

## Report from the SMHI monitoring cruise with R/V Aranda



**Survey period:**

2018-10-14 - 2018-10-21

**Principal:**

Swedish Meteorological and Hydrological Institute (SMHI),  
Swedish Agency for Marine and Water Management (SwAM).

**Cooperation partners:**

Finnish Environment Institute (SYKE)

## SUMMARY

The October cruise, which is part of the Swedish national marine monitoring programme, covered the Skagerrak, the Kattegat, the Sound, the Baltic Proper and the Gulf of Finland.

Initial problems with our CTD caused some delays since a thorough troubleshooting had to be performed. The problem turned out to be the computer and probably a malfunctioning serial port. The computer could temporarily be replaced until we reached Lysekil, there a permanent replacement computer was installed. The delay forced us to skip the second visit at Anholt E. Despite the initial problems we managed to get CTD profiles from all visited stations.

Oxygen concentrations close to zero were observed at many places in the deep water in the Baltic Proper. Anoxic conditions, when hydrogen sulphide forms, were found in the Western Gotland Basin from 60 metres depth. In the Eastern Gotland Basin from around 80 metres and at Hanöbukten closest to the bottom, at 80 metre there was no hydrogen sulphide but the oxygen concentration was very low,  $<0.1$  ml/l. At BCS III-10 in the southeast no hydrogen sulphide was found but the oxygen concentration was  $<0.1$  ml/l at the bottom. Also in the Bornholm Basin very low concentrations of oxygen were found at 80 metres, almost zero, then somewhat higher at the bottom. Oxygen concentrations in the Arkona Basin were lowest at the bottom with 3.41 ml/l.

Nutrient concentrations in the surface layer were at normal low levels for the season, higher values were found below the halocline which is normal. Silicate concentrations in the surface layer in the Baltic Proper continued to be somewhat higher than normal, however not as high as earlier this year or last year.

Surface water temperatures in the entire survey area were normal for the season, on the west coast around  $13^{\circ}\text{C}$  and in the Baltic Proper between  $11 - 14^{\circ}\text{C}$ , warmest in the southern parts. Somewhat colder water,  $8 - 9^{\circ}\text{C}$ , were found in the north at BY32 and at the coastal station REF M1V1. Salinity in the surface layer was somewhat higher than normal at several stations in all areas.

Next regular cruise is scheduled to start the 8<sup>th</sup> of November.

## RESULTS

The November expedition was conducted aboard the Finnish vessel Aranda, it started in Helsinki on the 14<sup>th</sup> of October and ended in the same port the 21<sup>st</sup>. The winds during the first half of the expedition were fresh from between south and west, in the Skagerrak from northwest. At the end of the expedition the winds decreased to moderate or weak. The weather was sunny and warm during the entire survey period.

Initial problems with our CTD caused some delays since a thorough troubleshooting had to be performed. The problem turned out to be the computer and probably a malfunctioning serial port. The computer could temporarily be replaced until we reached Lysekil, there a permanent replacement computer was installed. The delay forced us to skip the second visit at Anholt E. Despite the initial problems we managed to get CTD profiles from all visited stations, however oxygen measurements with the CTD are missing from the stations BY10 and BCS III-10 since these sensors were unplugged as part of the troubleshooting.

Extra samplings of phytoplankton were conducted during the expedition for Uppsala University, systematic biology.

Extra water was also collected for DTU aqua to be used for isotope analysis.

We also helped FMI, Finnish Meteorological Institute, to recover an APEX float in the Eastern Gotland Basin, at the same time a new float was deployed.

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.

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

### **The Skagerrak**

The surface water temperature in the Skagerrak was normal for the season, just above 13 °C, somewhat colder at the uttermost station Å17 with 12.5 °C. The temperature was pretty much stable down to 80 metres, at Släggö down to 50 metres, where it started to decrease with depth down to 120 metres at the deepest stations.

The salinity in the surface waters was also normal or slightly above and was measured to 28 psu at Släggö, just over 30 psu at P2 and between 31-33 psu at all the Å-stations, increasing from the coast and out. Salinity was at normal levels in the deeper water.

No distinct stratifications were found, neither in salinity nor temperature.

Nutrients in the form of dissolved inorganic nitrogen, DIN (the sum of nitrate, nitrite and ammonia), were in the surface waters on normal levels for the season at the stations Å17, P2 and Släggö, between 0.5 - 0.8 µmol/l. Somewhat higher at Å15 and Å13 with values just above 1 µmol/l. Values from 30 metre and below at Å17 and Å15 were lower than normal, at Å13 and Släggö they were normal. At P2 somewhat higher than normal between 15 - 30 metres, then normal values from 40

metres and below. Dissolved inorganic phosphorus, DIP (only in the form of phosphate), followed the same pattern as DIN at all stations, low values in the surface, up to 0.2  $\mu\text{mol/l}$ , then generally increasing from 50 metres and below.

Silicate concentrations were normal for the season at all stations, maybe somewhat below at Å17, with values from just over 1  $\mu\text{mol/l}$  to slightly over 4  $\mu\text{mol/l}$  in the surface, highest at P2 and lowest at Å17. It was slowly increasing from 50 metres and below, similar to the other nutrients.

No large peaks in fluorescence were found but some phytoplankton activity could be seen at all stations down to 10 metres, at Å16 to Å14 all the way down to 30 - 40 metres.

Oxygen conditions were good at all visited stations with normal concentrations for the season, lowest at the bottom at Släggö with 3.5  $\mu\text{mol/l}$ , and suspiciously low at the bottom at Å15, 3.8  $\mu\text{mol/l}$ .

### **The Kattegat and the Sound**

The water temperature was normal for the season in the entire area, just above 13 °C in the surface and just about constant in the full water column, between 13 - 14 °C. The salinity was higher than usual in the Kattegat down to around 20 metres, between 26 - 27 psu. The salinity was normal below 20 metres. A very weak halocline could be discerned around 20 metres, at N14 Falkenberg also a halocline at around 4 metres depth.

The salinity was normal for the season in the entire water column in the Sound, with a strong halocline at around 10 metres. The salinity above the halocline was around 10 psu and below just over 28 psu.

The concentrations of all nutrients, DIN, DIP and silicate, were on normal levels for the season in the entire water column in the Kattegat. DIN was consumed down to 15 - 20 metres where concentrations increased towards the bottom.

Nutrient concentrations were normal above the halocline in the Sound, and lower than normal below the halocline, just somewhat increasing towards the bottom.

Fluorescence measurements with the CTD showed some presence of phytoplankton in the surface water above the haloclines.

Oxygen concentrations in the Kattegat were on normal levels, at the bottom 3.8-4.8 ml/l, lowest at Anholt E. In the Sound the oxygen concentration below the halocline were somewhat higher than usual, at the lowest 4.2 ml/l closest to the bottom.

### **The Baltic Proper**

There was a well mixed upper layer with a thermocline around 40 metres in the Eastern Gotland Basin and around 20 - 30 metres in the Western Gotland Basin. Further south at BCS III-10 and BY5 the thermocline was found at 45 - 50 metres and closer to Bornholm at BY4 there was a weaker thermocline between 20 - 25 metres. In the Arkona Basin and in the Bight of Hanö there was no distinct stratification in temperature. The surface water temperatures were between 9 and 14 °C, coldest in the northwest at BY32 and close to the coast at REF M1V1, warmest in the southern parts at BY2, BY5 and BCS III-10. The water below the halocline in the Arkona Basin, Bight of

Hanö and Bornholm Basin were relatively warm and salty, it probably originates from the Kattegat and has flowed in through the Sound during the autumn.

The halocline the Baltic Proper was found at 70 metres in the Eastern Gotland Basin, at 45 - 50 metres in the Western Gotland Basin and the Bornholm Basin, at 40 metres in the Bight of Hanö and at BY1 in the Arkona Basin but already at 33 metres at BY2 with underlying warm water over 14 °C. The salinity in the surface layer were generally just above normal in the Baltic Proper with the exception of the eastern parts where values were at normal levels, from just under 9 psu in southwest to slightly below 7 psu in the north. In the Western Gotland Basin the salinity was a bit higher than normal also in the deeper water.

Nutrients in the form of dissolved inorganic nitrogen, DIN, were consumed at all stations down to about 20 metres, which is normal for this month. Concentrations increased with depth further down and were at normal levels everywhere except in the southern and middle part of the Eastern Gotland Basin where concentrations were slightly below normal. Also differed somewhat at deeper levels at BY38 where concentrations were a bit higher than normal, up to 15 µmol/l closest to the bottom. Concentration of phosphate, DIP, in the surface layer were at normal low levels in the Baltic Proper, somewhat lower at BY2 in the south and somewhat higher at BY32 in the north. Concentrations varied between 0.1 - 0.3 µmol/l offshore and between 0.5 - 0.6 at the coastal station REF M1V1. The concentrations below the halocline were slightly lower than normal in the Western Gotland Basin, just above 3.5 µmol/l. In the Bight of Hanö and the Bornholm Basin high values were measured below the halocline, over 7 µmol/l. Normal concentrations were observed in the deeper water at remaining stations.

Silicate concentrations were generally somewhat higher than normal above the halocline and varied between 9 - 14 µmol/l offshore and around 17 µmol/l at the coastal station REF M1V1. Concentrations were at normal levels below the halocline, around 50 - 60 µmol/l. Lower values were observed in the bottom water in the Arkona Basin, 20 - 30 µmol/l, which is normal since the water is shallower and affected by water originating from Kattegat.

Oxygen concentrations close to zero were observed at many places in the deep water in the Baltic Proper. Anoxic conditions, when hydrogen sulphide forms, were found in the Western Gotland Basin from 60 metres depth. In the Eastern Gotland Basin from around 80 metres and at Hanöbukten closest to the bottom, at 80 metre there was no hydrogen sulphide but the oxygen concentration was very low, <0.1 ml/l. At BCS III-10 in the southeast no hydrogen sulphide was found but the oxygen concentration was <0.1 ml/l at the bottom. Also in the Bornholm Basin very low concentrations of oxygen were found at 80 metres, almost zero, then somewhat higher at the bottom. Acute hypoxia ( $O_2$  <2 ml/l) were found in the Western Gotland Basin already around 50 metres, in the Eastern Gotland Basin and at BCS III-10 around 75 metres. In the Bornholm Basin and at Hanöbukten values below 2 ml/l were found at 60 metres. Oxygen concentrations in the Arkona Basin were lowest at the bottom with 3.41 ml/l.

Fluorescence measurements with the CTD showed some phytoplankton activity above the thermocline at the stations where it existed, where no thermocline were present some activity could be seen in the surface down to around 20 - 30 metres, however no large peaks were observed.

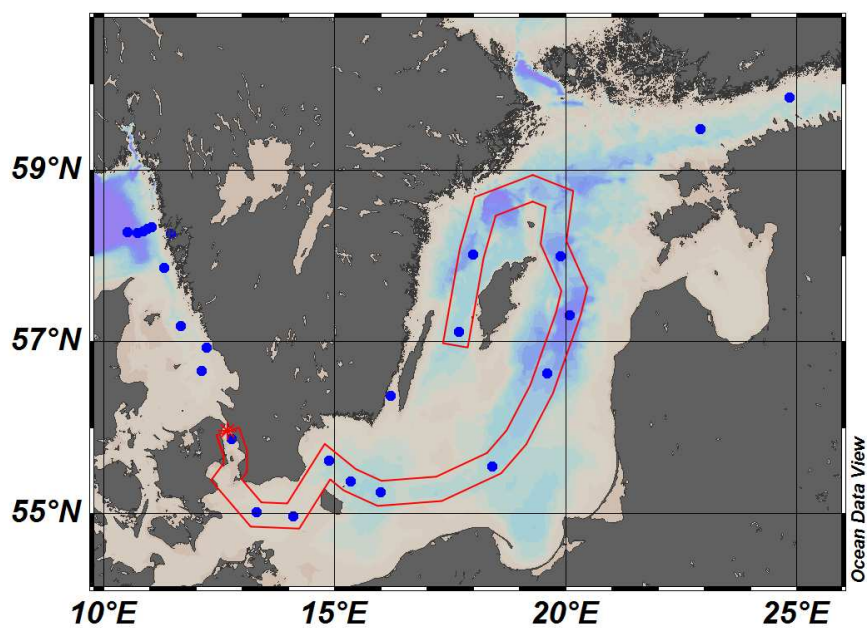
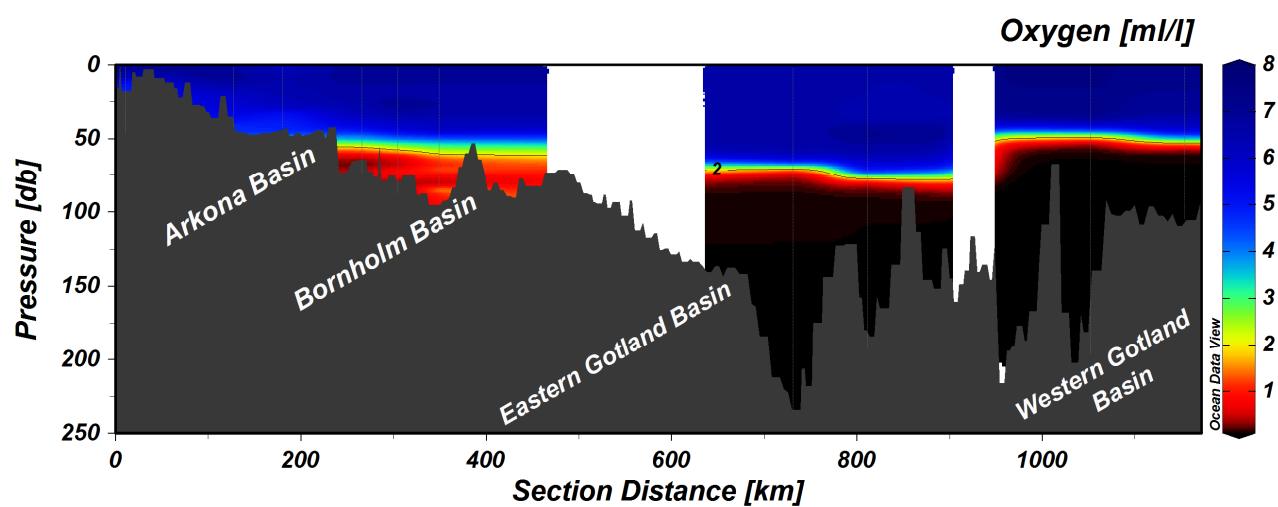
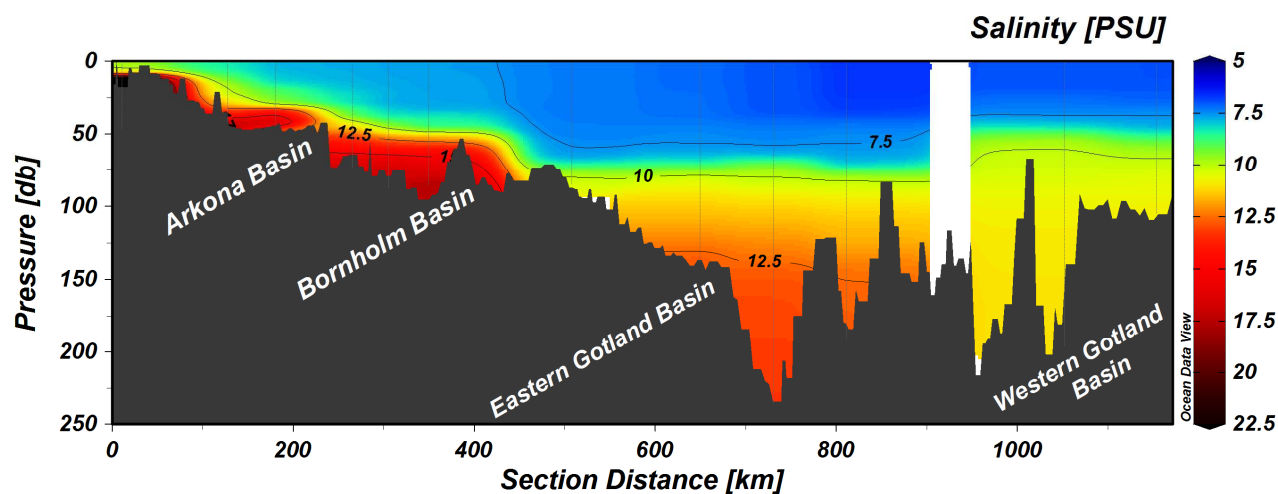


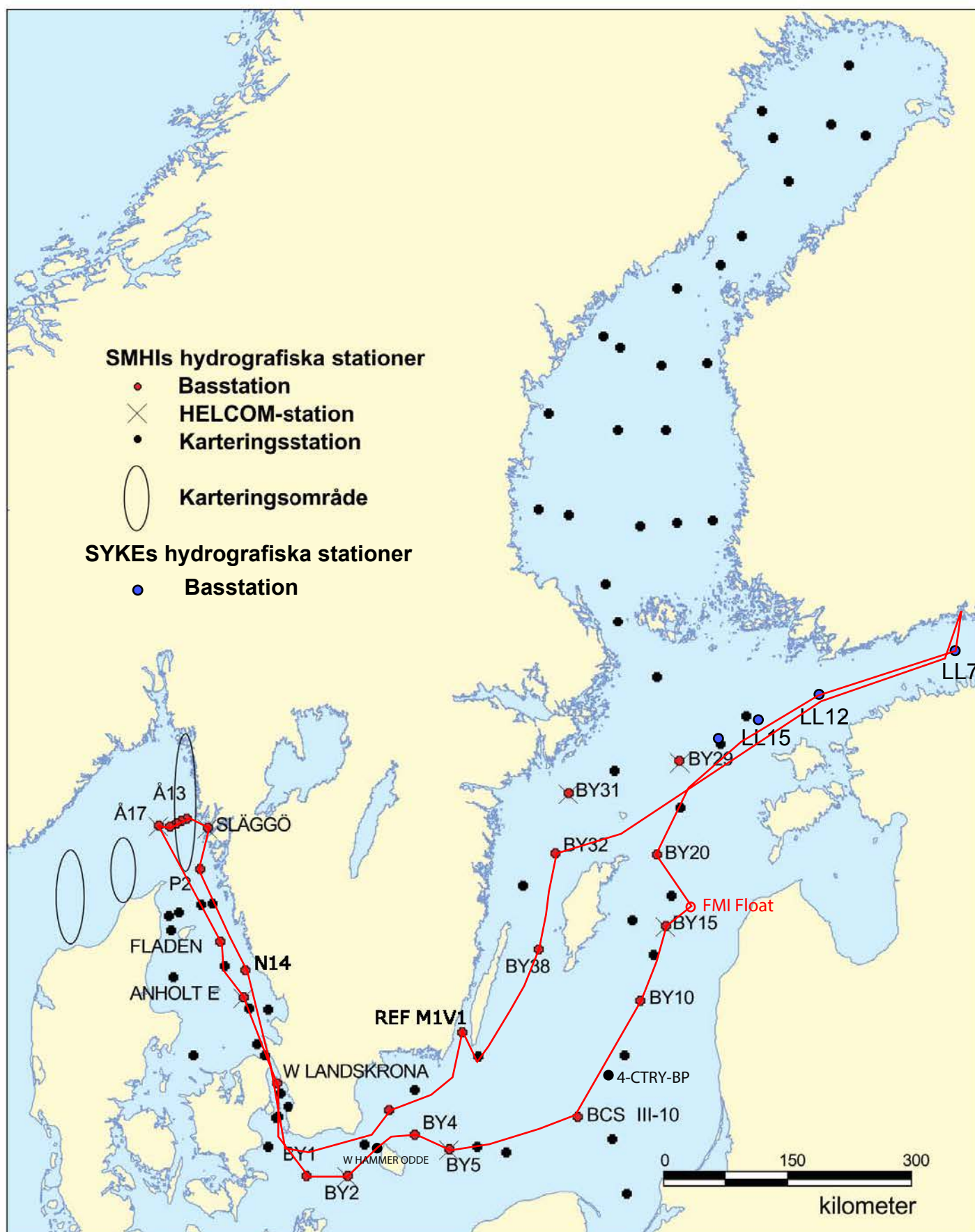
Figure 1. Transect showing dissolved oxygen and salinity from the Sound, through the Baltic Proper, to the Western Gotland Basin.

## **PARTICIPANTS**

| <b>Name</b>              |                       | <b>From</b> |
|--------------------------|-----------------------|-------------|
| Örjan Bäck               | Chief Scientist       | SMHI        |
| Kristin Andreasson       |                       | SMHI        |
| Johan Håkansson          |                       | SMHI        |
| Madeleine Nilsson        |                       | SMHI        |
| Daniel Bergman Sjöstrand | Helsingfors-Lysekil   | SMHI        |
| Ann-Turi Skjevik         | Lysekil - Helsingfors | SMHI        |

## **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



Time: 08:56

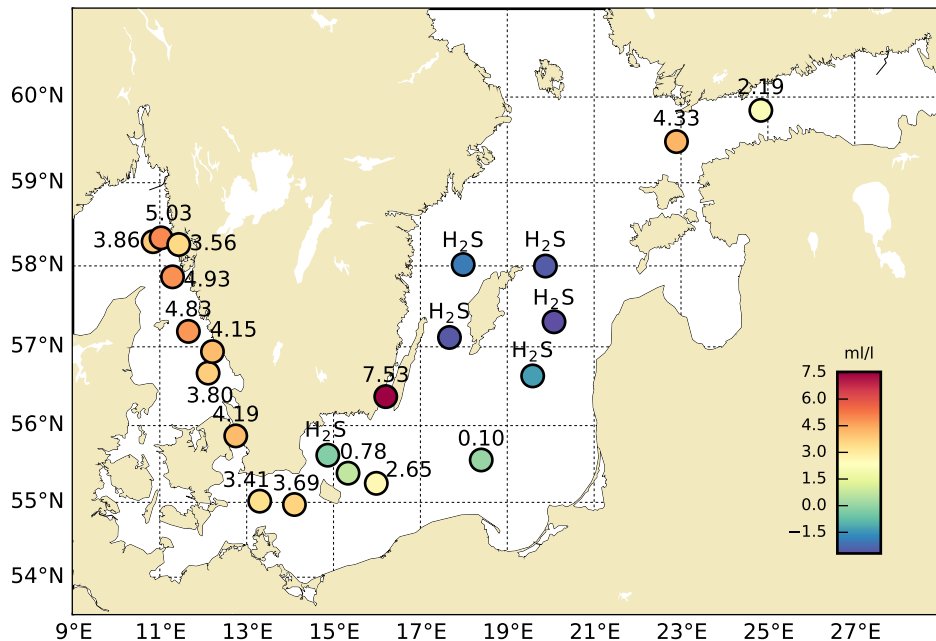
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|--------|--------|-----------|--------|-----------------|---------|----------|------------------------|--------------------|-------------------|-------------------|-----------------|---------------|-----------------|---------------------|------------------|-------|--------|---------|---------|---------|---------|---------|-------|-------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---|---|---|
| 0090   | 4      | GFXX29    | SYK    | BY23 / LL7      | 5950.80 | 02450.28 | 20181014               | 1050               | 100               | 7                 | 20              | 7             | 13.8            | 1130                | x---             | 13    | 13     | x       | x       | x       | x       | -       | x     | x     | x     | x     | x     | x     | x     | x     | x       | x       | -       | x | - | - |
| 0091   | 4      | BPNX60    | SYK    | LL12            | 5929.01 | 02253.77 | 20181014               | 1810               | 84                |                   | 17              | 9             | 13.4            | 9990                | x---             | 11    | 11     | x       | x       | x       | x       | -       | x     | x     | -     | x     | x     | x     | x     | x     | x       | x       | -       | x | - | - |
| 0092   | 4      | BPEX26    | BAS... | BY20 FÄRÖDJ     | 5759.89 | 01952.70 | 20181015               | 0715               | 203               | 6                 | 19              | 10            | 12.8            | 1230                | x--x             | 17    | 17     | x       | x       | -       | x       | x       | x     | x     | x     | x     | x     | x     | x     | x     | x       | x       | -       | x | - | - |
| 0093   | 4      | BPEX21    | BAS... | BY15 GOTLANDSDJ | 5718.73 | 02004.57 | 20181015               | 1415               | 249               |                   | 18              | 10            | 12.7            | 1040                | xxx-             | 24    | 24     | x       | x       | -       | x       | x       | x     | x     | x     | x     | x     | x     | x     | x     | x       | x       | x       | - | - |   |
| 0094   | 4      | BPEX21    | BAS... | BY15 GOTLANDSDJ | 5718.73 | 02004.57 | 20181015               | 1620               | 249               |                   | 18              | 9             | 12.7            | 1040                | ----             | 19    | 0      | -       | x       | -       | x       | -       | -     | -     | -     | -     | -     | -     | -     | -     | -       | -       | -       | - | - |   |
| 0095   | 4      | BPEX13    | BAS... | BY10            | 5638.02 | 01935.09 | 20181015               | 2115               | 147               |                   | 18              | 10            | 13.5            | 9990                | x---             | 15    | 15     | x       | x       | x       | x       | -       | x     | x     | x     | x     | x     | x     | x     | x     | x       | x       | -       | x | - | - |
| 0096   | 4      | BPSE11    | BAS... | BCS III-10      | 5533.31 | 01824.00 | 20181016               | 0540               | 90                |                   | 21              | 5             | 14.3            | 1020                | x-x-             | 12    | 12     | x       | x       | x       | x       | -       | x     | x     | x     | x     | x     | x     | x     | x     | x       | x       | -       | x | - | - |
| 0097   | 4      | BPSB07    | BAS... | BY5 BORNHOLMSDJ | 5515.00 | 01559.04 | 20181016               | 1445               | 91                |                   | 20              | 4             | 13.8            | 1120                | xxxx             | 12    | 12     | x       | x       | x       | x       | x       | x     | -     | x     | x     | x     | x     | x     | x     | x       | x       | x       | - | - |   |
| 0098   | 4      | BPSB06    | BAS... | BY4 CHRISTIANSÖ | 5522.98 | 01520.02 | 20181016               | 1820               | 94                |                   | 17              | 5             | 13.8            | 9990                | x---             | 12    | 12     | x       | x       | x       | x       | -       | x     | x     | -     | x     | x     | x     | x     | x     | x       | -       | x       | - | - |   |
| 0099   | 4      | BPSA03    | BAS... | BY2 ARKONA      | 5458.27 | 01405.92 | 20181017               | 0030               | 47                |                   | 16              | 2             | 14.0            | 9999                | xxx-             | 8     | 8      | x       | x       | x       | x       | -       | x     | x     | -     | x     | x     | x     | x     | x     | x       | -       | x       | - | - |   |
| 0100   | 4      | BPSA02    | BAS... | BY1             | 5500.93 | 01318.03 | 20181017               | 0350               | 47                |                   | 2               | 3             | 12.3            | 9999                | x---             | 8     | 8      | x       | x       | x       | x       | -       | x     | x     | -     | x     | x     | x     | x     | x     | x       | -       | x       | - | - |   |
| 0101   | 4      | SOCX39    | BAS... | W LANDSKRONA    | 5552.03 | 01244.89 | 20181017               | 0945               | 50                | 7                 | 17              | 4             | 12.6            | 1310                | x---             | 9     | 9      | x       | x       | x       | x       | -       | x     | x     | -     | x     | x     | x     | x     | x     | x       | -       | x       | - | - |   |
| 0102   | 4      | KAEX29    | BAS... | ANHOLT E        | 5640.15 | 01206.71 | 20181017               | 1435               | 62                |                   | 18              | 7             | 14.3            | 1520                | xxxx             | 10    | 10     | x       | x       | x       | x       | x       | x     | -     | x     | x     | x     | x     | x     | x     | x       | x       | -       | - |   |   |
| 0103   | 4      | KANX25    | BAS... | FLADEN          | 5711.56 | 01139.48 | 20181017               | 1845               | 84                |                   | 24              | 5             | 13.8            | 9999                | x---             | 12    | 12     | x       | x       | x       | x       | -       | x     | x     | -     | x     | x     | x     | x     | x     | -       | x       | -       | - |   |   |
| 0104   | 4      | SKEX18    | BAS... | Å17             | 5817.10 | 01030.25 | 20181018               | 0130               | 340               |                   | 30              | 11            | 12.4            | 9990                | xxx-             | 15    | 14     | x       | x       | -       | x       | x       | x     | x     | -     | x     | x     | x     | x     | x     | x       | -       | x       | - | - |   |
| 0105   | 4      | SKEX17    | BAS... | Å16             | 5816.03 | 01043.44 | 20181018               | 0400               | 202               |                   | 30              | 11            | 12.2            | 9990                | ----             | 13    |        |         |         |         |         |         |       |       |       |       |       |       |       |       |         |         |         |   |   |   |

# Bottom water oxygen concentration (ml/l)

Ship: Aranda

Date: 20181014-20181020

Series: 0090-0115



# STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

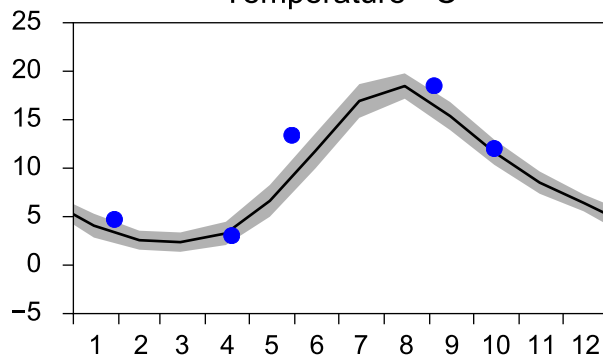
Annual Cycles

— Mean 2001-2015

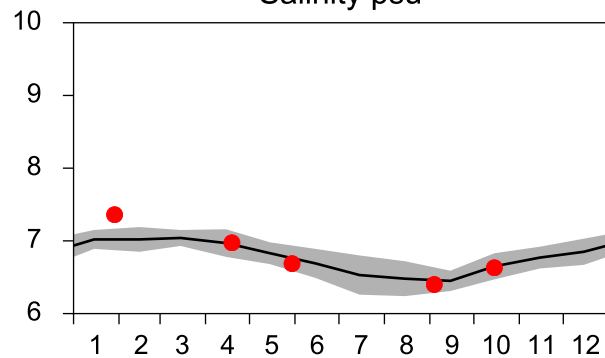
■ St.Dev.

