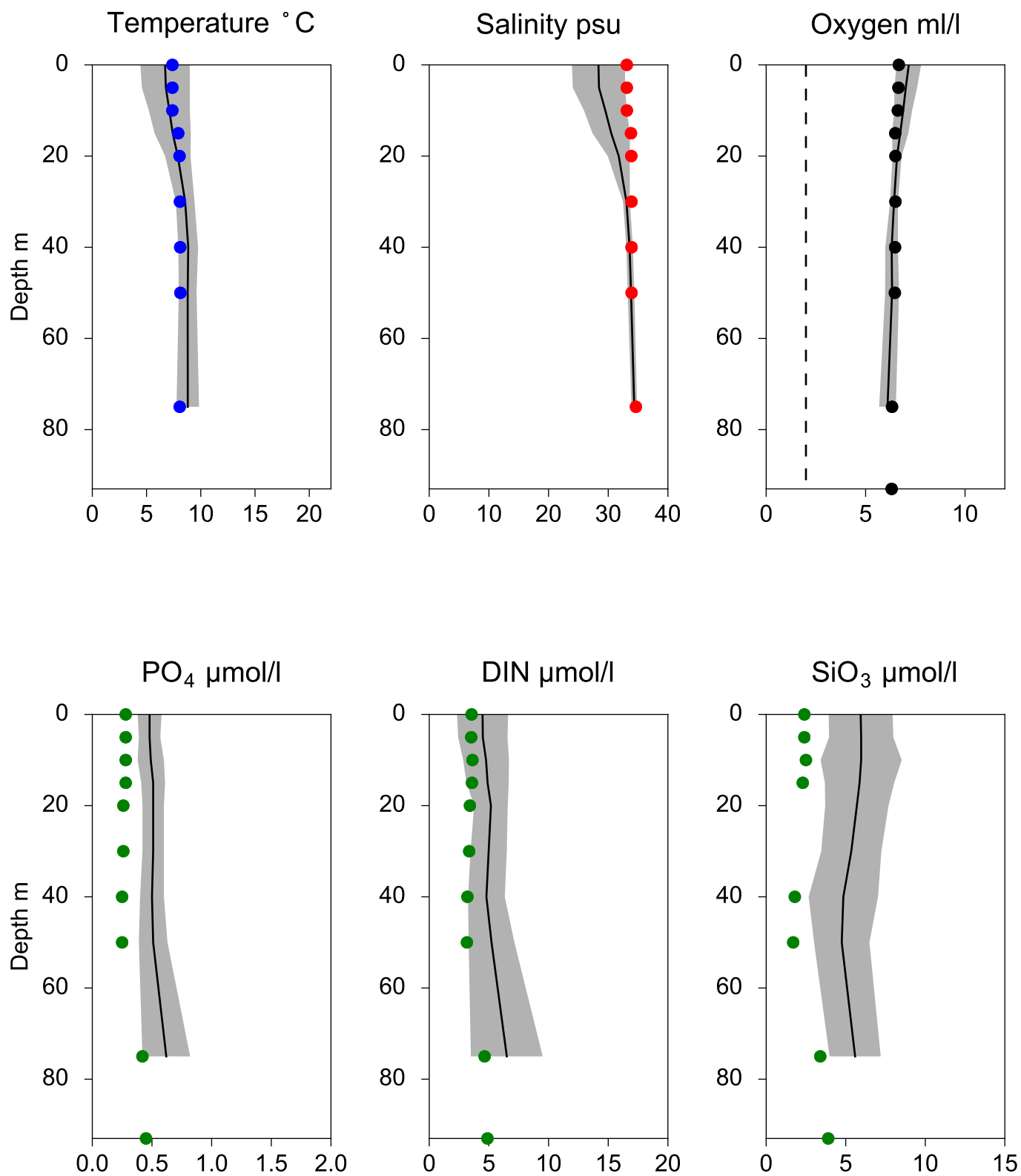


Vertical profiles P2 December

— Mean 2001-2015

■ St.Dev.

● 2018-12-07



STATION Å17 SURFACE WATER (0-10 m)

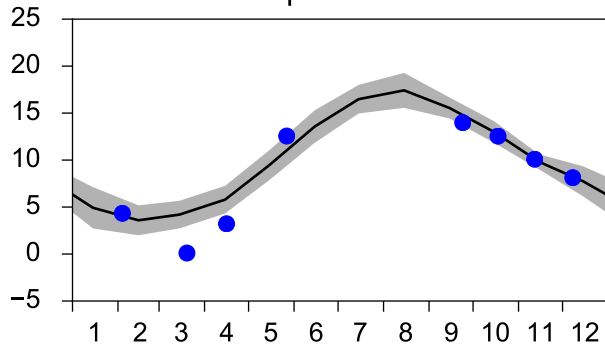
Annual Cycles

— Mean 2001-2015

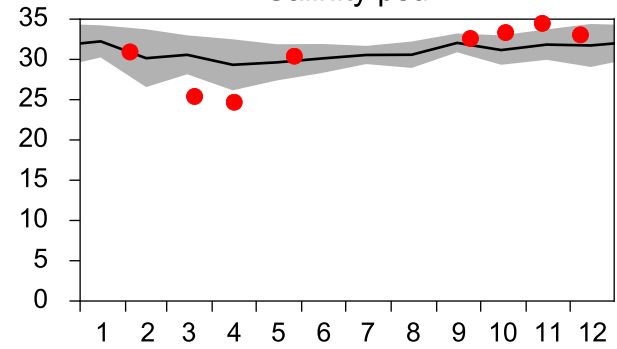
■ St.Dev.

● 2018

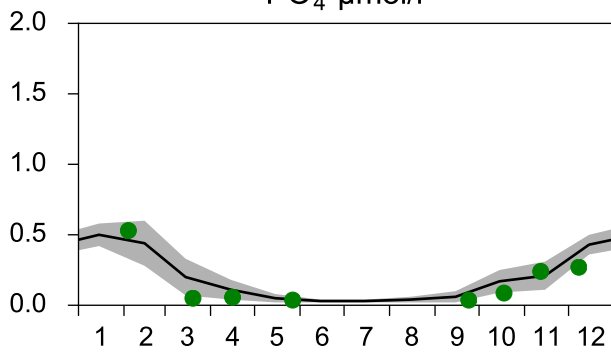
Temperature °C



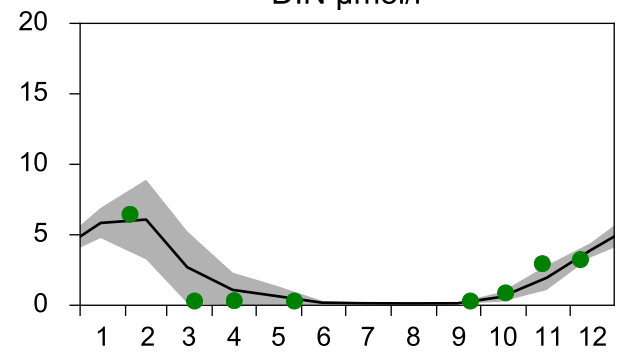
Salinity psu



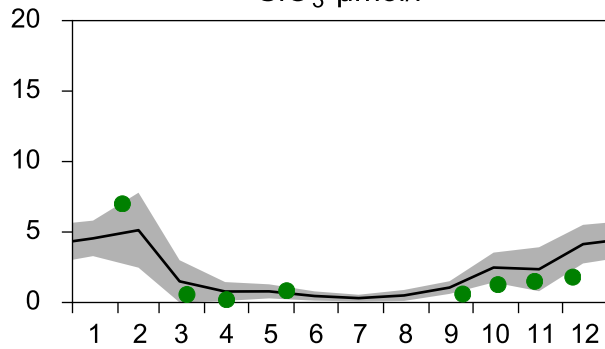
PO₄ µmol/l



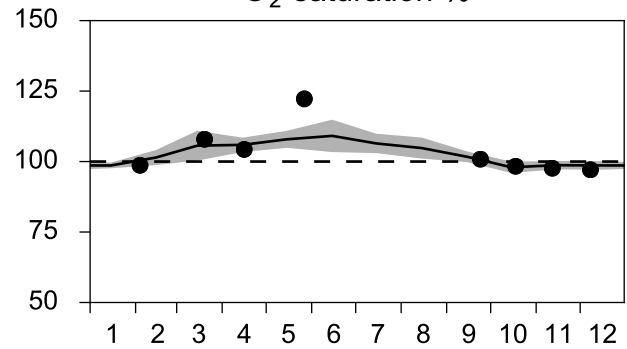
DIN µmol/l



SiO₃ µmol/l

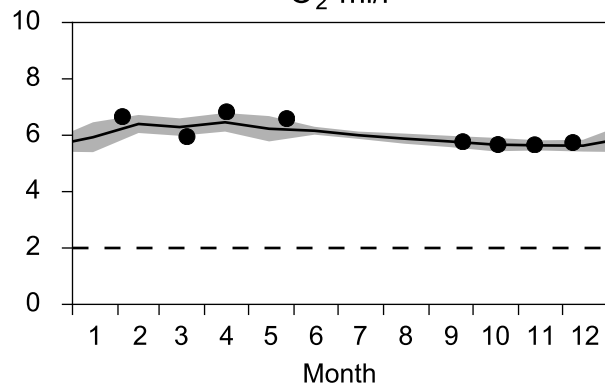


O₂ saturation %

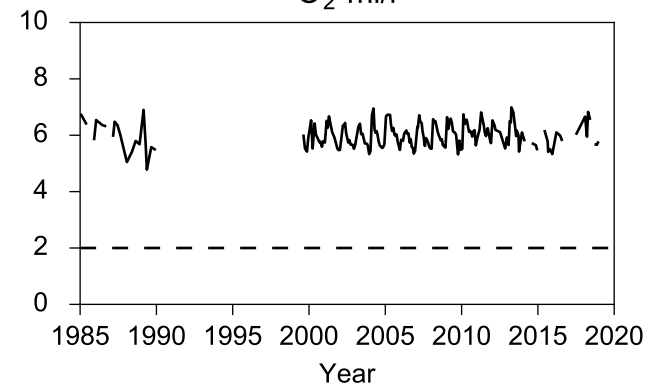


OXYGEN IN BOTTOM WATER (depth >= 300 m)

O₂ ml/l

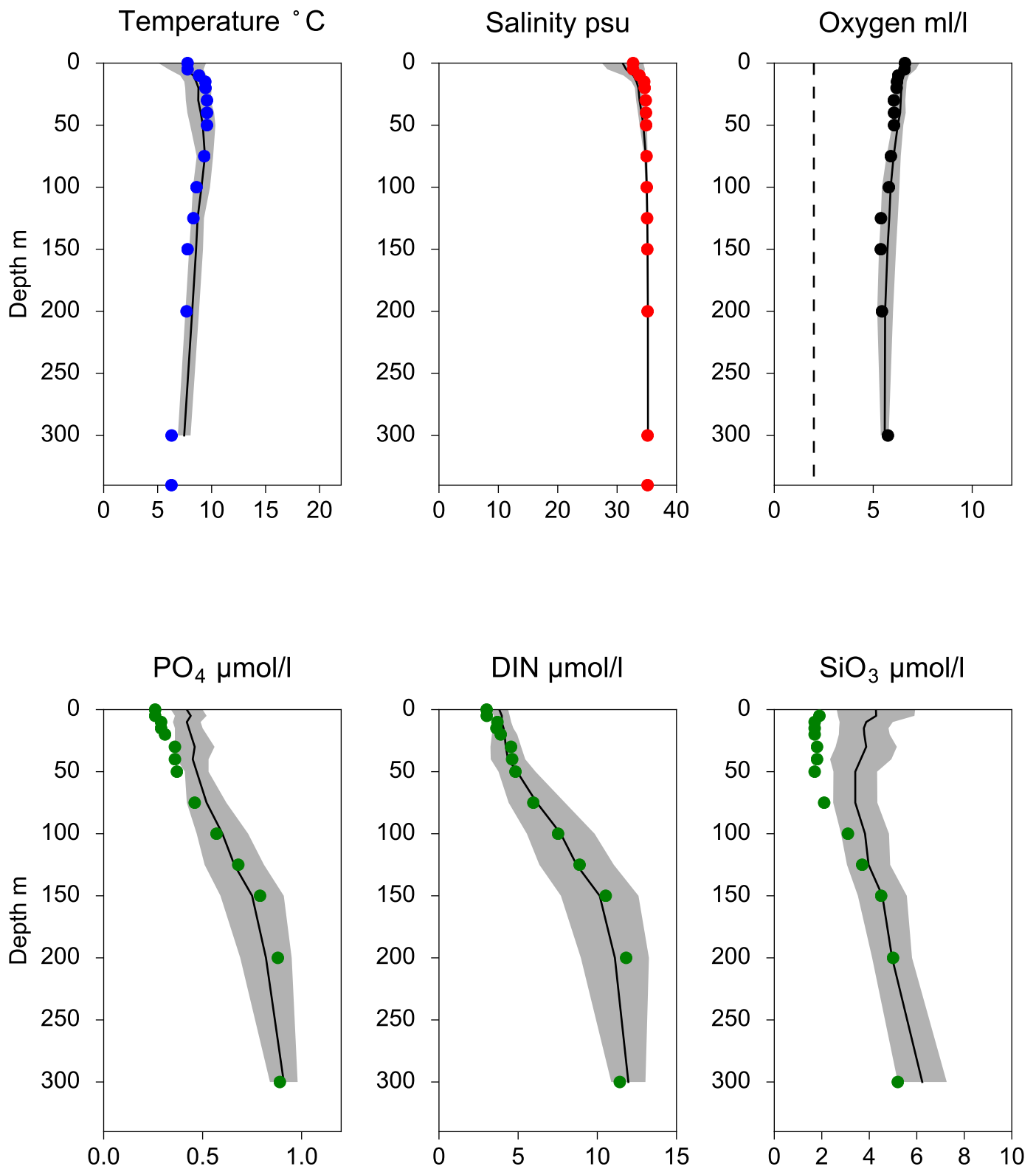


O₂ ml/l



Vertical profiles A17 December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-08



STATION Å15 SURFACE WATER (0-10 m)

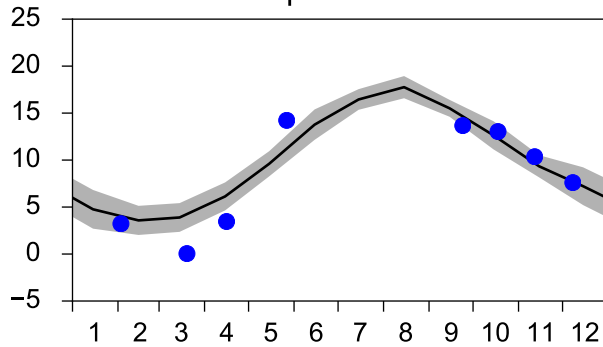
Annual Cycles

— Mean 2001-2015

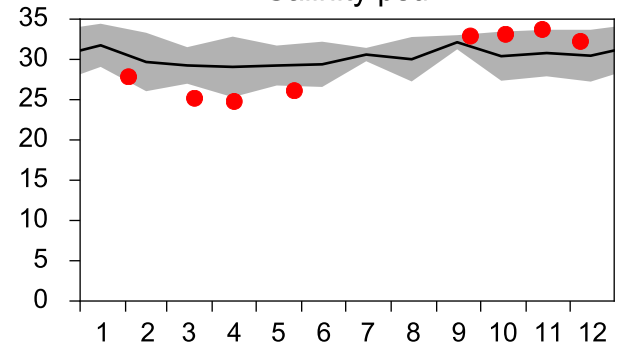
■ St.Dev.

