

Report from SMHI's marine monitoring cruise with R/V Svea



Survey period:	2023-11-11 – 2023-11-16
Principals:	Swedish Meteorological and Hydrological Institute (SMHI), Swedish Agency for Marine and Water Management (SwAM)
Cooperation partners:	Swedish University of Agricultural Sciences (SLU), Swedish Maritime Administration (SMA)

SUMMARY

During the cruise, which is part of the Swedish pelagic monitoring program, the Skagerrak, the Kattegat, the Sound and the Baltic Proper were visited.

The temperature in the surface water had decreased slightly since the last cruise and was now 8–12 °C. This is normal for the time of year except in the East Gotland Basin where it was warmer than normal. The surface salinity was normal along the Swedish west coast and higher than normal in large parts of the Baltic Proper.

The concentration of nutrients has now increased at most stations, which is normal for the time of year. In the Kattegat, the concentration of DIN was still low, but still within the normal range. In the Sound, all nutrients were above normal in the surface. Because of the storm Babet in October, the surface water was mixed and the concentration of nutrients increased significantly in the surface water in the Baltic Proper. Now in November, the concentrations at several stations had decreased, but they were still above normal at some stations.

In the Arkona Basin, the oxygen concentration closest to the bottom was 5.1 ml/l at BY1 and 3.3 ml/l at BY2. In the Bornholm Basin, hydrogen sulphide was measured closest to the bottom and there was an acute lack of oxygen (<2 ml/l) from 70 meters. In Hanö Bay, the oxygen concentration was close to zero at the bottom. At station BCSIII-10 in the south-east of the Baltic Proper, there was no hydrogen sulphide at the bottom, just like in October, but an acute lack of oxygen started at 60 metres. In the Eastern Gotland Basin, there was a lack of oxygen (<4 ml/l) from 60 m and an acute lack of oxygen from 65 m. In the Western Gotland Basin, there was a lack of oxygen already from 45 m and an acute lack of oxygen from 55 m.

The next regular cruise is planned to start on December 5, and mapping of nutrient will be done in the Gulf of Bothnia. The expedition starts in Kalmar, has a shift change in Gävle and ends in Lysekil.

RESULTS

The cruise was carried out with R/V Svea and started in Falkenberg on November 11th and ended in Kalmar on the evening of November 16th. During the cruise, the buoy at Huvudskär Ost was recovered before the winter. The buoy is planned to be deployed again in March 2024.

The weather during the cruise was cloudy with mostly light winds. In the afternoon of November 16, the winds increased from the east-northeast and there were relatively high seas. The air temperature remained between 5 and 9°C during the cruise.

All planned stations were visited, i.e. 27 of the planned 27 stations. A visit was made to Östergarnsholm where a carbon dioxide system was replaced and an ADCP was deployed to Uppsala University.

Svea's instrument for measuring profiles underway, MVP, was operating during day time at all stations depending on the circumstances, starting at P2 in Skagerrak. The Ferrybox system and the ADCP were also run continuously throughout the expedition.

At the time of writing this report, not all CTD data has been processed and therefore CTD data for station BY31 is missing from the report.

This report is based on data that has undergone an initial quality control and is compared to monthly means from the period 1991 - 2020. When additional quality control has been performed, certain values may change. Values in the report have been rounded and by that can differ a bit from values published in the data base. Data from this cruise are published as soon as possible on the data host's website, this usually takes place within a week after the cruise has ended. Some analyses are made after the cruise and are published later .

Data can be downloaded here:

<https://www.smhi.se/en/services/open-data/national-archive-for-oceanographic-data/download-data-1.153150>

The Skagerrak

The temperature in the surface water had decreased slightly since October and was now around 10–11°C down to about 10–15 m, which is normal for November. At station Å14, however, it was somewhat warmer than normal in the surface water, 12°C. Below the surface layer, the water was still slightly warmer because it had not yet been reached by the cooling. Even deeper, below 100 m in the outer part of the Å-transect, the temperature was stable and around 8 °C. The surface salinity was normal and varied from 28 psu at the coastal station Släggö in Gullmarsfjorden to around 33 psu along the offshore Å-transect. In the deep water below 100 m, the salinity was stable and around 35 psu. The salinity stratification (halocline) was around 15–40 m in the outer Skagerrak and shallower closer to the coast. At station P2, the stratification was around 10 metres.

The nutrients DIN (dissolved inorganic nitrogen), phosphate and silicate had increased since October and were normal in the surface water, except for silicate which was above normal at Släggö. In the deep water, there were higher levels of nutrients but mostly within normal ranges. At the outer part of the Å-transect, station Å17, the nutrients were higher than normal around 20–50 m and then normal further down in the water column.

The oxygen situation was good at all stations in Skagerrak, with normal values for the season. The lowest concentration closest to the bottom was measured at Släggö, 4.3 ml/l. But around 55 meters there was a layer with a lower oxygen content, 3.4 ml/l, this coincided with a deeper stratification in both temperature and salinity.

The chlorophyll fluorescence, which is a measure of biological activity measured from the CTD probe, showed higher levels down to about 15 meters, highest at station P2.

The Kattegat and the Sound

The surface temperature in the Kattegat and the Sound was normal for the month at all stations, around 10°C, and had decreased slightly since October. The salinity was also normal in the surface and varied from 23 psu in the northern part to 13 psu in the Sound. A salinity and temperature stratification were observed around 10–20 m in the Kattegat. In central Kattegat there was a layer of warmer water, 13 °C, around 17 meters. Below the stratification in the northern and central Kattegat, the water was somewhat colder and saltier than normal. In the Sound, there was a salinity and temperature stratification at 5 m and one at 10 m. Below the stratification in the Sound, the water was warmer than normal, 14 degrees.

All concentrations of nutrients in the surface were normal in the Kattegat; phosphate and silicate had increased slightly since October, while DIN was still low. Below the stratification in the Kattegat, there were higher levels of DIN than normal. In the Sound, all nutrients were above normal in the surface water.

The oxygen levels in the bottom water of the Kattegat were normal for the time of year. In the Kattegat, all values were above 4 ml/l (limit for oxygen deficiency) and in the Sound it was just below that, 3.3 ml/l. An oxygen minimum was observed in Sound around 30 meters, 2.8 ml/l.

The chlorophyll fluorescence showed plankton activity in the surface water down to 10 m.

The Baltic Proper

The temperature in the surface water varied from a minimum of 8 °C in the Western Gotland Basin to a maximum of 10°C in the south-eastern Baltic Proper, where it was also warmer than normal for the season. The deep water in the entire Baltic Proper was warmer than normal. The surface salinity was above normal at several stations and varied between 6.8 psu in the Western Gotland Basin to 8.4 psu in the Arkona Basin. The salinity stratification, the halocline, was around 30–60 m and it often coincided with the temperature stratification.

Because of the storm Babet in October, the surface water was mixed and the concentration of nutrients in the surface water increased. Now in November, the concentrations at several stations had decreased, but they were still above normal at some stations. The concentration of phosphate and silicate was above normal in the south-eastern Baltic Proper, the Bornholm Basin and the Arkona Basin. The concentration of DIN was above normal in the Eastern Gotland Basin and the northern Baltic Proper. In the western Arkona Basin and the Hanö Bay, DIN was below normal.

In the deep water below the halocline, the levels of nutrients increased. In the deep basins around Gotland, the concentrations were still much higher than normal, above all the concentration of ammonium is very high, which is an effect of the very poor oxygen conditions.

In the Arkona Basin, the oxygen concentration closest to the bottom was 5.1 ml/l at BY1 and 3.3 ml/l at BY2. In the Bornholm Basin, hydrogen sulphide was observed closest to the bottom and there was an acute lack of oxygen (<2 ml/l) from 70 meters. In Hanö Bay, the oxygen concentration was close to zero at the bottom.

At station BCSIII-10 in the south-east of the Baltic Proper, there was no hydrogen sulphide at the bottom, just like in October, but an acute lack of oxygen started at 60 metres.

In the Eastern Gotland Basin, there was a lack of oxygen (<4 ml/l) from 60 m and an acute lack of oxygen from 65 m. In the Western Gotland Basin at station BY32, there was a lack of oxygen already from 45 m and an acute lack of oxygen from 55 m.

Fluorescence measurements from the CTD probe showed the presence of biological activity in the surface water at all stations, which was highest at BY1 in the Arkona Basin, otherwise generally low.