● 2018

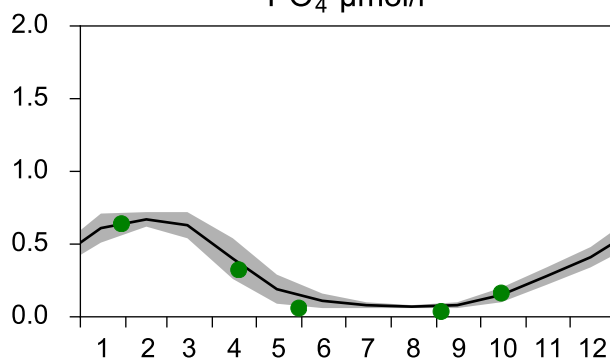
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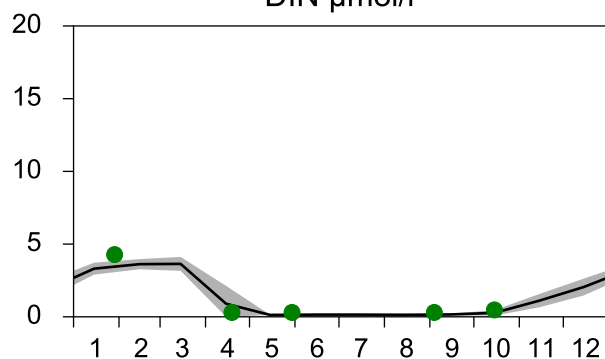
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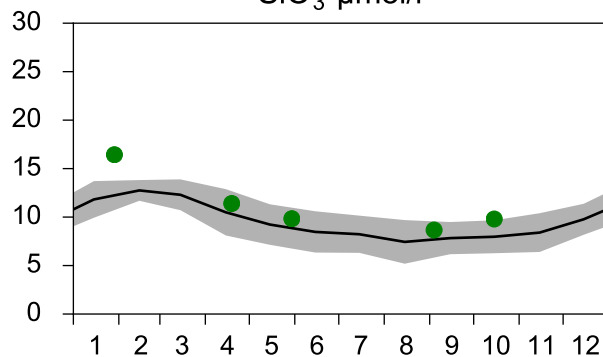
PO<sub>4</sub> µmol/l



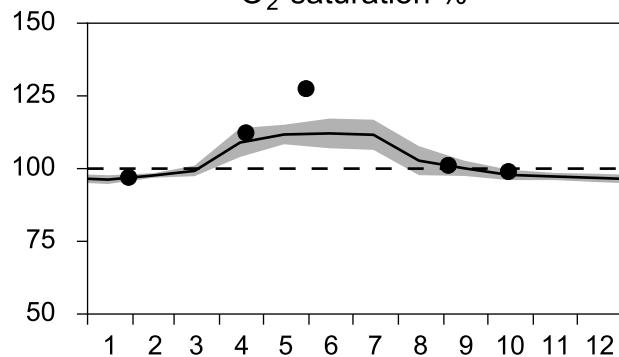
DIN µmol/l



SiO<sub>3</sub> µmol/l

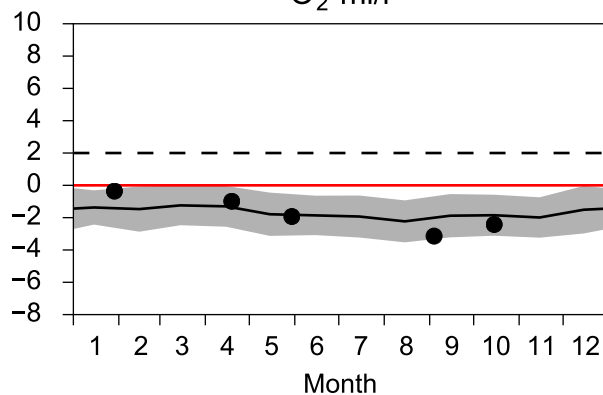


O<sub>2</sub> saturation %

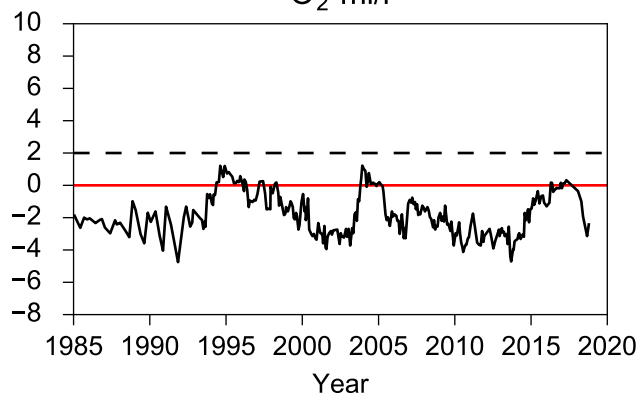


## OXYGEN IN BOTTOM WATER (depth >= 175 m)

O<sub>2</sub> ml/l

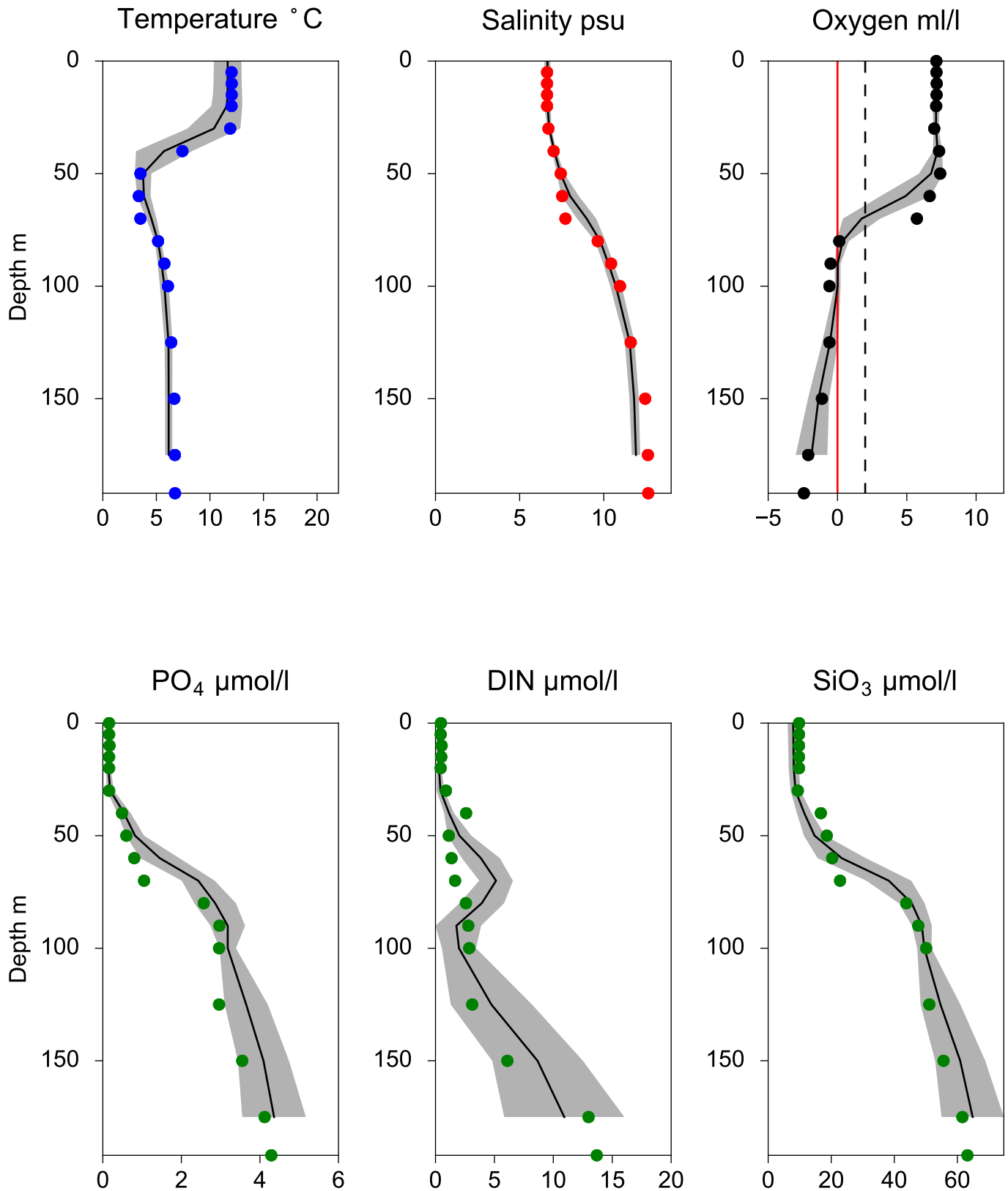


O<sub>2</sub> ml/l



# Vertical profiles BY20 FÅRÖDJ October

— Mean 2001-2015    St.Dev.    • 2018-10-15



# STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

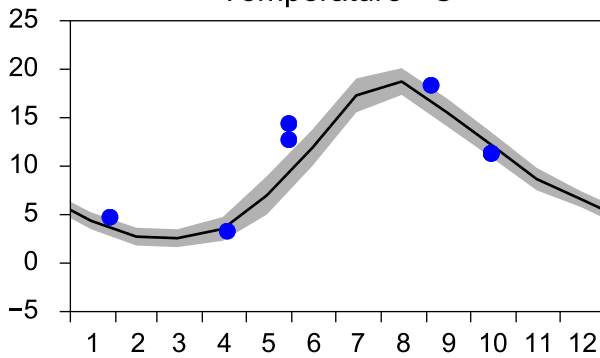
Annual Cycles

— Mean 2001-2015

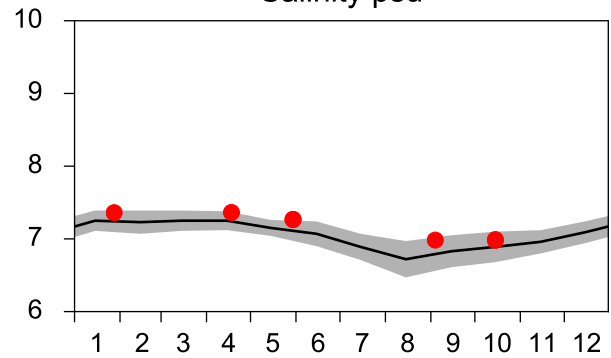
■ St.Dev.

● 2018

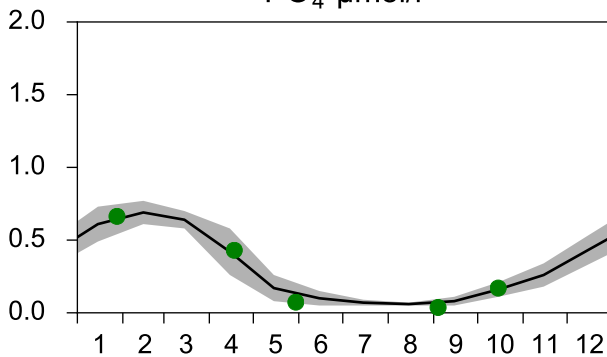
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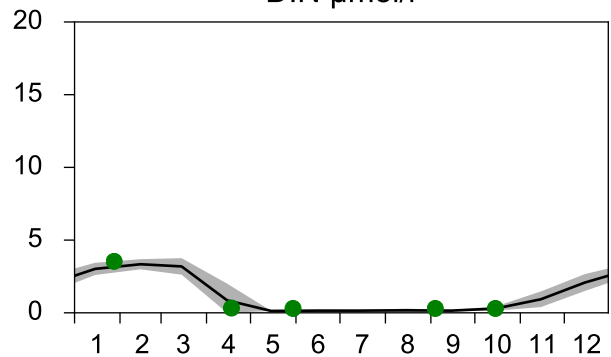
Salinity psu



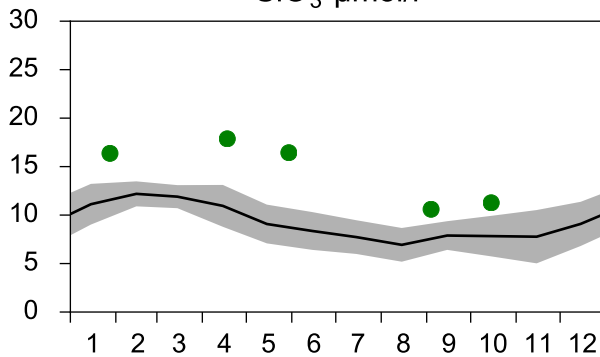
PO<sub>4</sub> µmol/l



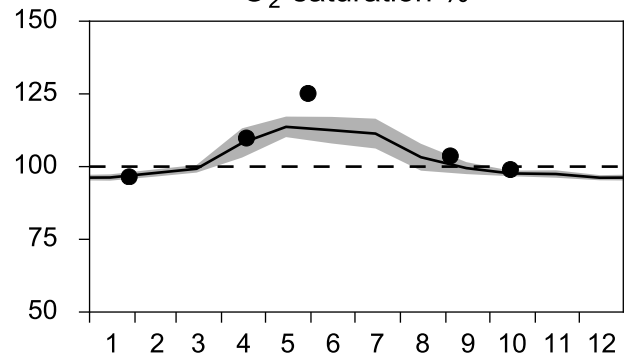
DIN µmol/l



SiO<sub>3</sub> µmol/l

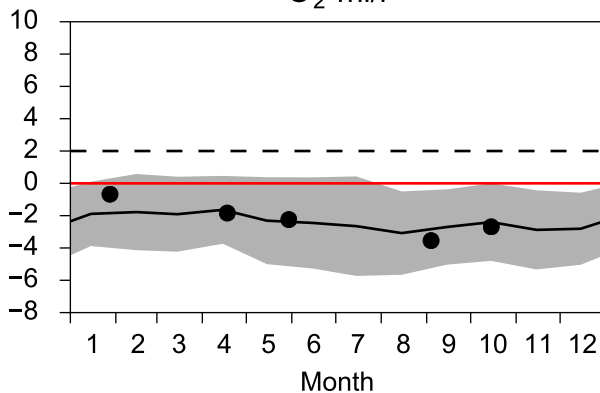


O<sub>2</sub> saturation %

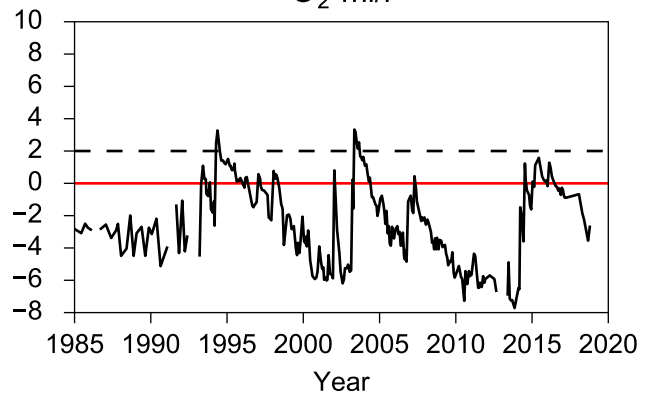


## OXYGEN IN BOTTOM WATER (depth >= 225 m)

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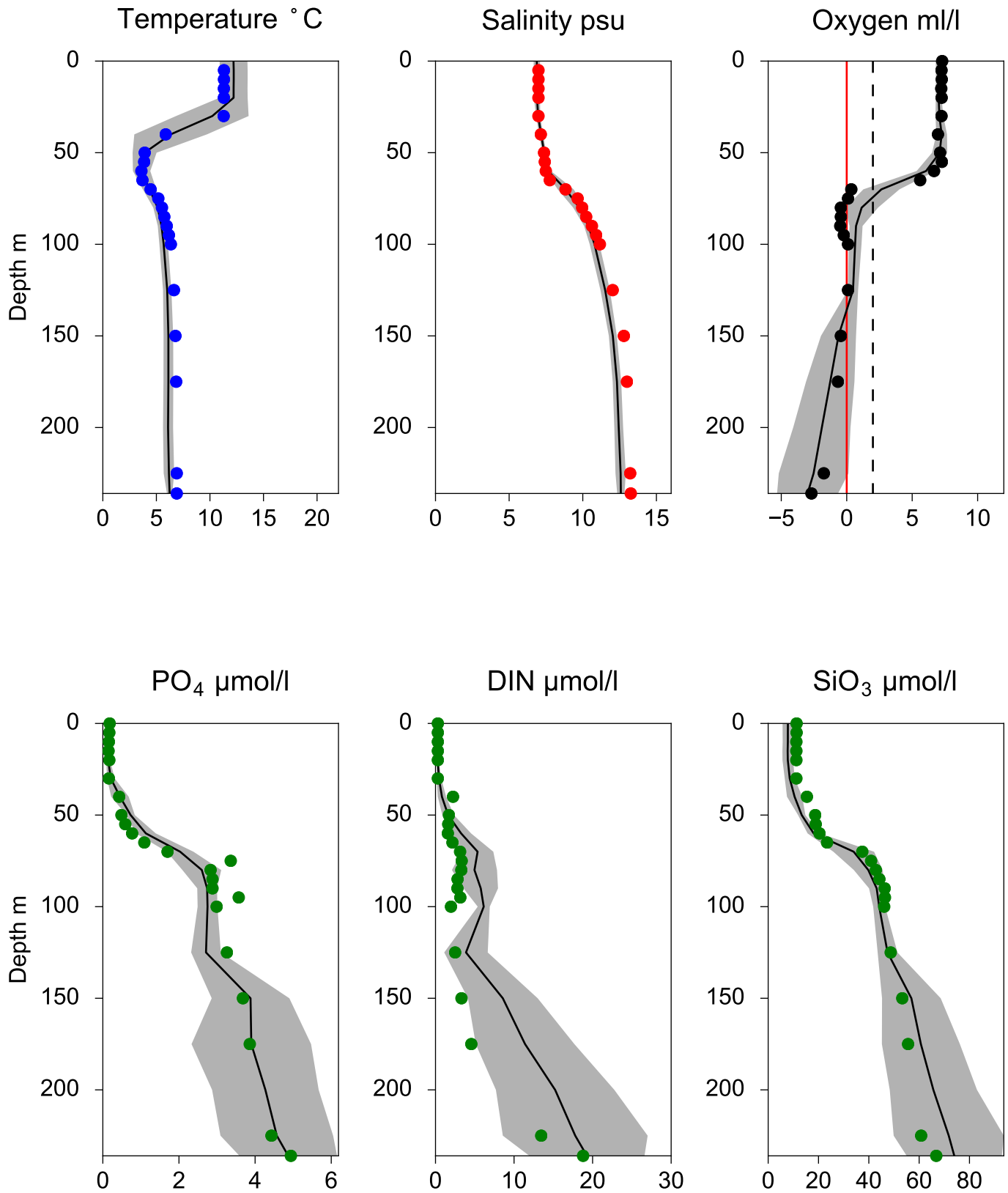


O<sub>2</sub> ml/l



# Vertical profiles BY15 GOTLANDSDJ October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-15



# STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

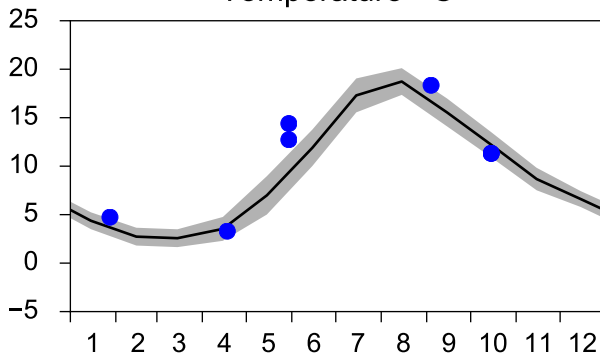
Annual Cycles

— Mean 2001-2015

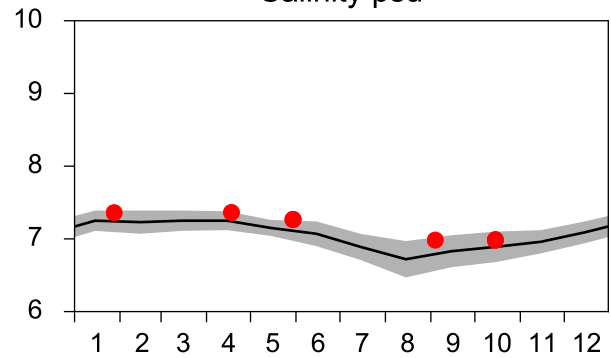
■ St.Dev.

● 2018

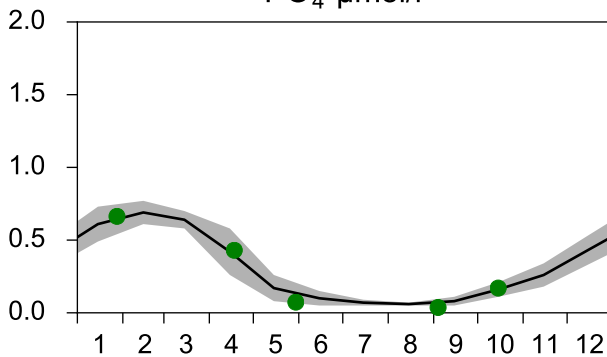
Temperature °C



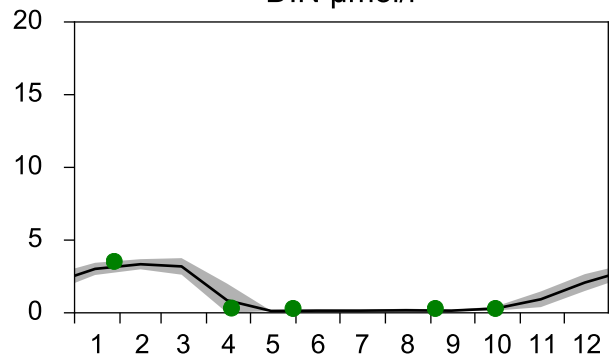
Salinity psu



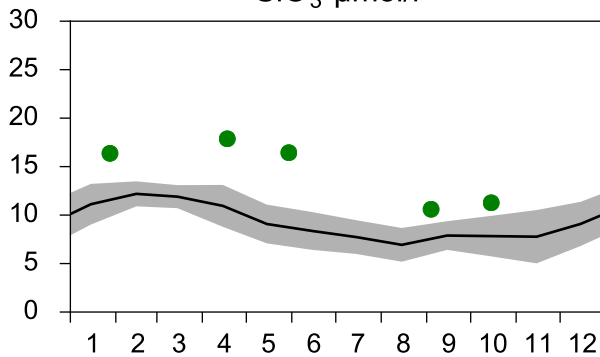
PO<sub>4</sub> µmol/l



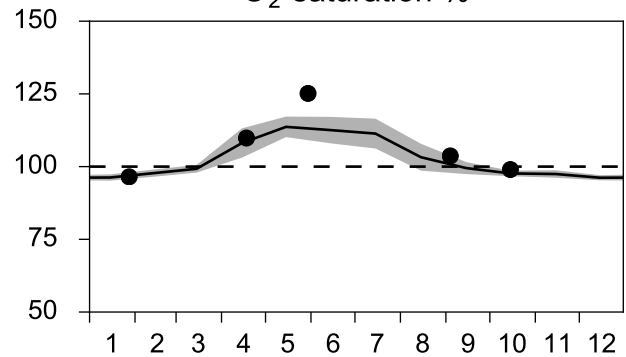
DIN µmol/l



SiO<sub>3</sub> µmol/l

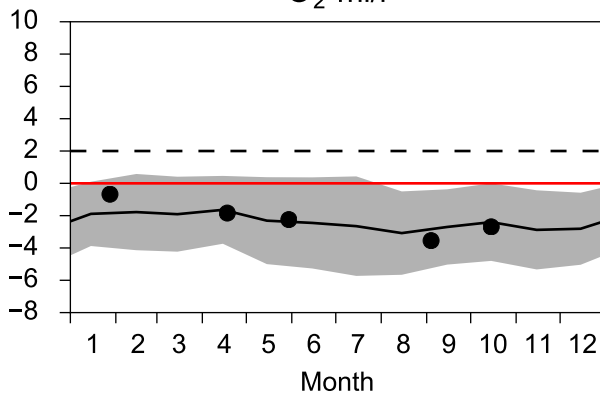


O<sub>2</sub> saturation %

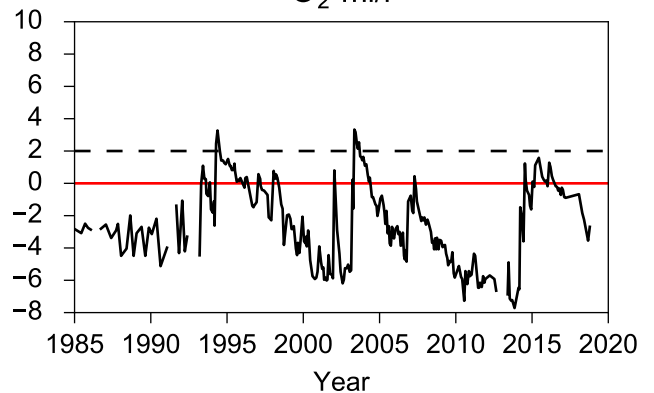


## OXYGEN IN BOTTOM WATER (depth >= 225 m)

O<sub>2</sub> ml/l

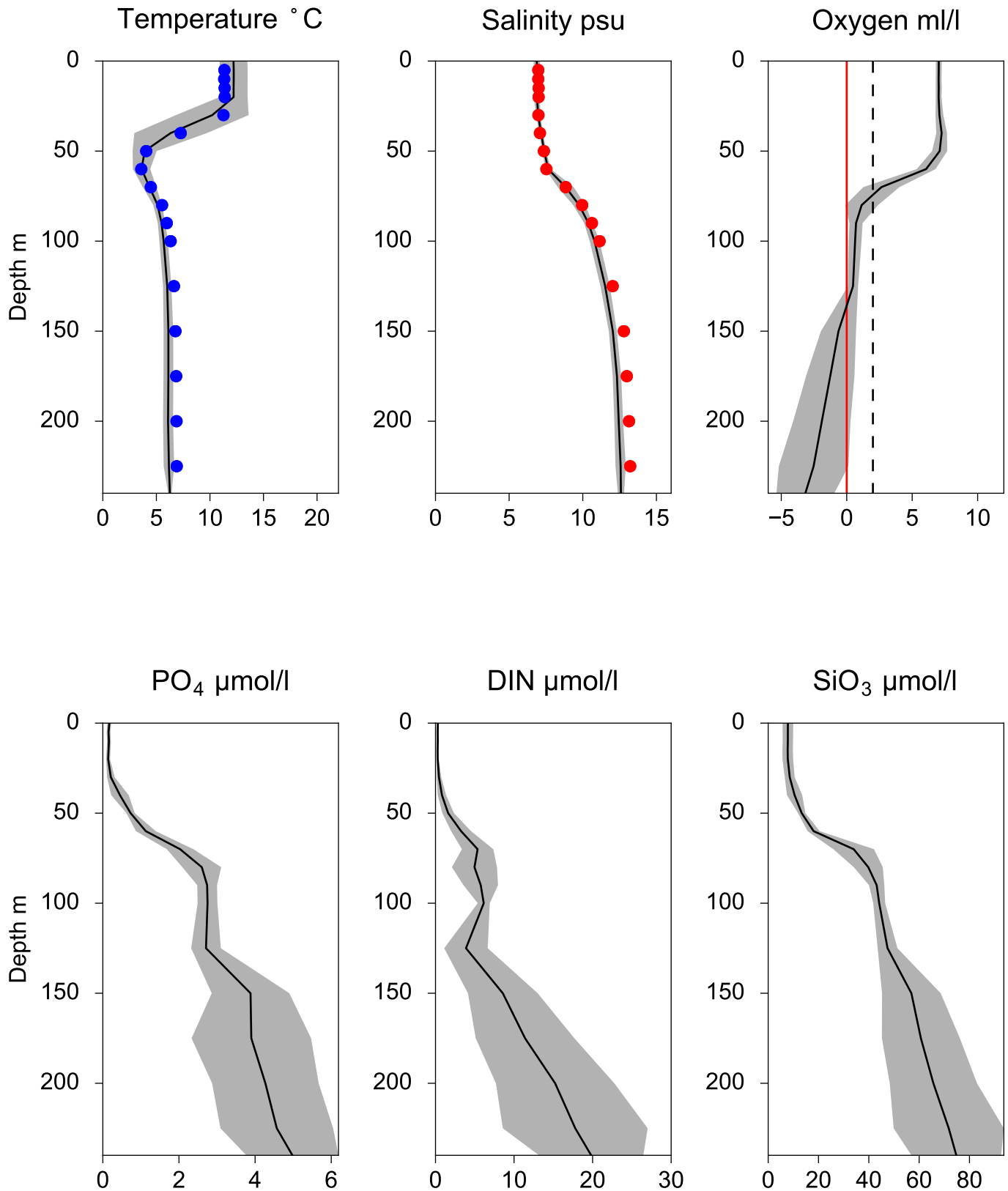


O<sub>2</sub> ml/l



# Vertical profiles BY15 GOTLANDSDJ October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-15



# STATION BY10 SURFACE WATER (0-10 m)

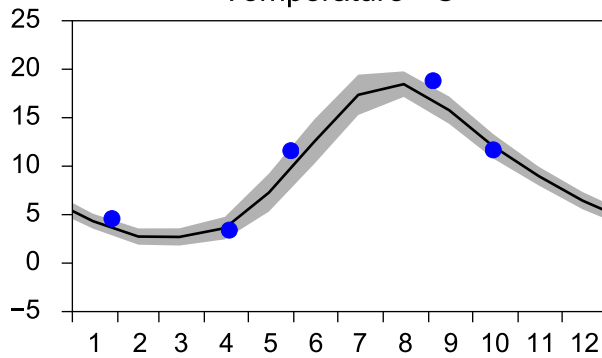
Annual Cycles

— Mean 2001-2015

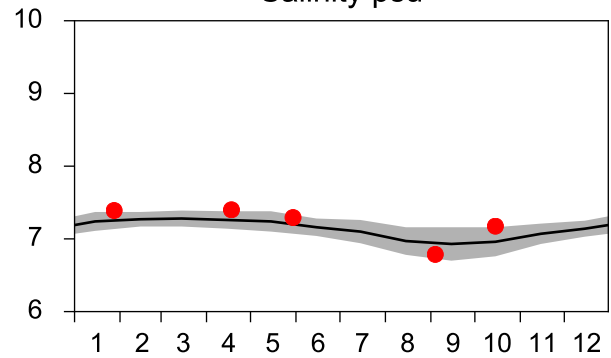
■ St.Dev.