● 2018

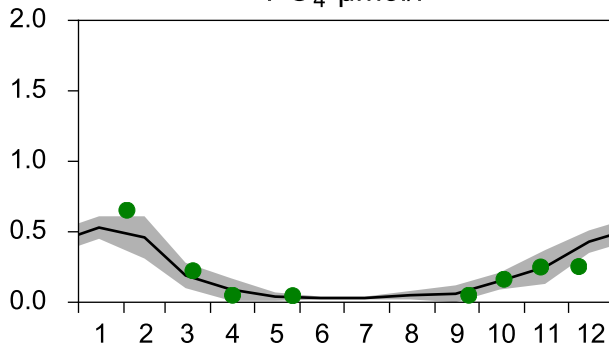
Temperature °C



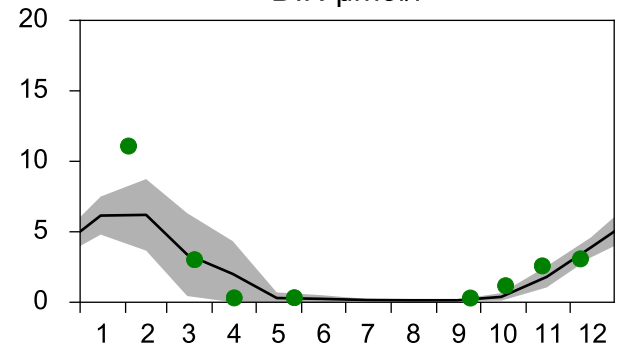
Salinity psu



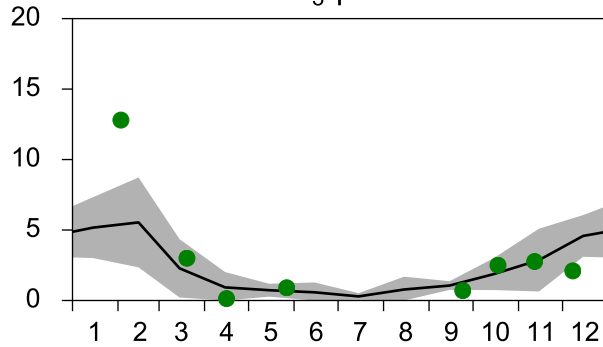
PO₄ µmol/l



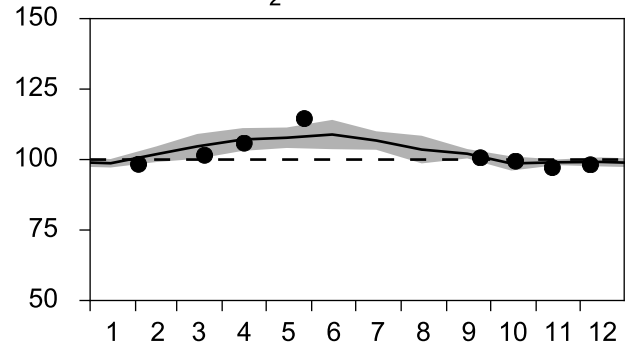
DIN µmol/l



SiO₃ µmol/l

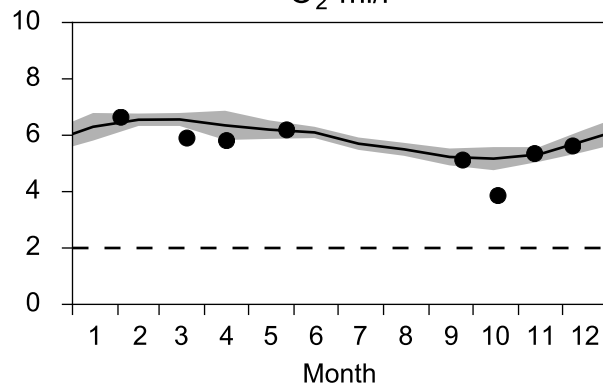


O₂ saturation %

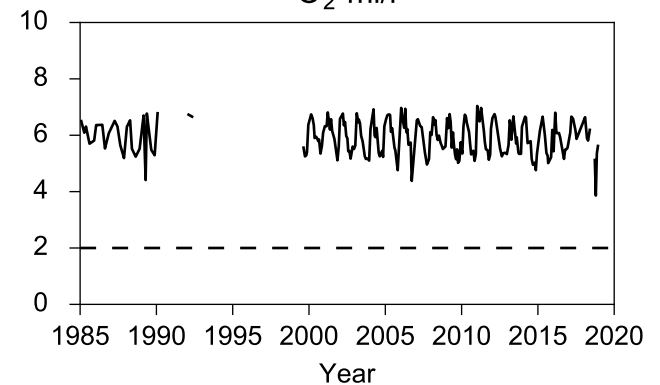


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

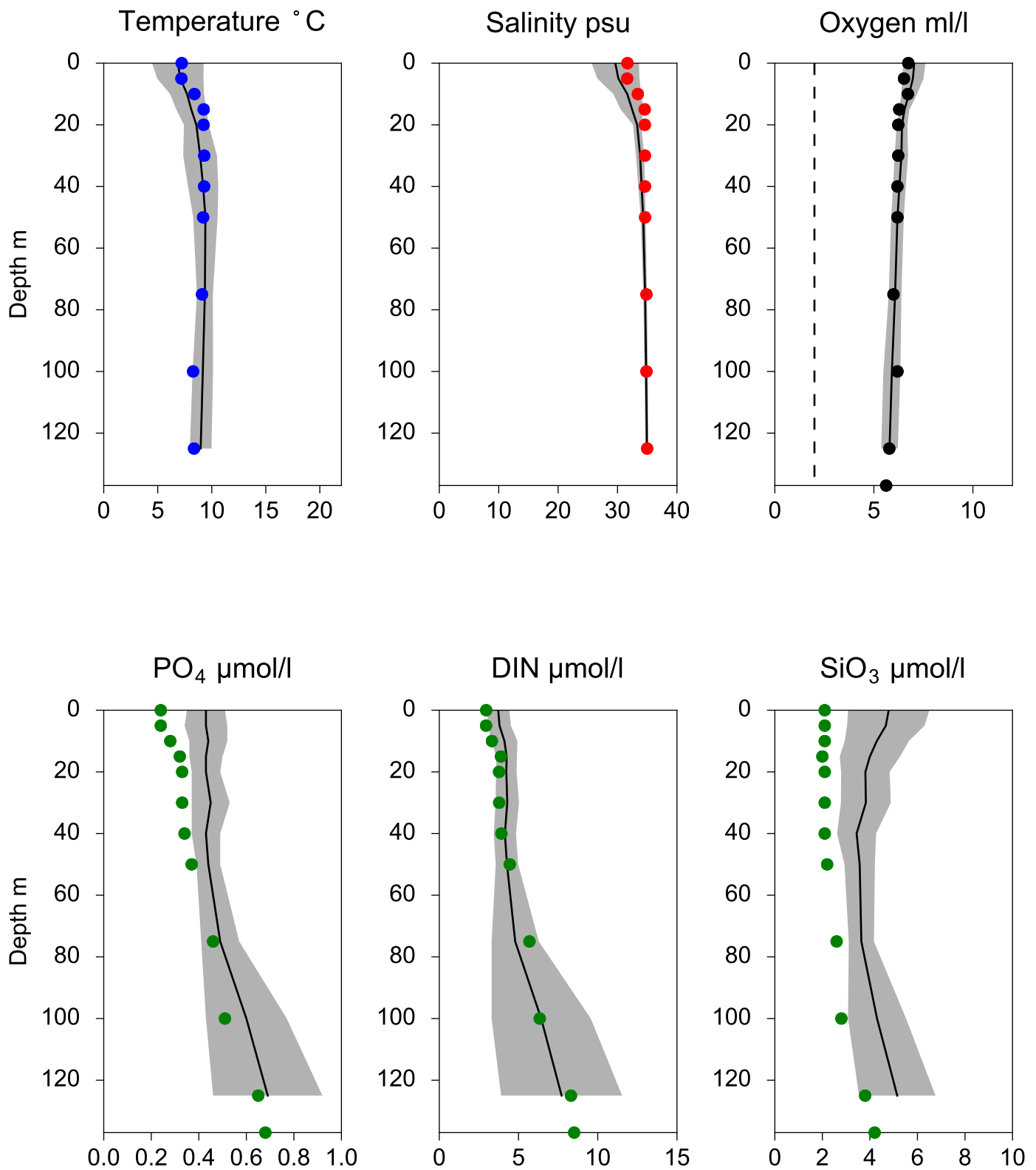


O₂ ml/l



Vertical profiles Å15 December

— Mean 2001-2015 St.Dev. • 2018-12-08



STATION Å13 SURFACE WATER (0-10 m)

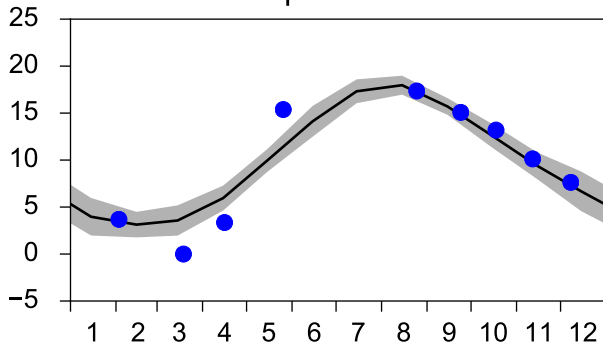
Annual Cycles

— Mean 2001-2015

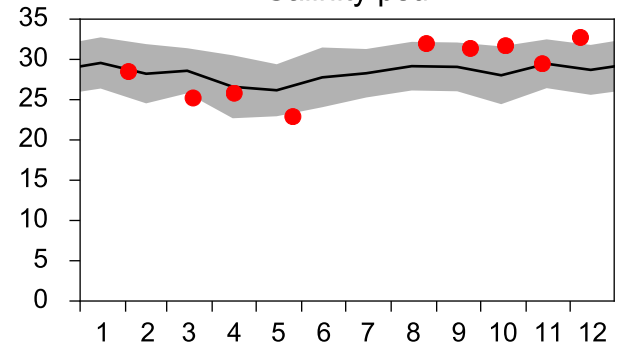
■ St.Dev.