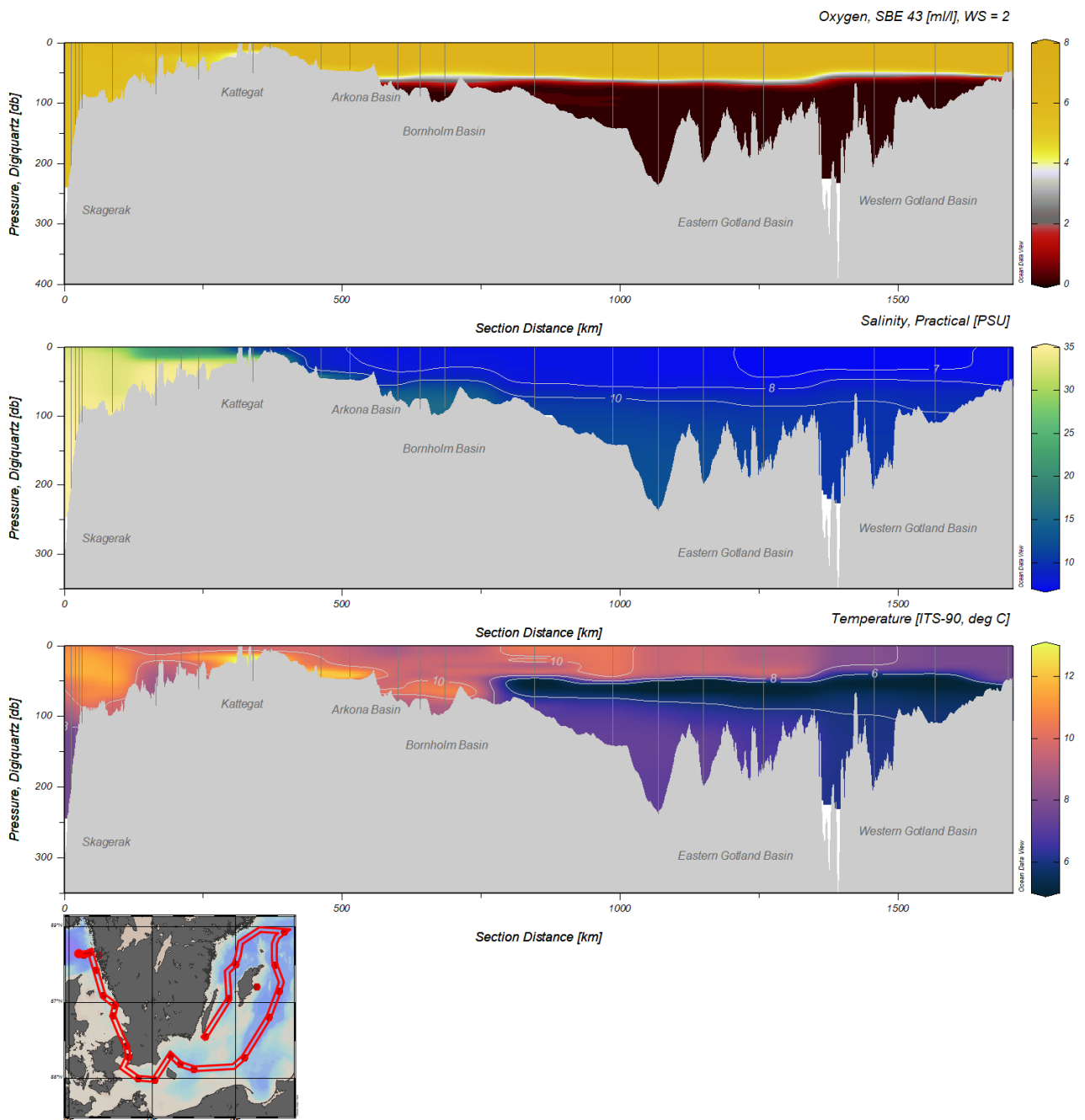


Figure 1. Transect showing CTD measurements of dissolved oxygen concentration, salinity and temperature from the Skagerrak, through the Kattegat and Öresund, further into the Baltic Proper, also shown in the map (bottom).

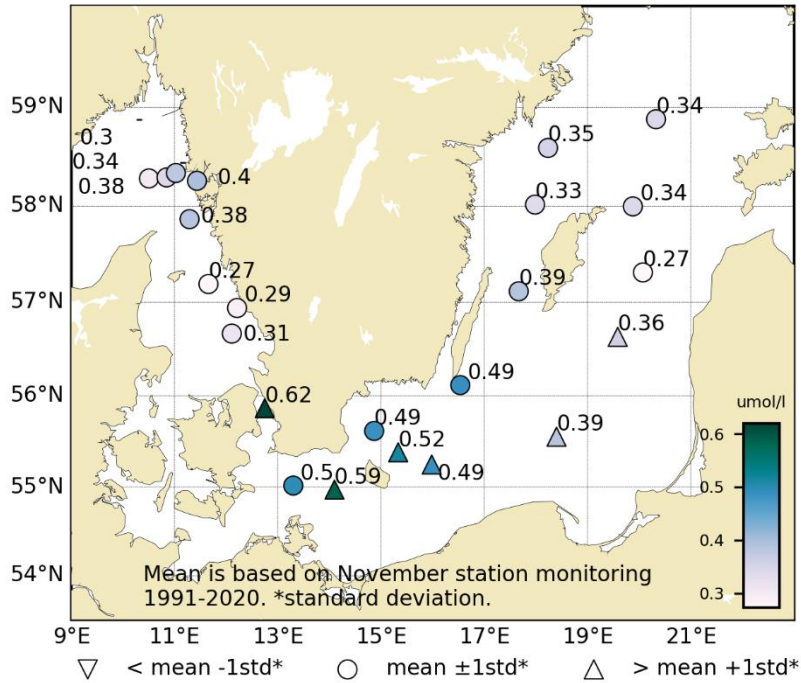


Figure 2. Concentration ($\mu\text{mol/l}$) of phosphate in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

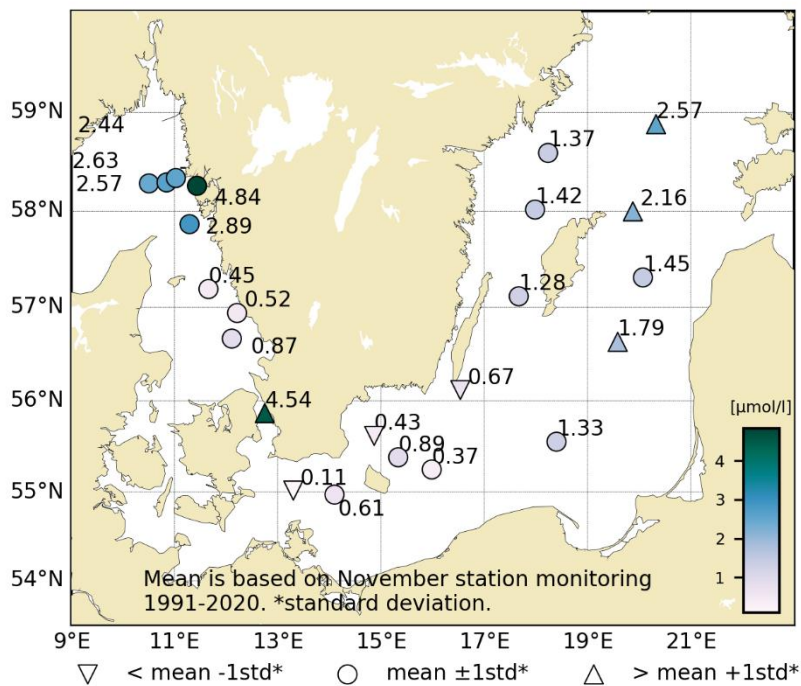


Figure 3. Concentration ($\mu\text{mol/l}$) of dissolved inorganic nitrogen (DIN) in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

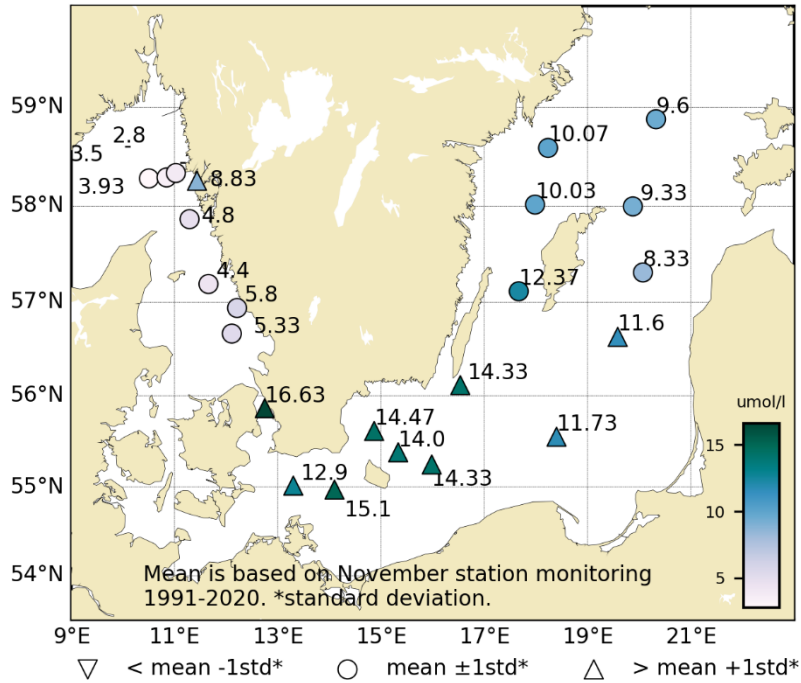


Figure 4. Concentration ($\mu\text{mol/l}$) of silicate in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