● 2018

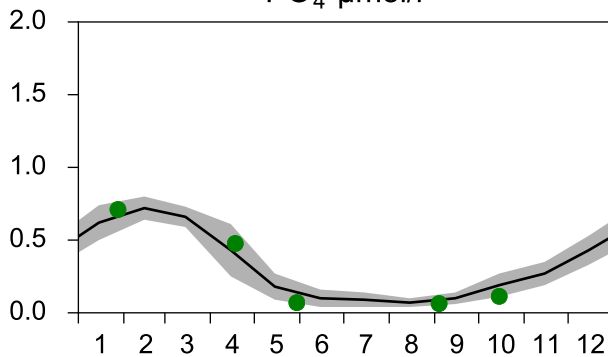
Temperature °C



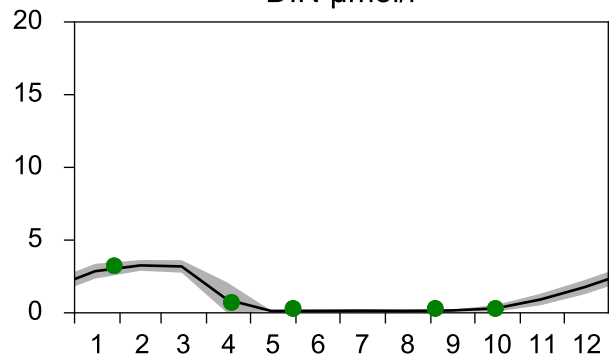
Salinity psu



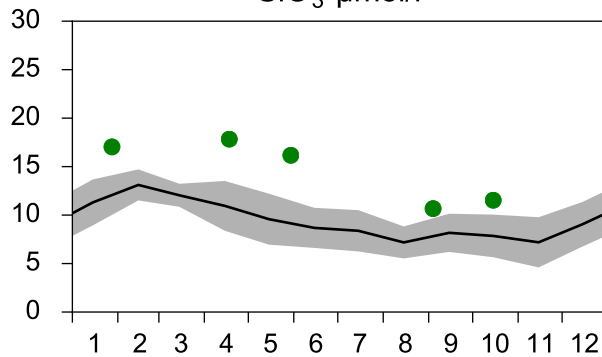
PO<sub>4</sub> µmol/l



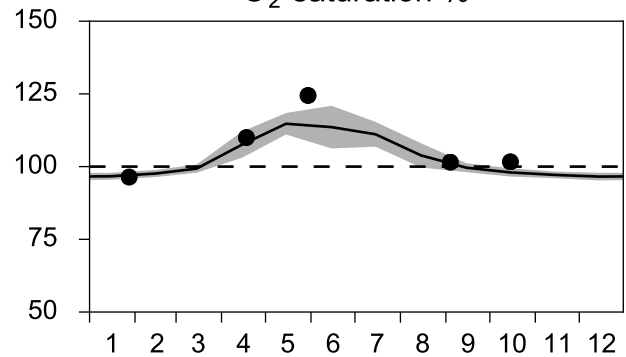
DIN µmol/l



SiO<sub>3</sub> µmol/l

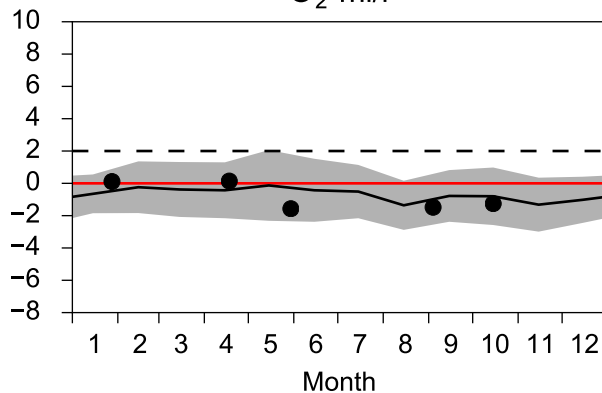


O<sub>2</sub> saturation %

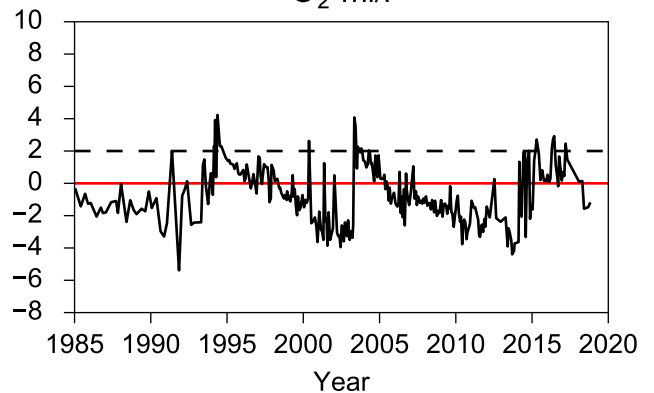


## OXYGEN IN BOTTOM WATER (depth >= 125 m)

O<sub>2</sub> ml/l

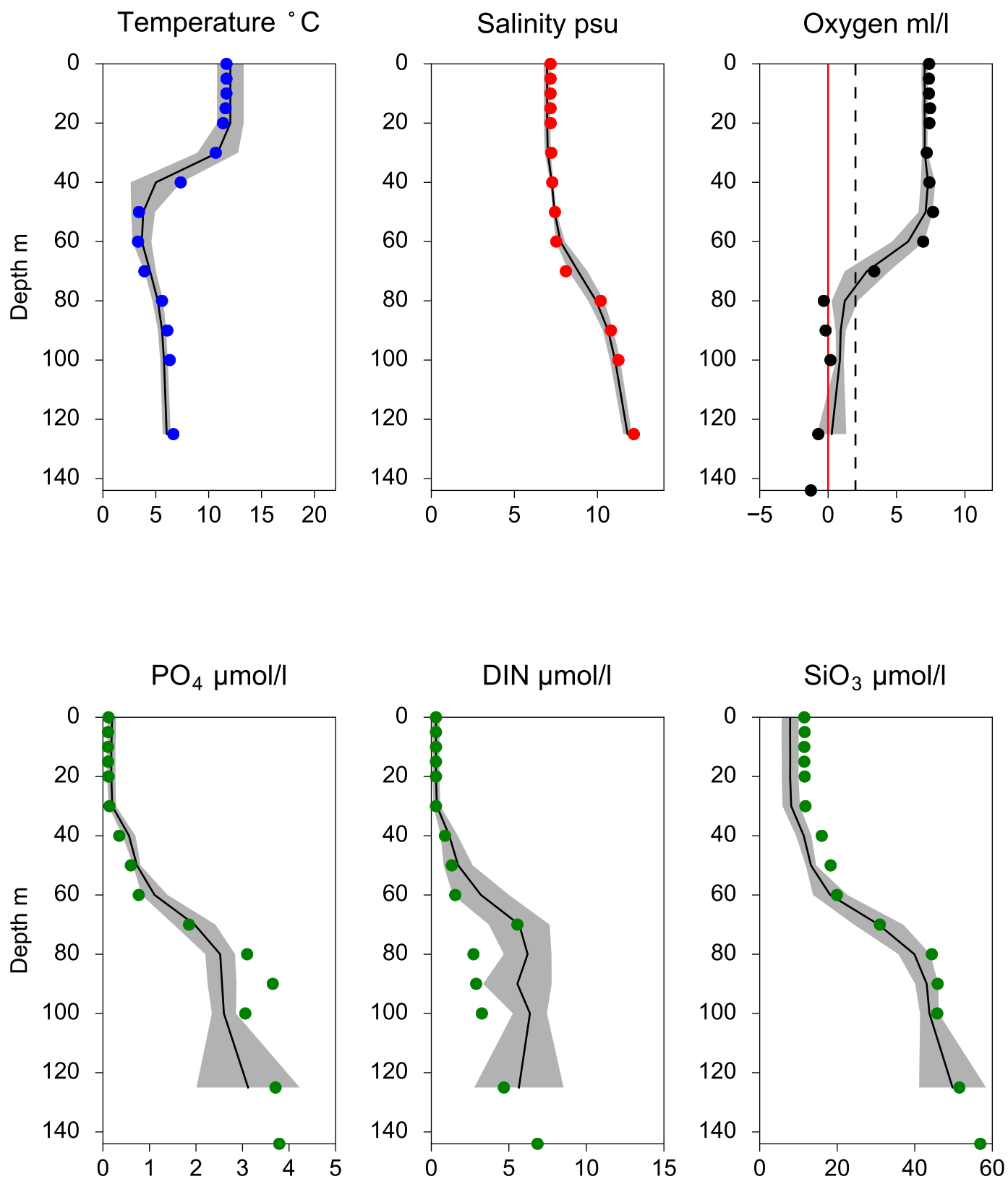


O<sub>2</sub> ml/l



# Vertical profiles BY10 October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-15



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

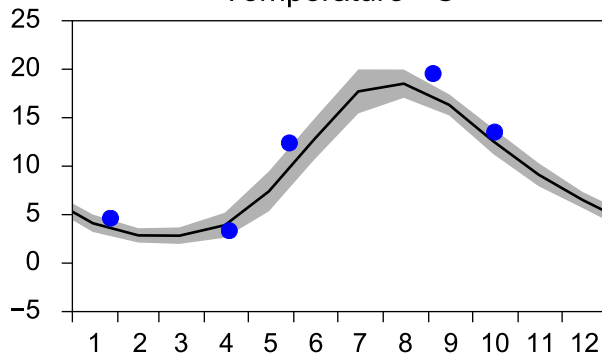
Annual Cycles

— Mean 2001-2015

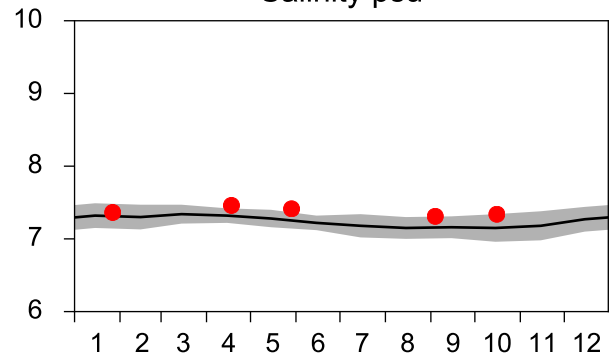
■ St.Dev.

● 2018

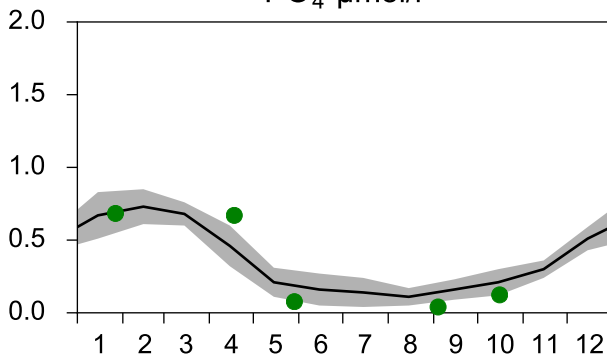
Temperature °C



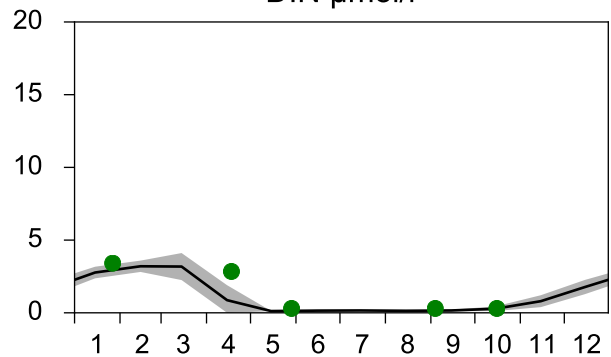
Salinity psu



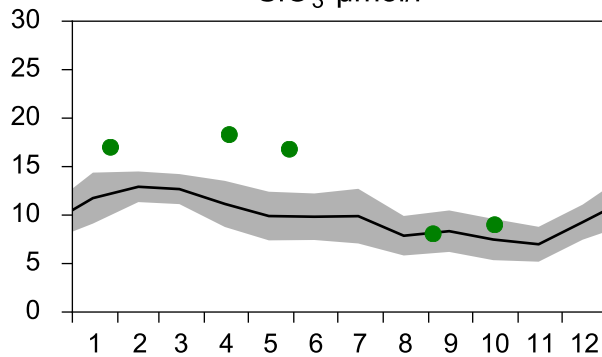
PO<sub>4</sub> µmol/l



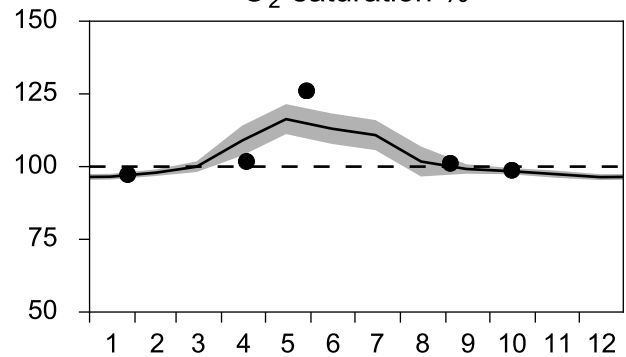
DIN µmol/l



SiO<sub>3</sub> µmol/l

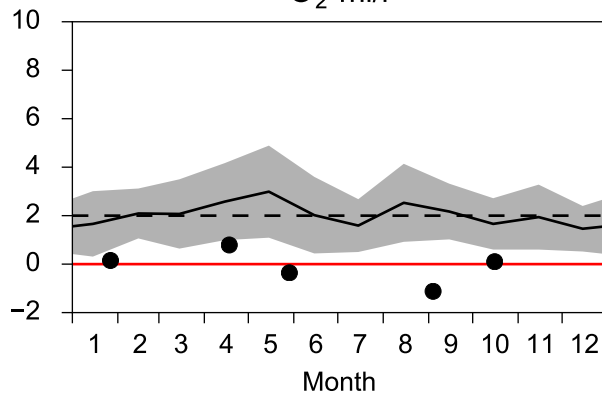


O<sub>2</sub> saturation %

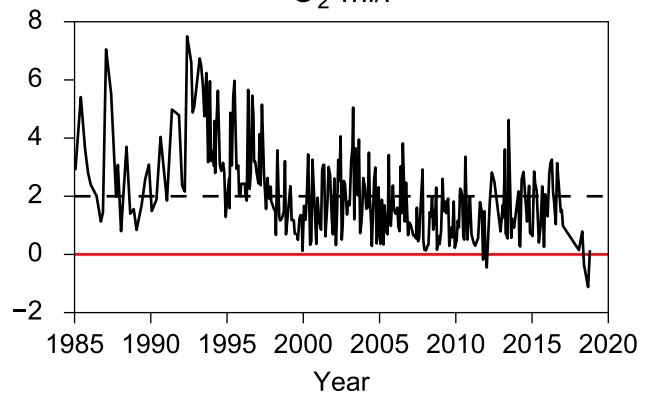


## OXYGEN IN BOTTOM WATER (depth >= 80 m)

O<sub>2</sub> ml/l

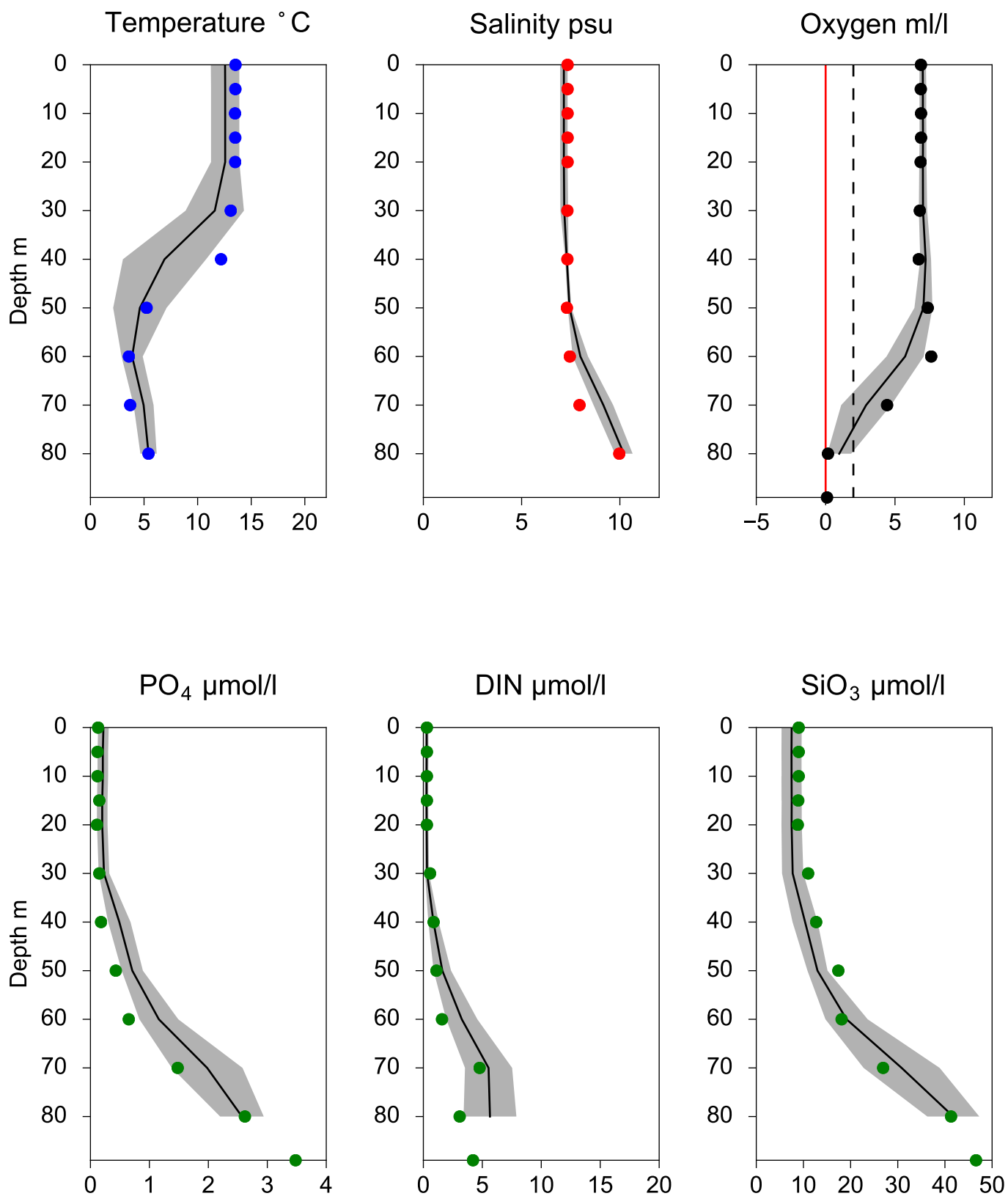


O<sub>2</sub> ml/l



## Vertical profiles BCS III-10 October

— Mean 2001-2015    St.Dev.    • 2018-10-16



# STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

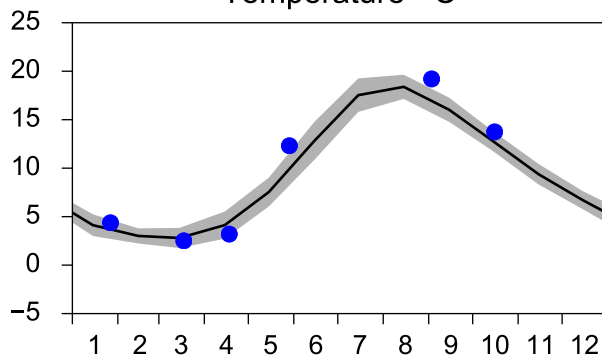
Annual Cycles

— Mean 2001-2015

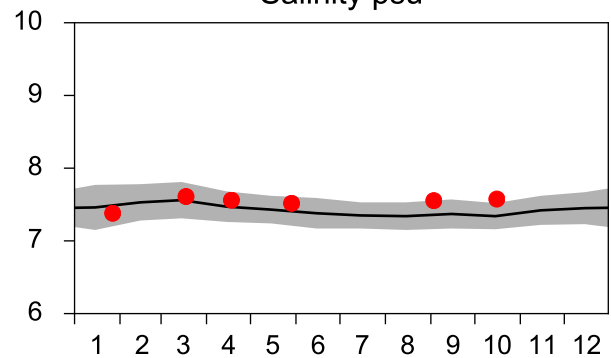
■ St.Dev.

● 2018

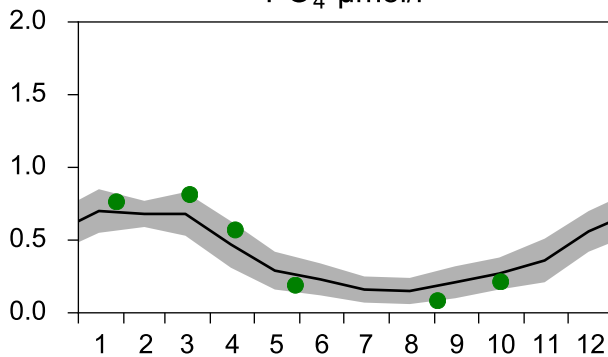
Temperature °C



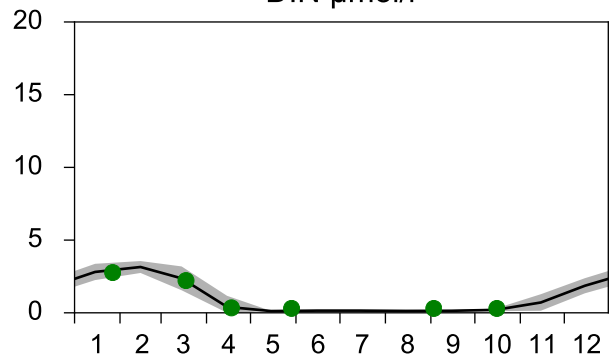
Salinity psu



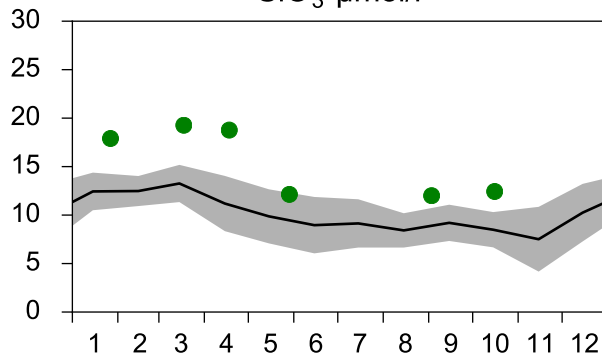
PO<sub>4</sub> μmol/l



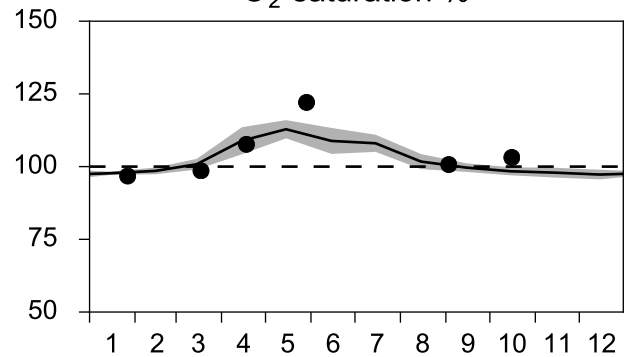
DIN μmol/l



SiO<sub>3</sub> μmol/l

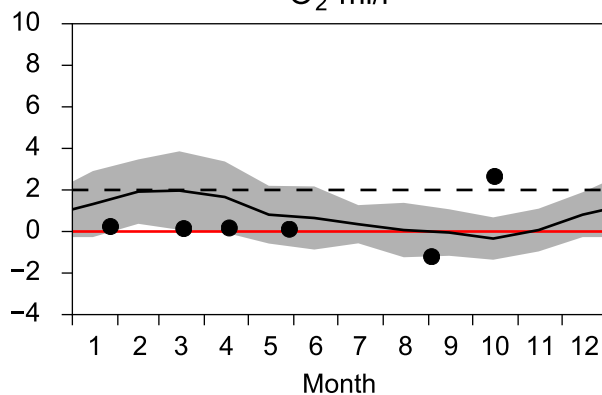


O<sub>2</sub> saturation %

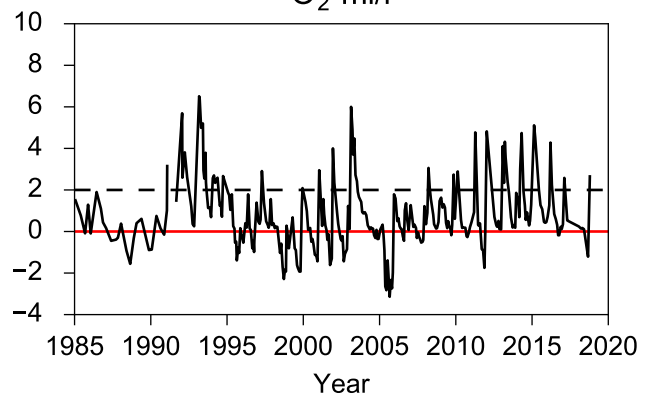


## OXYGEN IN BOTTOM WATER (depth >= 80 m)

O<sub>2</sub> ml/l

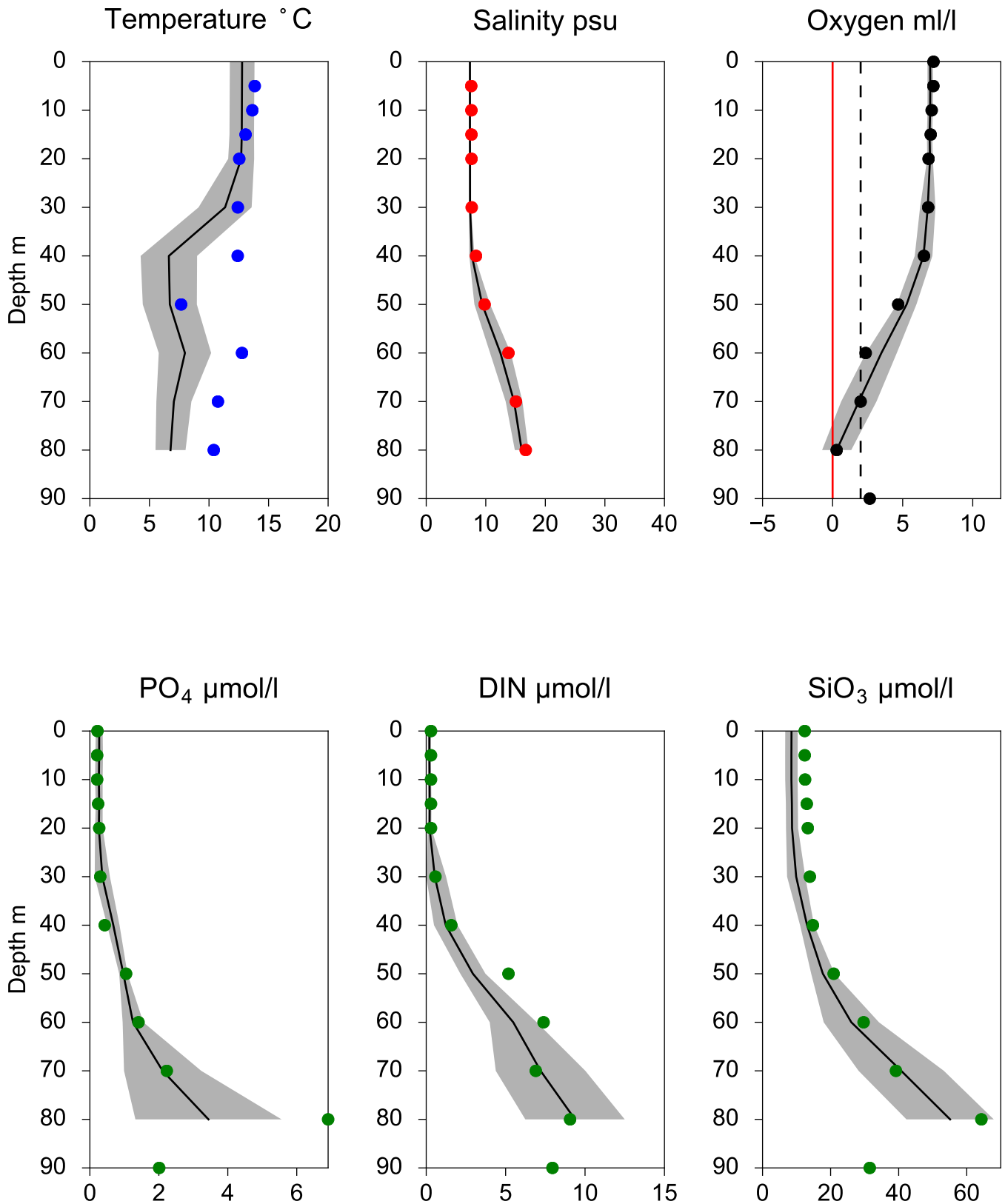


O<sub>2</sub> ml/l



# Vertical profiles BY5 BORNHOLMSDJ October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-16



# STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

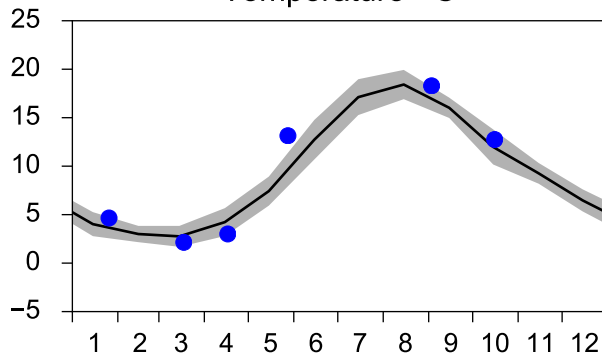
Annual Cycles

— Mean 2001-2015

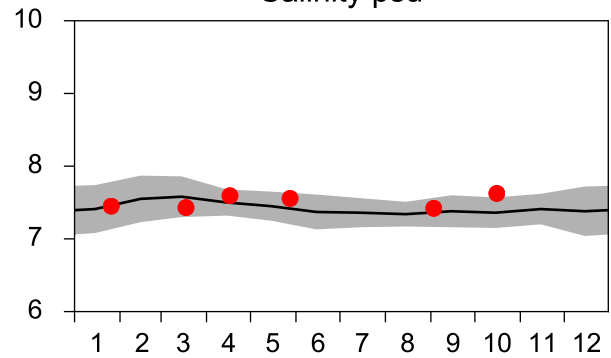
■ St.Dev.