● 2018

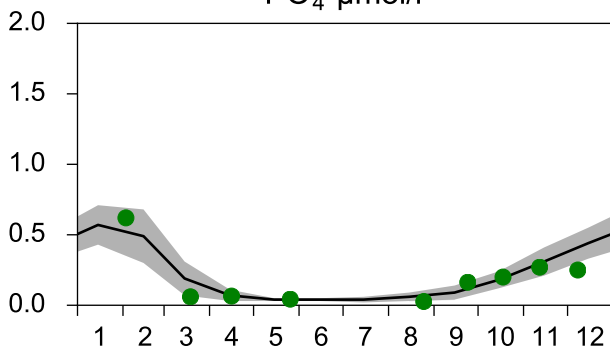
Temperature °C



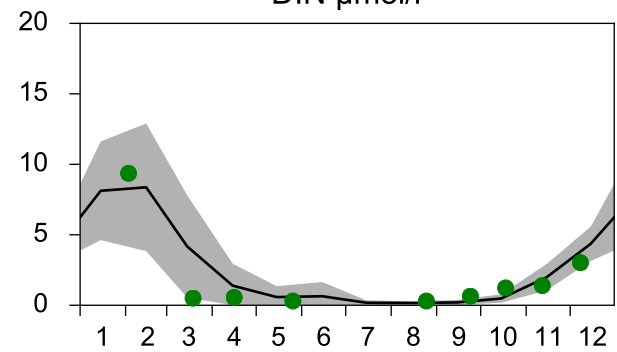
Salinity psu



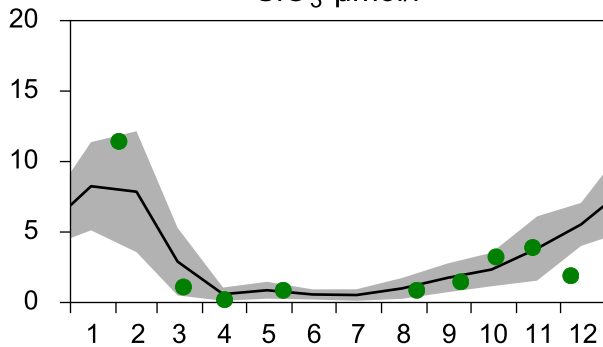
PO₄ µmol/l



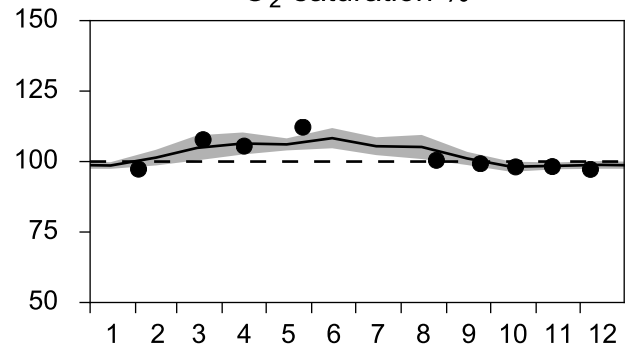
DIN µmol/l



SiO₃ µmol/l

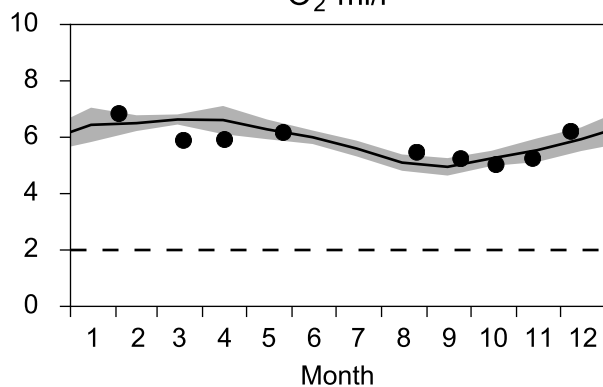


O₂ saturation %

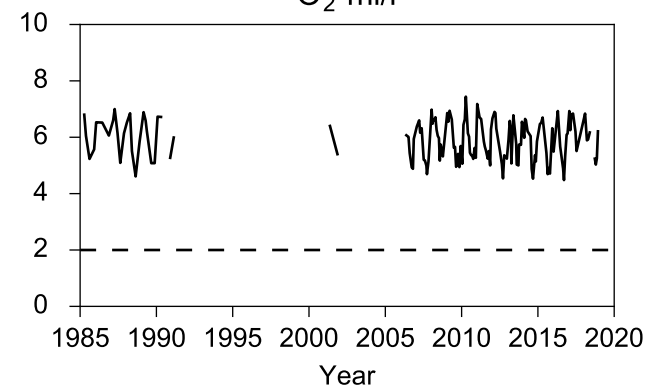


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

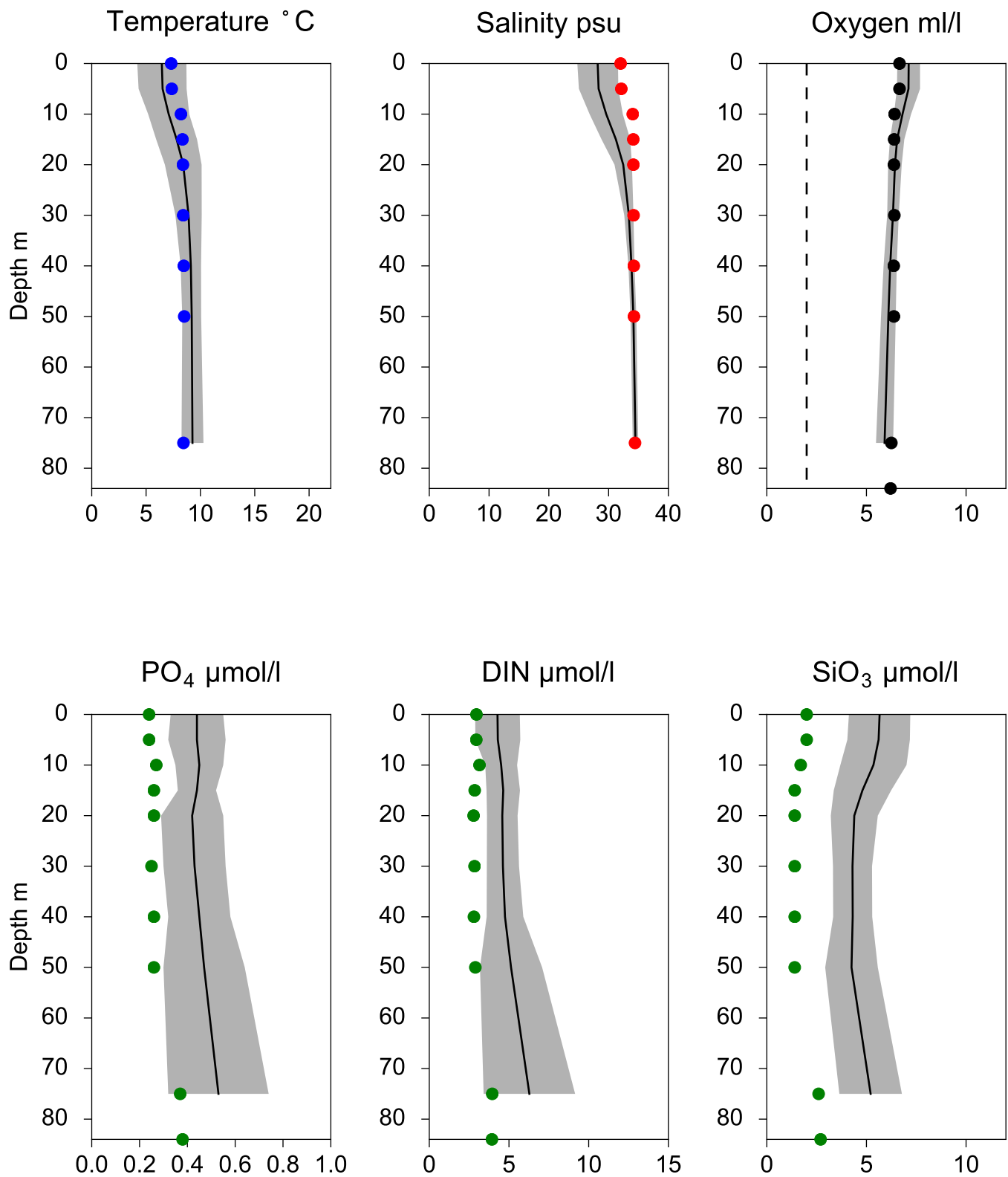


O₂ ml/l



Vertical profiles Å13 December

— Mean 2001-2015 St.Dev. • 2018-12-08



STATION SLÄGGÖ SURFACE WATER (0-10 m)

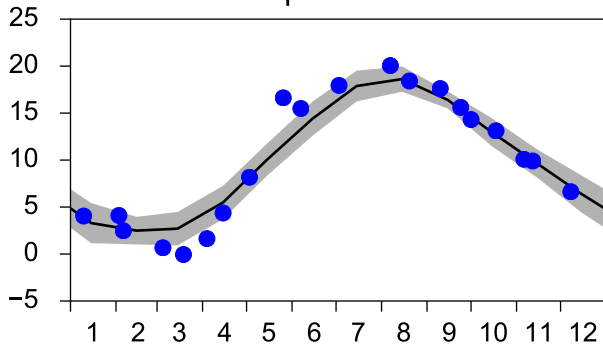
Annual Cycles

— Mean 2001-2015

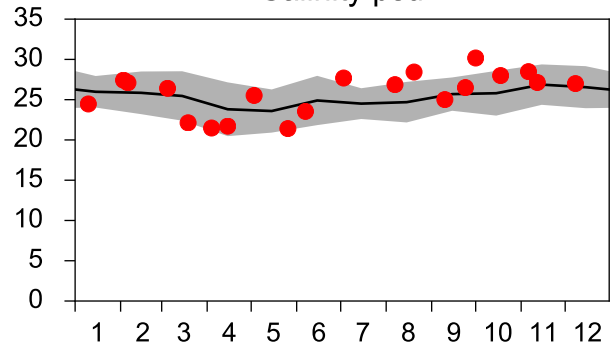
■ St.Dev.

● 2018

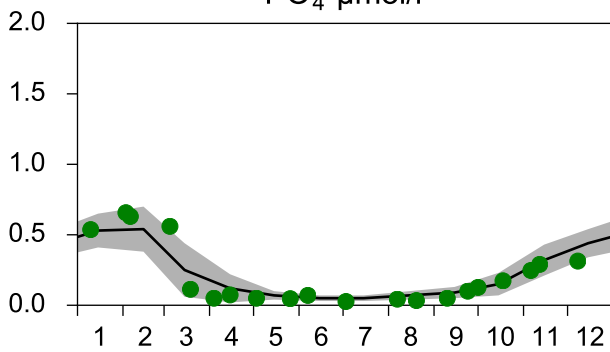
Temperature °C



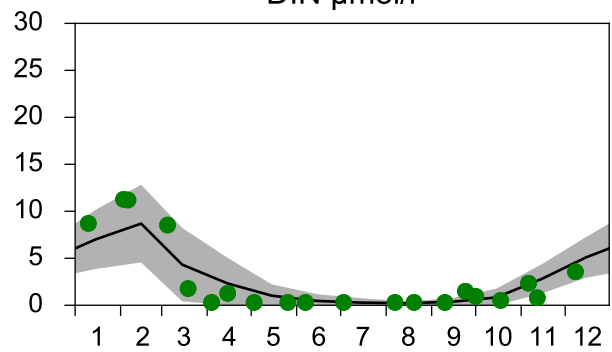
Salinity psu



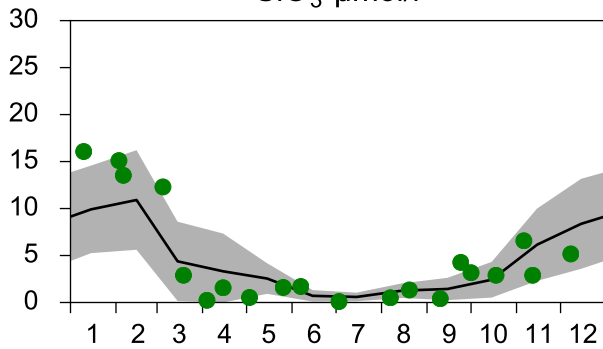
PO₄ µmol/l



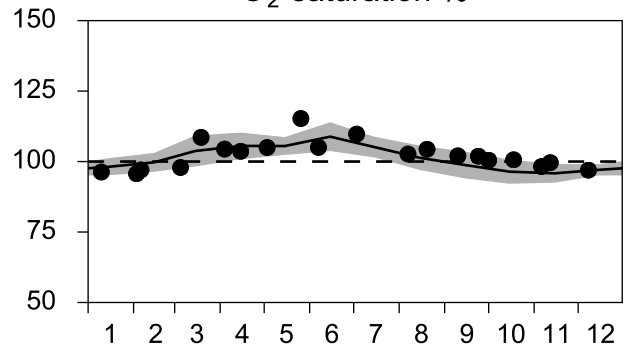
DIN µmol/l



SiO₃ µmol/l

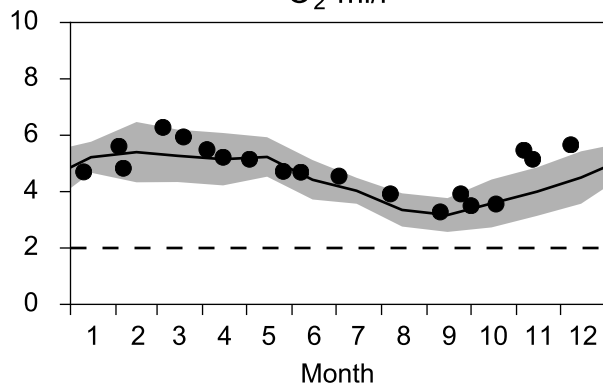


O₂ saturation %

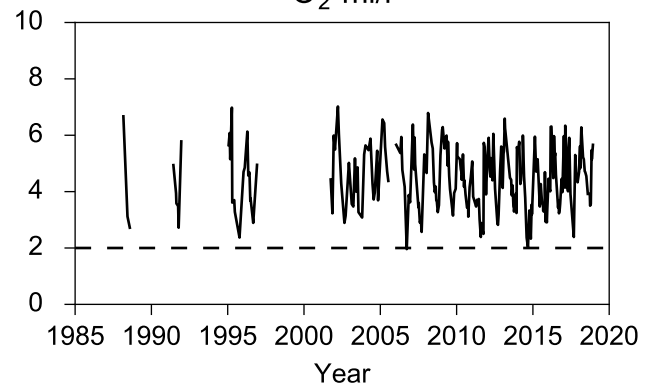


OXYGEN IN BOTTOM WATER (depth >= 64 m)

O₂ ml/l

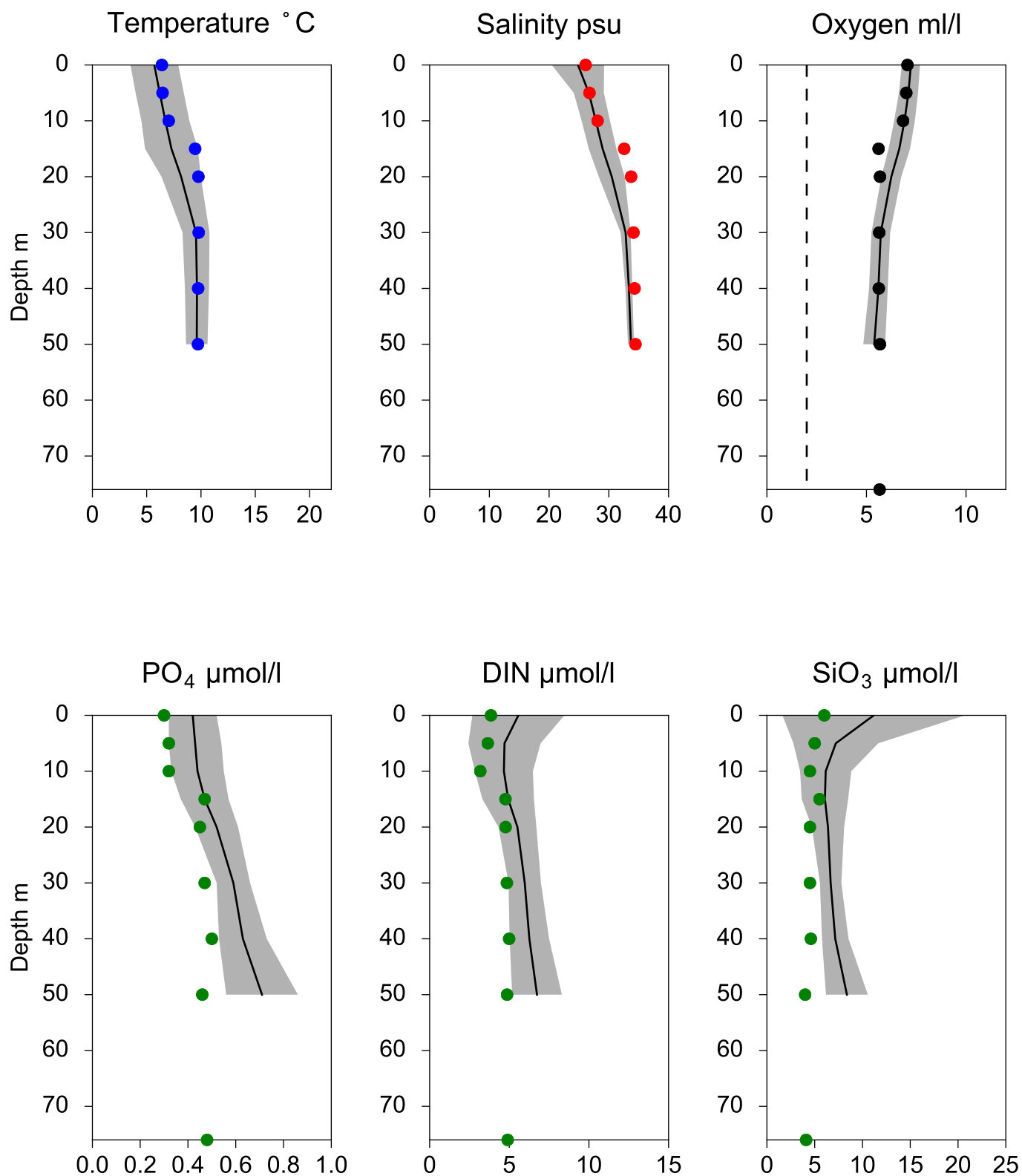


O₂ ml/l



Vertical profiles SLÄGGÖ December

— Mean 2001-2015 St.Dev. • 2018-12-08



STATION N14 FALKENBERG SURFACE WATER (0-10 m)