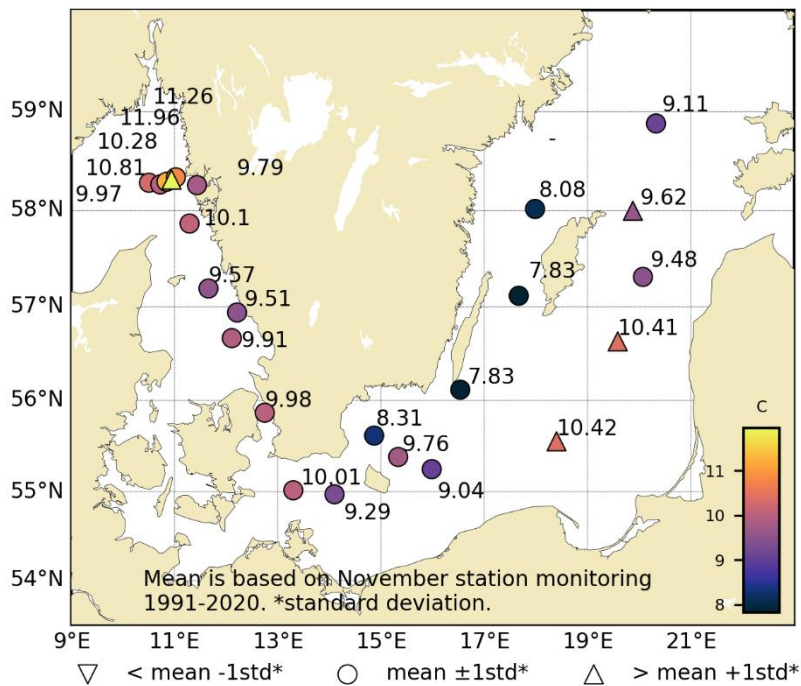


Figure 5. Temperature in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

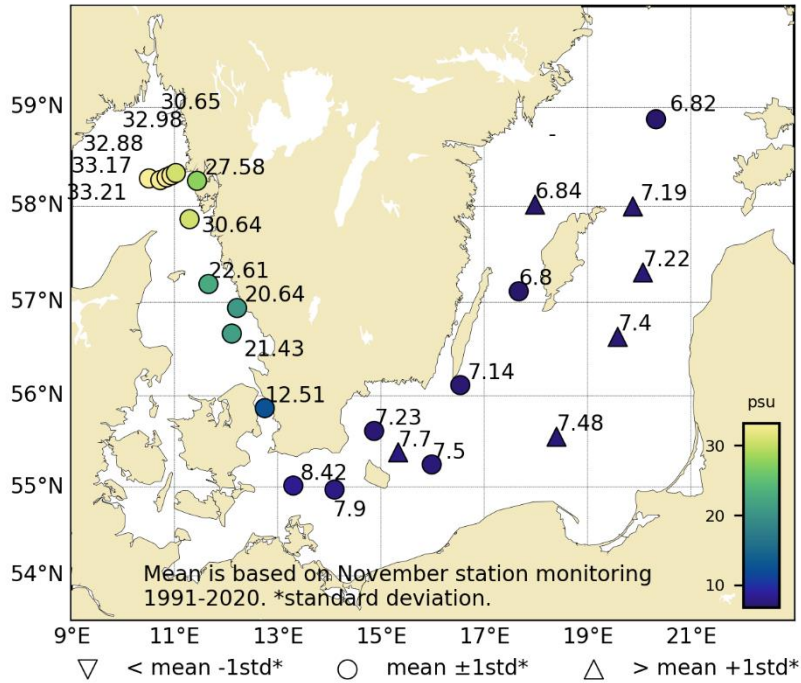


Figure 6. Salinity in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

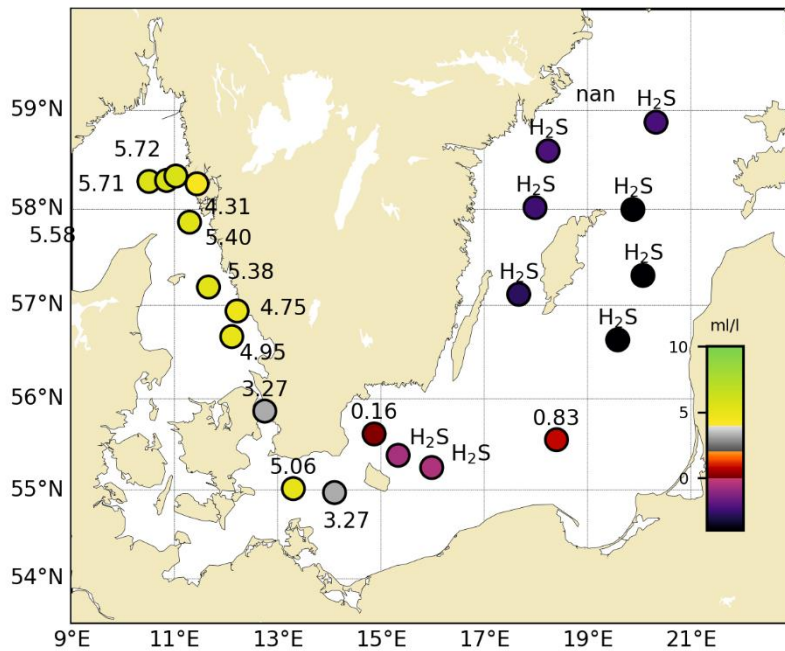


Figure 7. Dissolved oxygen concentration in ml/l in the bottom water, approximately 1 meter above the seabed. Note that the values have not been compared to statistics in the same way as in figures 2–6, that's why only circles are shown.

PARTICIPANTS

Namn	Roll	Från
Sara Johansson	Chief Scientist, Marine chemist, Quality Manager	SMHI
Ann-Turi Skjevik	Marine Biologist	SMHI
Ola Kalén	Oceanographer	SMHI
Anna-Kerstin Thell	Marine chemist	SMHI
Johan Kronsell	Oceanographer	SMHI
Irena Draca	Marine technician	SMHI
Kristoffer Johansson Dale	Marine technician	SMHI

APPENDICES

- Track chart
- Table over stations, analyzed parameters and number of sampling depths
- Map of dissolved oxygen in the bottom water
- Vertical profiles for regular monitoring stations
- Monthly average surface water plots for regular monitoring stations