● 2018

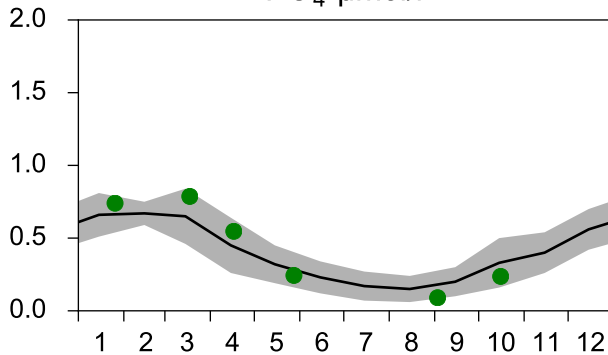
Temperature °C



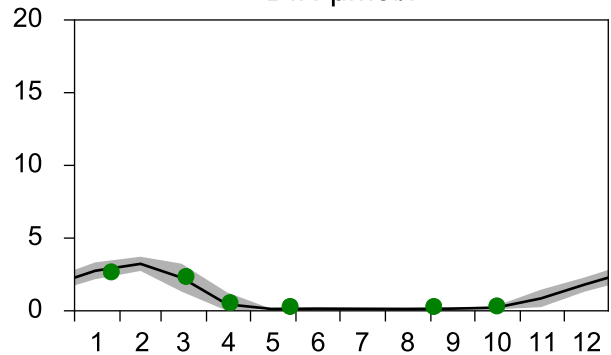
Salinity psu



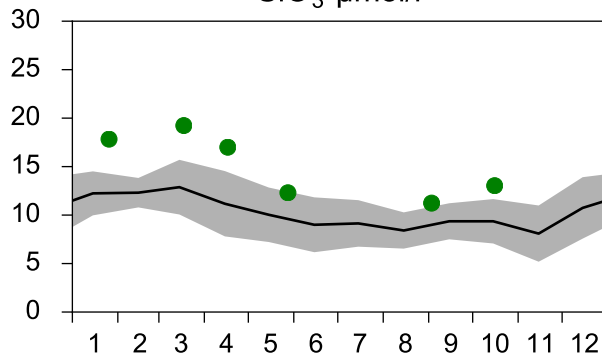
PO<sub>4</sub> µmol/l



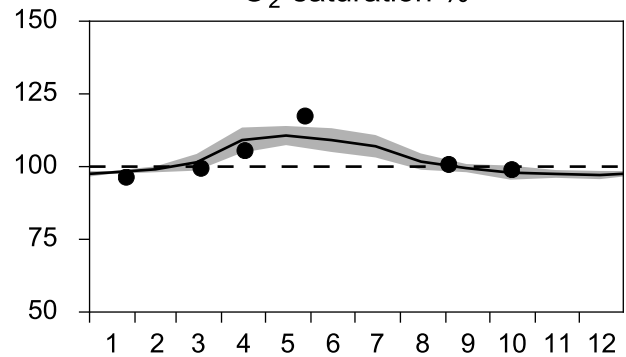
DIN µmol/l



SiO<sub>3</sub> µmol/l

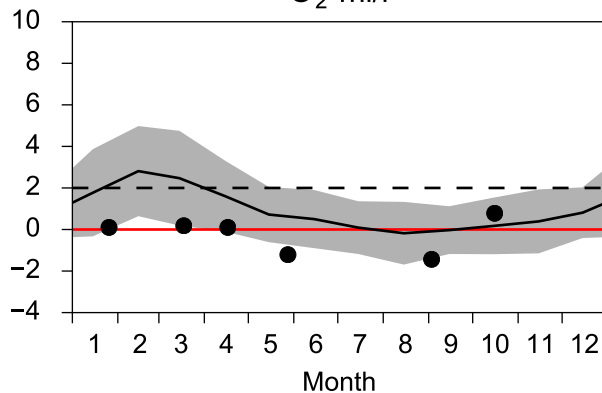


O<sub>2</sub> saturation %

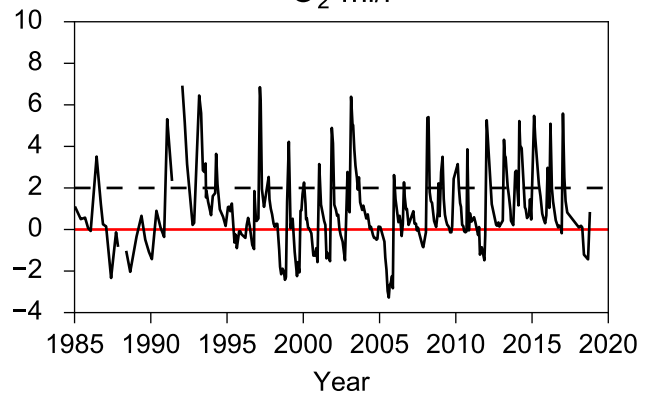


## OXYGEN IN BOTTOM WATER (depth >= 80 m)

O<sub>2</sub> ml/l



O<sub>2</sub> ml/l

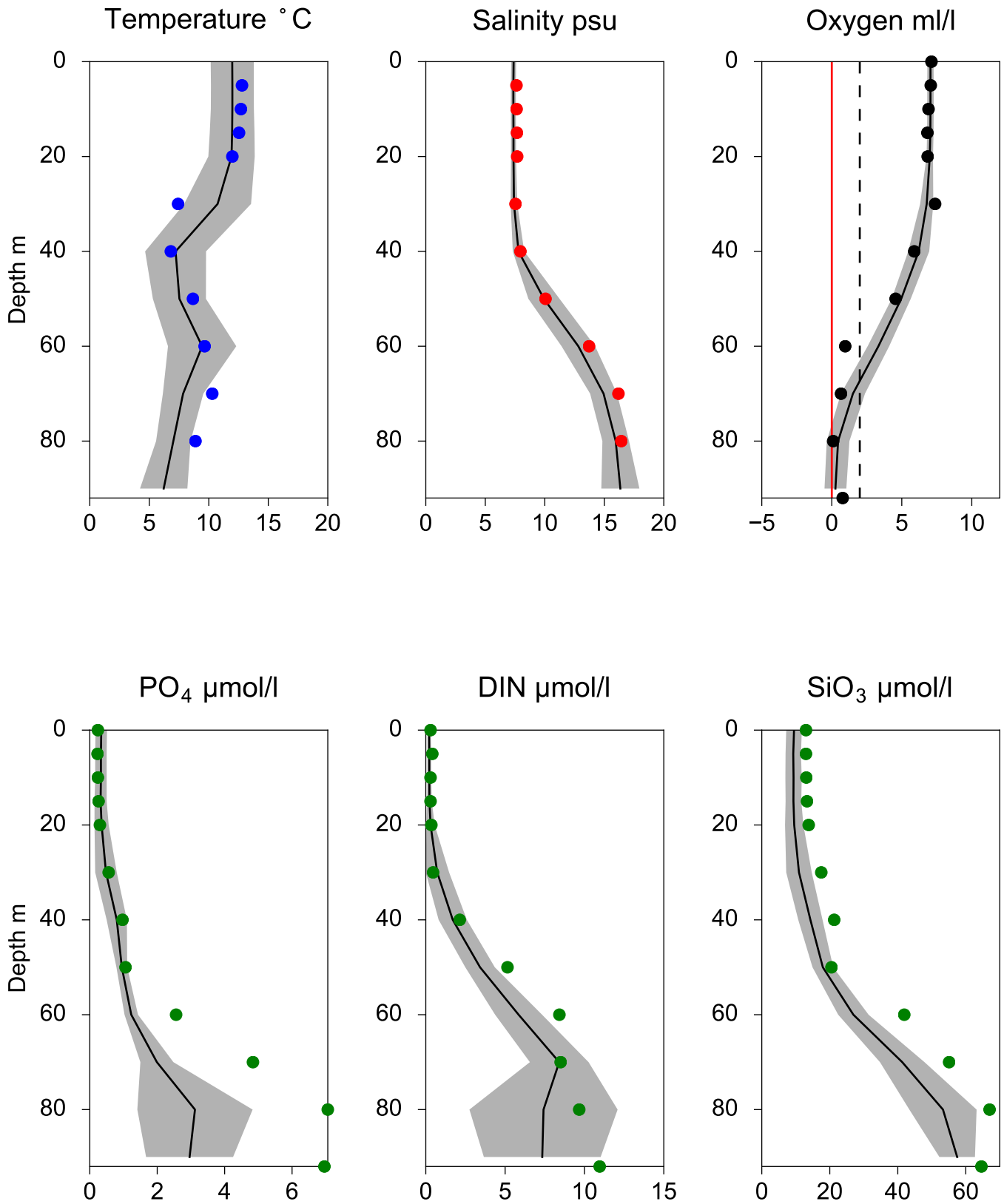


# Vertical profiles BY4 CHRISTIANSÖ October

— Mean 2001-2015

■ St.Dev.

● 2018-10-16



# STATION BY2 ARKONA SURFACE WATER (0-10 m)

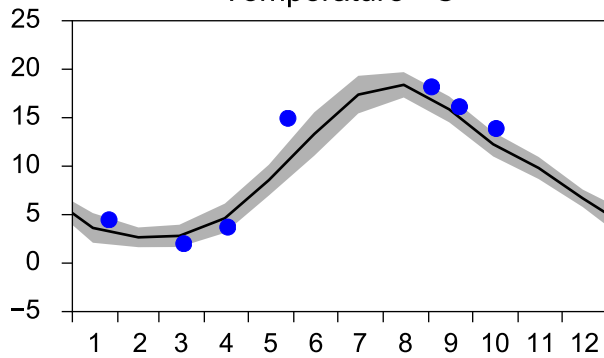
Annual Cycles

— Mean 2001-2015

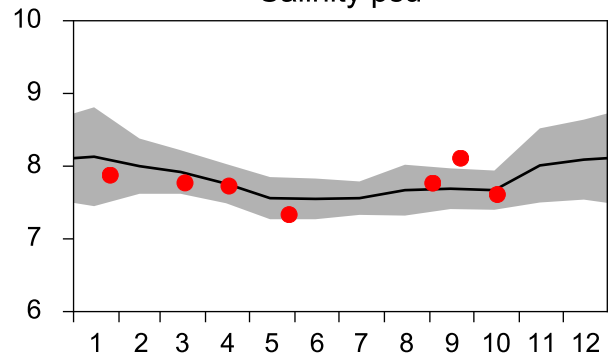
■ St.Dev.

● 2018

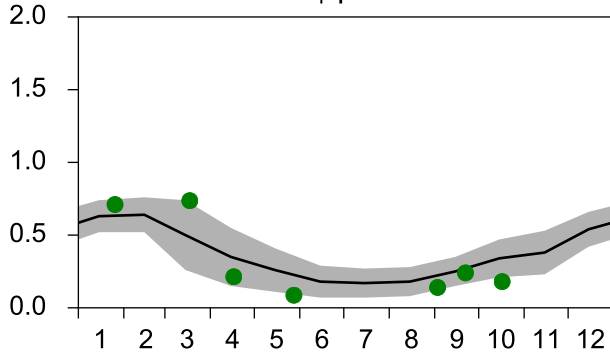
Temperature °C



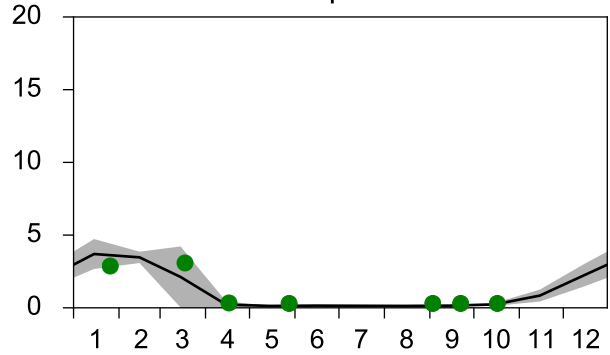
Salinity psu



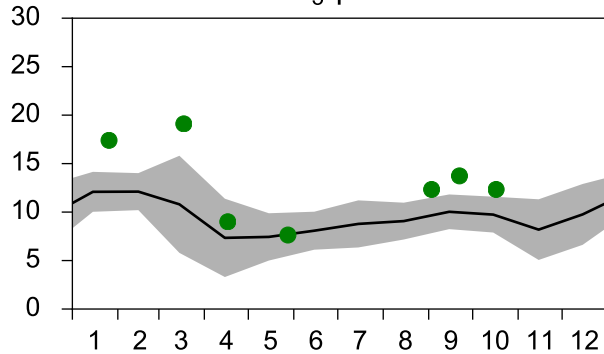
PO<sub>4</sub> µmol/l



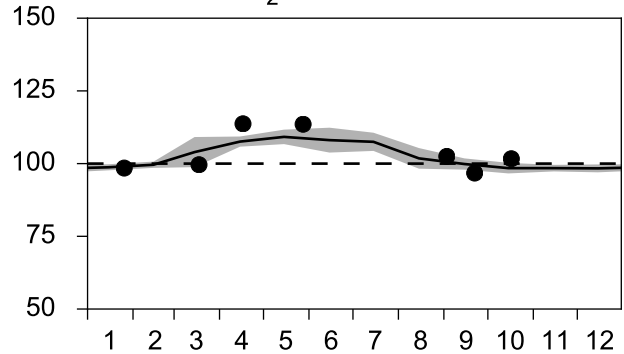
DIN µmol/l



SiO<sub>3</sub> µmol/l

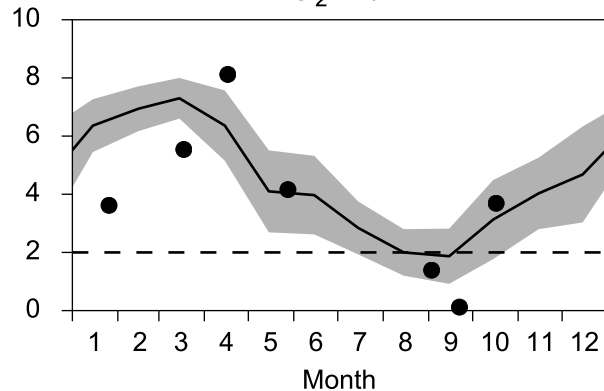


O<sub>2</sub> saturation %

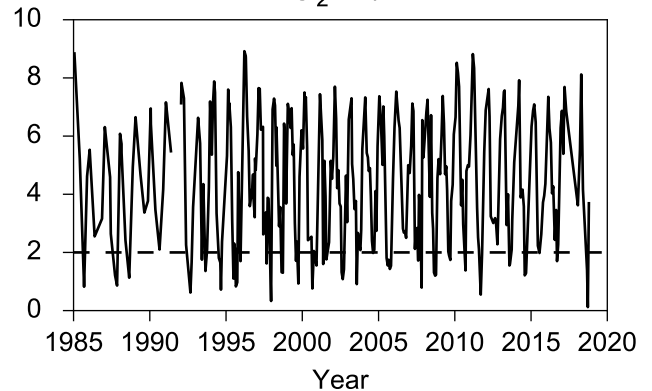


## OXYGEN IN BOTTOM WATER (depth >= 40 m)

O<sub>2</sub> ml/l

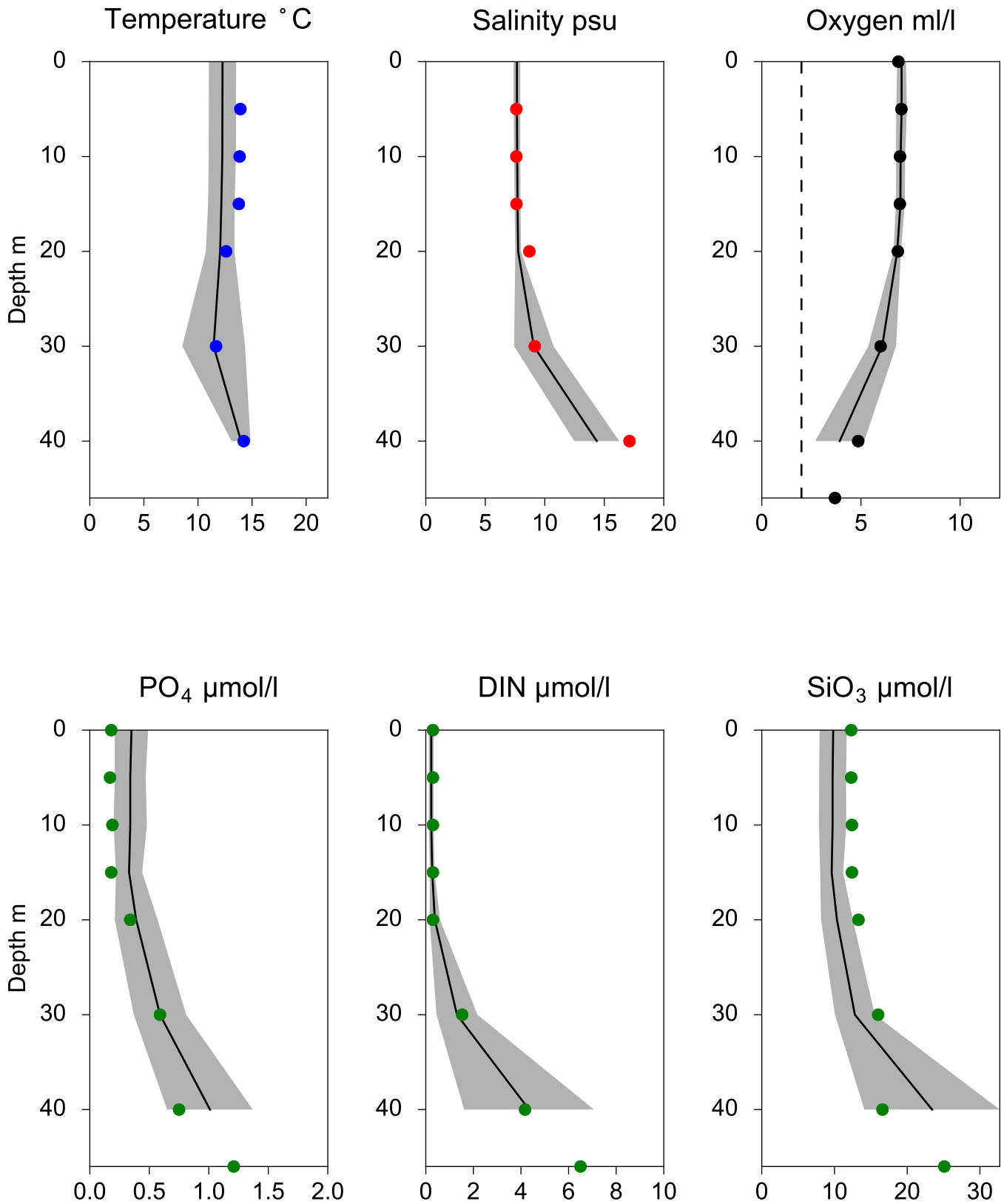


O<sub>2</sub> ml/l



# Vertical profiles BY2 ARKONA October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-17



# STATION BY1 SURFACE WATER (0-10 m)

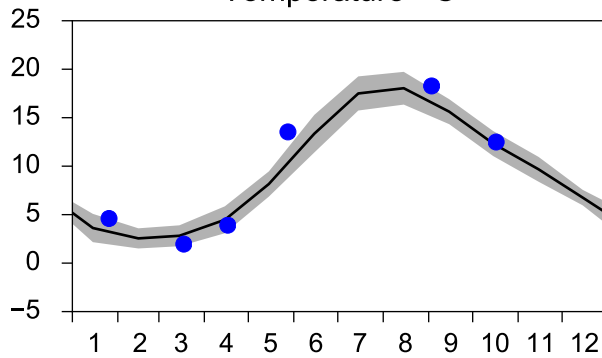
Annual Cycles

— Mean 2001-2015

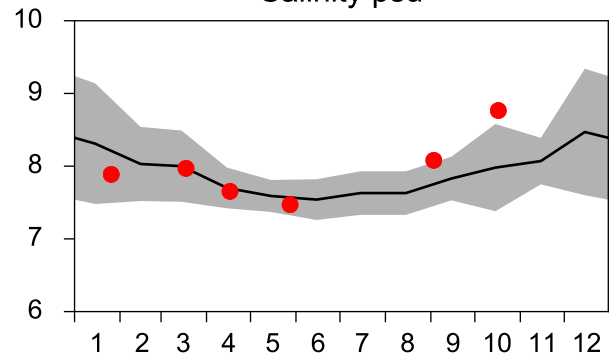
■ St.Dev.

● 2018

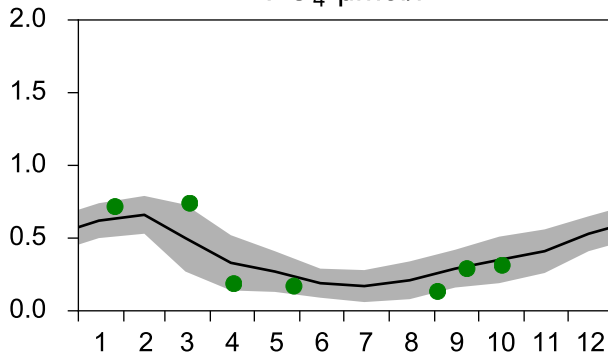
Temperature °C



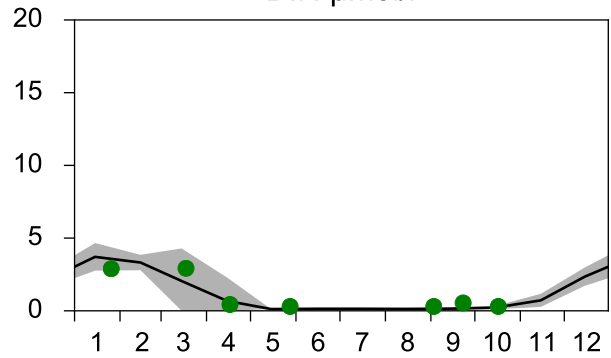
Salinity psu



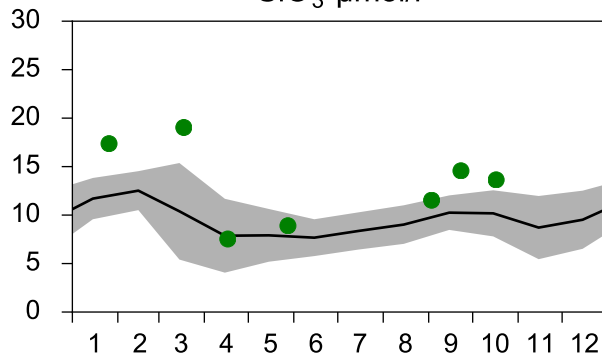
PO<sub>4</sub> µmol/l



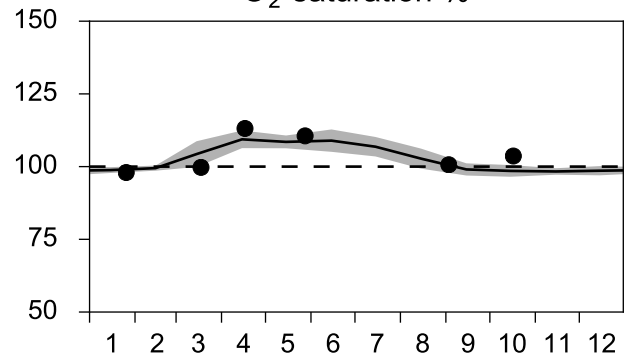
DIN µmol/l



SiO<sub>3</sub> µmol/l

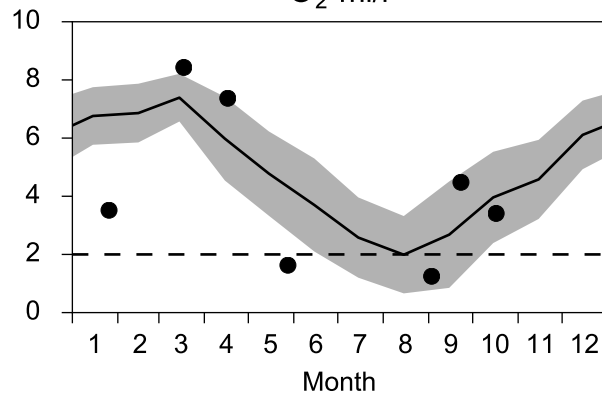


O<sub>2</sub> saturation %

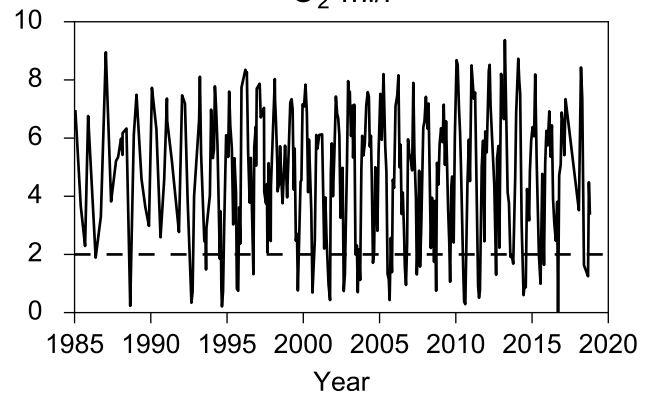


## OXYGEN IN BOTTOM WATER (depth >= 40 m)

O<sub>2</sub> ml/l

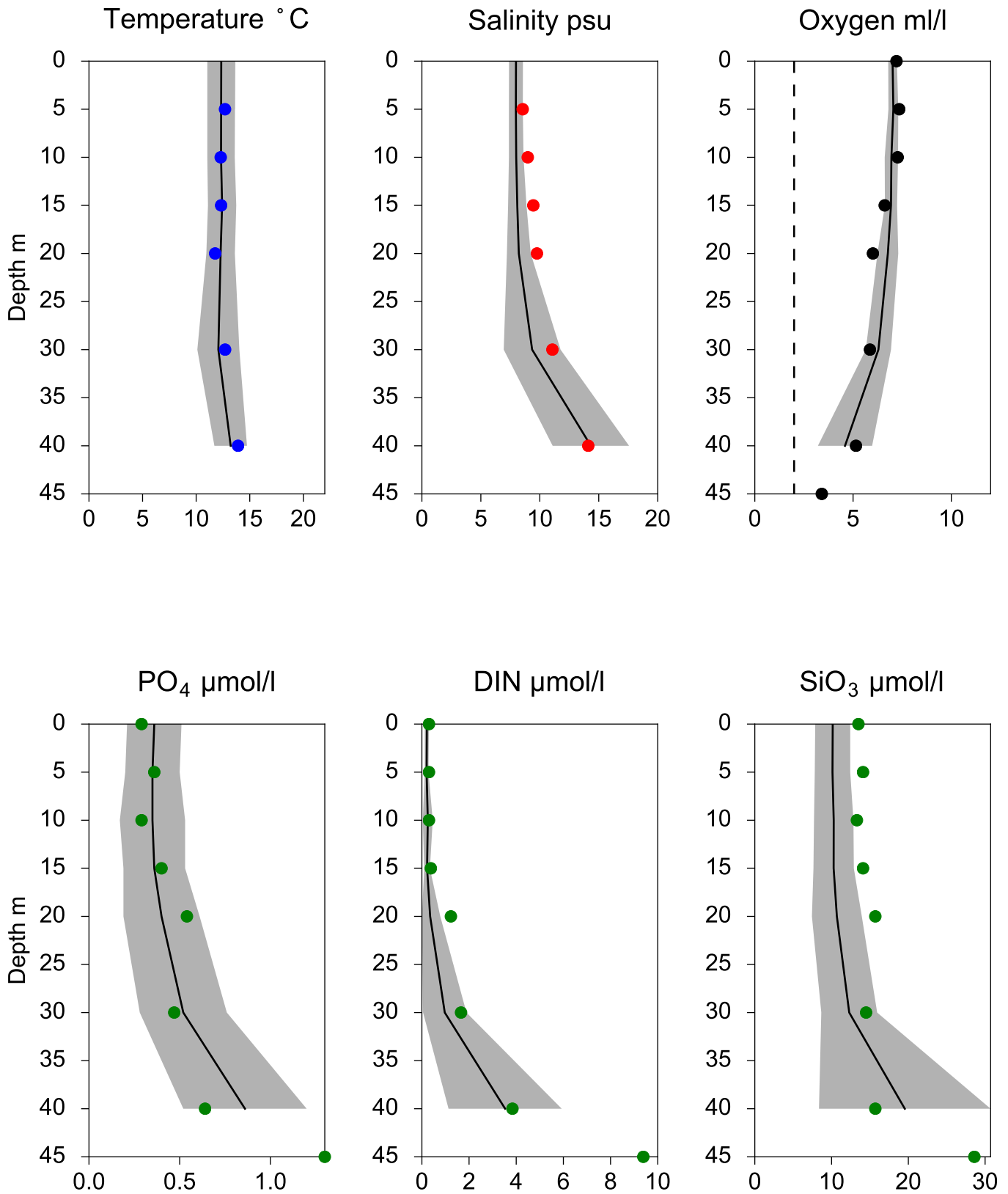


O<sub>2</sub> ml/l



# Vertical profiles BY1 October

— Mean 2001-2015    St.Dev.    • 2018-10-17



# STATION W LANDSKRONA SURFACE WATER (0-10 m)

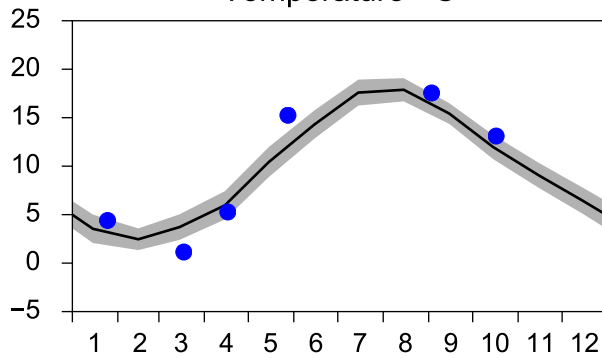
Annual Cycles

— Mean 2001-2015

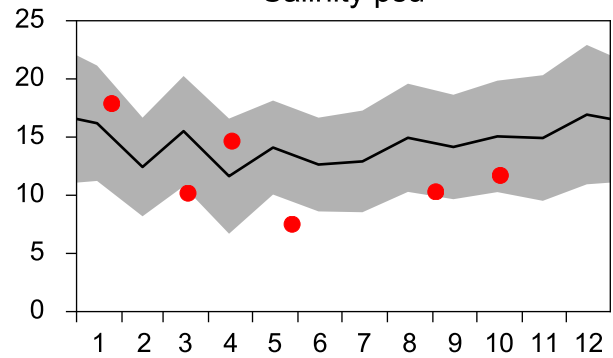
■ St.Dev.