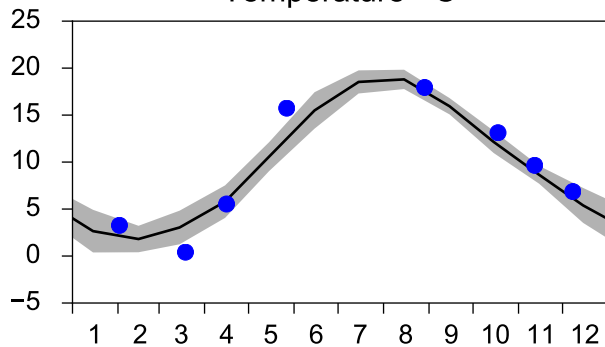
Annual Cycles

— Mean 2001-2015

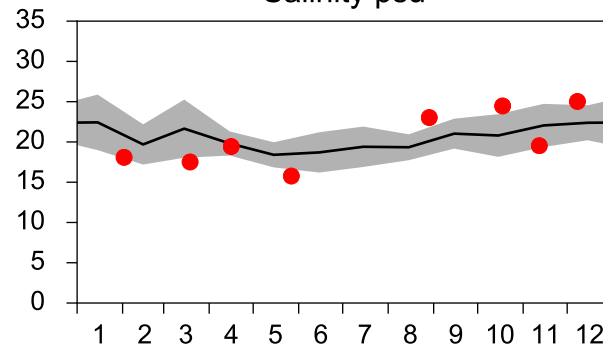
■ St.Dev.

● 2018

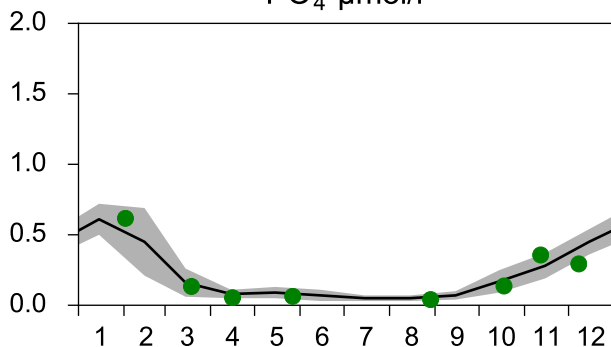
Temperature °C



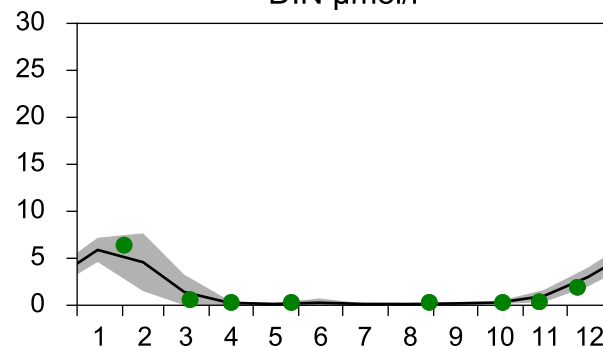
Salinity psu



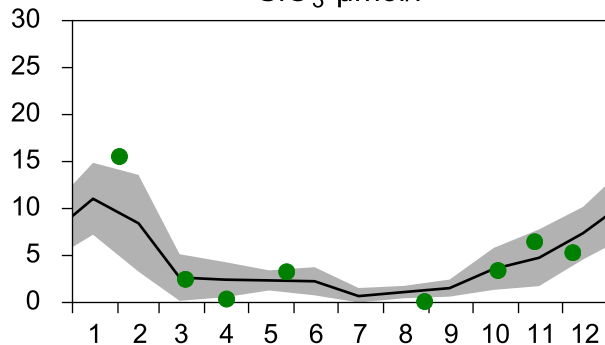
PO₄ µmol/l



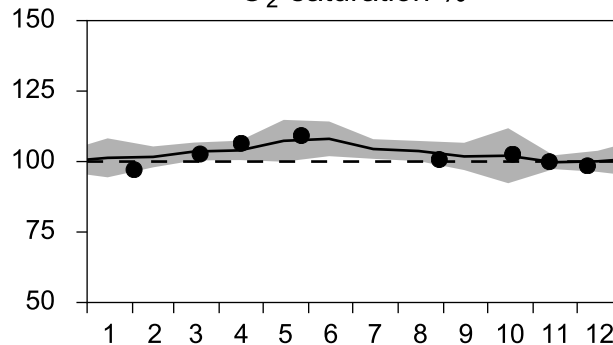
DIN µmol/l



SiO₃ µmol/l

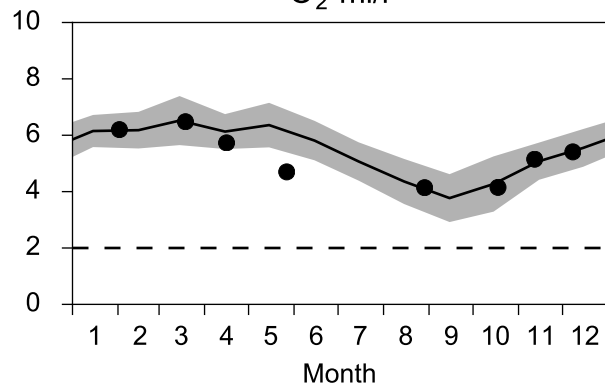


O₂ saturation %

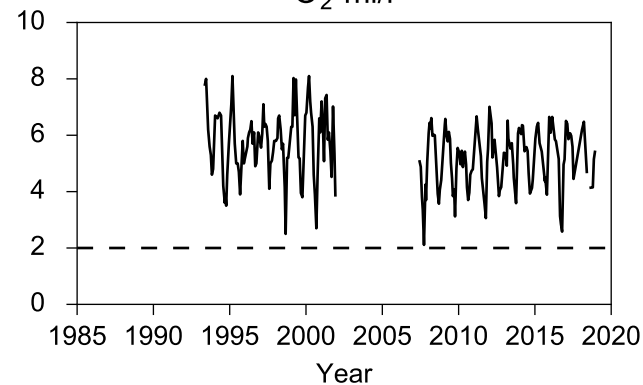


OXYGEN IN BOTTOM WATER (depth >= 25 m)

O₂ ml/l

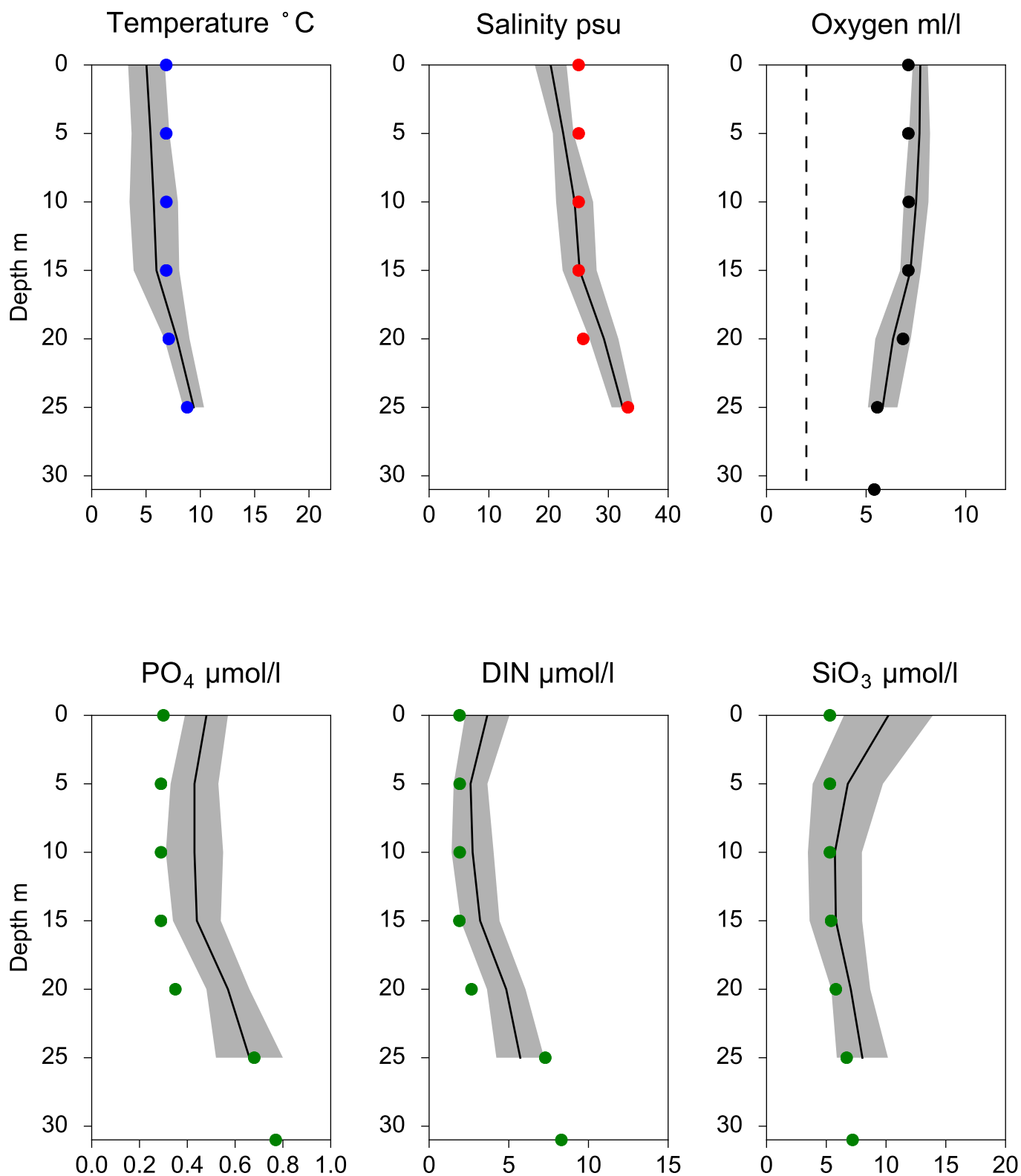


O₂ ml/l



Vertical profiles N14 FALKENBERG December

— Mean 2001-2015 St.Dev. • 2018-12-08



STATION ANHOLT E SURFACE WATER (0-10 m)

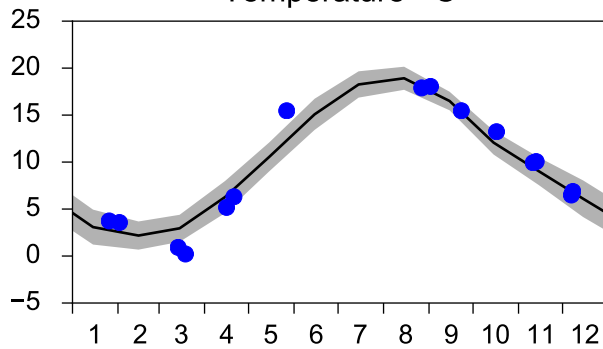
Annual Cycles

— Mean 2001-2015

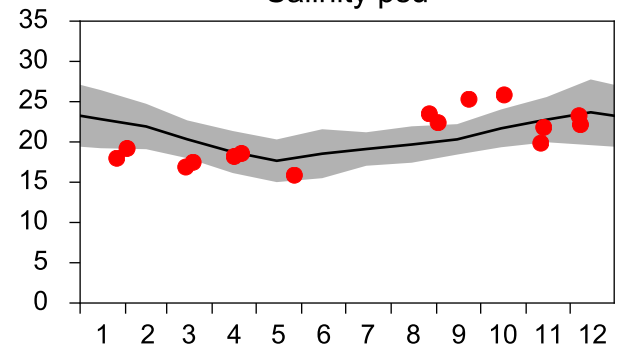
■ St.Dev.