SMHI

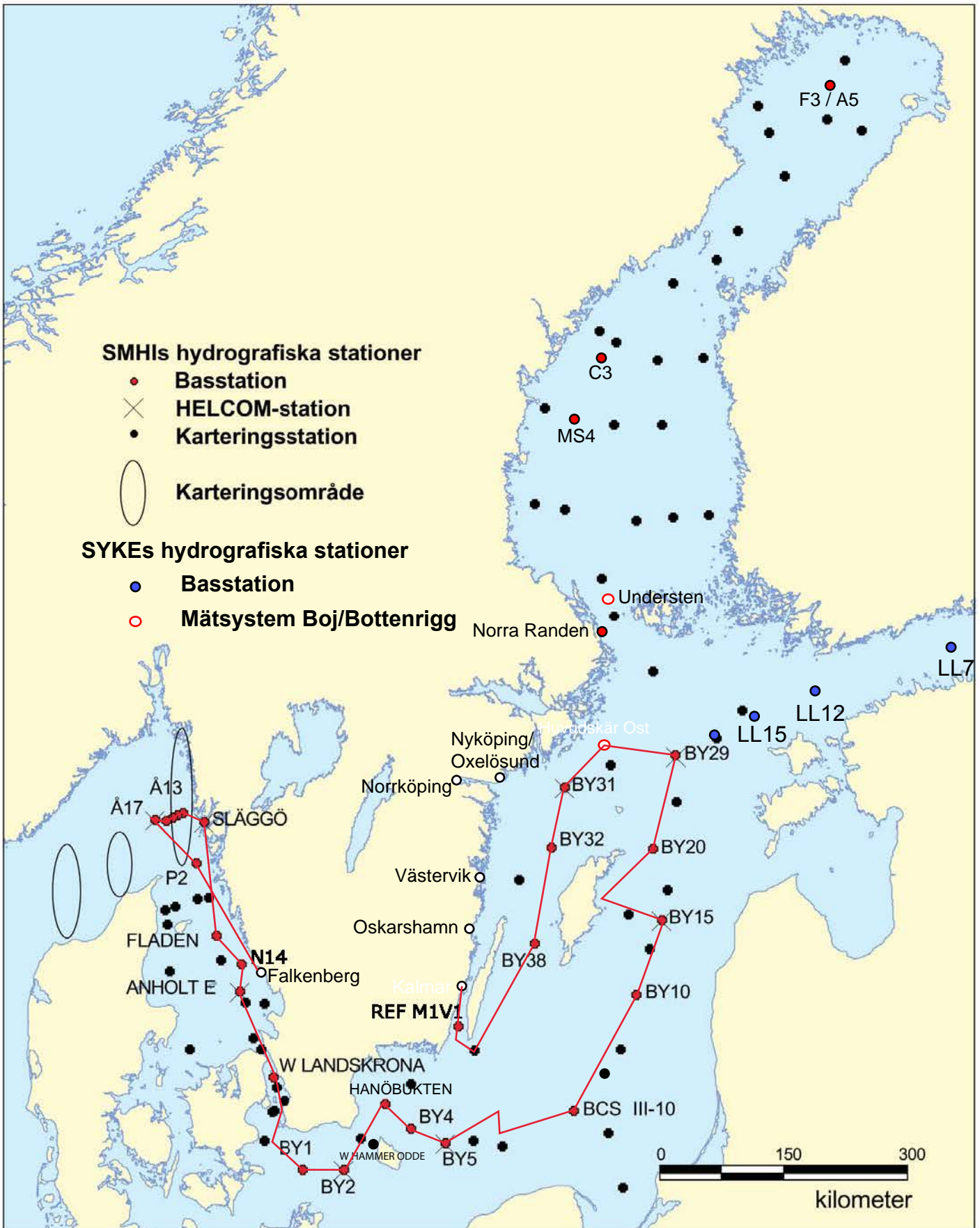


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Provning
ISO/IEC 17025

**Havs
och Vatten
myndigheten**

TRACKCHART

Country: Sweden
Ship: R/V Svea
Date: 231111-231117



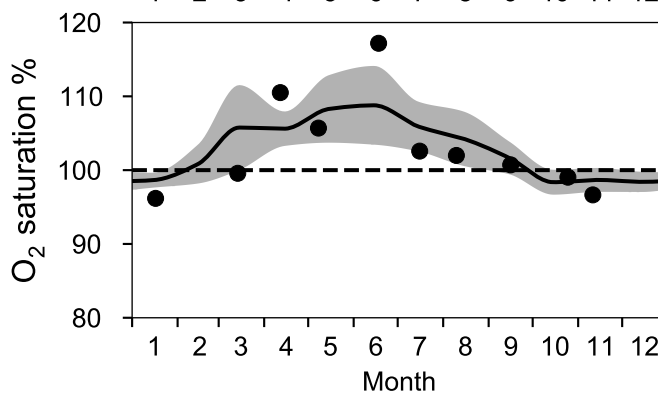
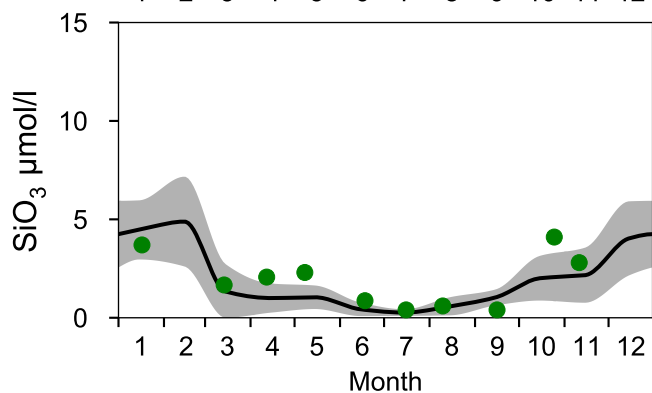
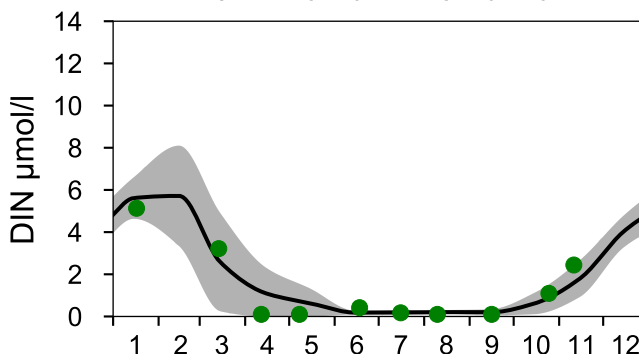
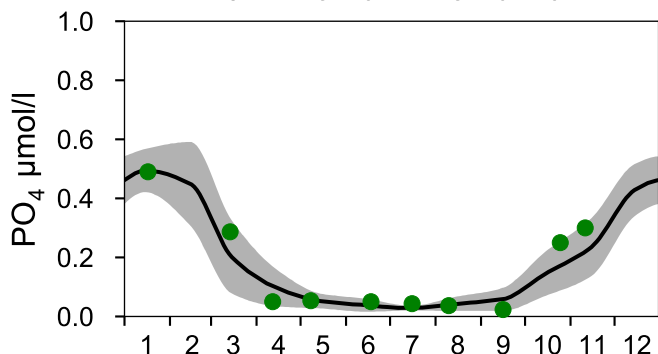
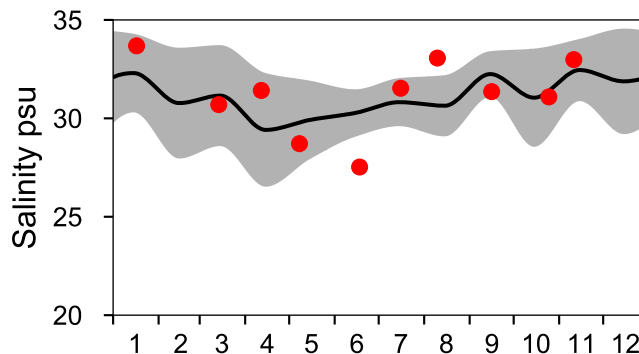
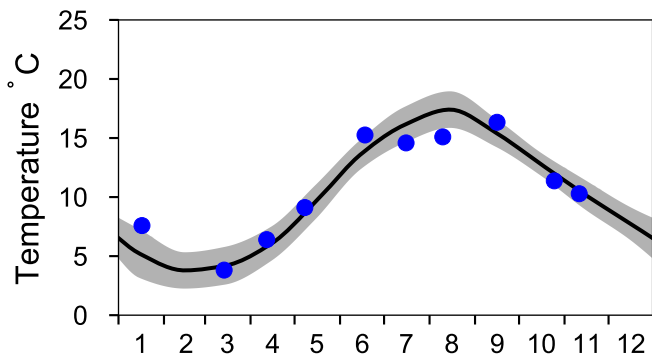
STATION Å17 SURFACE WATER (0-10 m)

Annual Cycles

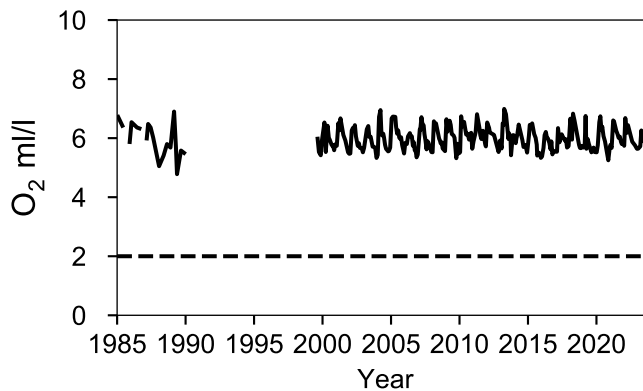
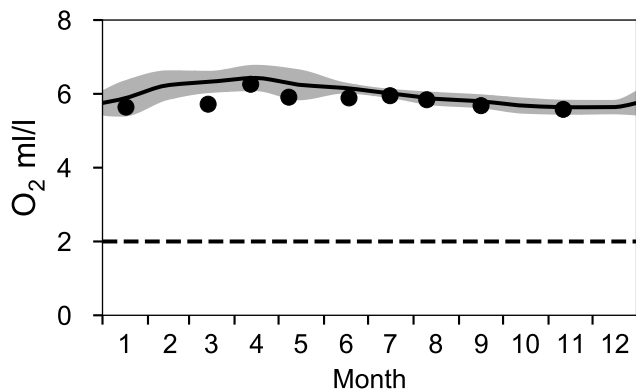
— Mean 1991-2020

■ St.Dev.