● 2018

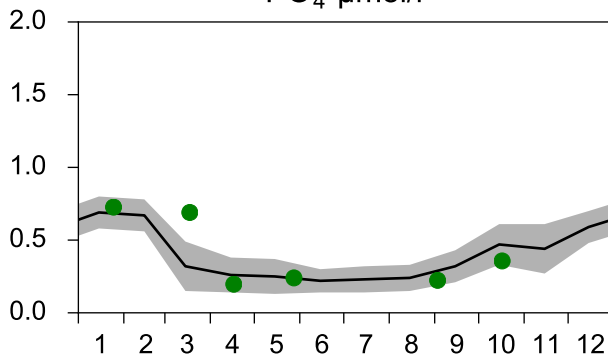
Temperature °C



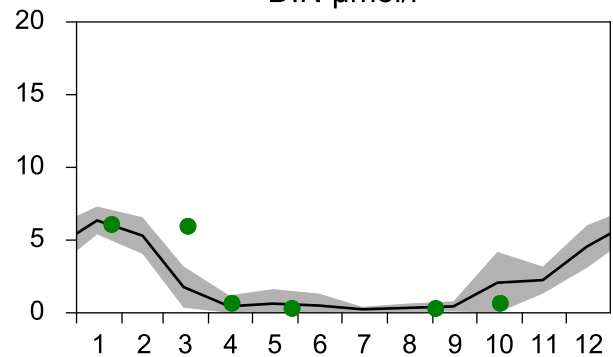
Salinity psu



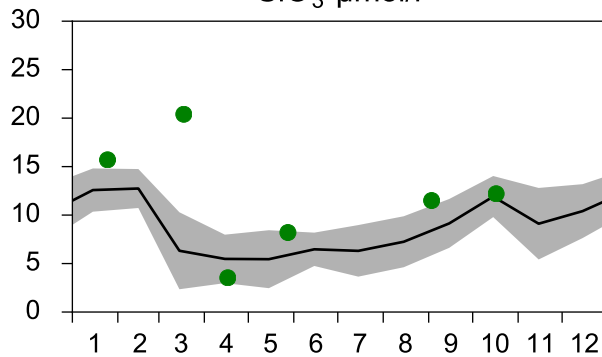
PO<sub>4</sub> µmol/l



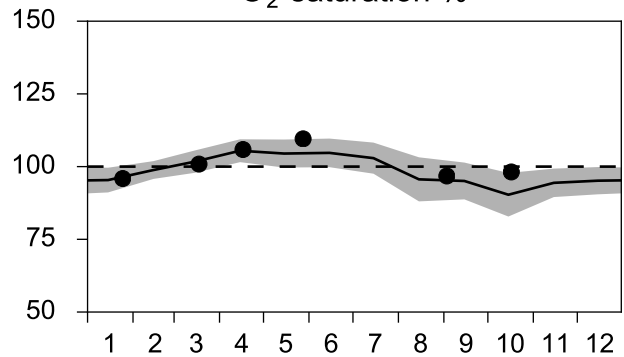
DIN µmol/l



SiO<sub>3</sub> µmol/l

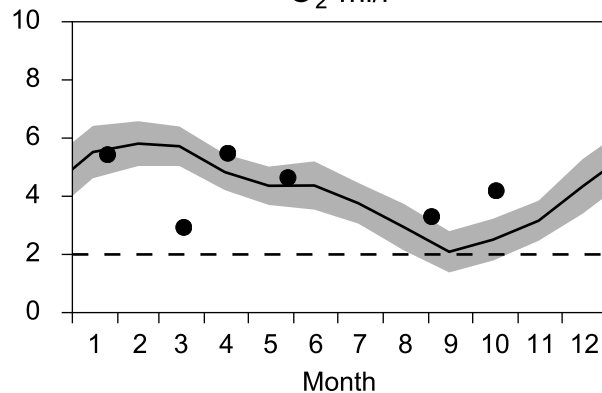


O<sub>2</sub> saturation %

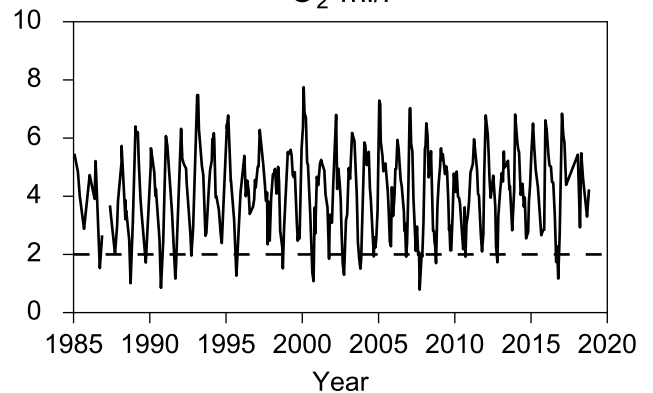


## OXYGEN IN BOTTOM WATER (depth >= 40 m)

O<sub>2</sub> ml/l

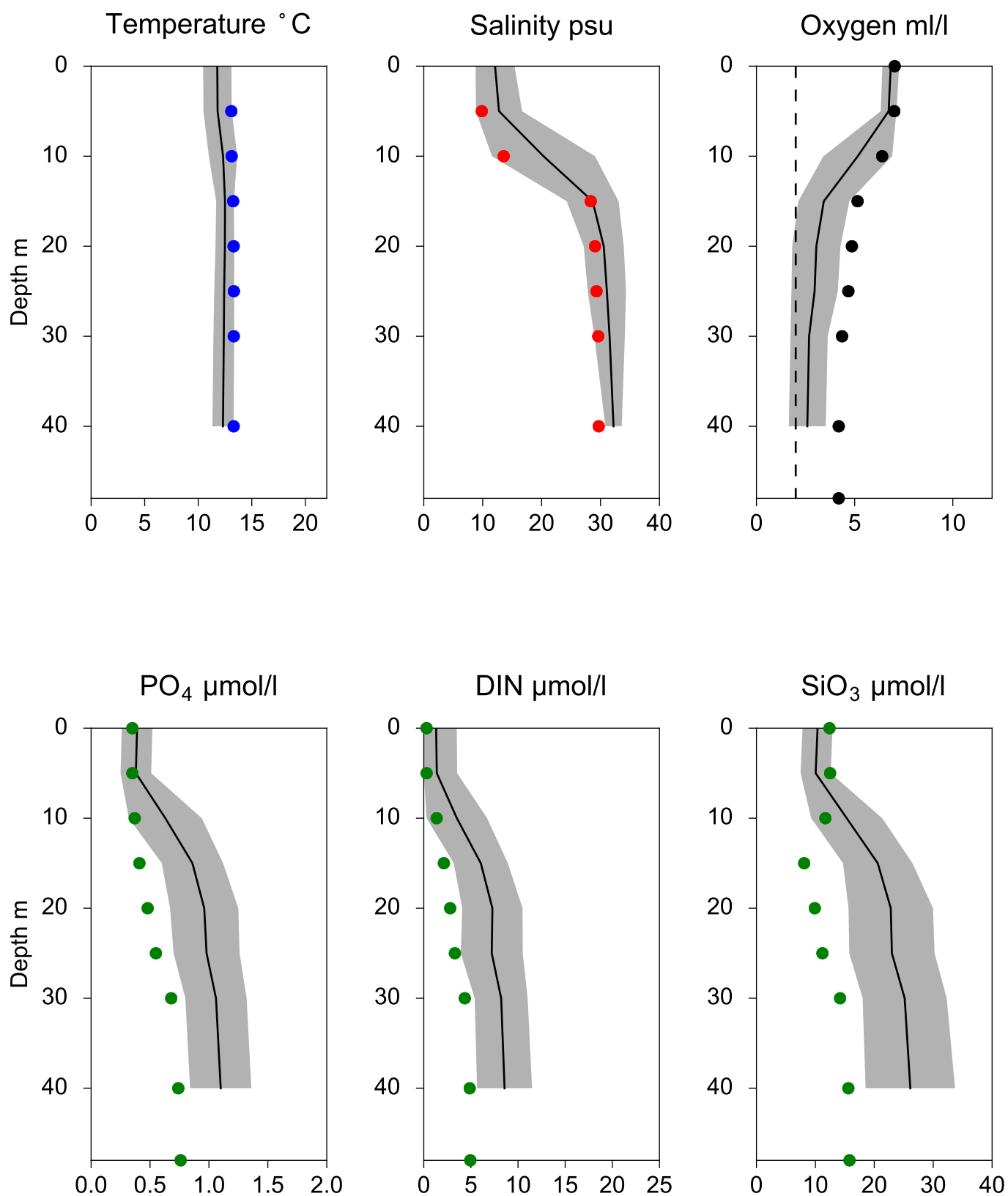


O<sub>2</sub> ml/l



# Vertical profiles W LANDSKRONA October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-17



# STATION ANHOLT E SURFACE WATER (0-10 m)

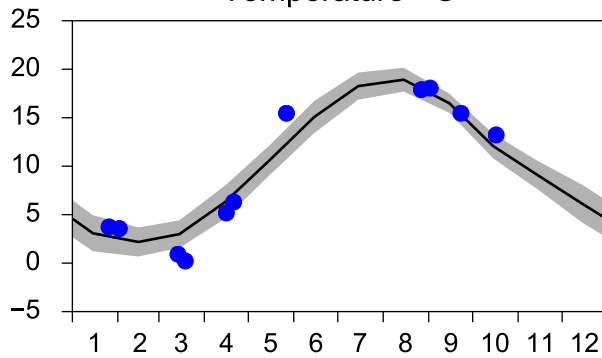
Annual Cycles

— Mean 2001-2015

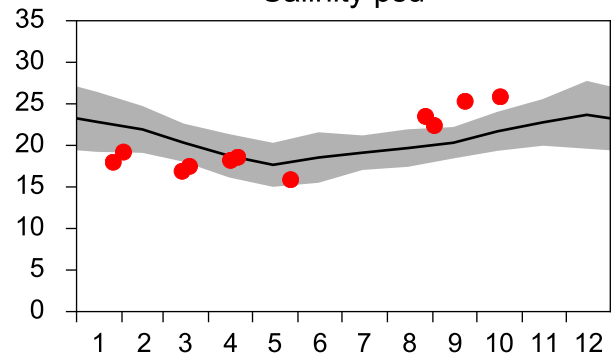
■ St.Dev.

● 2018

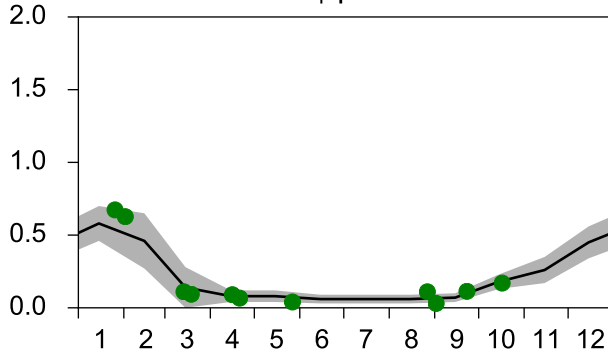
Temperature °C



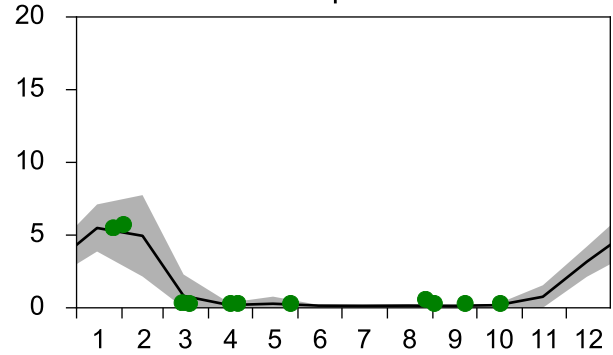
Salinity psu



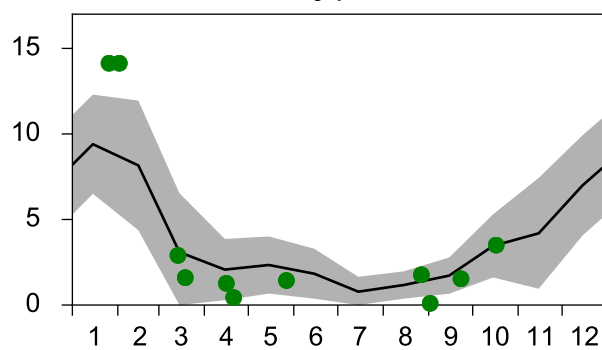
PO<sub>4</sub> µmol/l



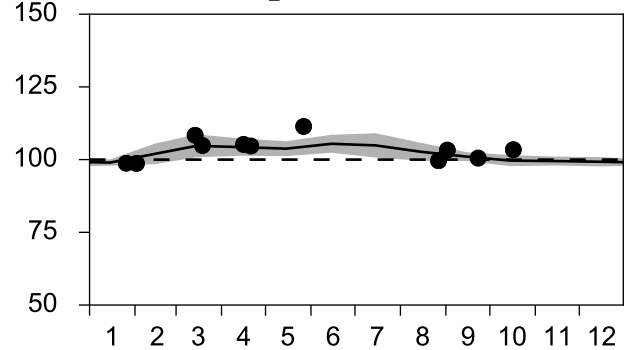
DIN µmol/l



SiO<sub>3</sub> µmol/l

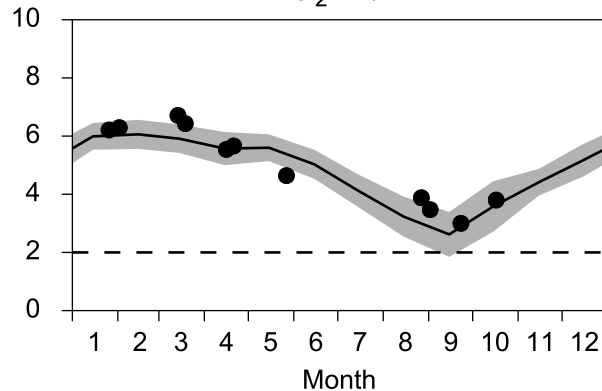


O<sub>2</sub> saturation %

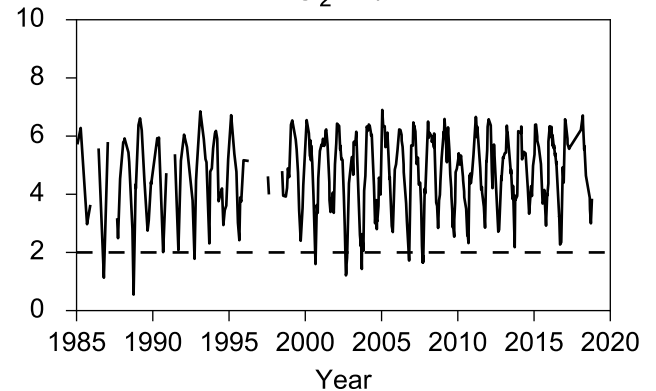


## OXYGEN IN BOTTOM WATER (depth >= 52 m)

O<sub>2</sub> ml/l

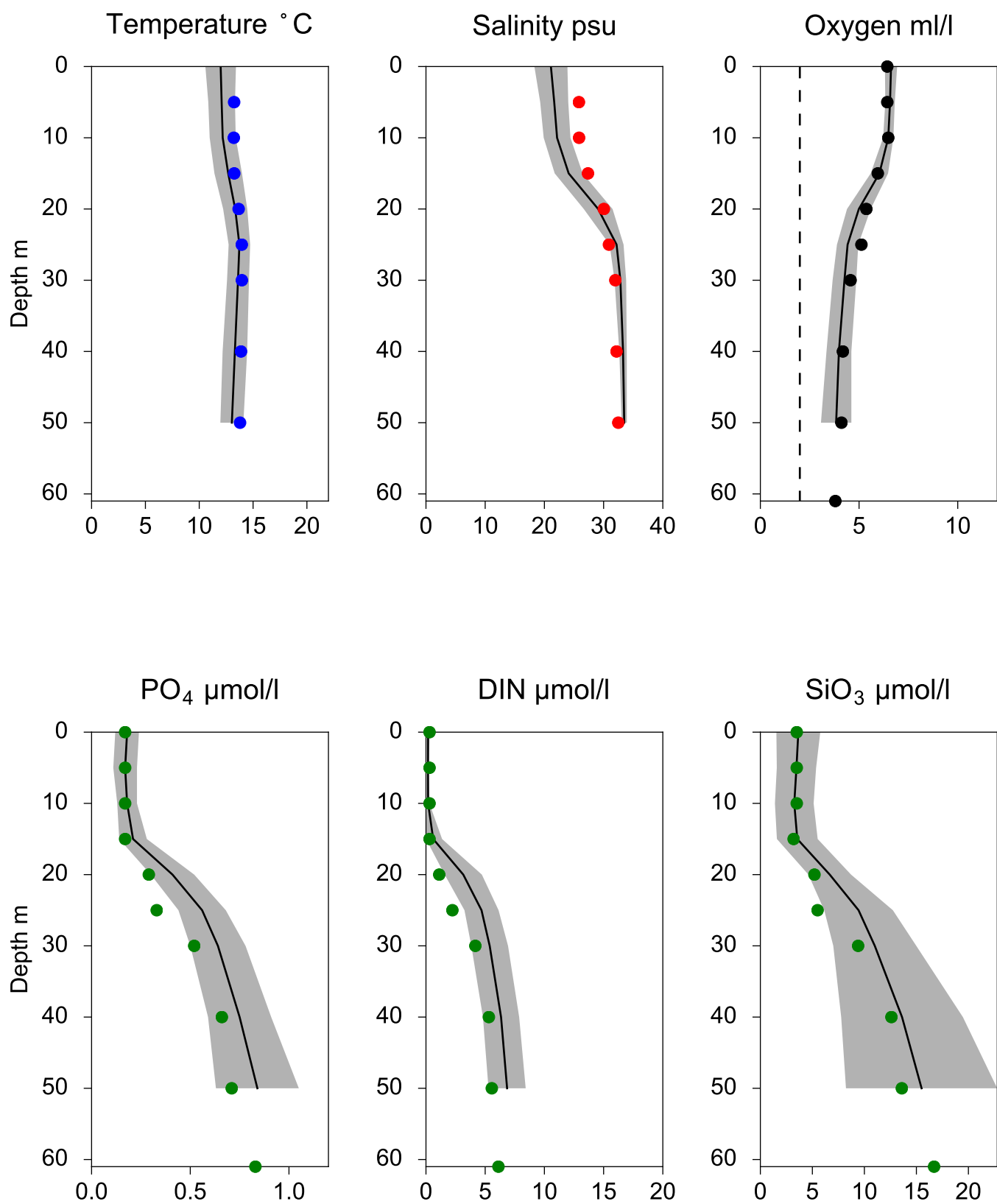


O<sub>2</sub> ml/l



# Vertical profiles ANHOLT E October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-17



# STATION FLADEN SURFACE WATER (0-10 m)

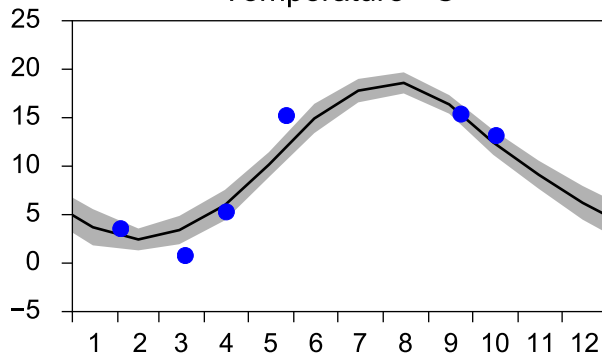
Annual Cycles

— Mean 2001-2015

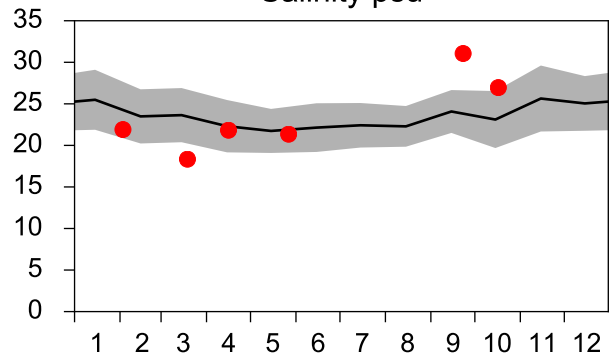
■ St.Dev.

● 2018

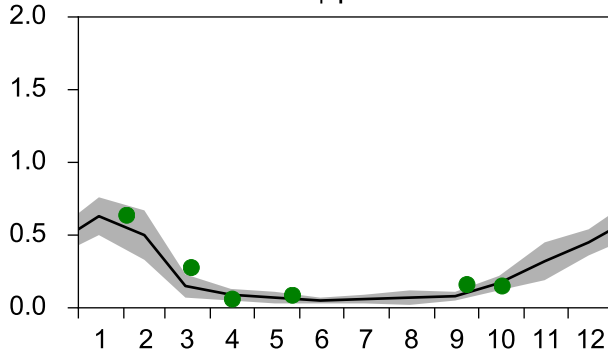
Temperature °C



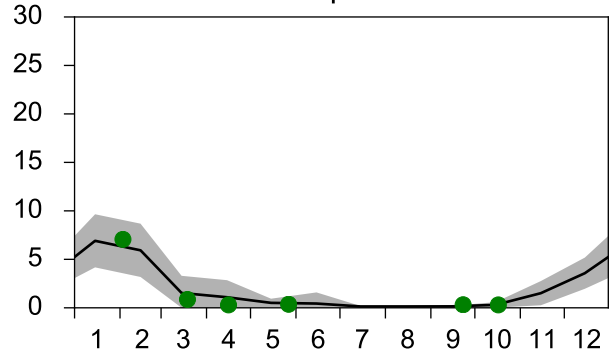
Salinity psu



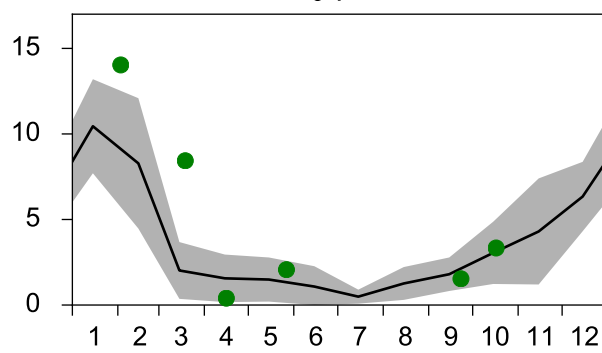
PO<sub>4</sub> µmol/l



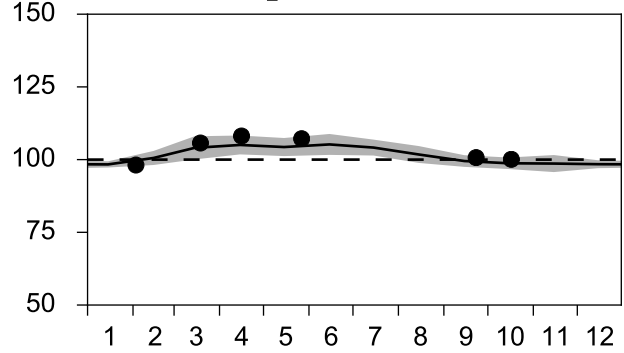
DIN µmol/l



SiO<sub>3</sub> µmol/l

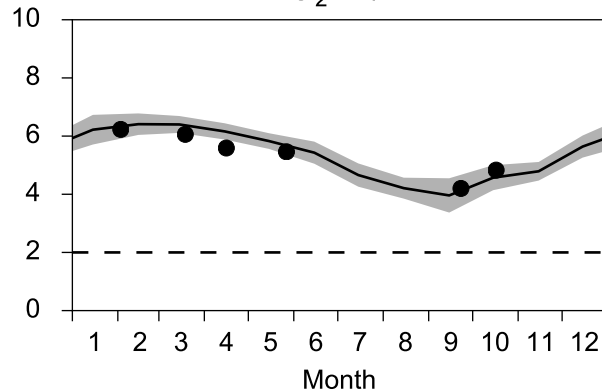


O<sub>2</sub> saturation %

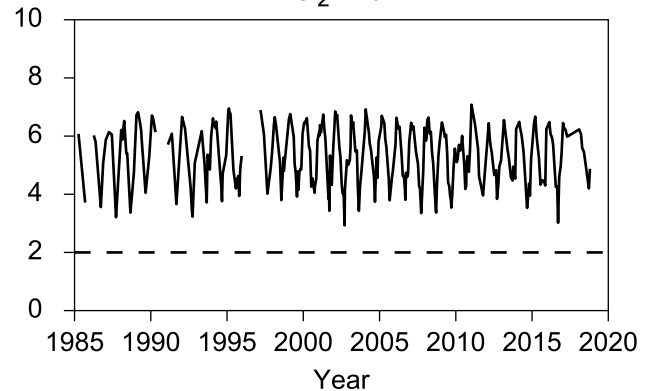


## OXYGEN IN BOTTOM WATER (depth >= 74 m)

O<sub>2</sub> ml/l

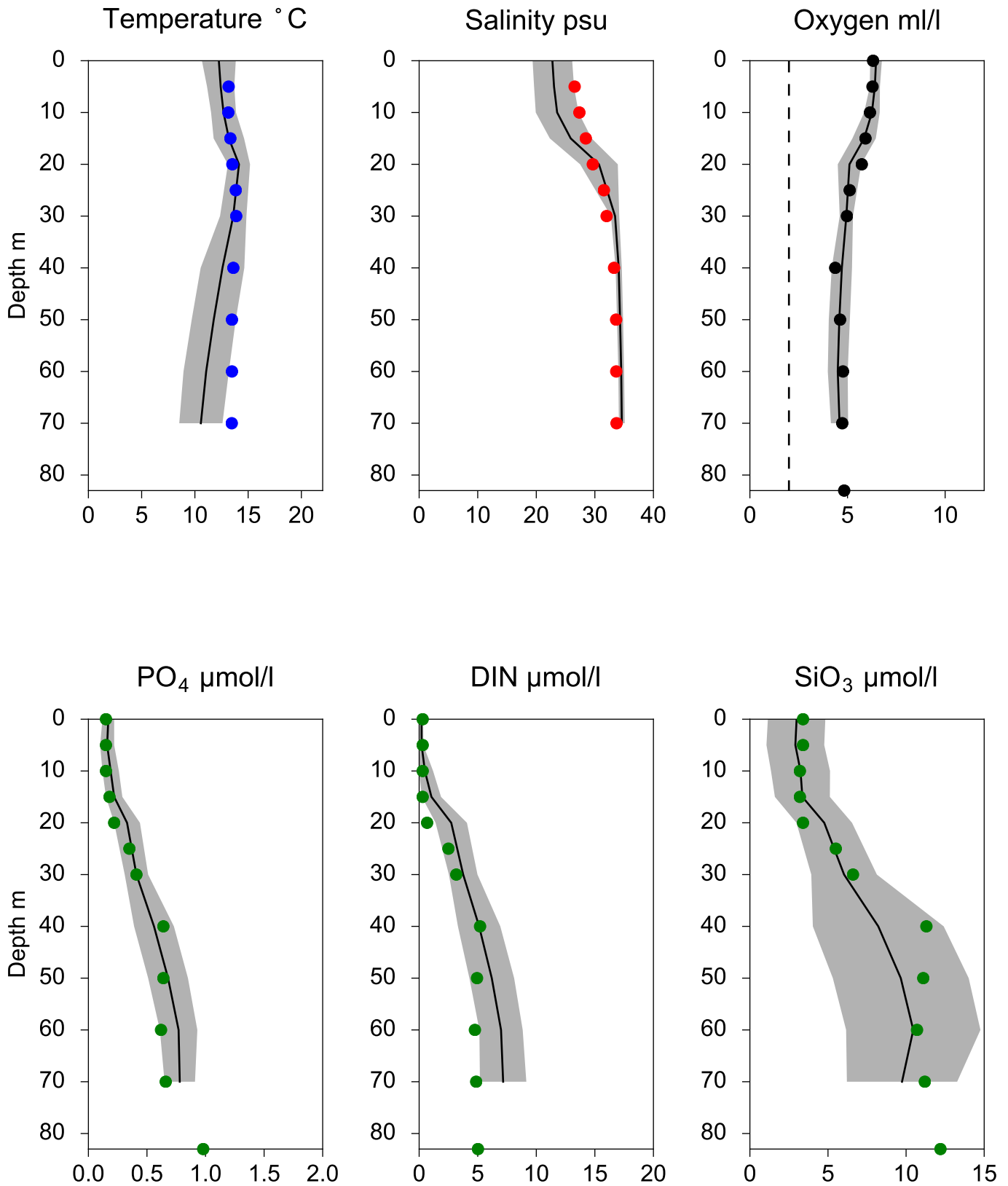


O<sub>2</sub> ml/l



# Vertical profiles FLADEN October

— Mean 2001-2015    St.Dev.    • 2018-10-17



# STATION Å17 SURFACE WATER (0-10 m)

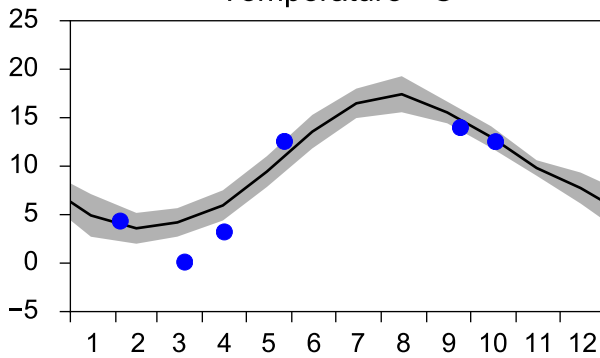
Annual Cycles

— Mean 2001-2015

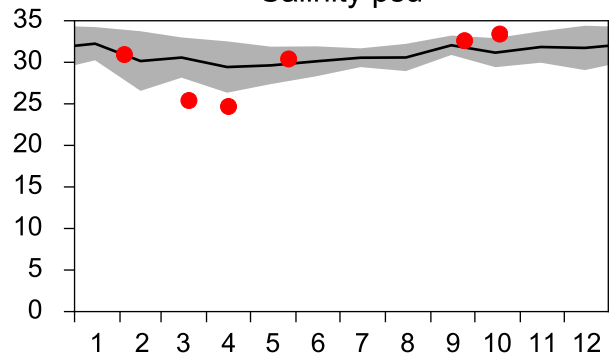
■ St.Dev.