● 2018

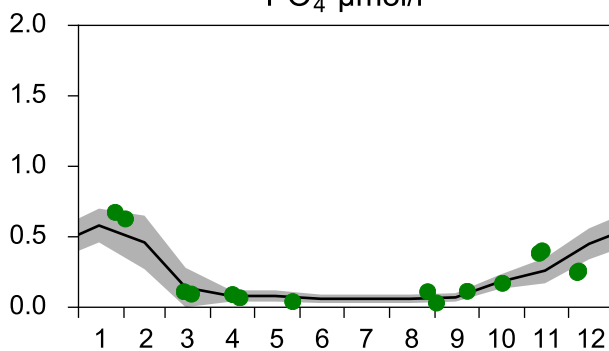
Temperature °C



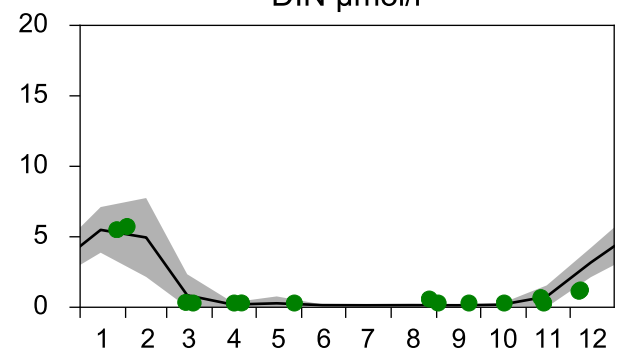
Salinity psu



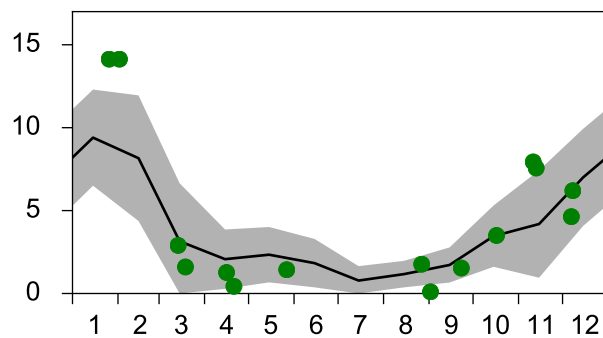
PO₄ µmol/l



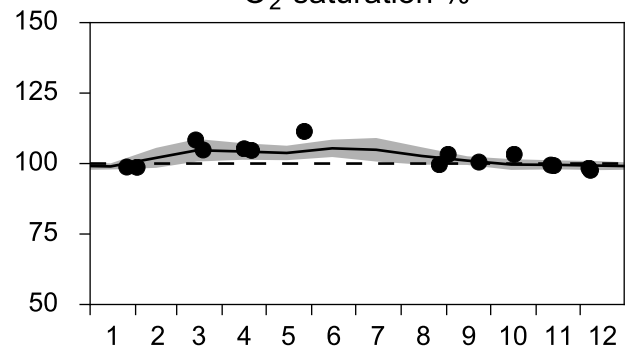
DIN µmol/l



SiO₃ µmol/l

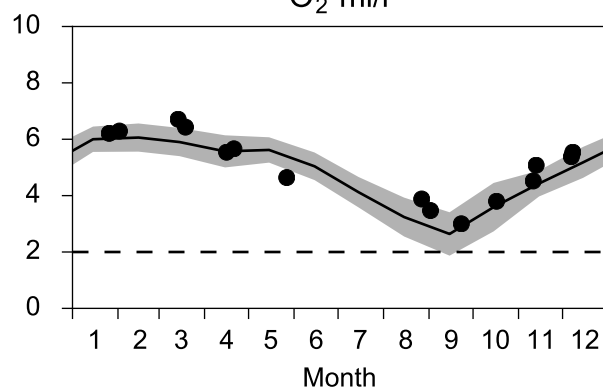


O₂ saturation %

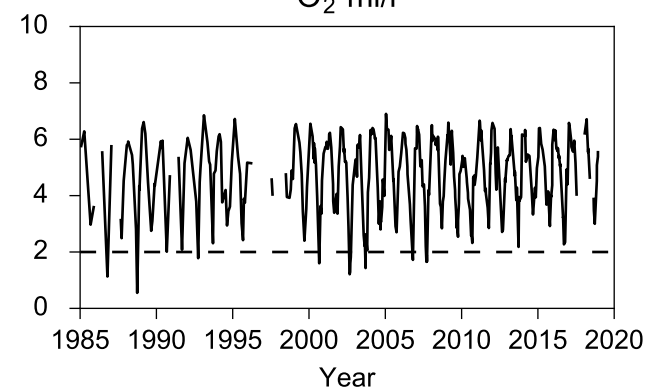


OXYGEN IN BOTTOM WATER (depth >= 52 m)

O₂ ml/l

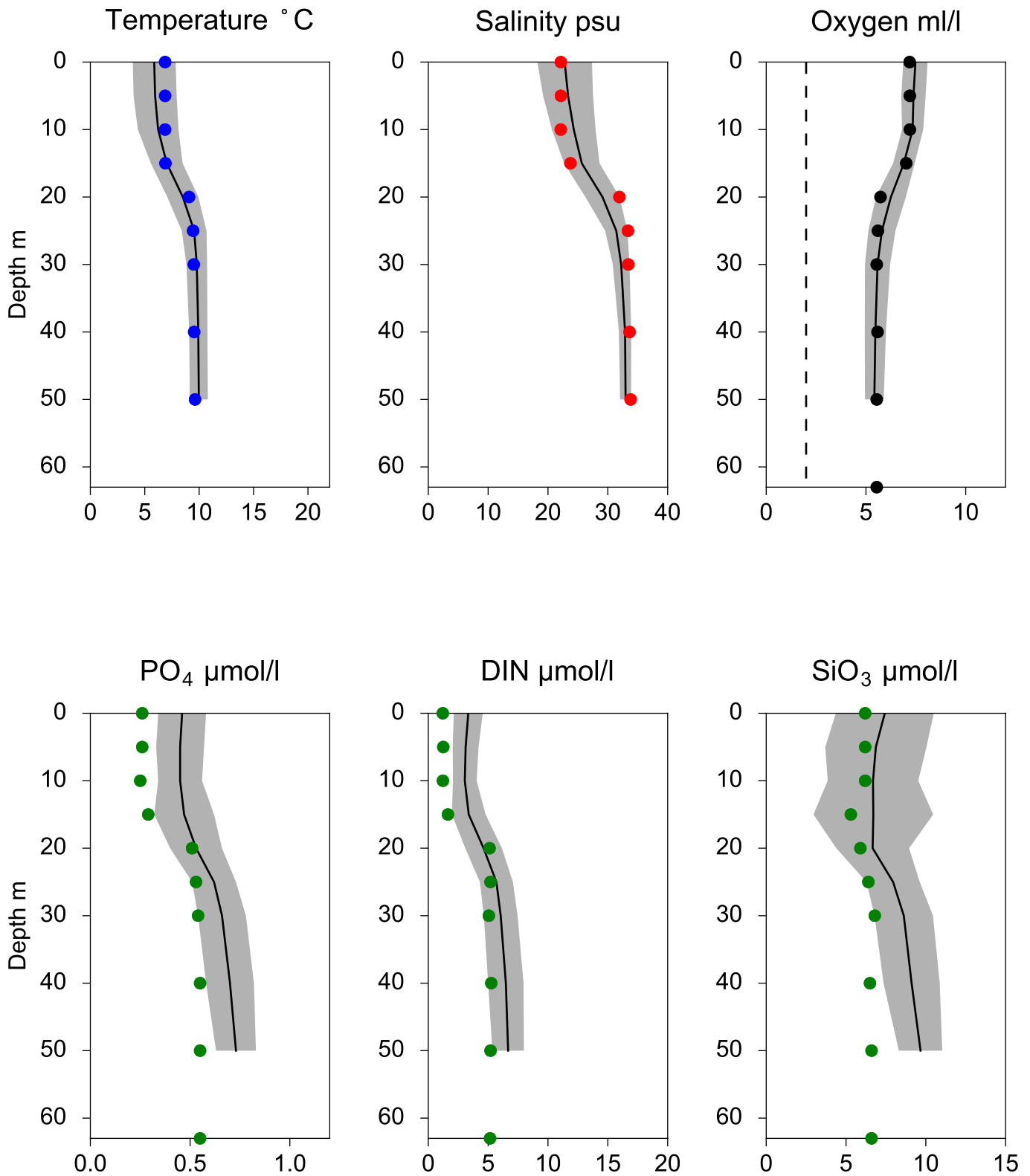


O₂ ml/l



Vertical profiles ANHOLT E December

— Mean 2001-2015 St.Dev. • 2018-12-08



STATION HANÖBUKTEN SURFACE WATER (0-10 m)

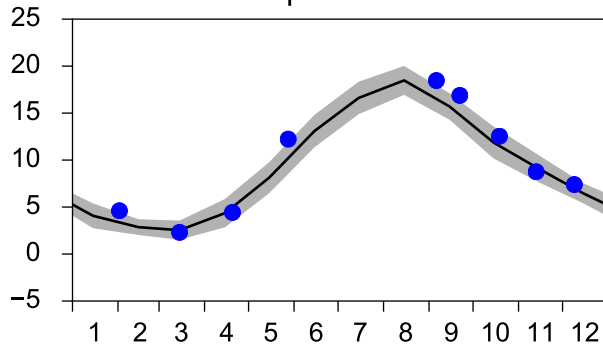
Annual Cycles

— Mean 2001-2015

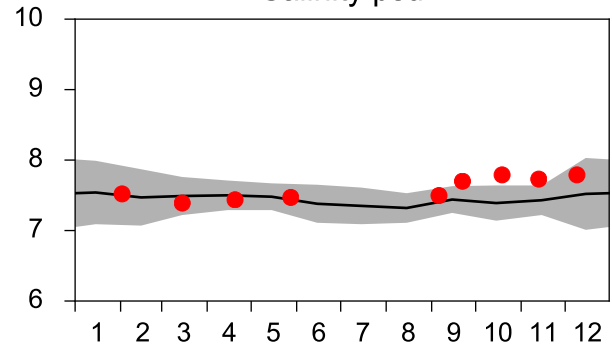
■ St.Dev.

● 2018

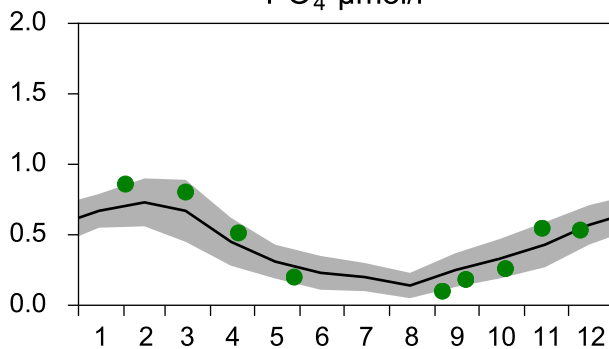
Temperature °C



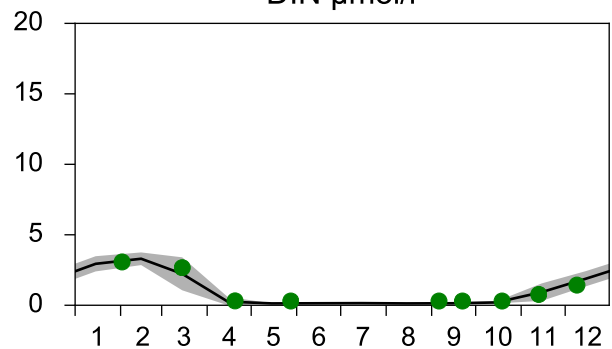
Salinity psu



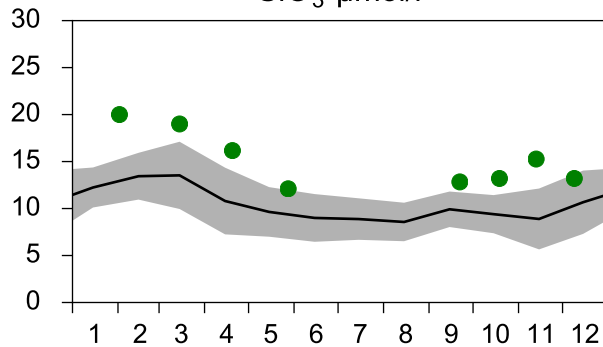
PO₄ µmol/l



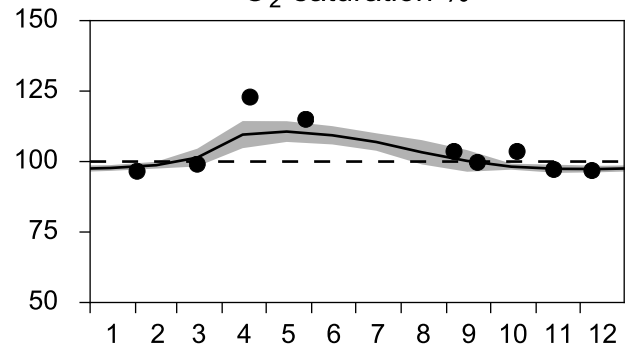
DIN µmol/l



SiO₃ µmol/l

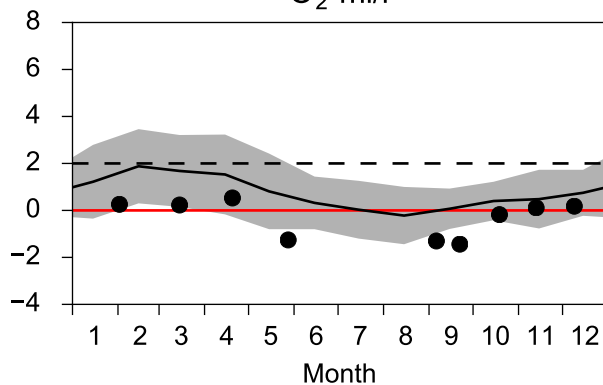


O₂ saturation %

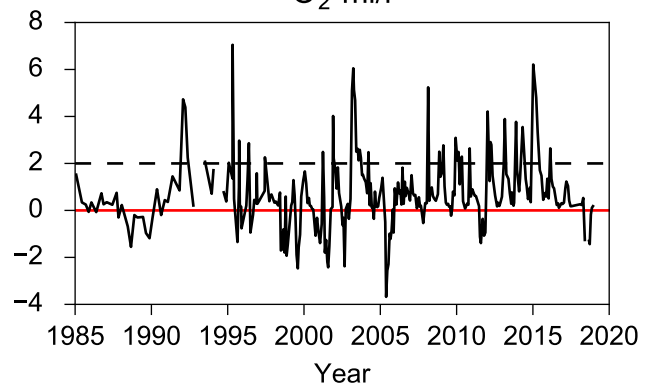


OXYGEN IN BOTTOM WATER (depth >= 70 m)

O₂ ml/l



O₂ ml/l



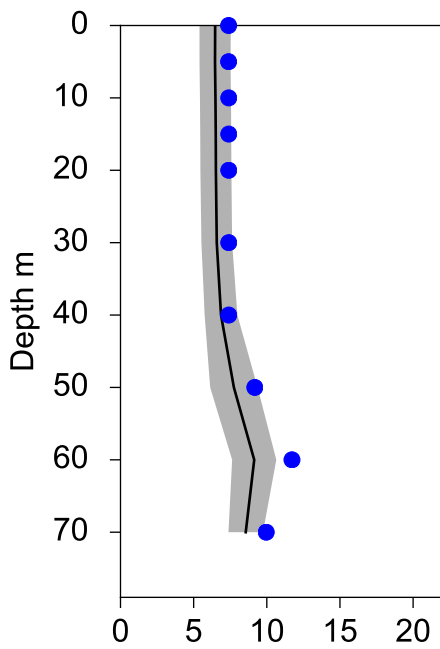
Vertical profiles HANÖBUKTEN December

— Mean 2001-2015

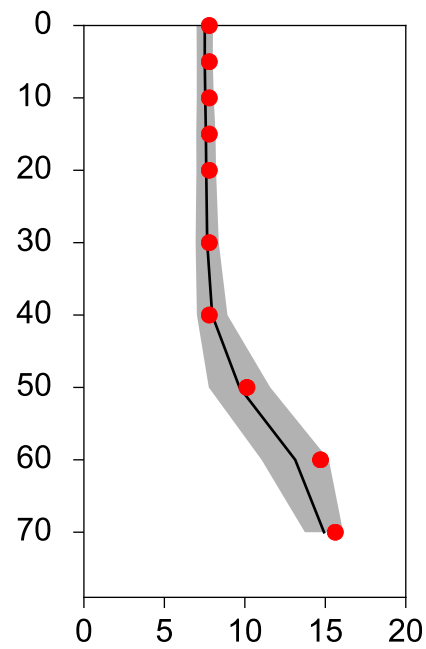
■ St.Dev.