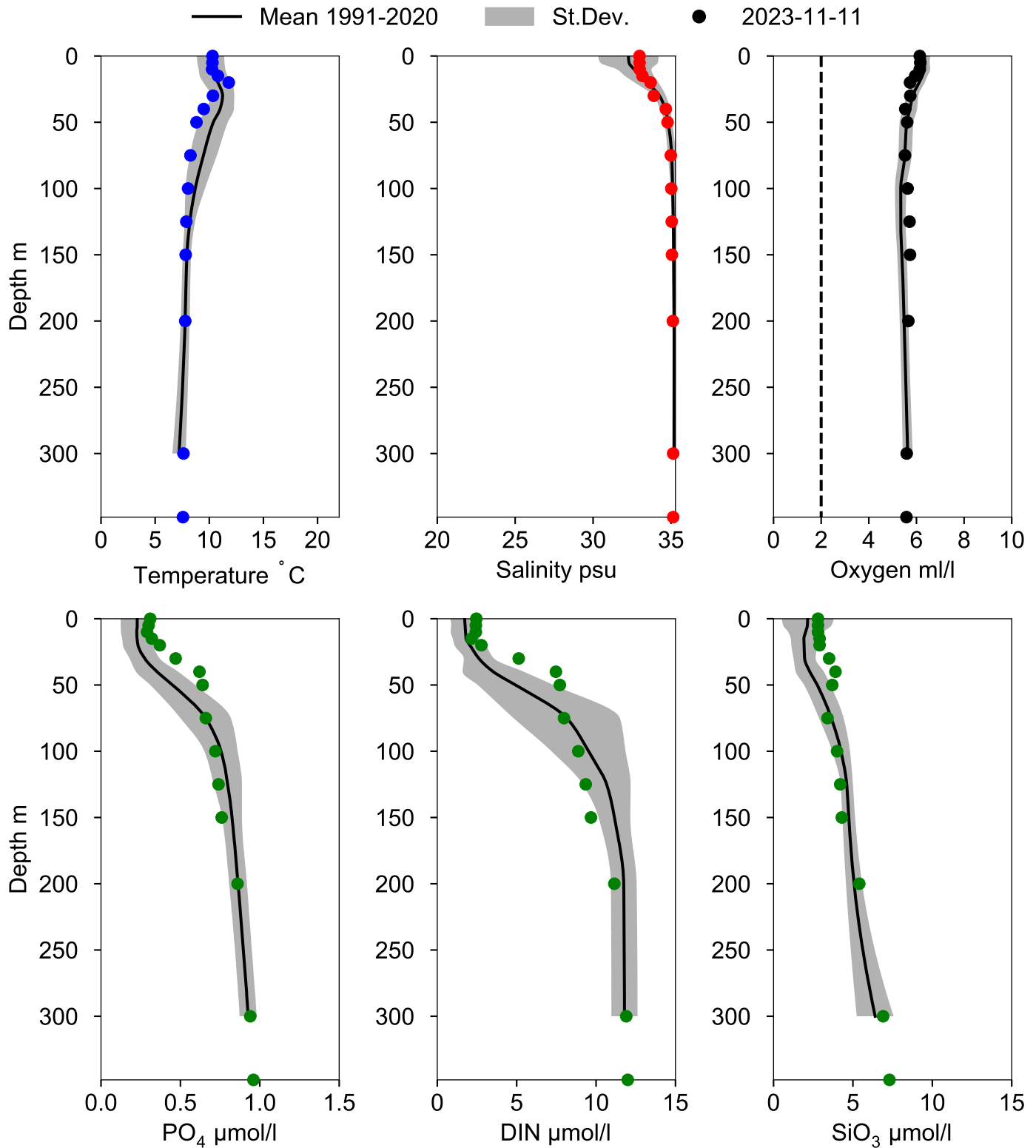
● 2023



OXYGEN IN BOTTOM WATER (depth >= 300 m)



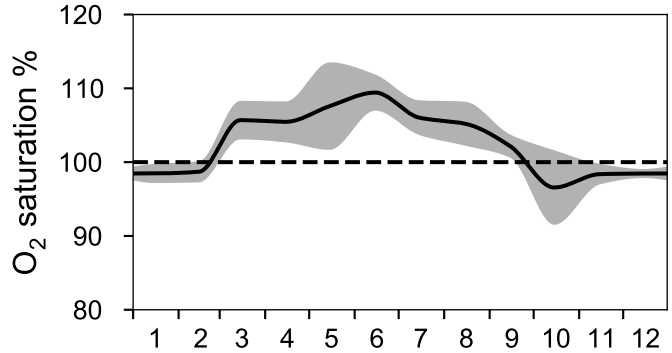
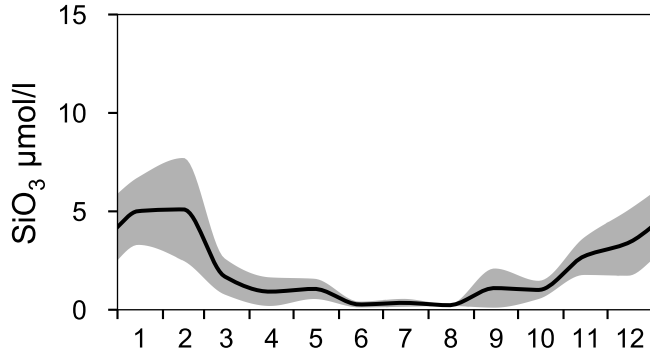
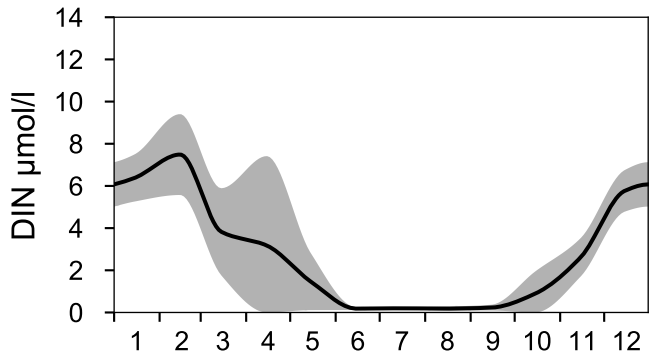
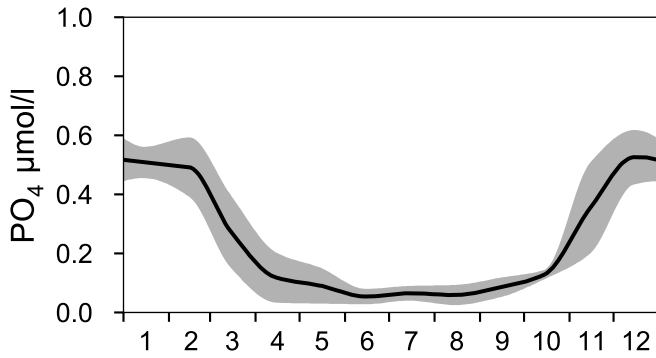
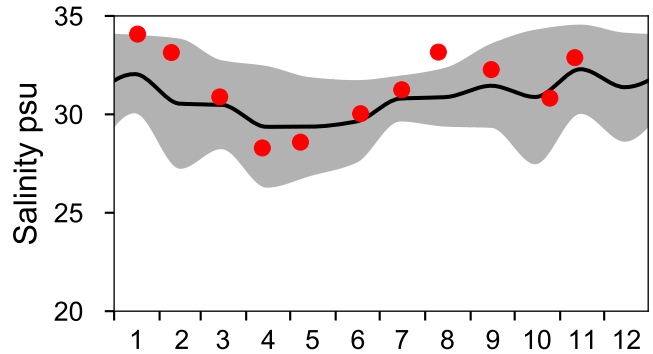
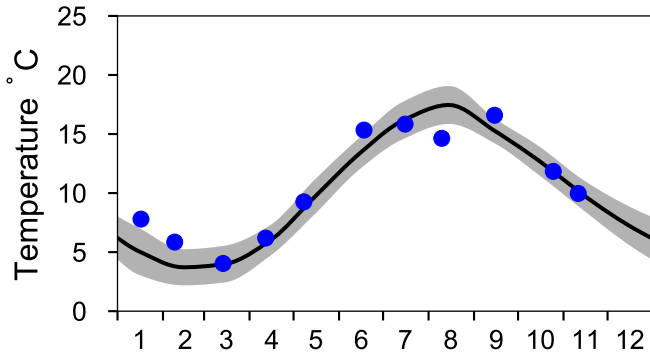
Vertical profiles A17 November



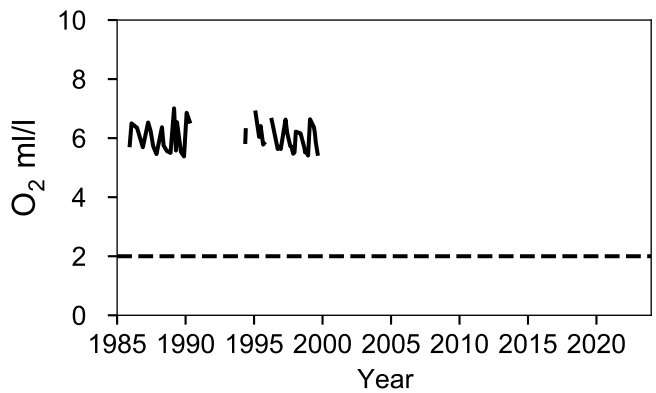
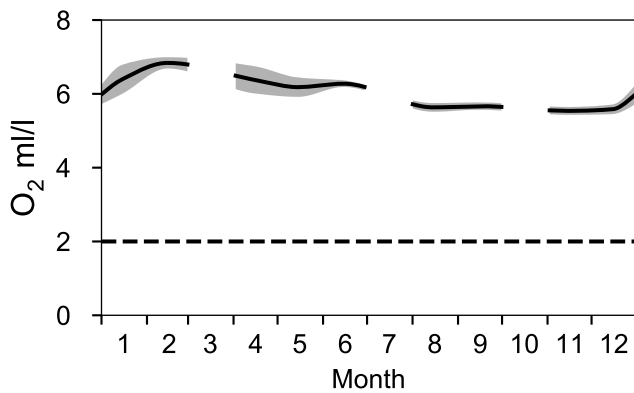
STATION Å16 SURFACE WATER (0-10 m)