● 2018

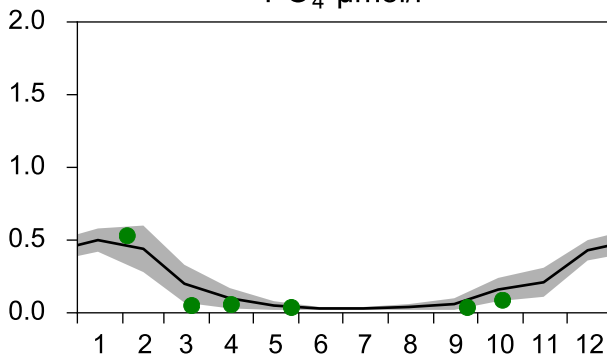
Temperature °C



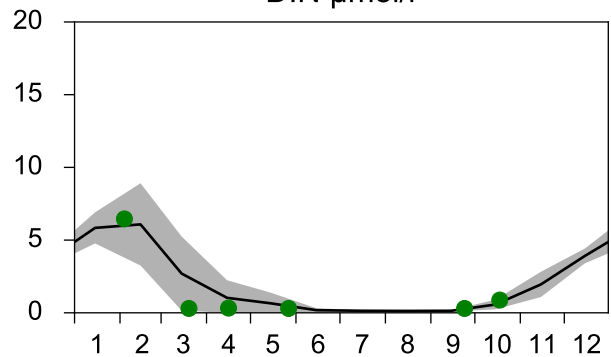
Salinity psu



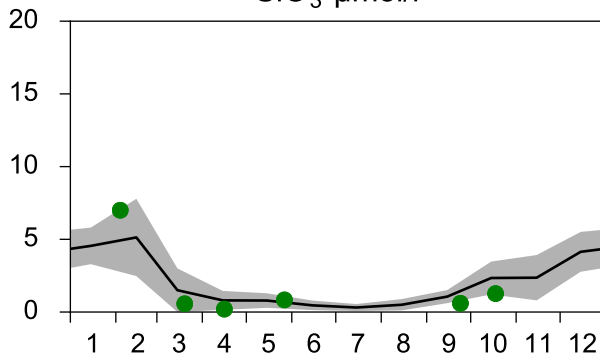
PO<sub>4</sub> µmol/l



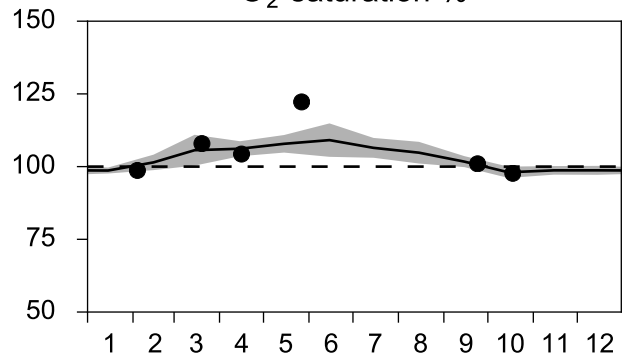
DIN µmol/l



SiO<sub>3</sub> µmol/l

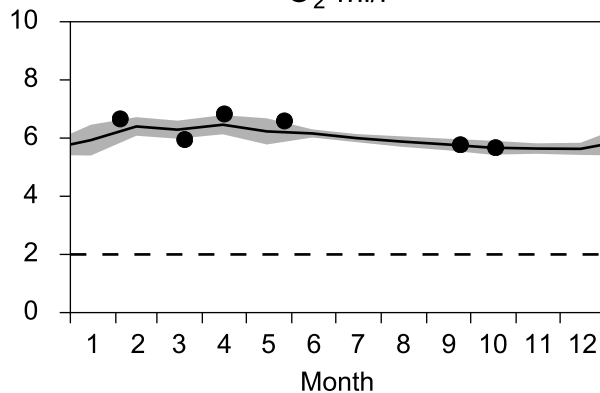


O<sub>2</sub> saturation %

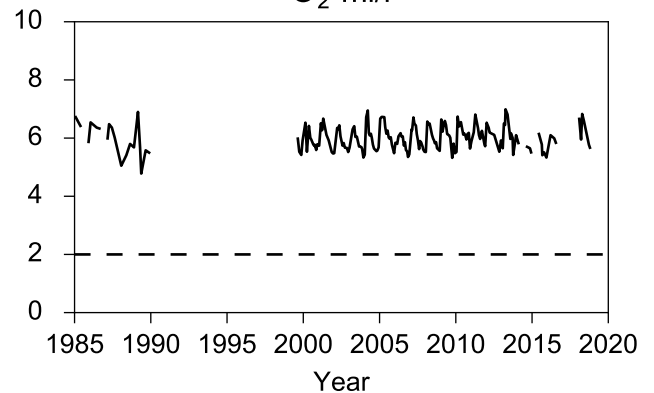


## OXYGEN IN BOTTOM WATER (depth >= 300 m)

O<sub>2</sub> ml/l

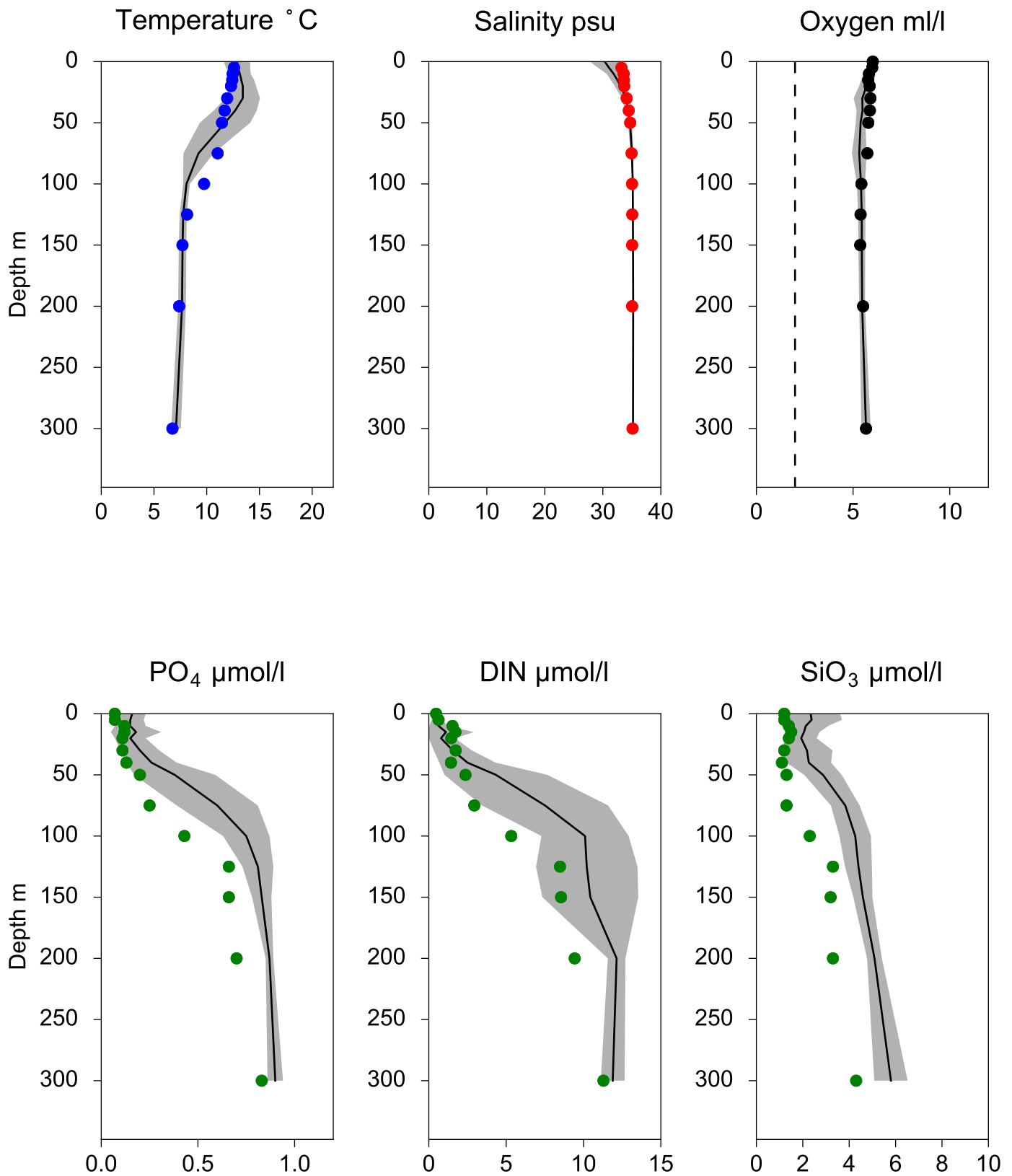


O<sub>2</sub> ml/l



# Vertical profiles Å17 October

— Mean 2001-2015    St.Dev.    • 2018-10-18



# STATION Å15 SURFACE WATER (0-10 m)

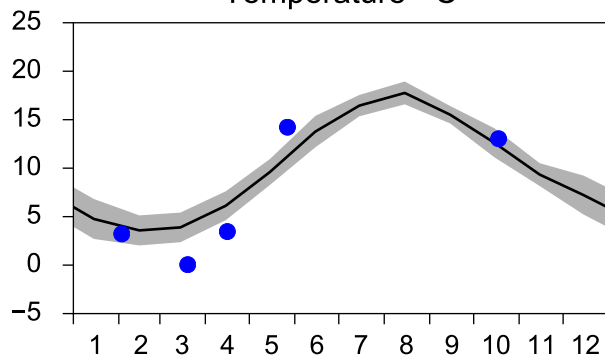
Annual Cycles

— Mean 2001-2015

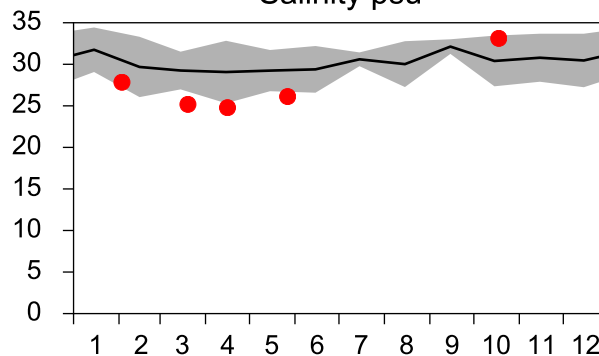
■ St.Dev.

● 2018

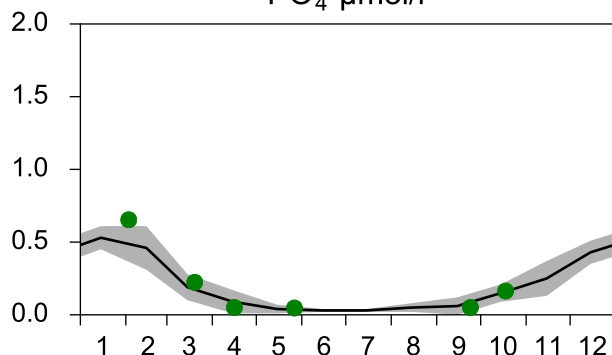
Temperature °C



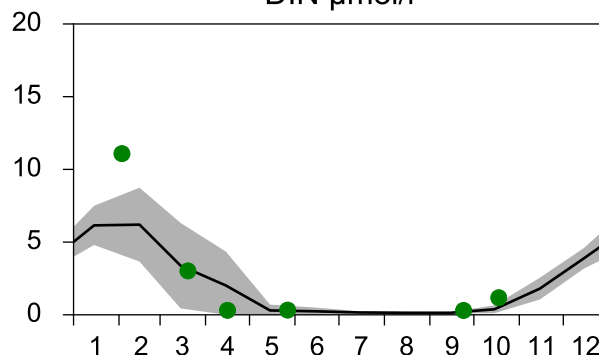
Salinity psu



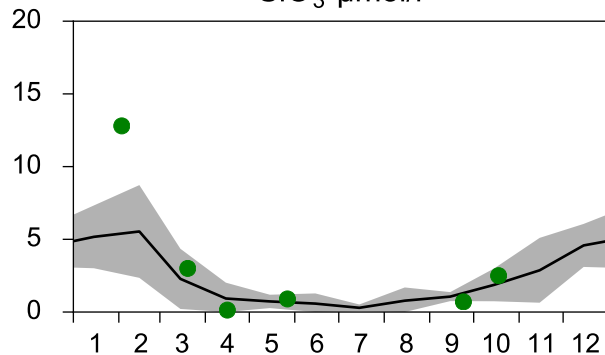
PO<sub>4</sub> μmol/l



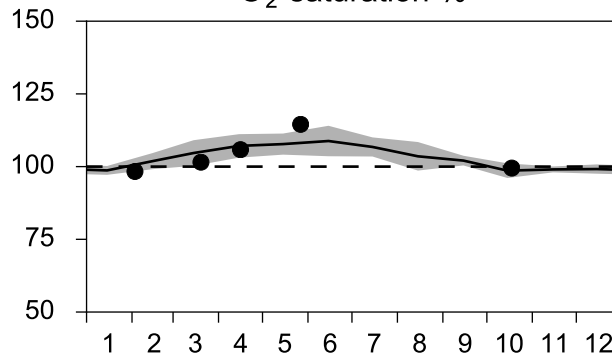
DIN μmol/l



SiO<sub>3</sub> μmol/l

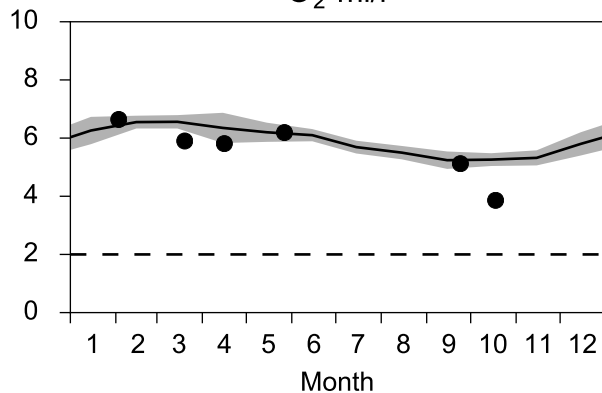


O<sub>2</sub> saturation %

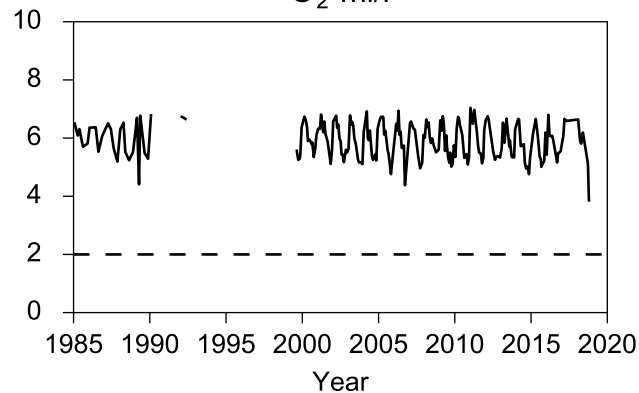


## OXYGEN IN BOTTOM WATER (depth >= 125 m)

O<sub>2</sub> ml/l

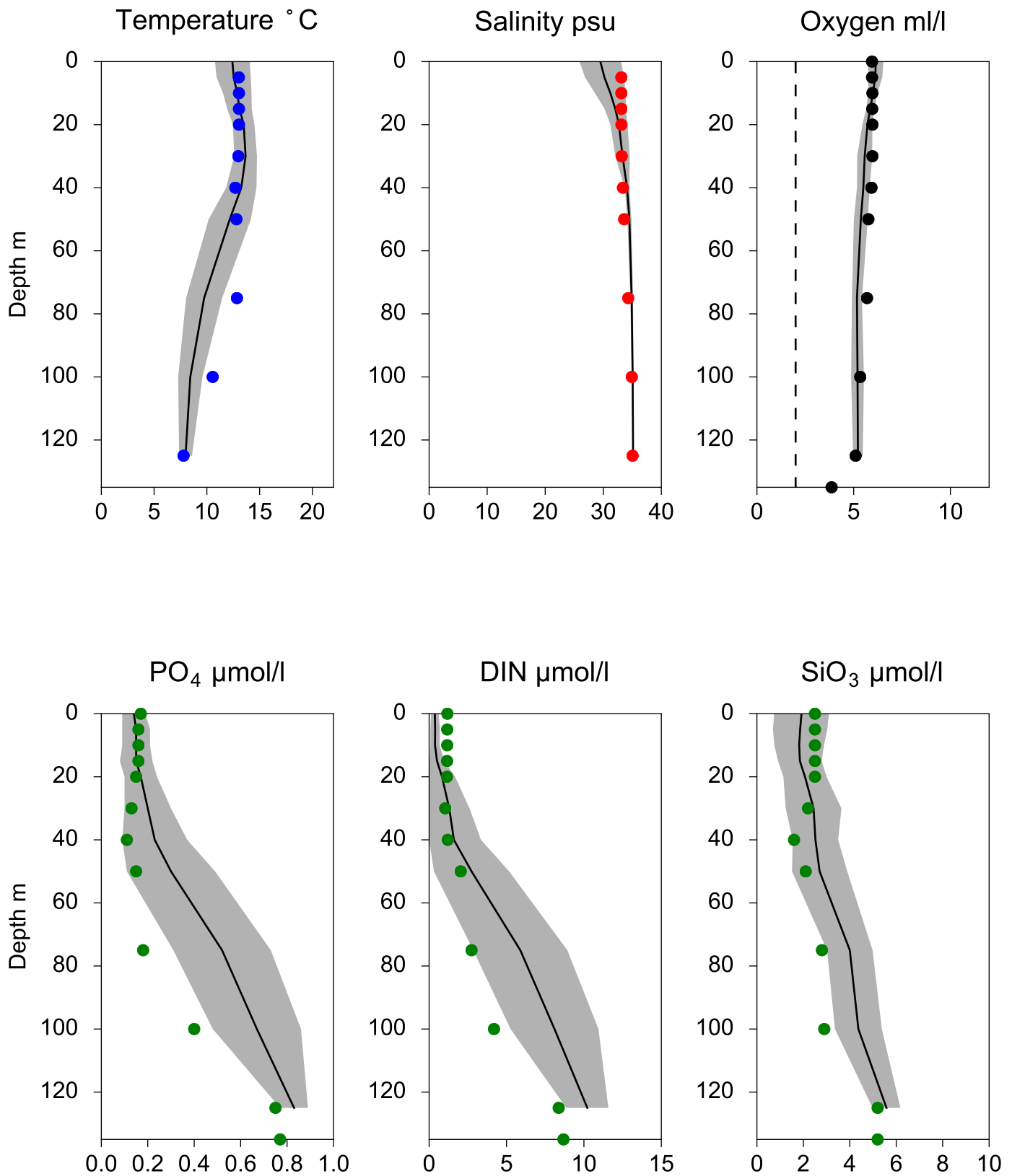


O<sub>2</sub> ml/l



## Vertical profiles Å15 October

— Mean 2001-2015    St.Dev.    • 2018-10-18



## STATION Å13 SURFACE WATER (0-10 m)

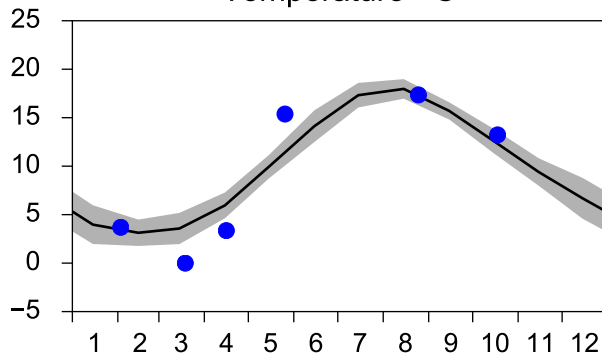
Annual Cycles

— Mean 2001-2015

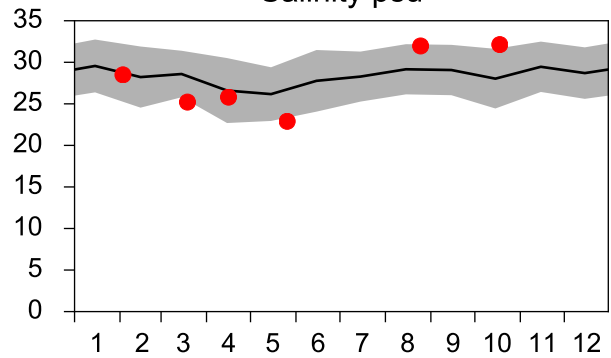
■ St.Dev.

● 2018

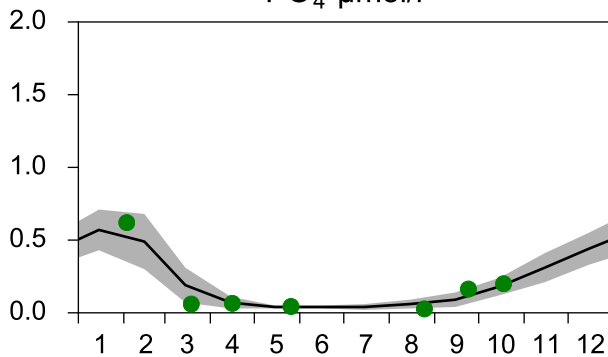
Temperature °C



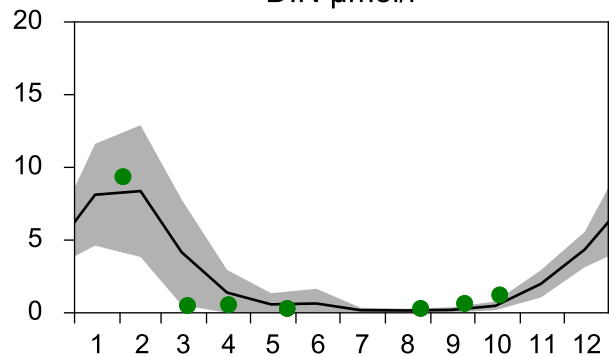
Salinity psu



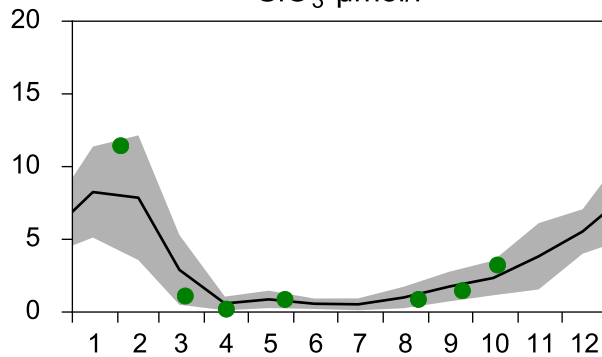
PO<sub>4</sub> µmol/l



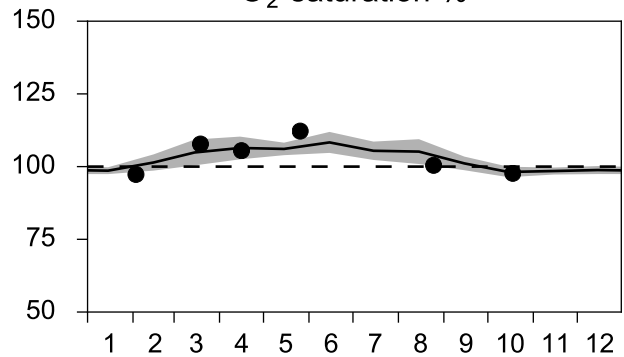
DIN µmol/l



SiO<sub>3</sub> µmol/l

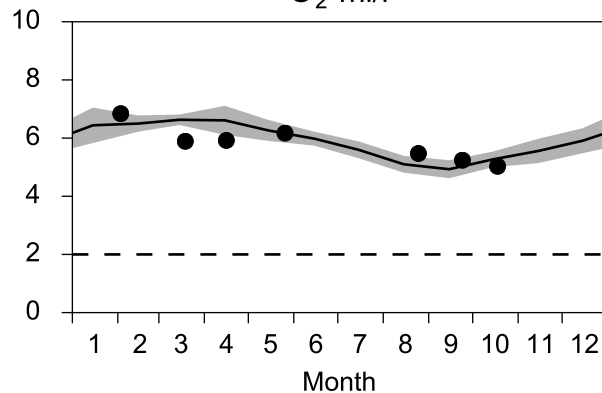


O<sub>2</sub> saturation %

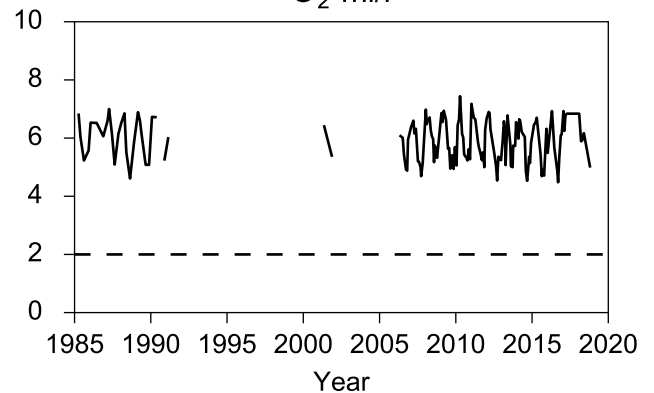


## OXYGEN IN BOTTOM WATER (depth >= 80 m)

O<sub>2</sub> ml/l

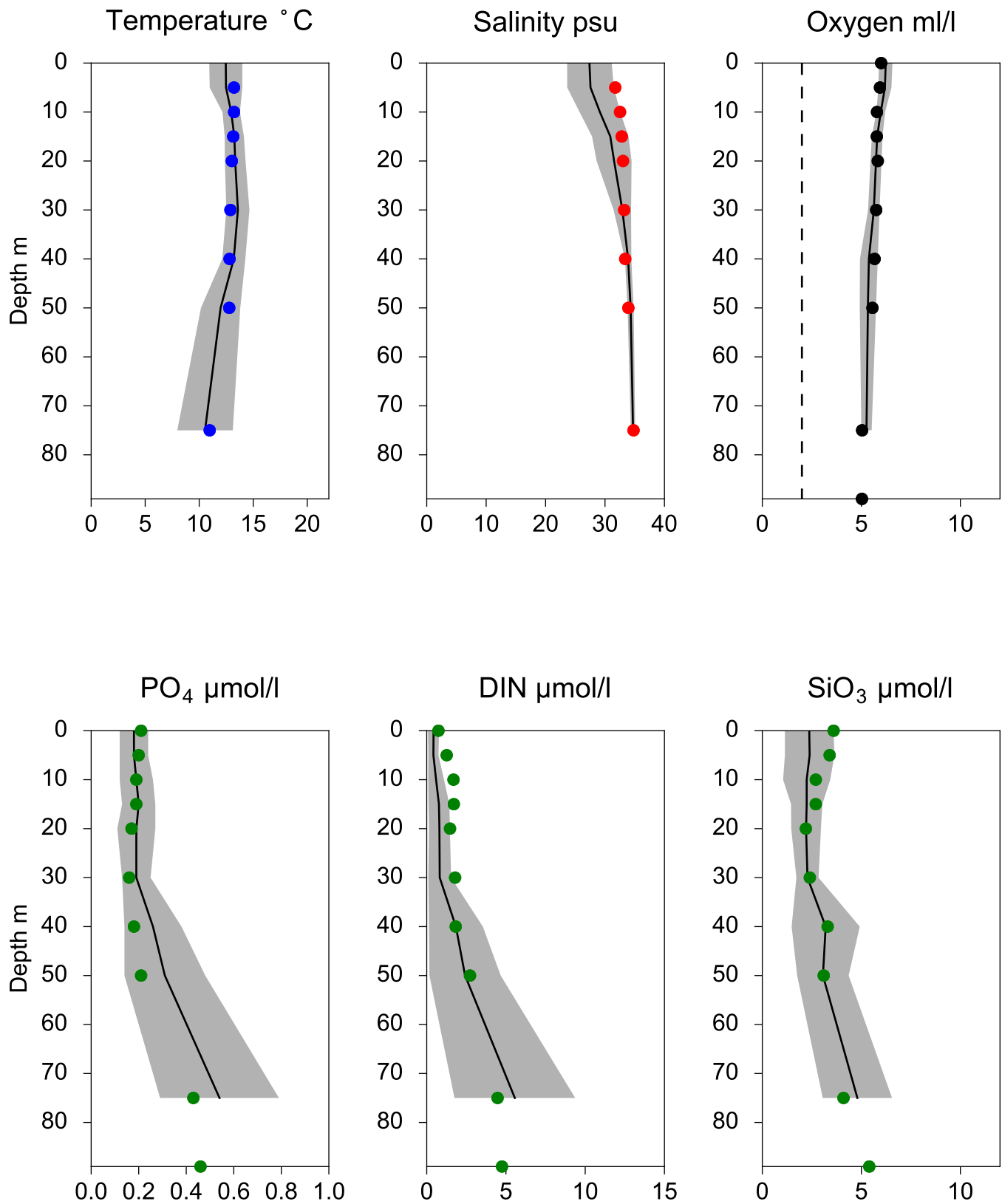


O<sub>2</sub> ml/l



# Vertical profiles Å13 October

— Mean 2001-2015    St.Dev.    • 2018-10-18



# STATION SLÄGGÖ SURFACE WATER (0-10 m)

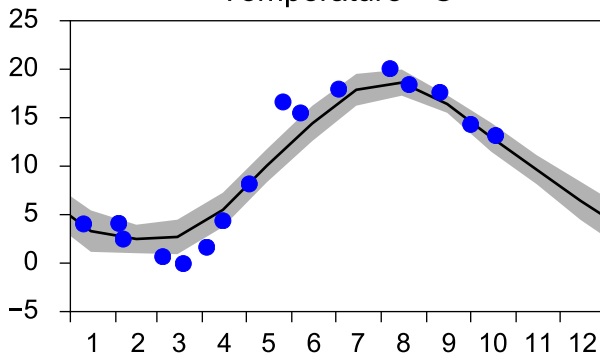
Annual Cycles

— Mean 2001-2015

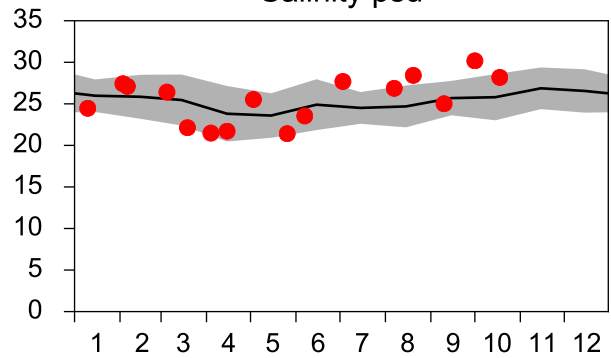
■ St.Dev.

● 2018

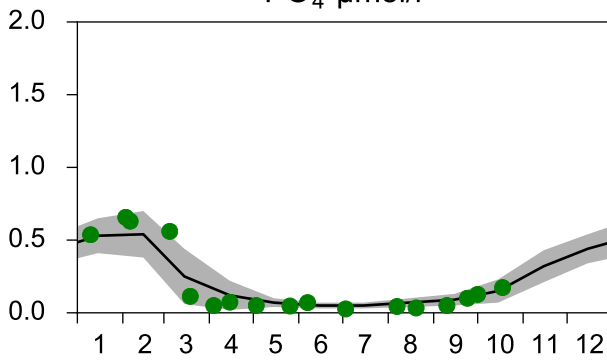
Temperature °C



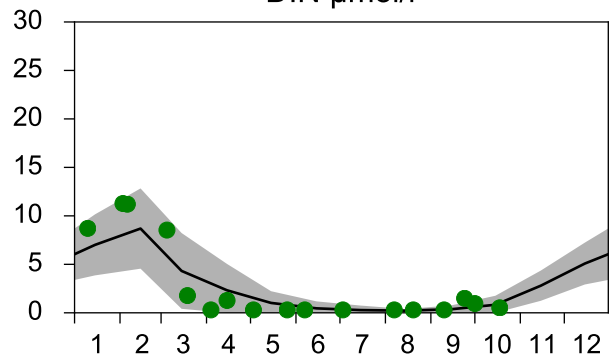
Salinity psu



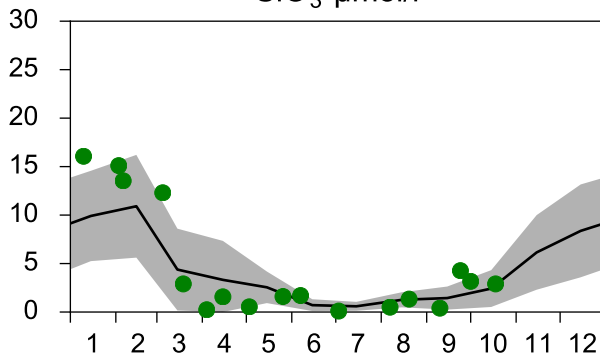
PO<sub>4</sub> µmol/l



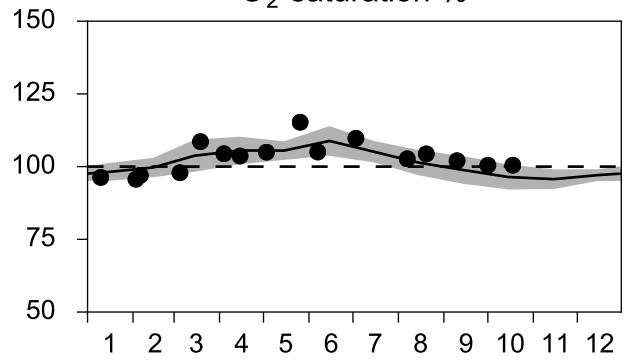
DIN µmol/l



SiO<sub>3</sub> µmol/l

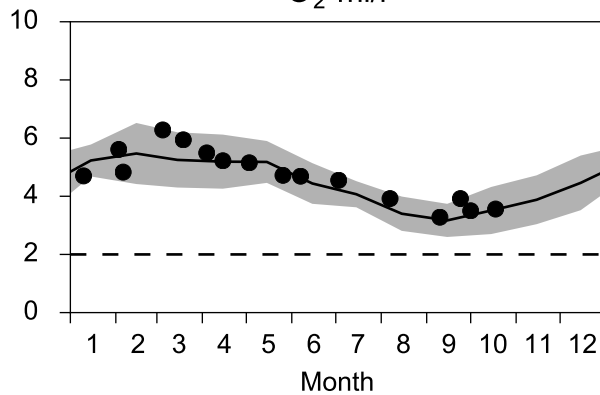


O<sub>2</sub> saturation %

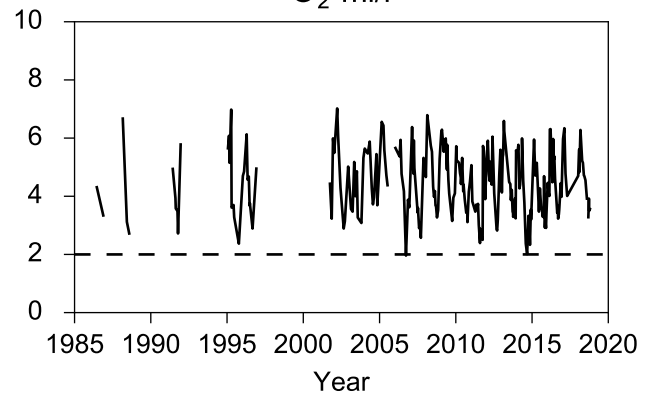


## OXYGEN IN BOTTOM WATER (depth >= 64 m)

O<sub>2</sub> ml/l



O<sub>2</sub> ml/l

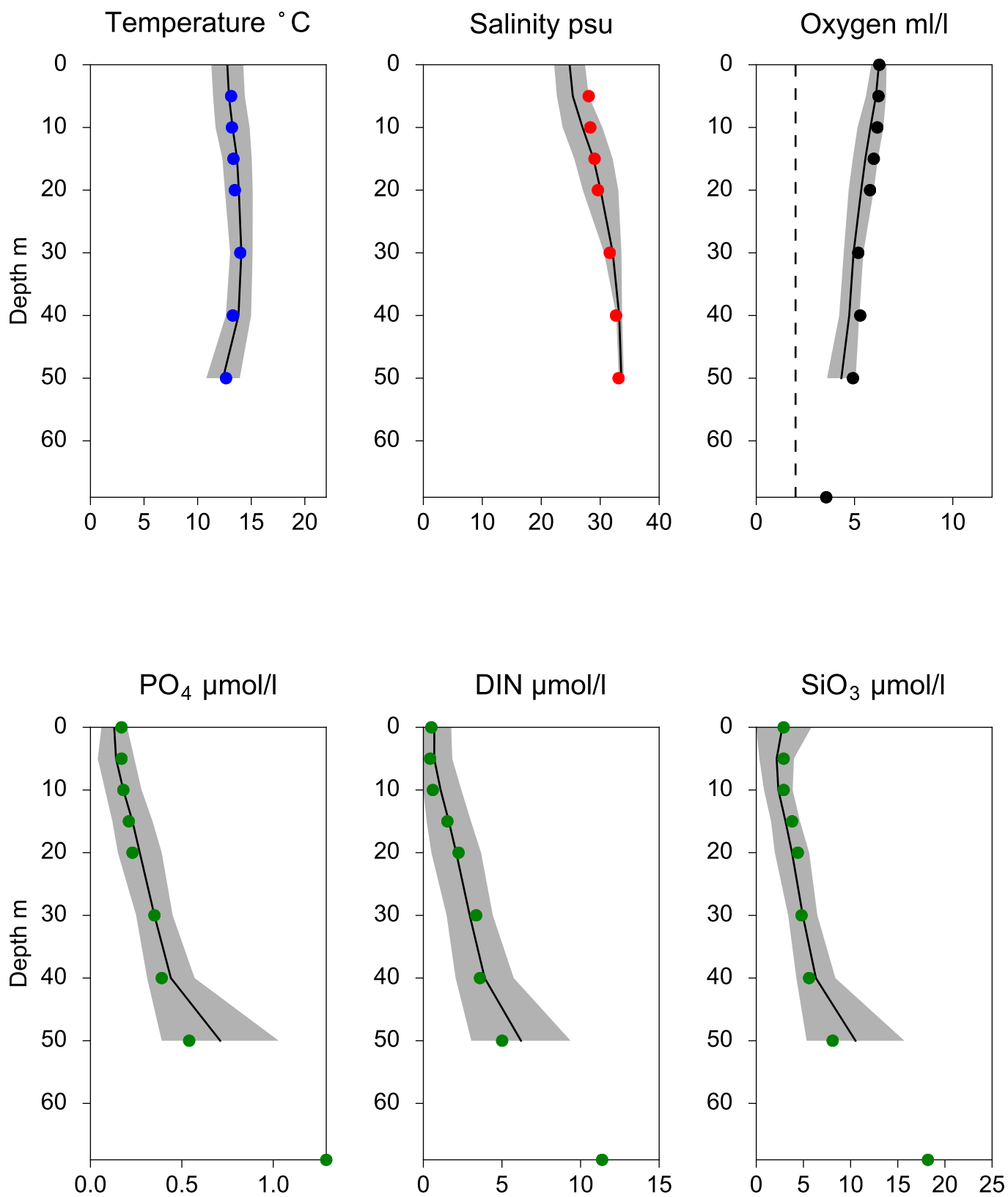


# Vertical profiles SLÄGGÖ October

— Mean 2001-2015

■ St.Dev.