● 2018-12-09

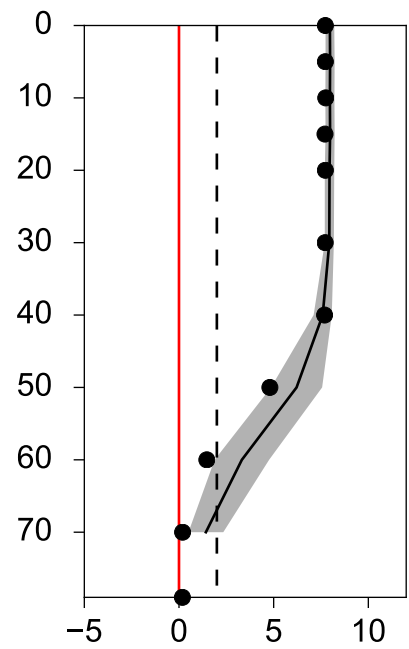
Temperature °C



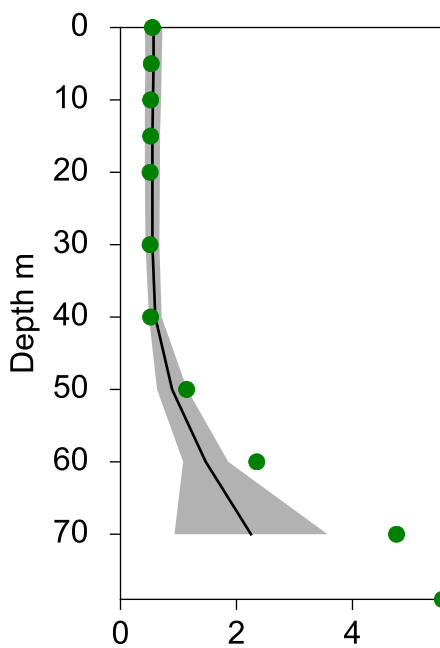
Salinity psu



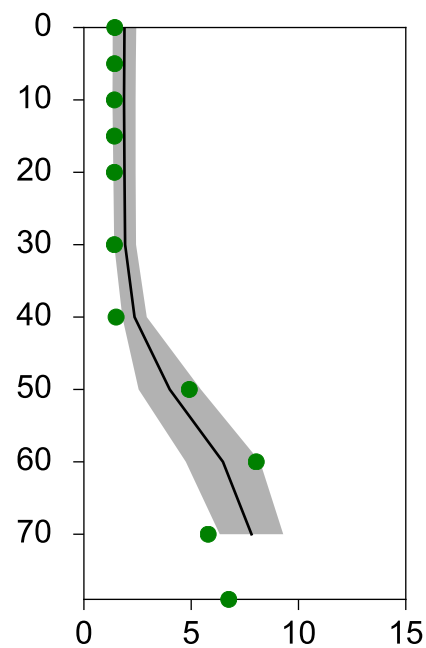
Oxygen ml/l



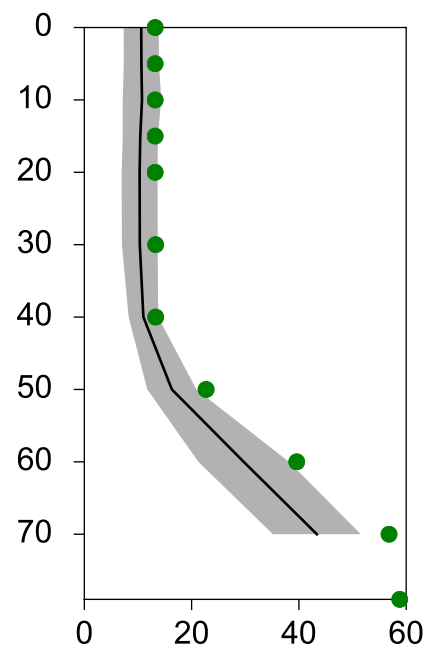
PO₄ μmol/l



DIN μmol/l



SiO₃ μmol/l



STATION REF M1V1 SURFACE WATER (0-10 m)

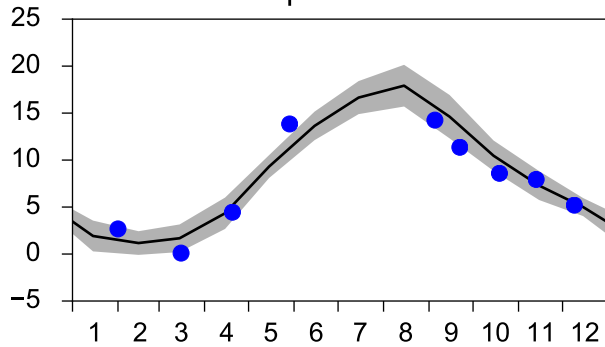
Annual Cycles

— Mean 2001-2015

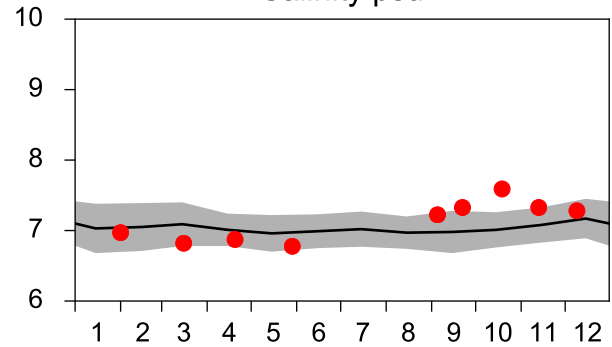
■ St.Dev.

● 2018

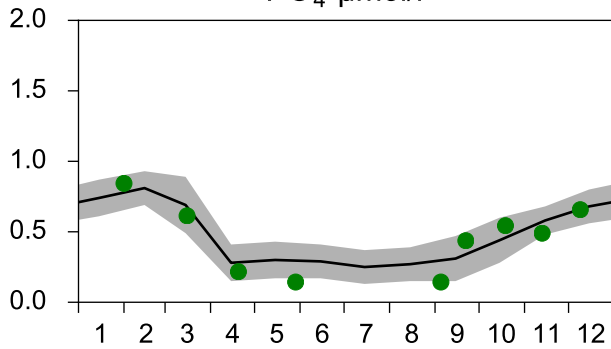
Temperature °C



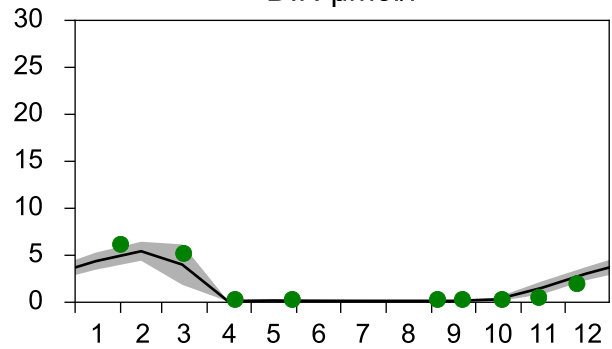
Salinity psu



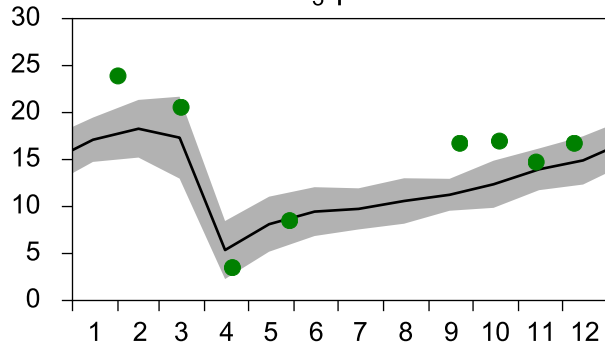
PO₄ µmol/l



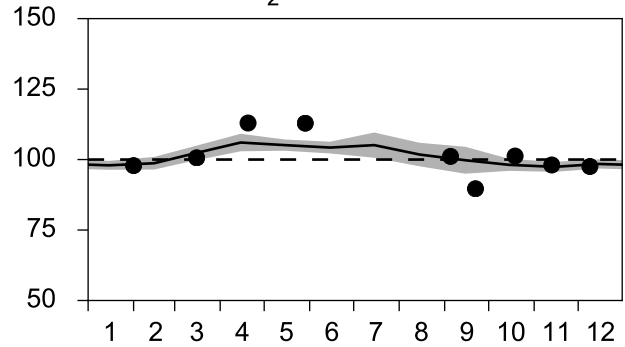
DIN µmol/l



SiO₃ µmol/l

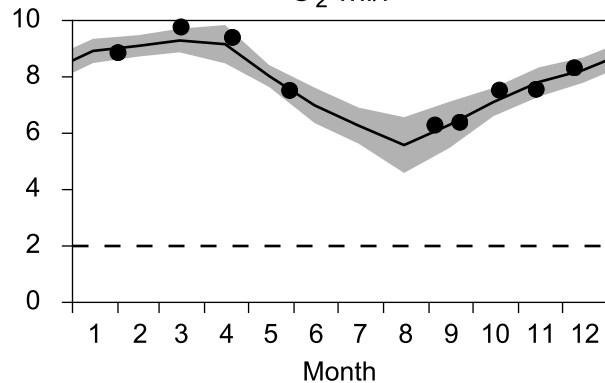


O₂ saturation %

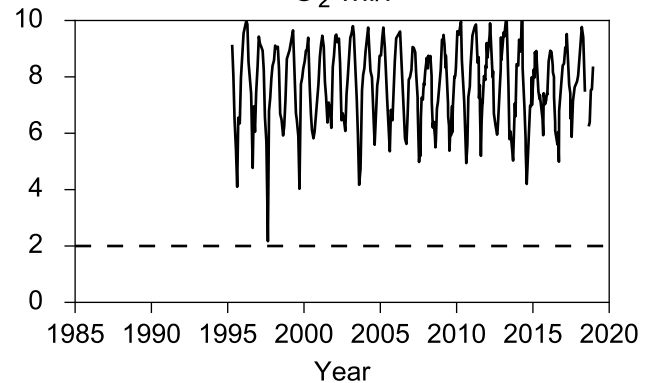


OXYGEN IN BOTTOM WATER (depth >= 17 m)