Annual Cycles

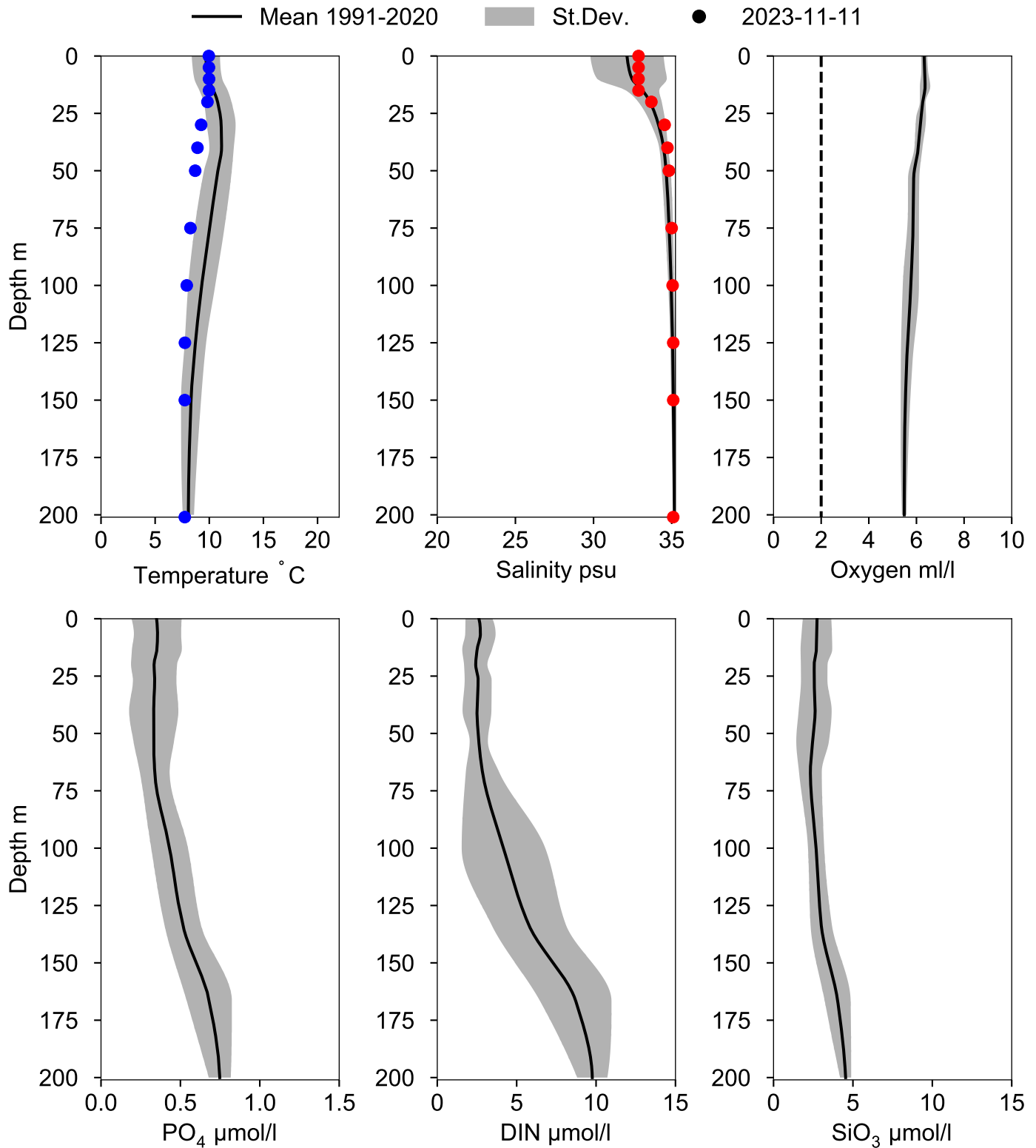
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 193 m)



Vertical profiles A16 November



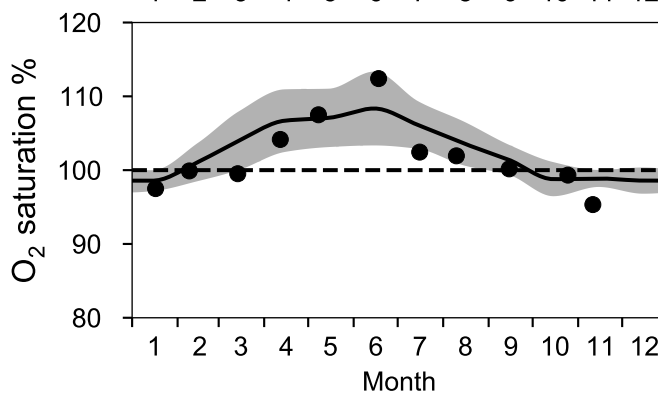
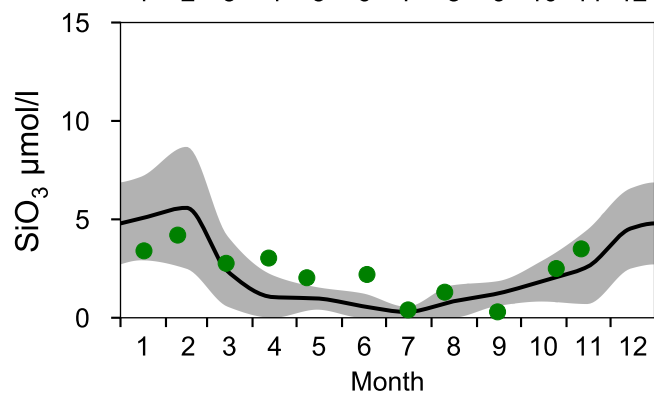
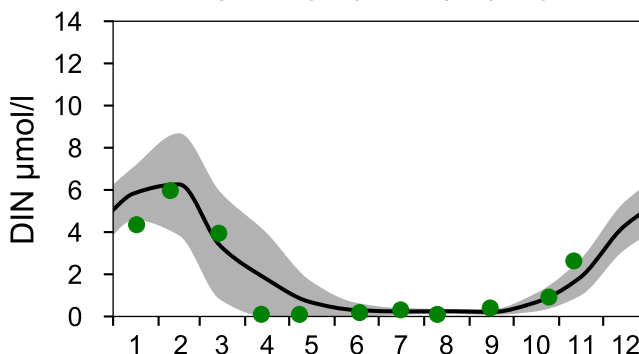
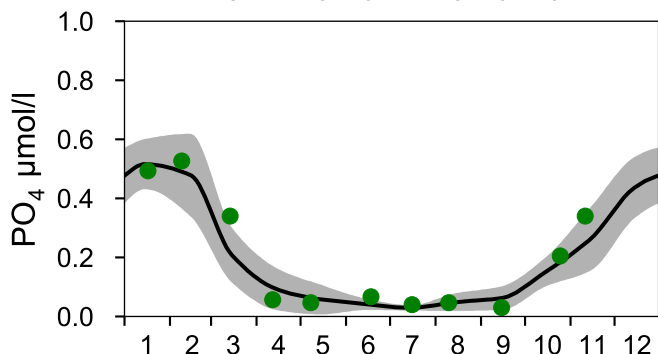
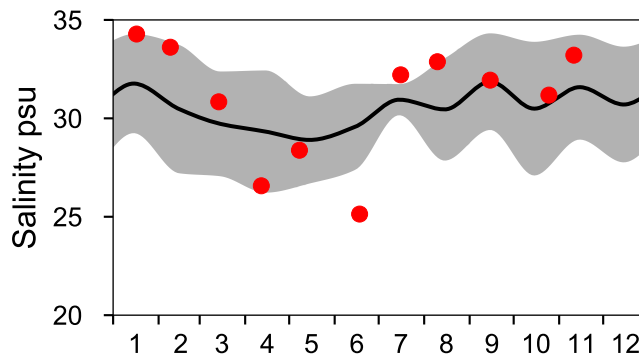
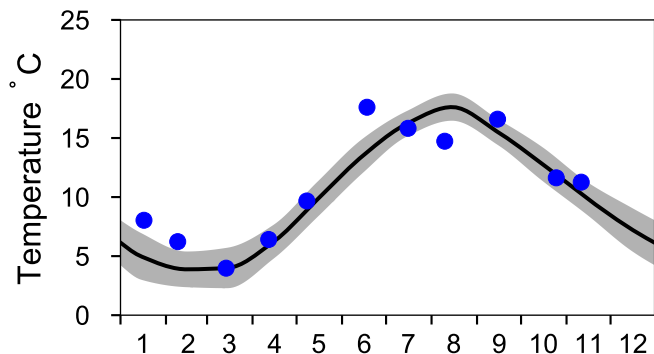
STATION Å15 SURFACE WATER (0-10 m)

Annual Cycles

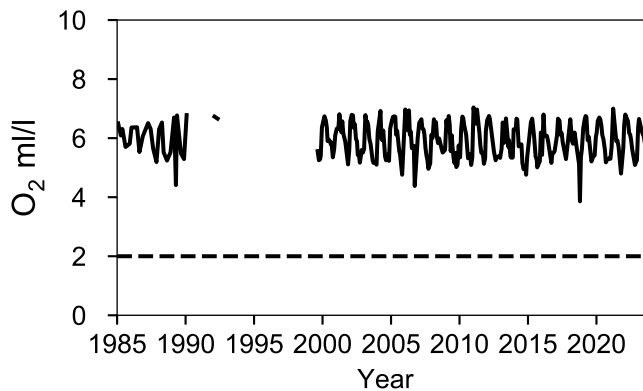
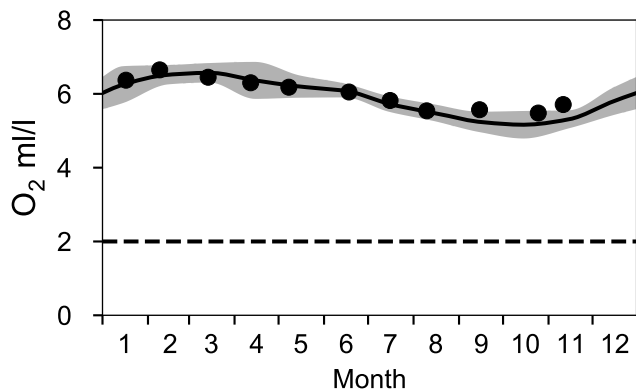
— Mean 1991-2020

■ St.Dev.