● 2018-10-18



# STATION P2 SURFACE WATER (0-10 m)

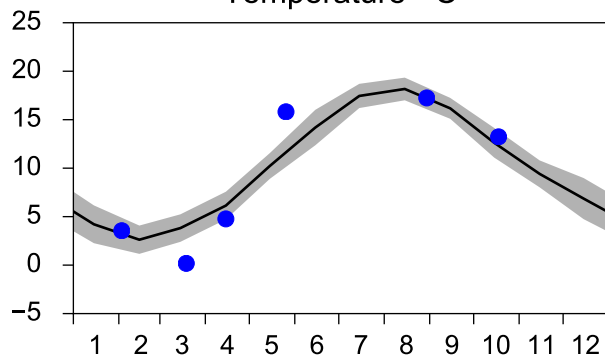
Annual Cycles

— Mean 2001-2015

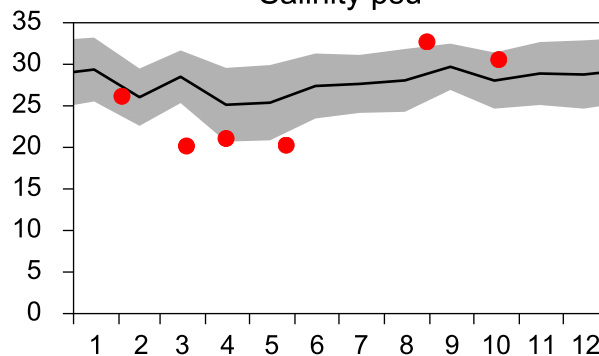
■ St.Dev.

● 2018

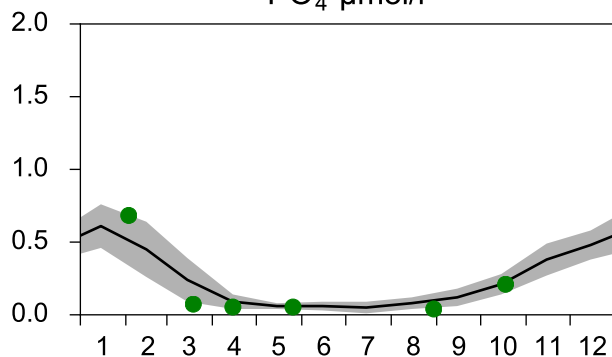
Temperature °C



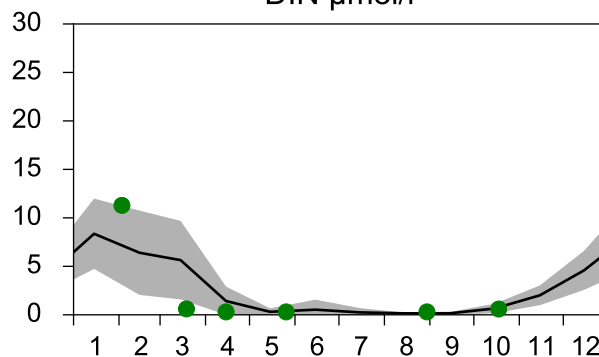
Salinity psu



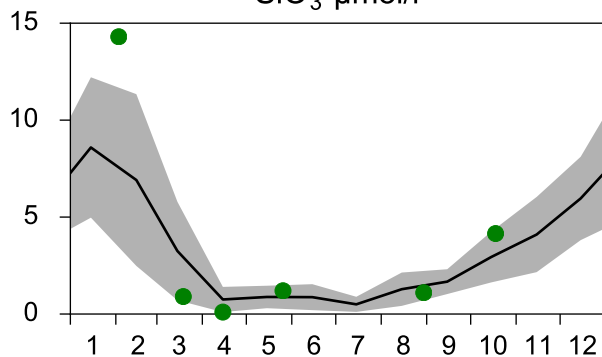
PO<sub>4</sub> µmol/l



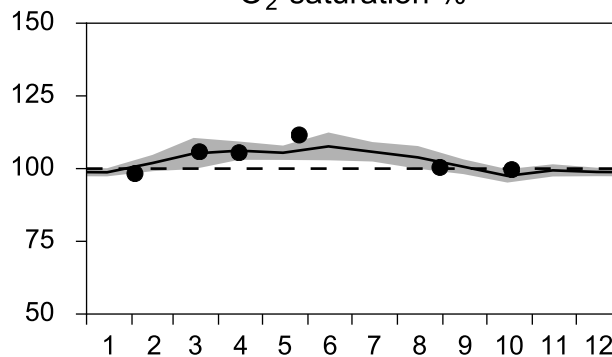
DIN µmol/l



SiO<sub>3</sub> µmol/l

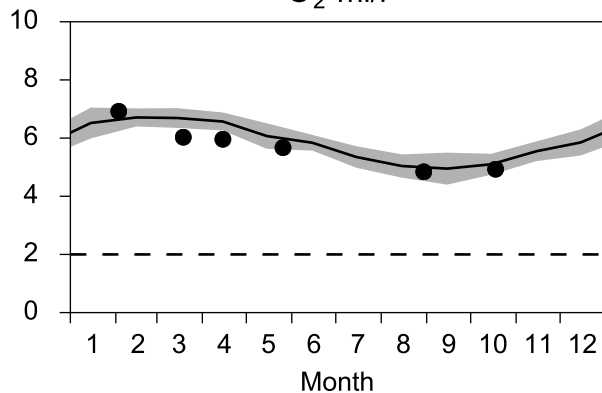


O<sub>2</sub> saturation %

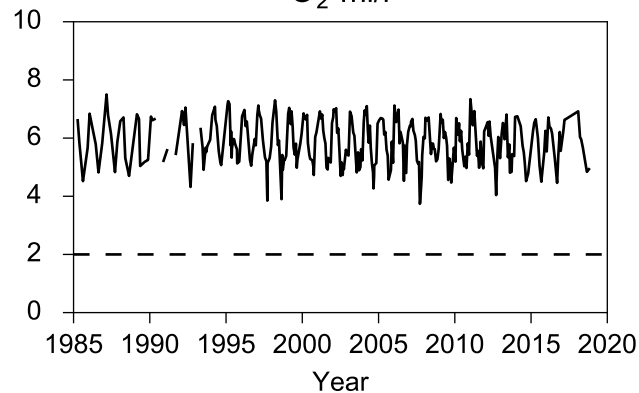


## OXYGEN IN BOTTOM WATER (depth >= 75 m)

O<sub>2</sub> ml/l

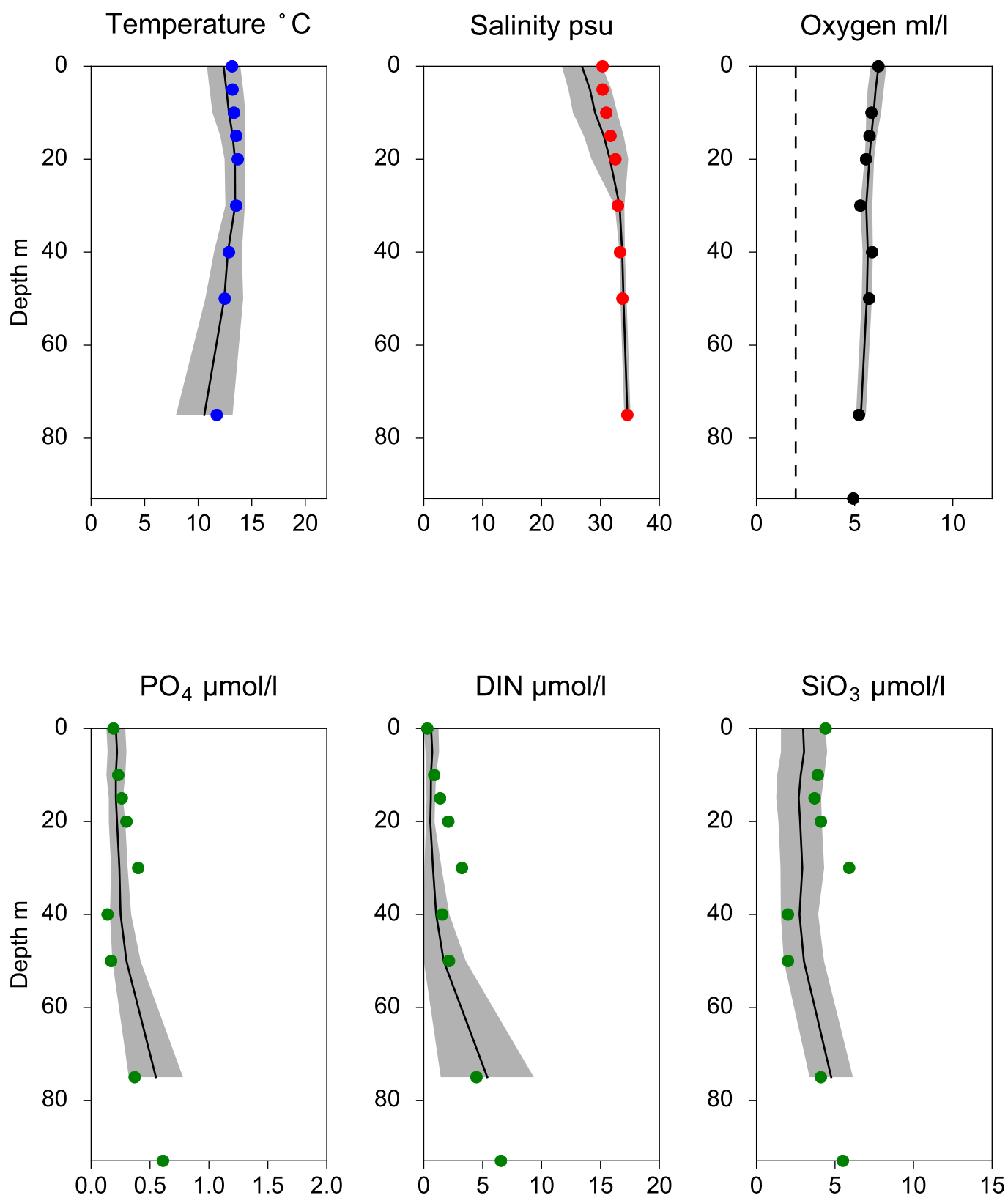


O<sub>2</sub> ml/l



## Vertical profiles P2 October

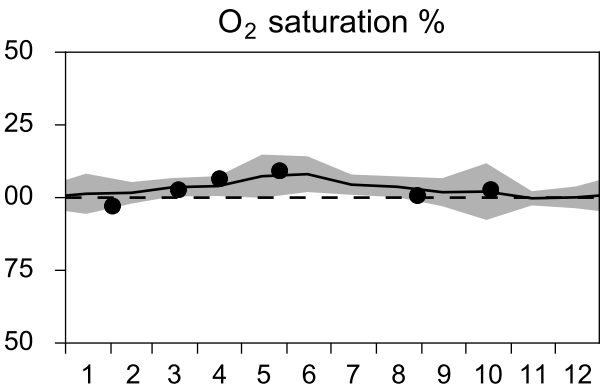
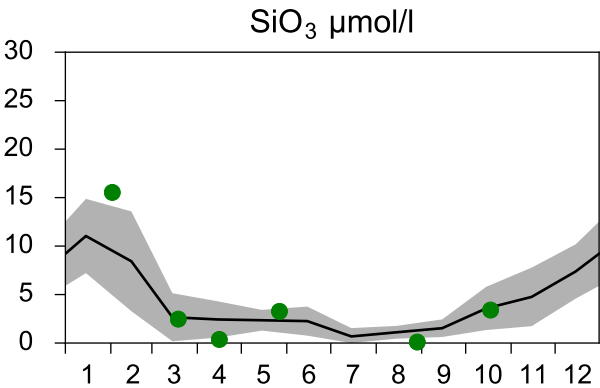
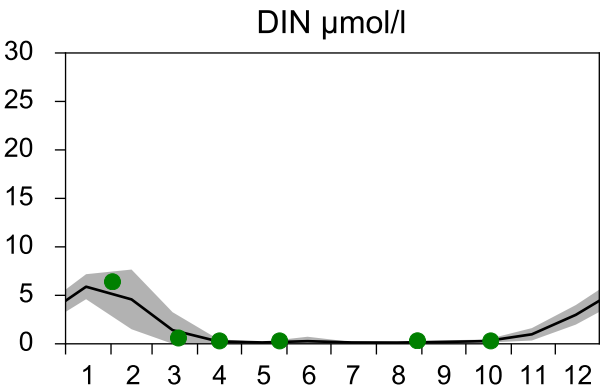
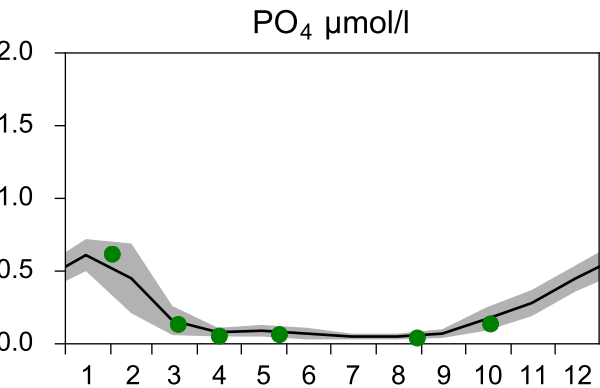
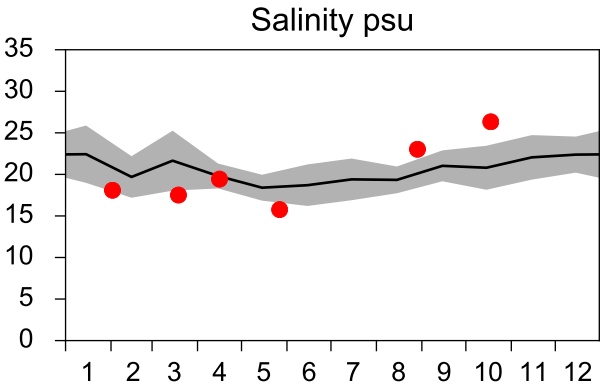
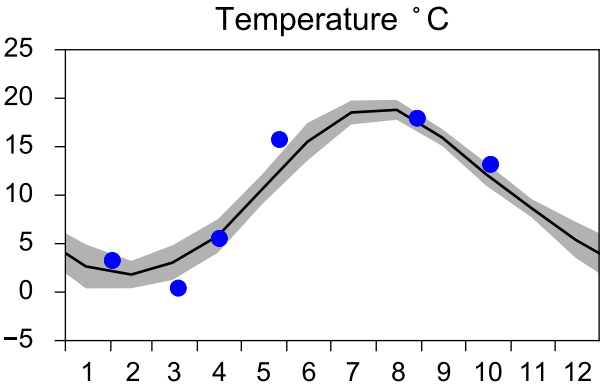
— Mean 2001-2015    St.Dev.    • 2018-10-18



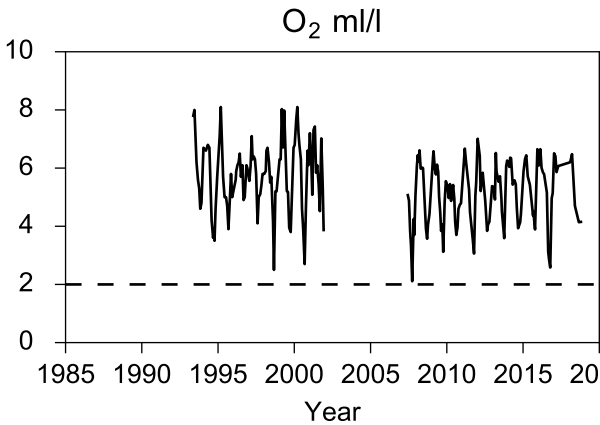
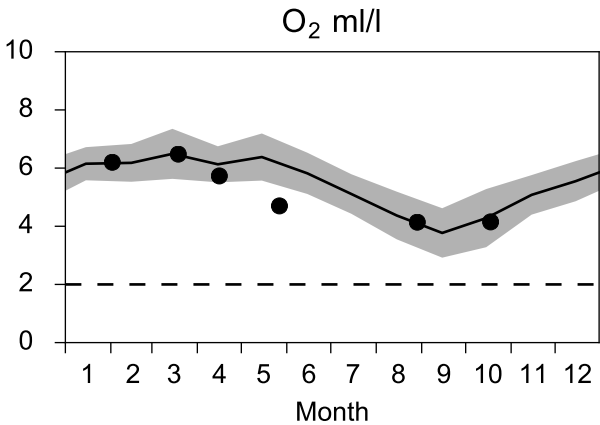
# STATION N14 FALKENBERG SURFACE WATER (0-10 m)

Annual Cycles

— Mean 2001-2015    St.Dev.    • 2018

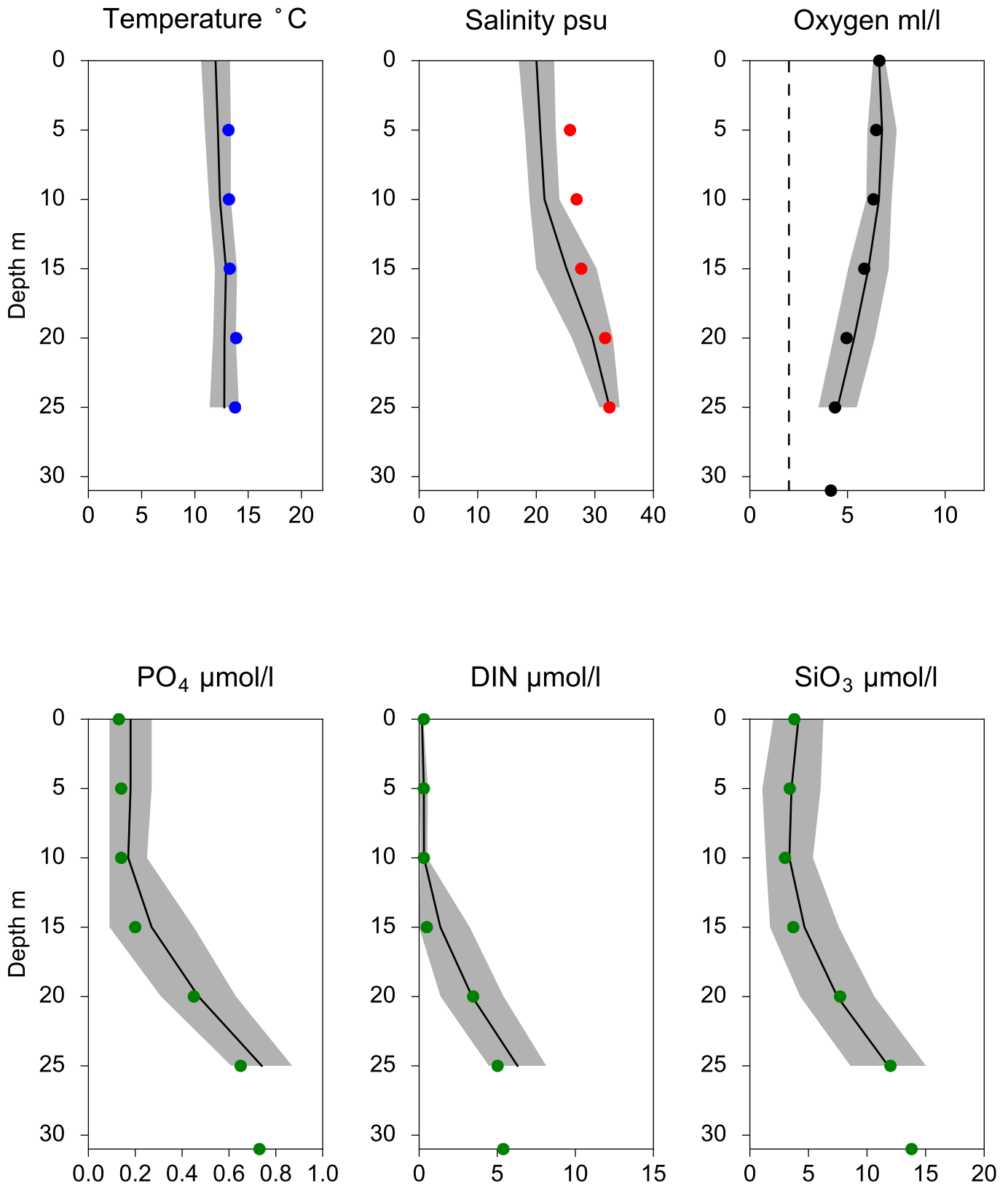


## OXYGEN IN BOTTOM WATER (depth >= 25 m)



# Vertical profiles N14 FALKENBERG October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-18



# STATION HANÖBUKTEN SURFACE WATER (0-10 m)

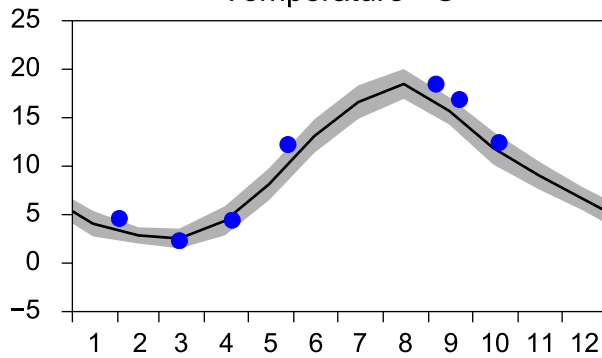
Annual Cycles

— Mean 2001-2015

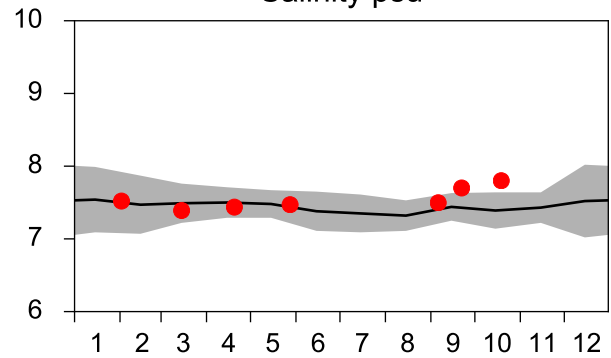
■ St.Dev.

● 2018

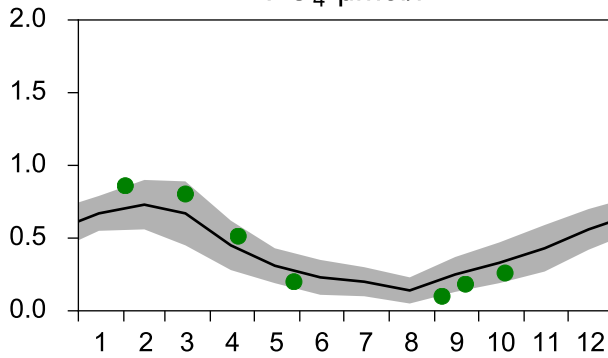
Temperature °C



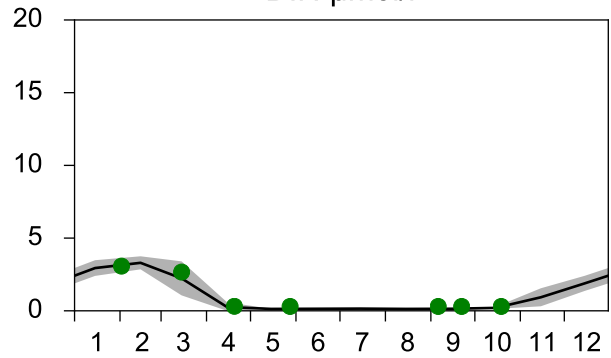
Salinity psu



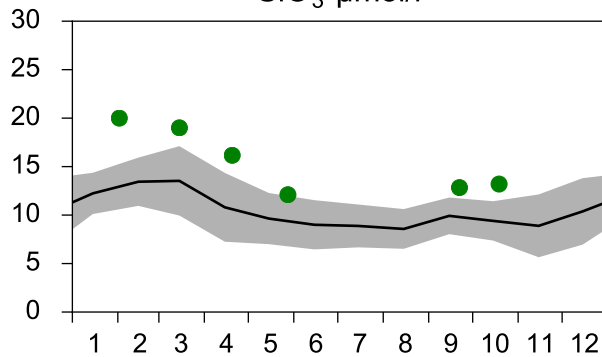
PO<sub>4</sub> µmol/l



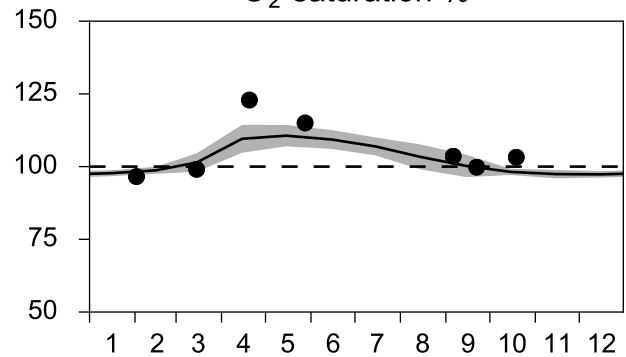
DIN µmol/l



SiO<sub>3</sub> µmol/l

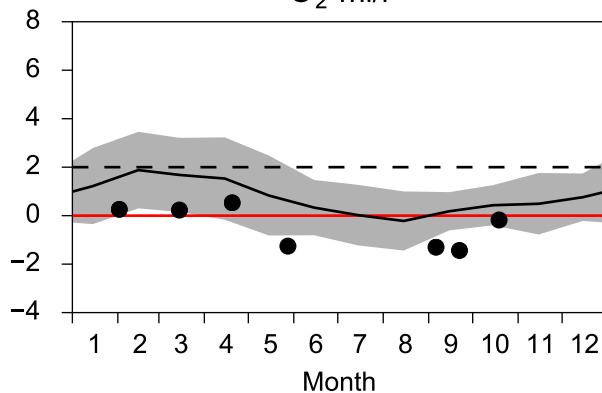


O<sub>2</sub> saturation %

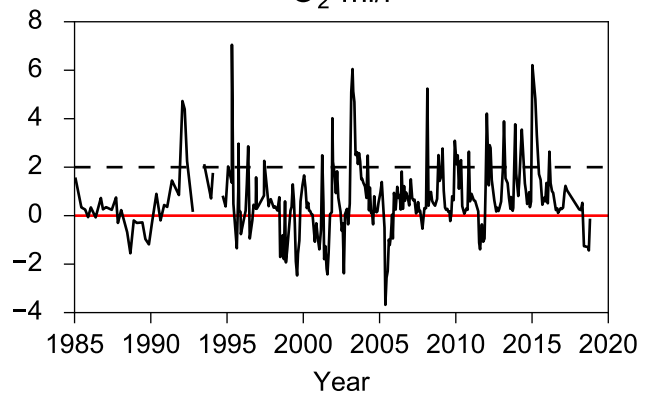


## OXYGEN IN BOTTOM WATER (depth >= 70 m)

O<sub>2</sub> ml/l



O<sub>2</sub> ml/l



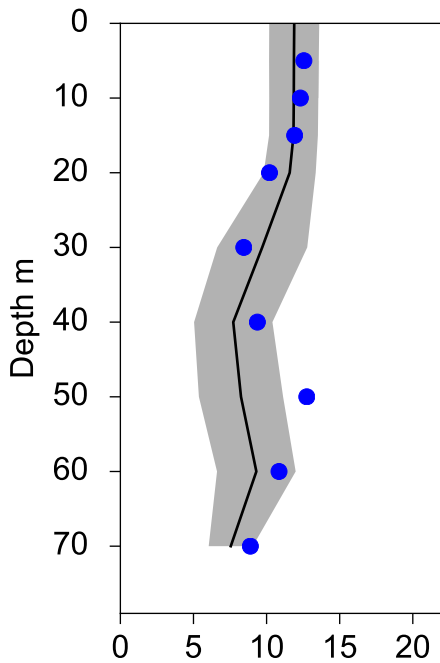
# Vertical profiles HANÖBUKTEN October

— Mean 2001-2015

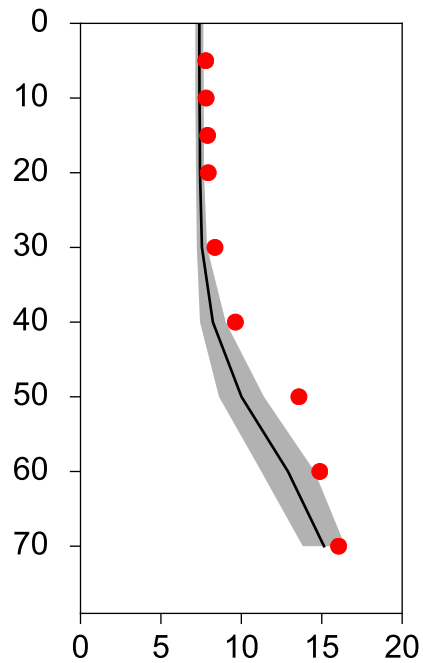
■ St.Dev.