O₂ ml/l

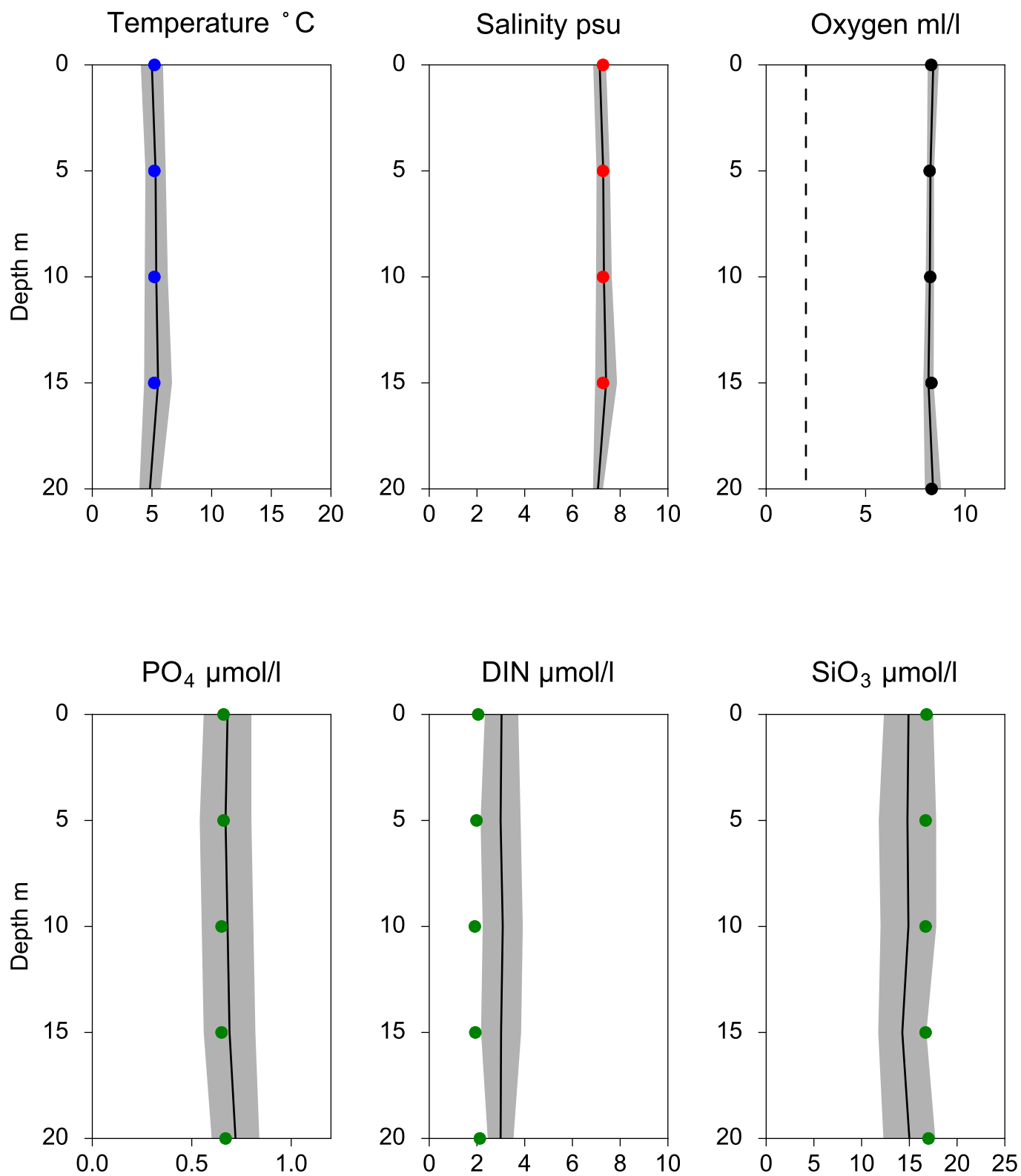


O₂ ml/l



Vertical profiles REF M1V1 December

— Mean 2001-2015 St.Dev. • 2018-12-09



STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

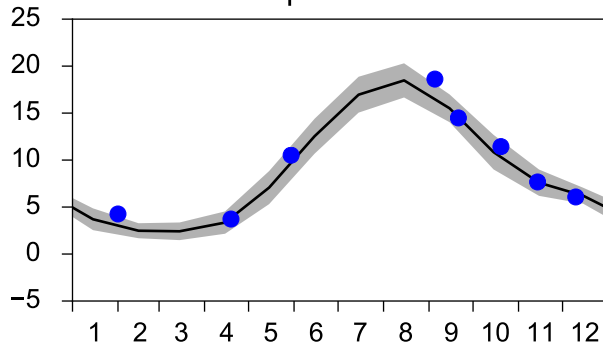
Annual Cycles

— Mean 2001-2015

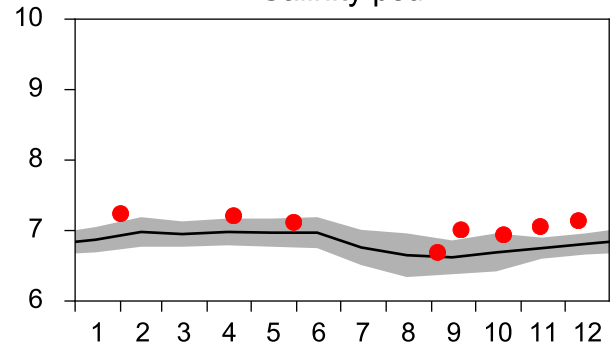
■ St.Dev.

● 2018

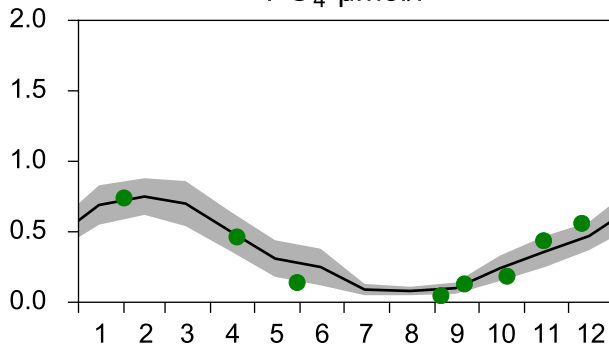
Temperature °C



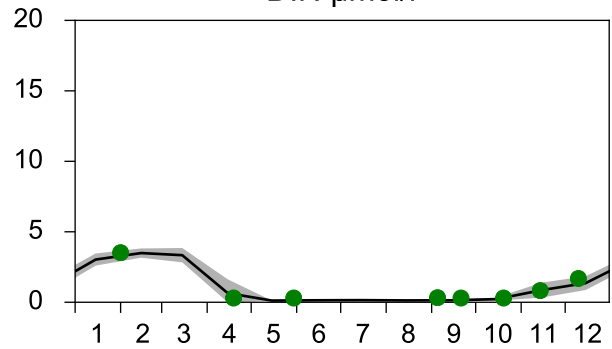
Salinity psu



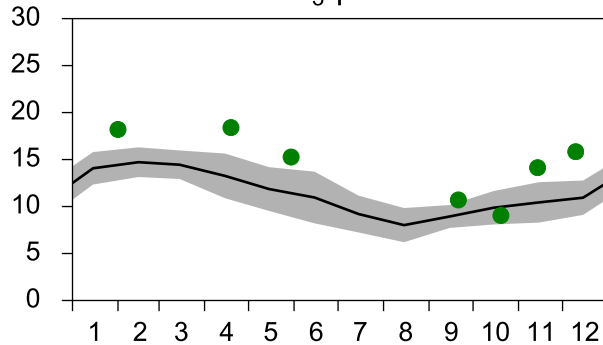
PO₄ µmol/l



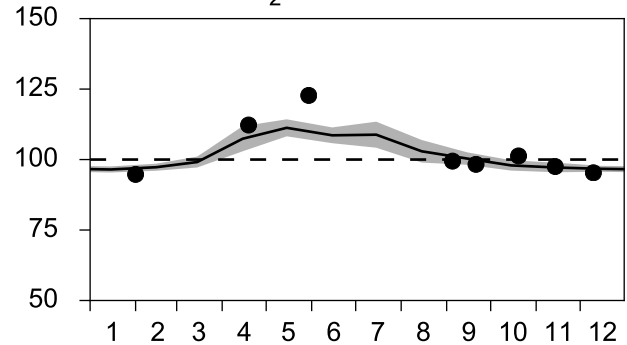
DIN µmol/l



SiO₃ µmol/l

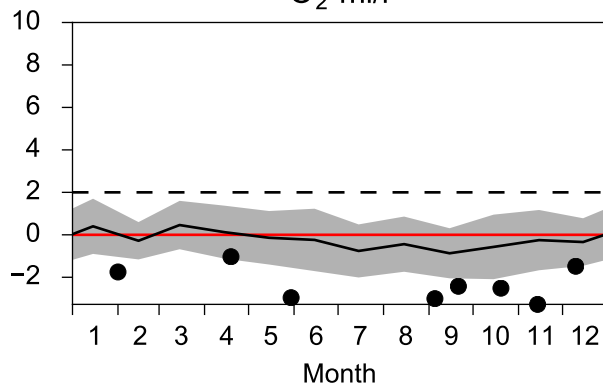


O₂ saturation %

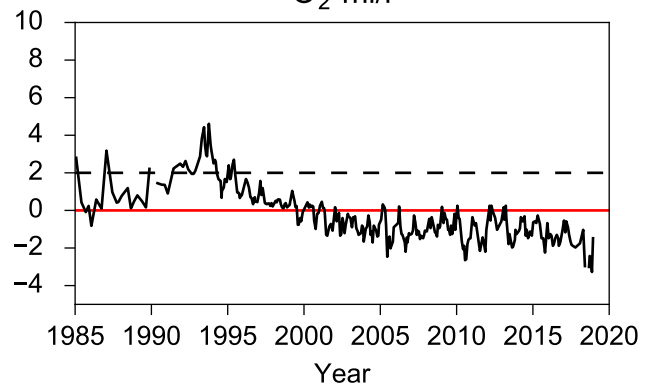


OXYGEN IN BOTTOM WATER (depth >= 100 m)

O₂ ml/l

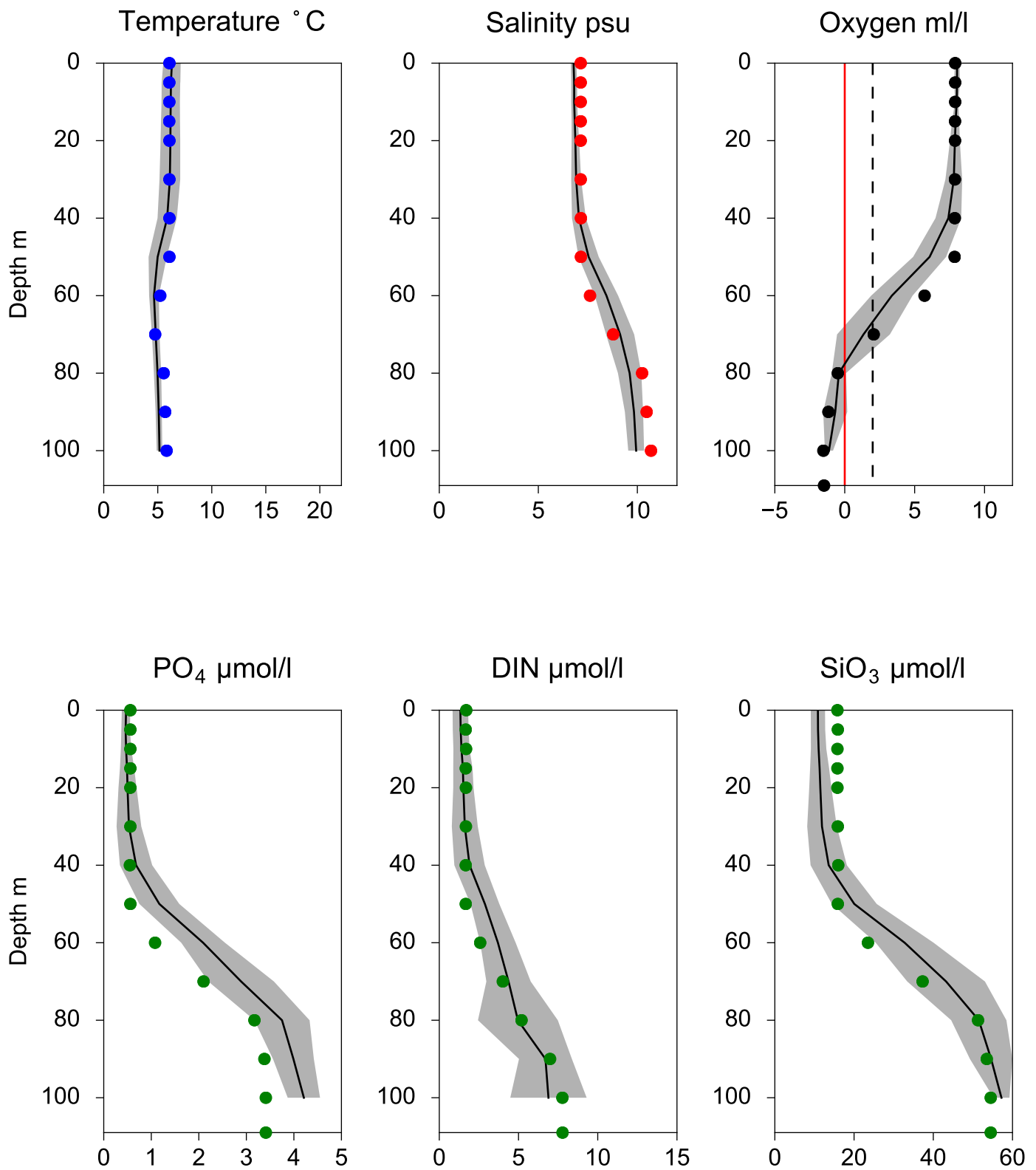


O₂ ml/l



Vertical profiles BY38 KARLSÖDJ December

— Mean 2001-2015 St.Dev. • 2018-12-10



STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

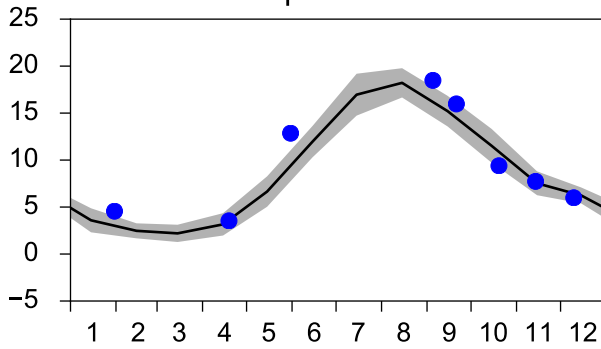
Annual Cycles

— Mean 2001-2015

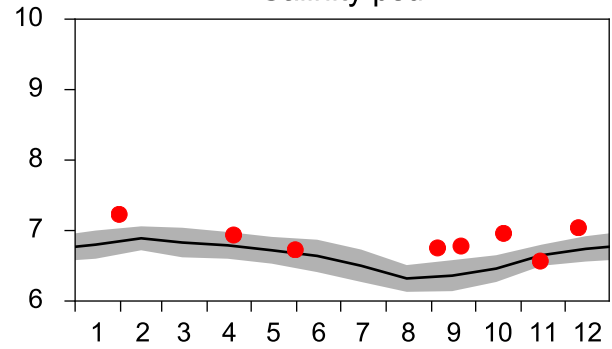
■ St.Dev.