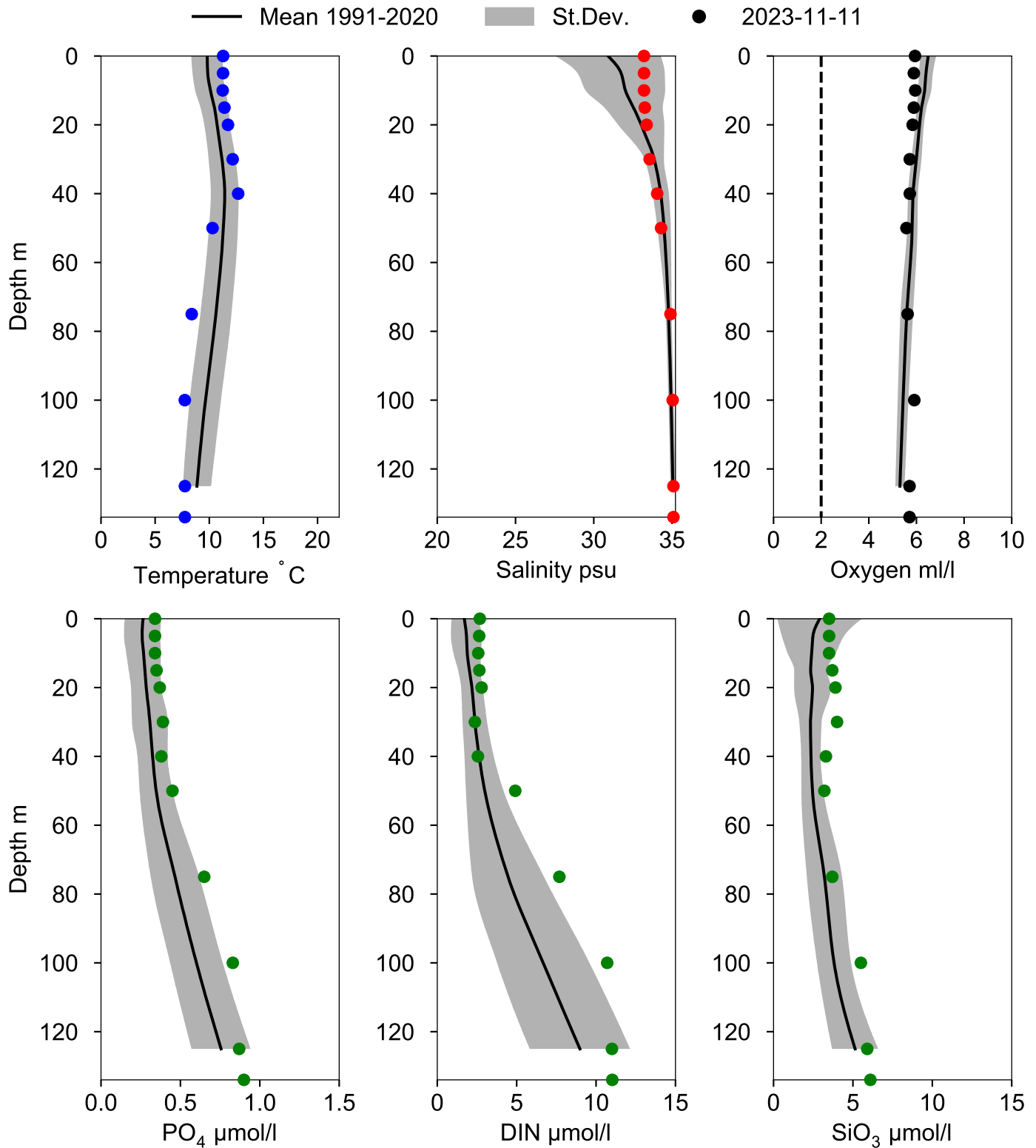
● 2023



OXYGEN IN BOTTOM WATER (depth >= 125 m)



Vertical profiles A15 November



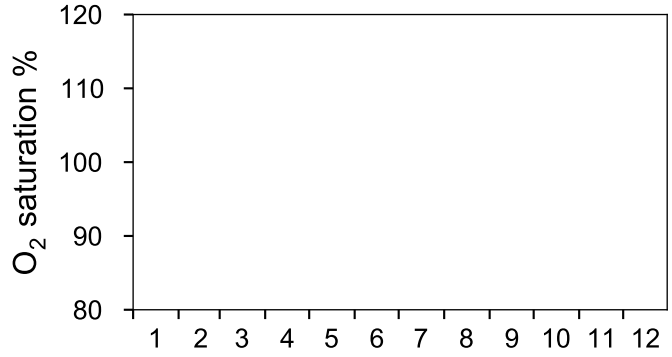
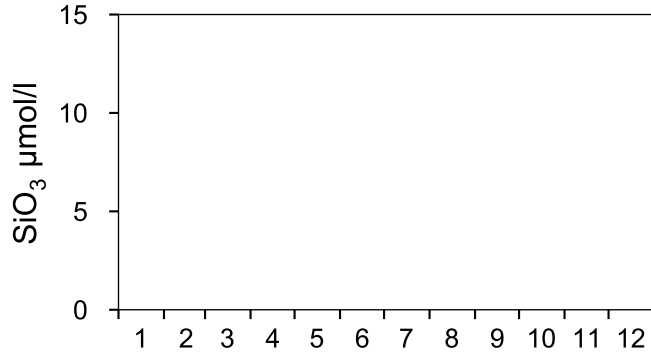
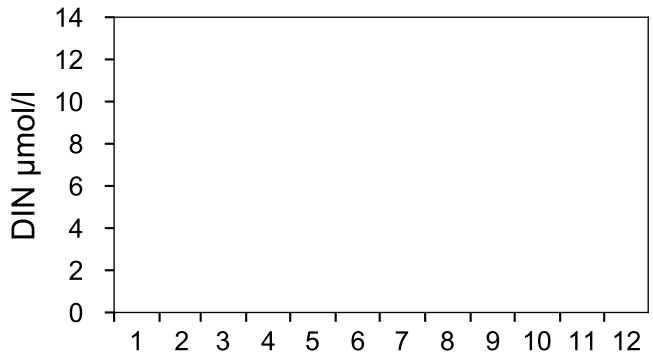
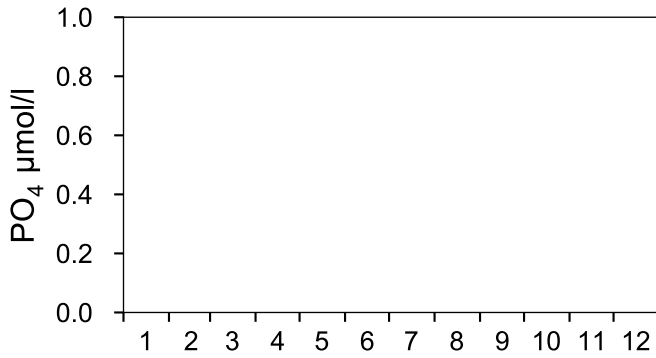
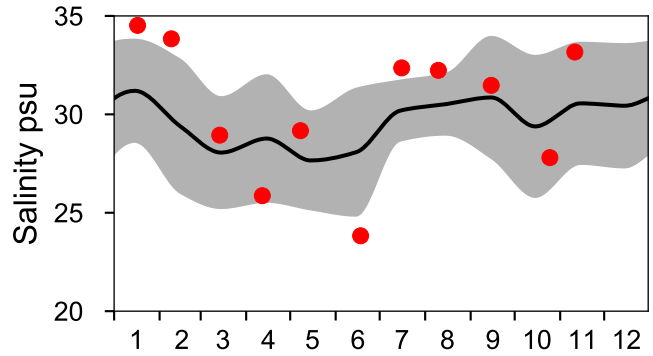
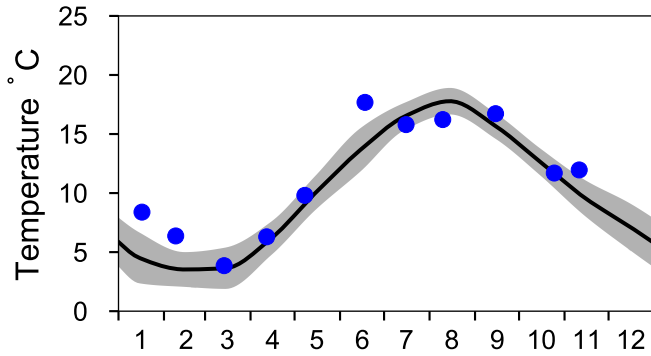
STATION Å14 SURFACE WATER (0-10 m)