● 2018-10-19

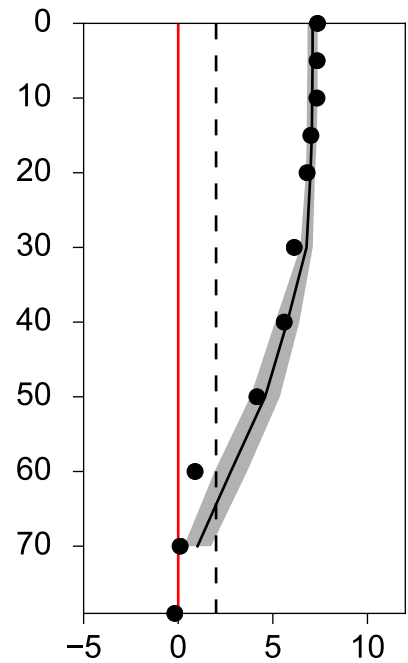
Temperature °C



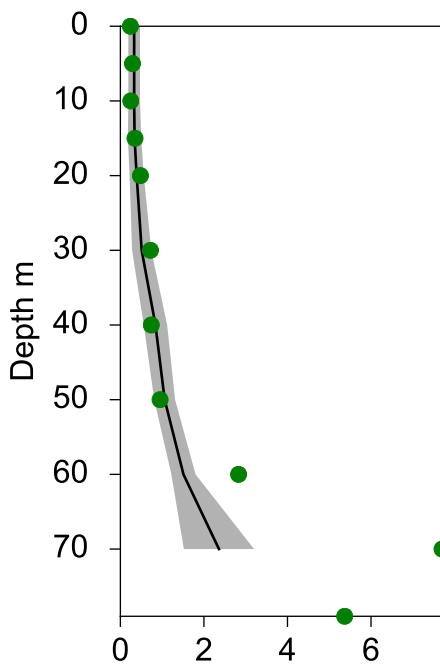
Salinity psu



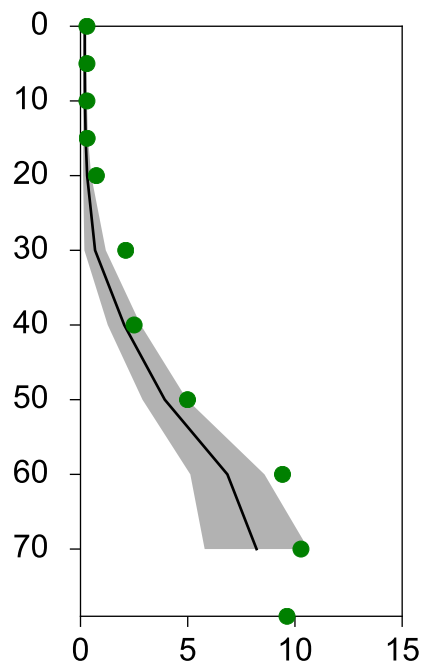
Oxygen ml/l



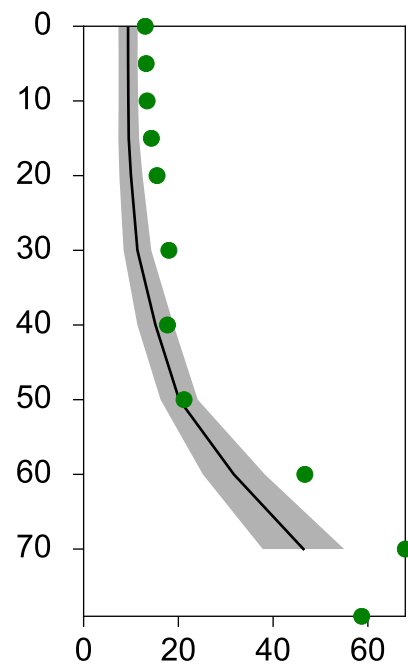
PO<sub>4</sub> µmol/l



DIN µmol/l



SiO<sub>3</sub> µmol/l



# STATION REF M1V1 SURFACE WATER (0-10 m)

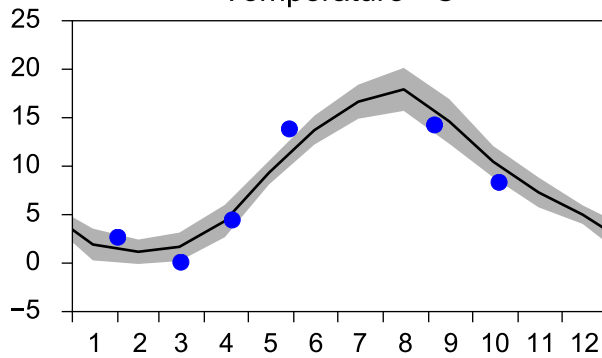
Annual Cycles

— Mean 2001-2015

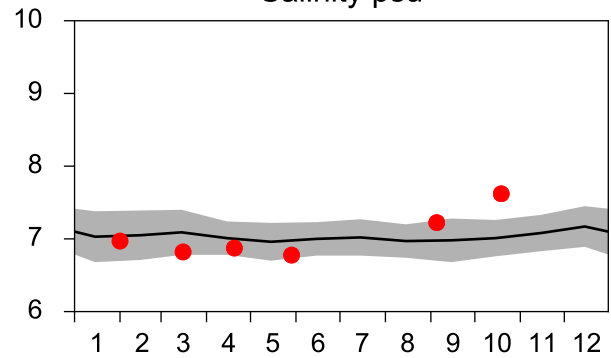
■ St.Dev.

● 2018

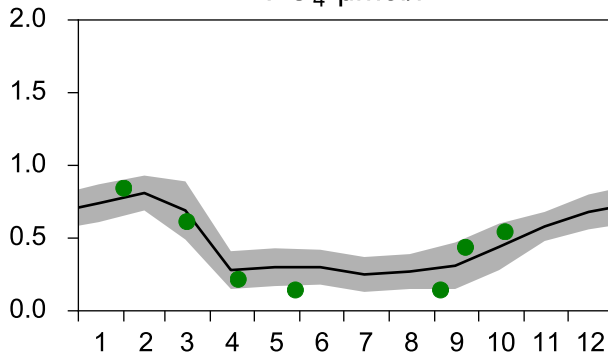
Temperature °C



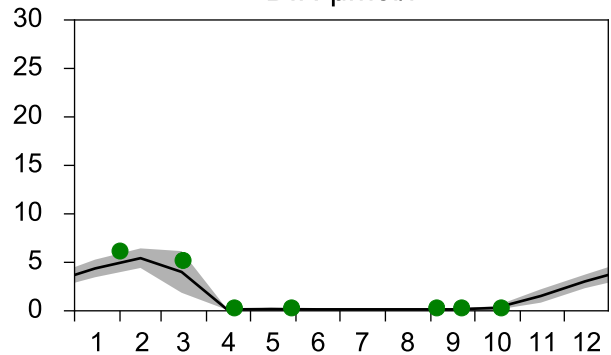
Salinity psu



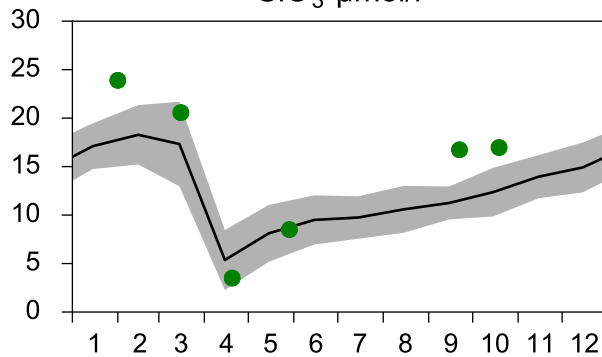
PO<sub>4</sub> µmol/l



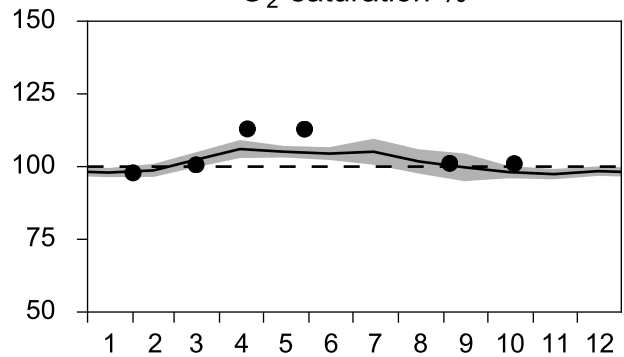
DIN µmol/l



SiO<sub>3</sub> µmol/l

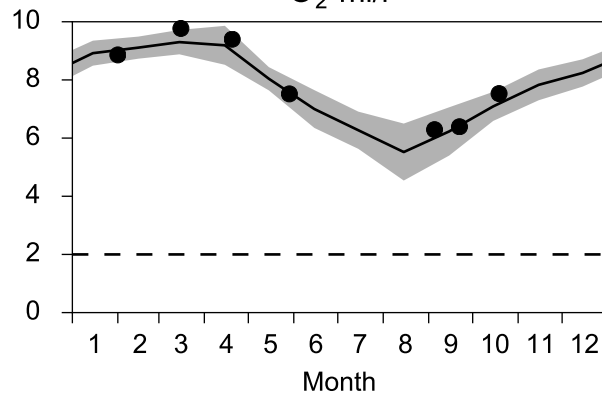


O<sub>2</sub> saturation %

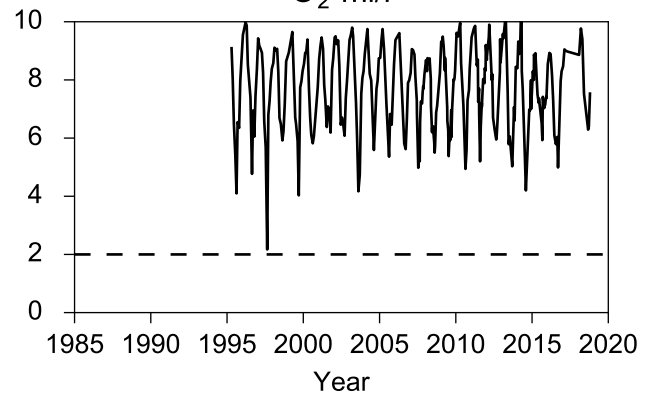


## OXYGEN IN BOTTOM WATER (depth >= 17 m)

O<sub>2</sub> ml/l

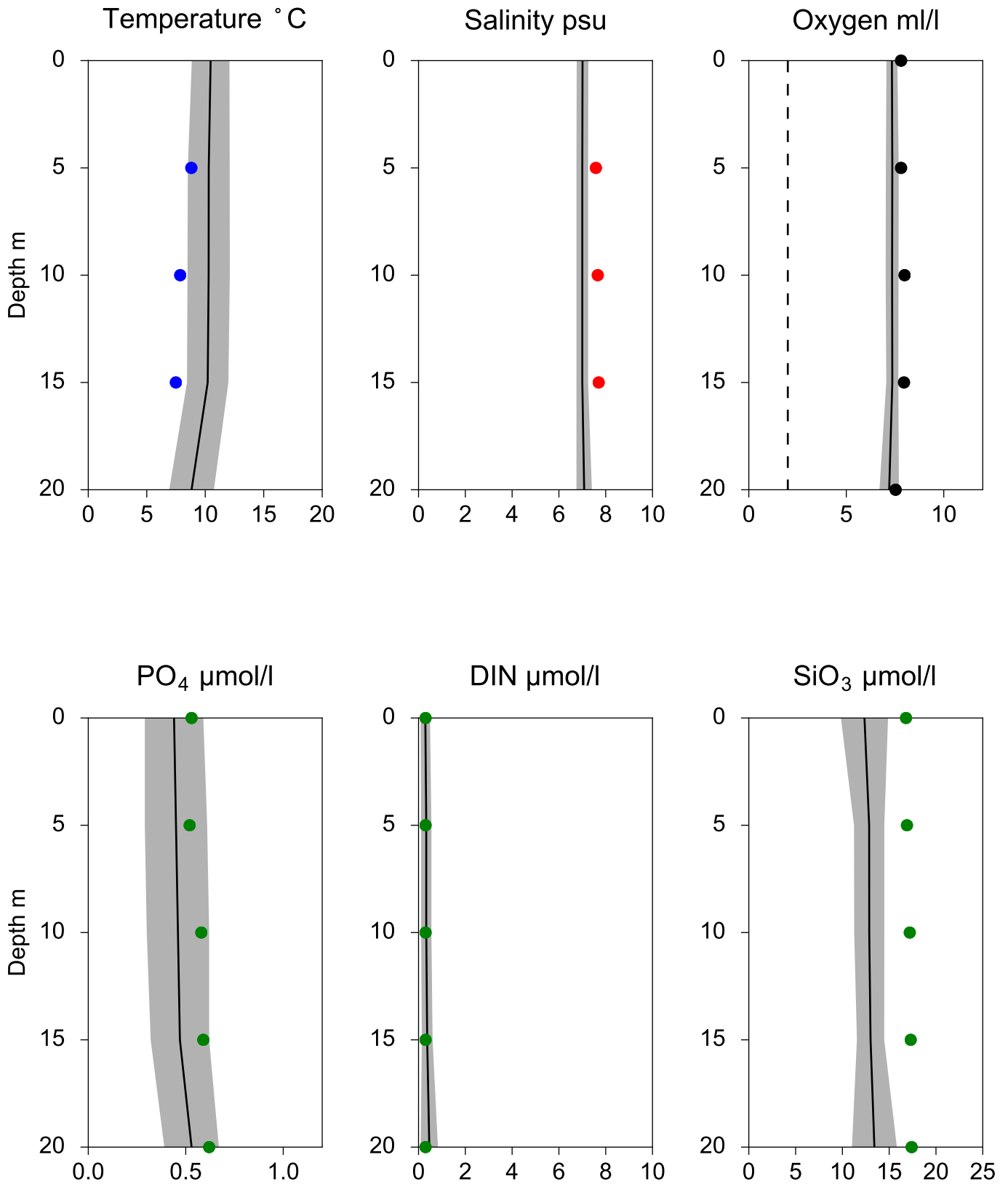


O<sub>2</sub> ml/l



# Vertical profiles REF M1V1 October

— Mean 2001-2015    ■ St.Dev.    ● 2018-10-19



# STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

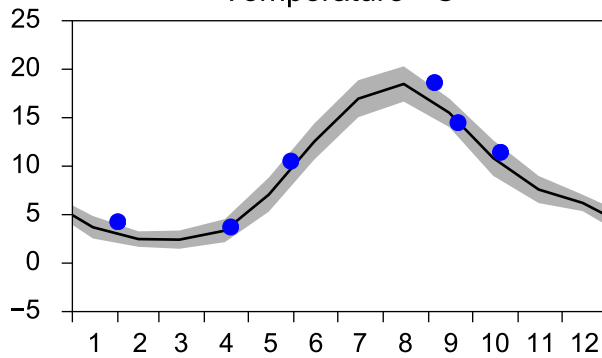
Annual Cycles

— Mean 2001-2015

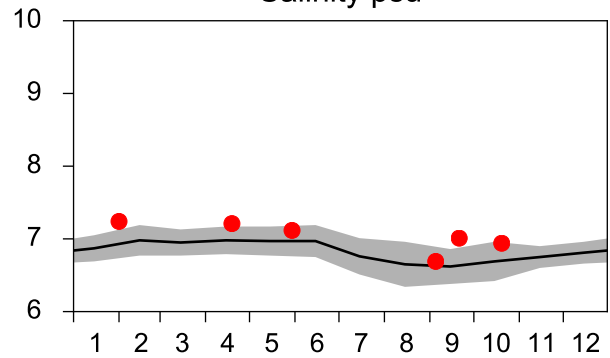
■ St.Dev.

● 2018

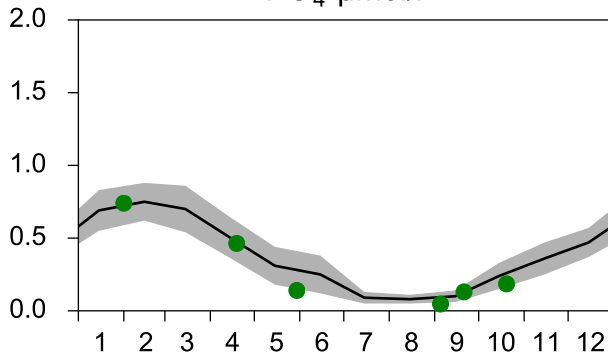
Temperature °C



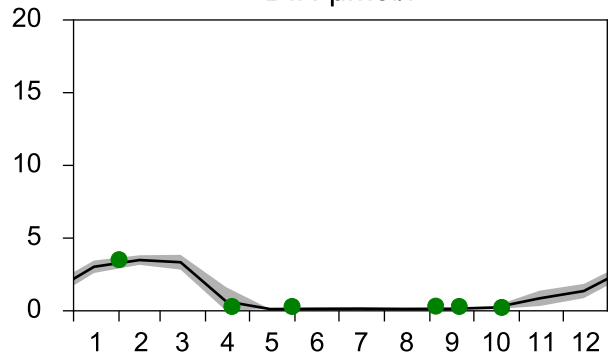
Salinity psu



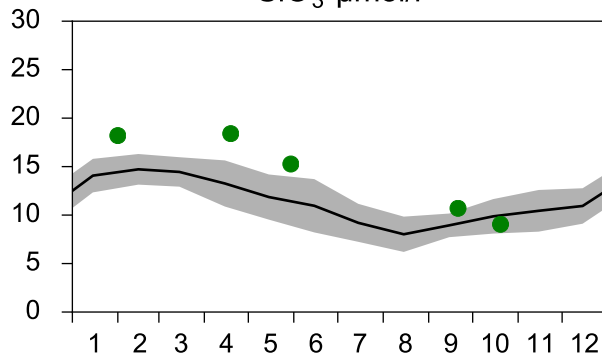
PO<sub>4</sub> µmol/l



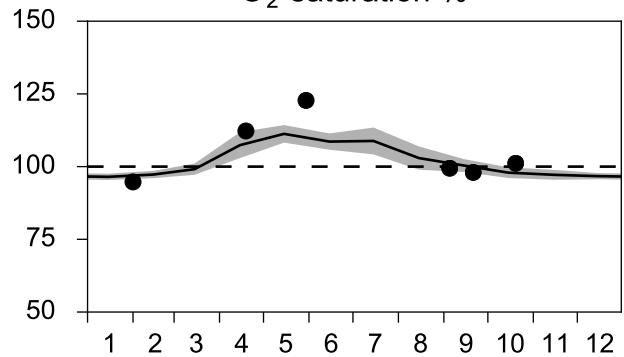
DIN µmol/l



SiO<sub>3</sub> µmol/l

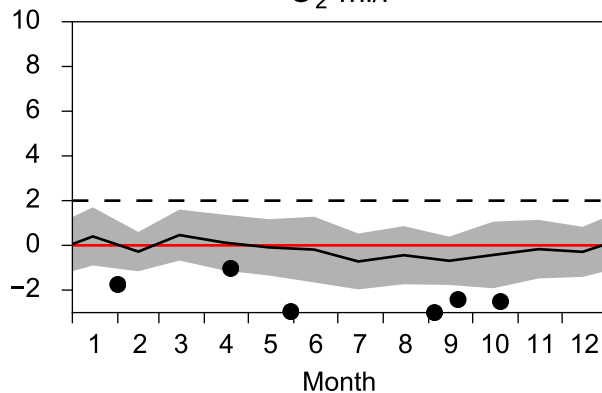


O<sub>2</sub> saturation %

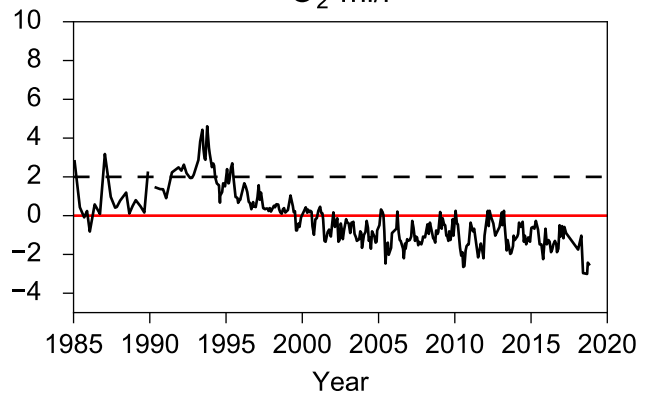


## OXYGEN IN BOTTOM WATER (depth >= 100 m)

O<sub>2</sub> ml/l

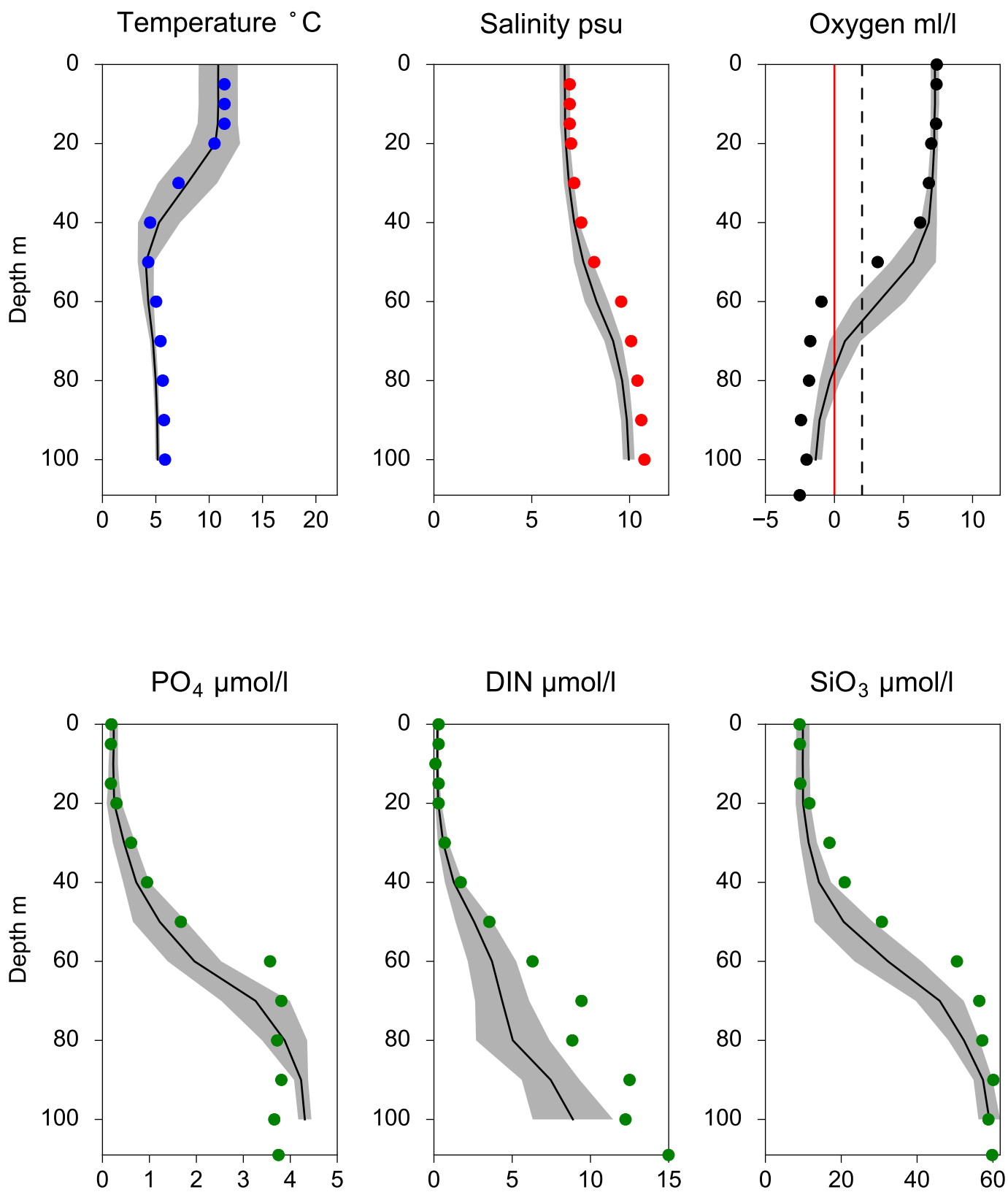


O<sub>2</sub> ml/l



# Vertical profiles BY38 KARLSÖDJ October

— Mean 2001-2015    St.Dev.    • 2018-10-20



# STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

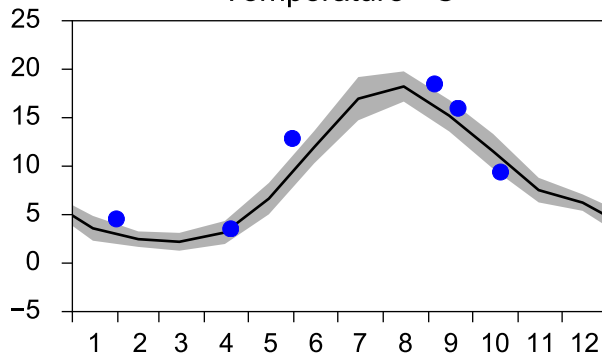
Annual Cycles

— Mean 2001-2015

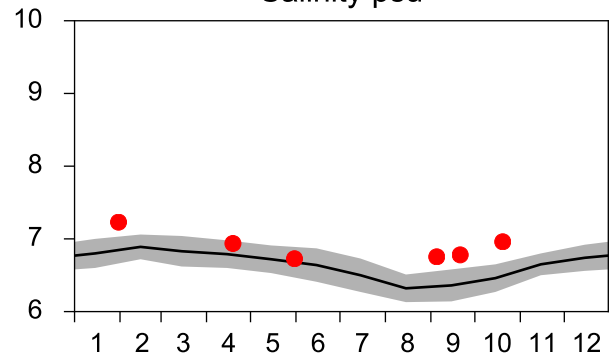
■ St.Dev.

● 2018

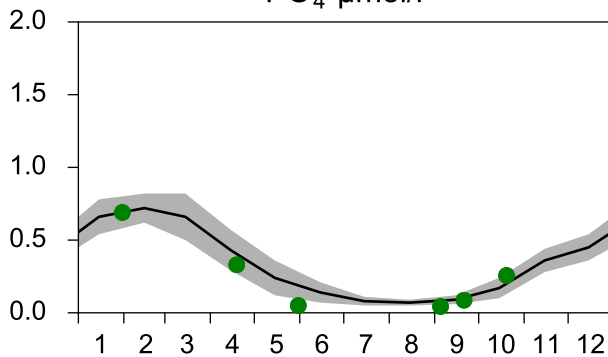
Temperature °C



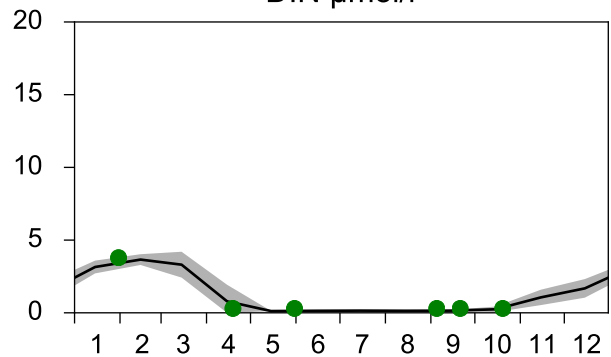
Salinity psu



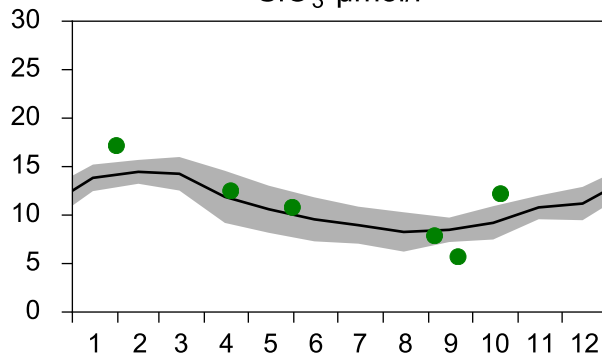
PO<sub>4</sub> µmol/l



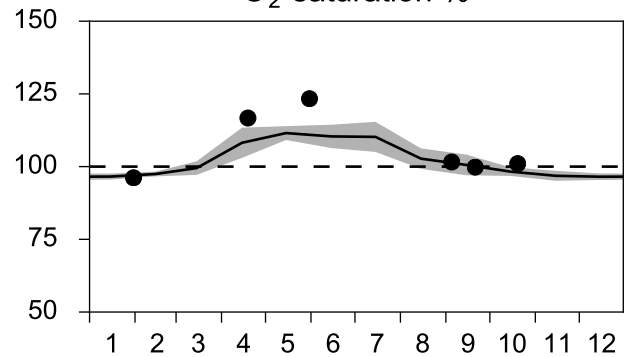
DIN µmol/l



SiO<sub>3</sub> µmol/l

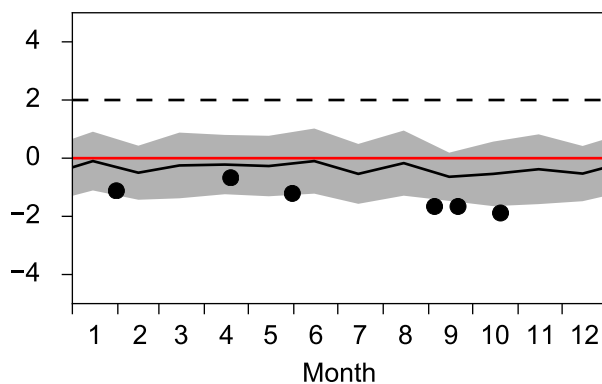


O<sub>2</sub> saturation %

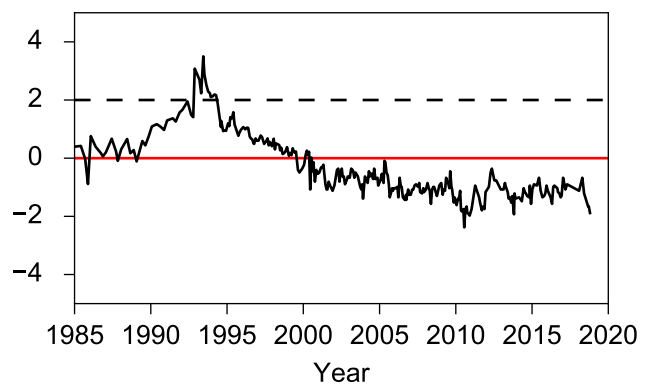


## OXYGEN IN BOTTOM WATER (depth >= 175 m)

O<sub>2</sub> ml/l



O<sub>2</sub> ml/l



# Vertical profiles BY32 NORRKÖPINGSDJ October

— Mean 2001-2015    St.Dev.    • 2018-10-20