● 2018

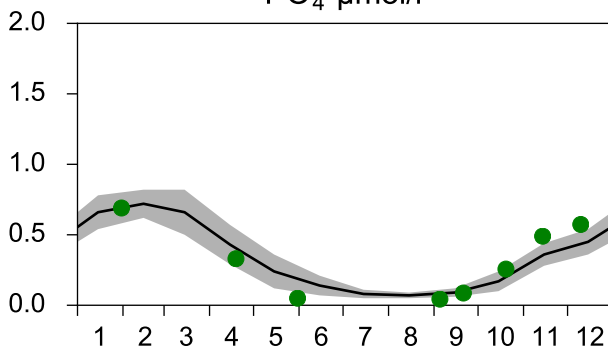
Temperature °C



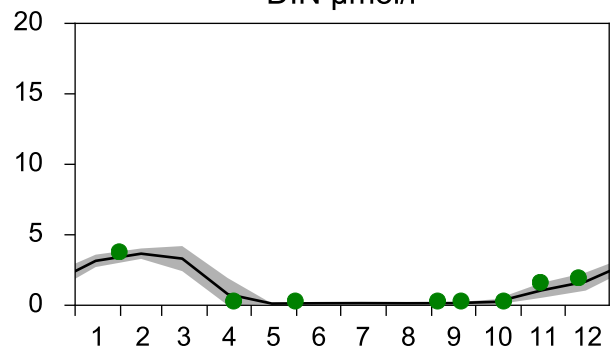
Salinity psu



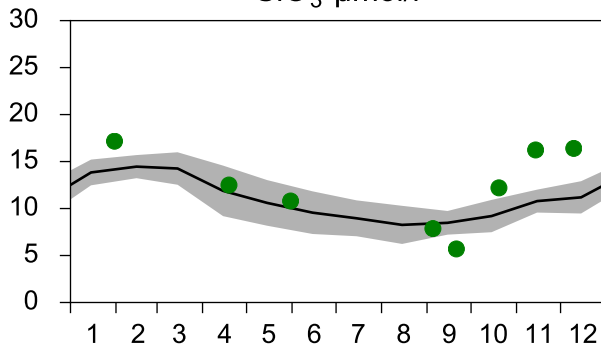
PO₄ µmol/l



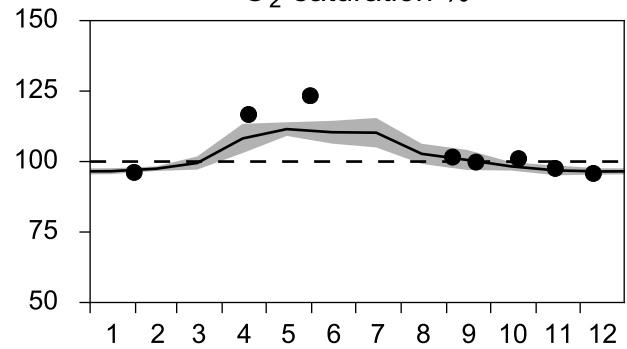
DIN µmol/l



SiO₃ µmol/l

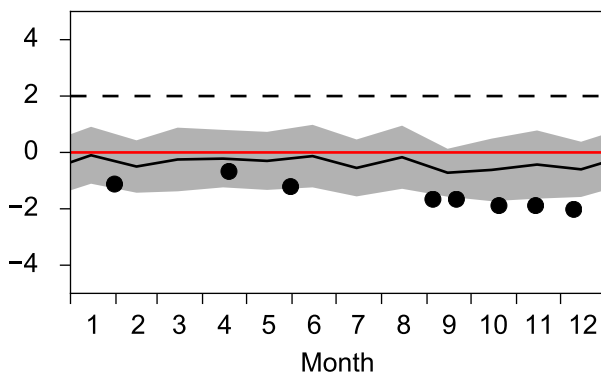


O₂ saturation %

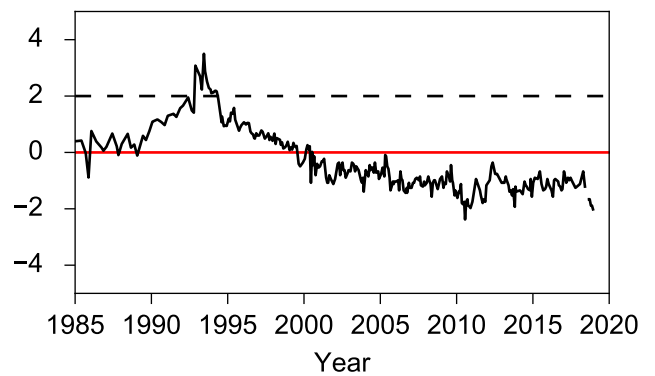


OXYGEN IN BOTTOM WATER (depth >= 175 m)

O₂ ml/l

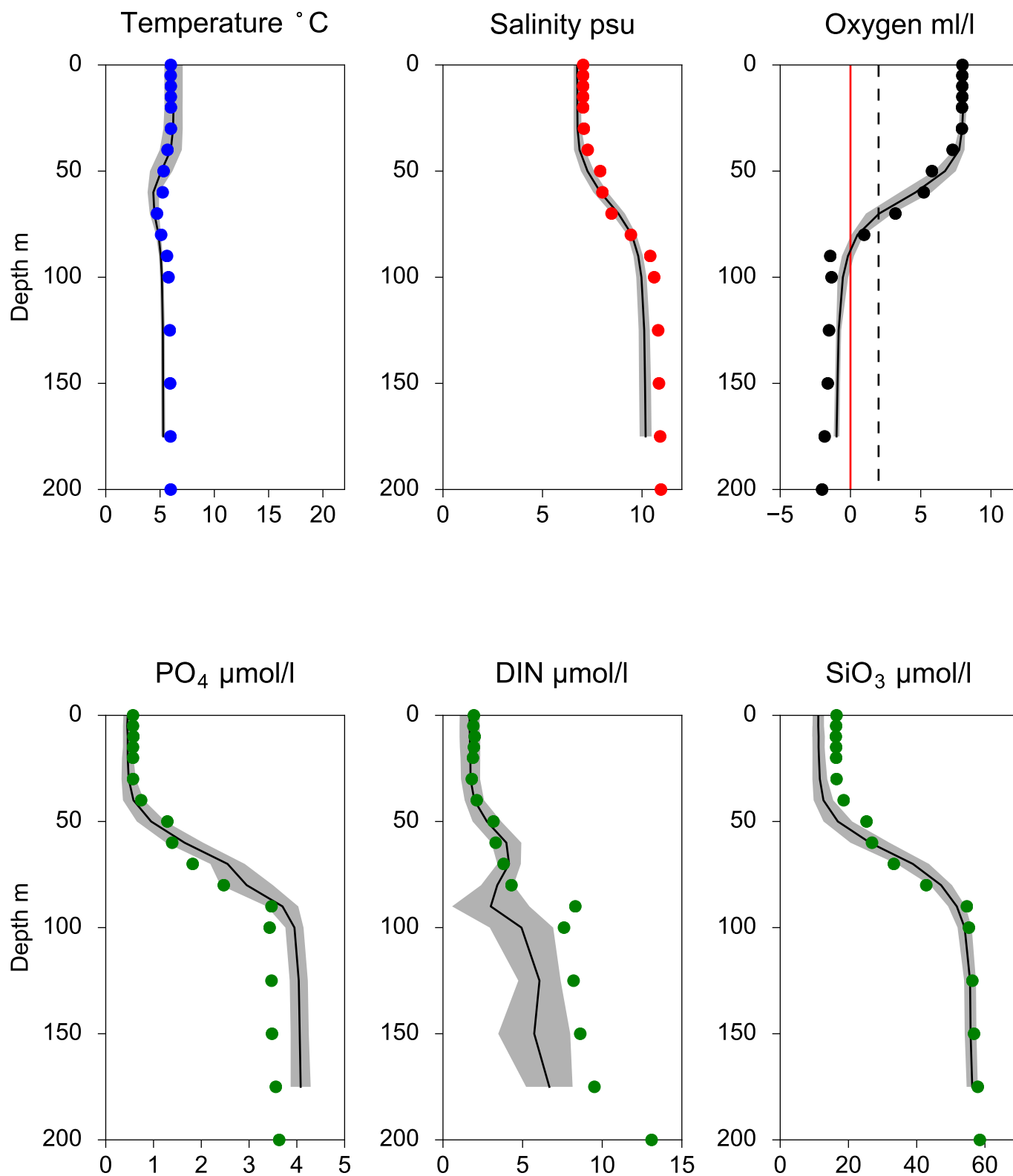


O₂ ml/l



Vertical profiles BY32 NORRKÖPINGSDJ December

— Mean 2001-2015 St.Dev. • 2018-12-10



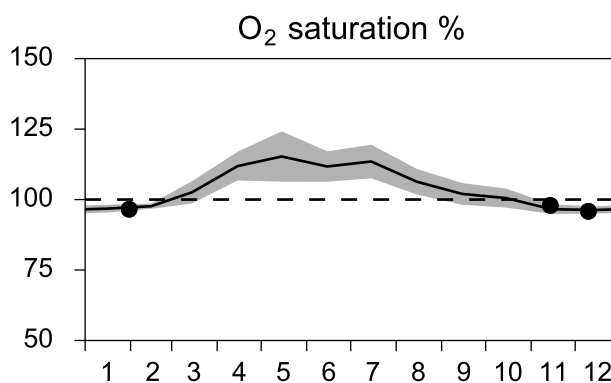
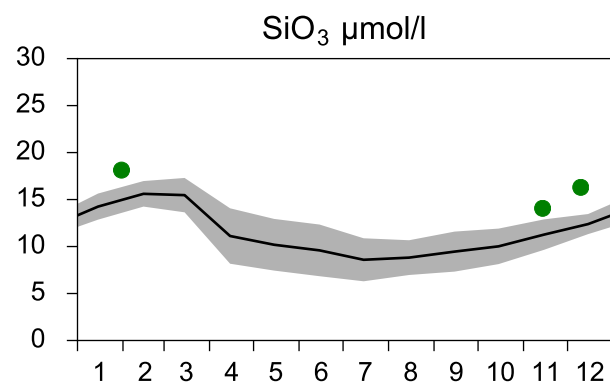
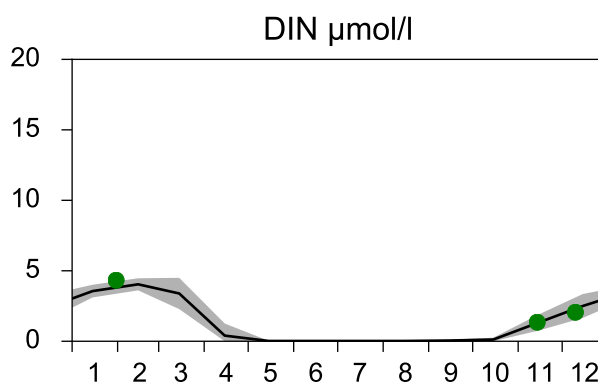
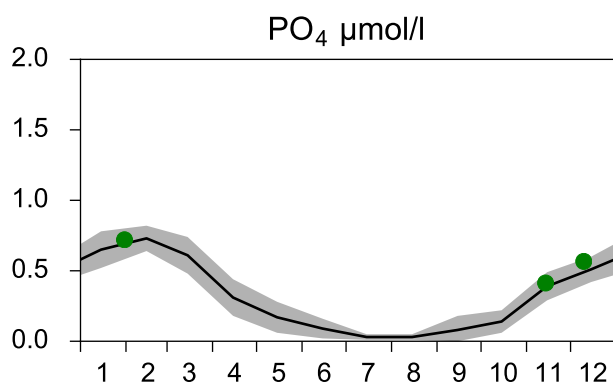
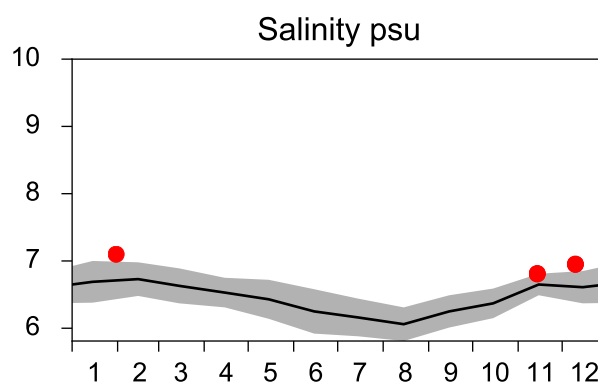
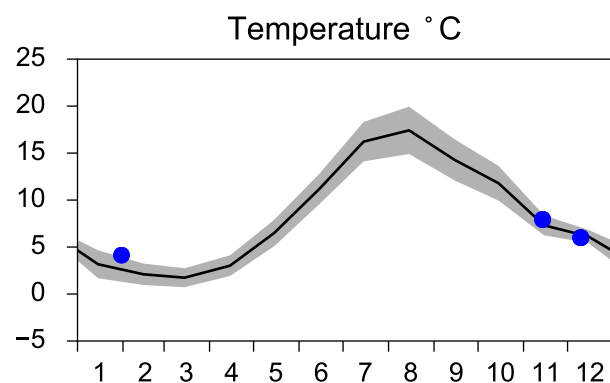
STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

Annual Cycles

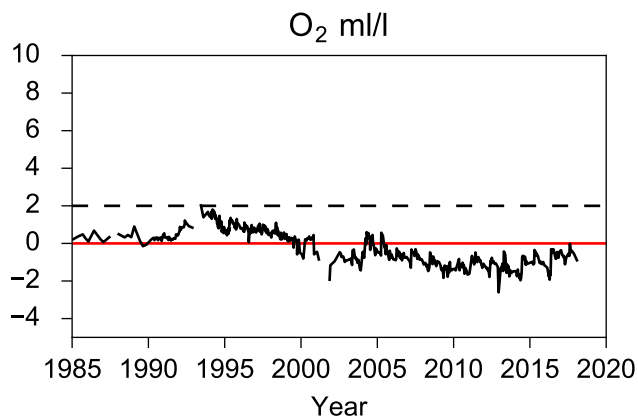
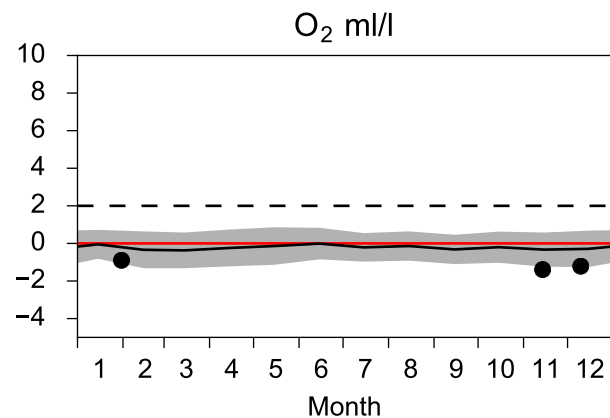
— Mean 2001-2015

■ St.Dev.

● 2018



OXYGEN IN BOTTOM WATER (depth >= 425 m)



Vertical profiles BY31 LANDSORTSDJ December

— Mean 2001-2015 ■ St.Dev. ● 2018-12-10