Annual Cycles

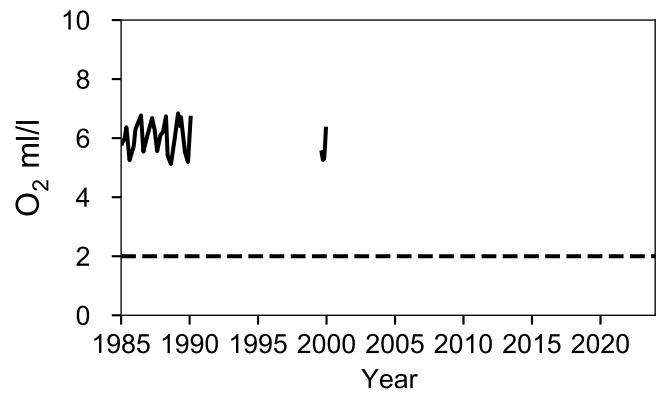
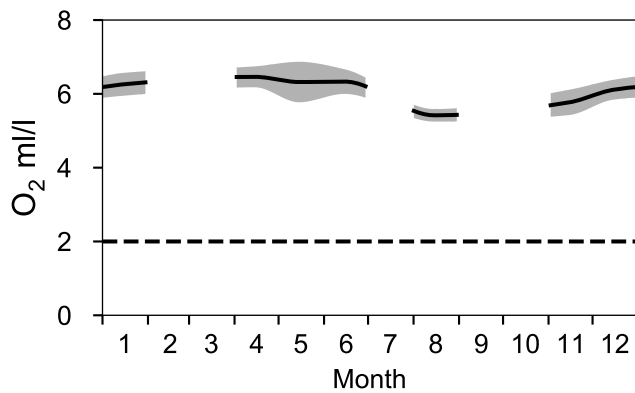
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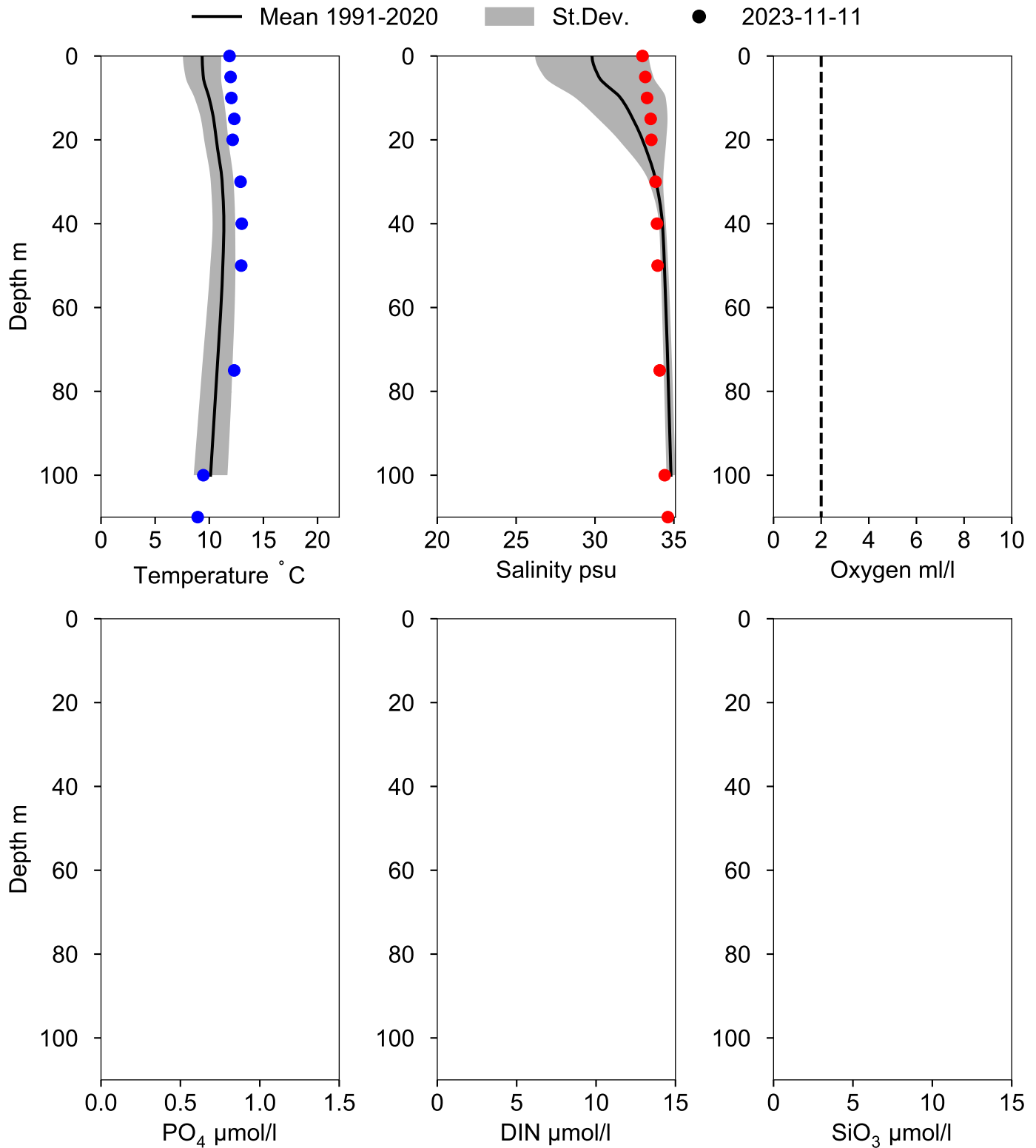
● 2023



OXYGEN IN BOTTOM WATER (depth >= 100 m)



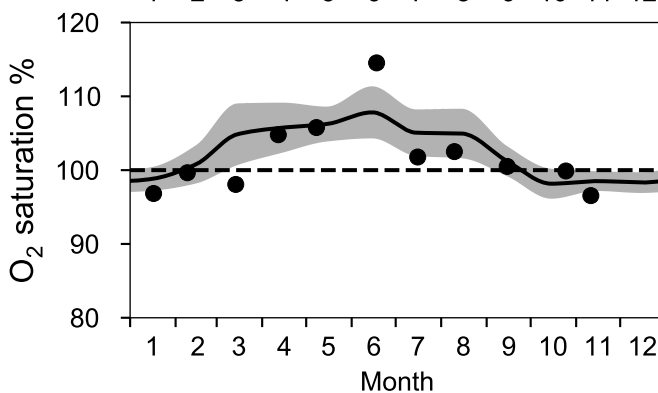
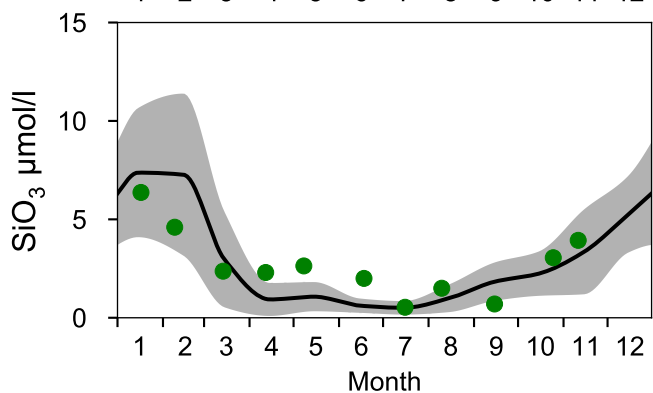
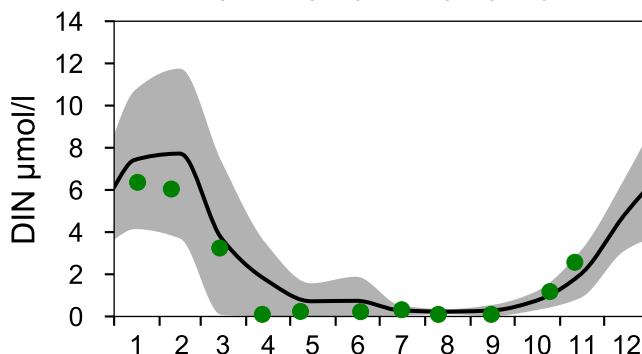
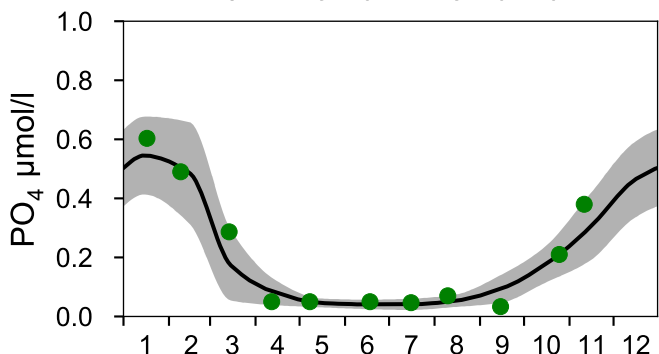
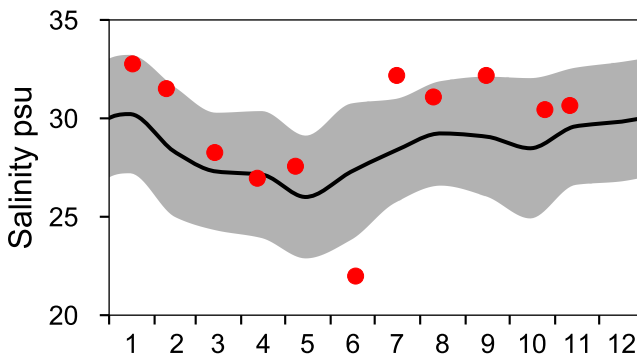
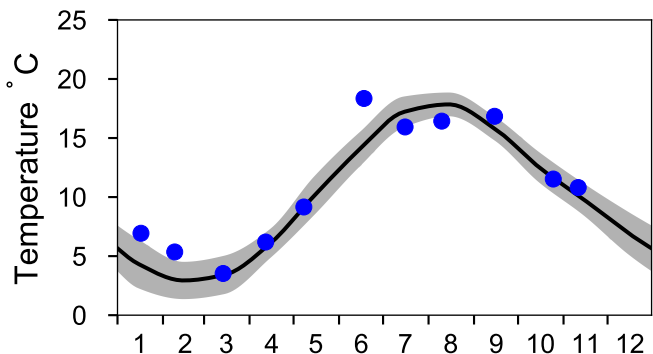
Vertical profiles Å14 November



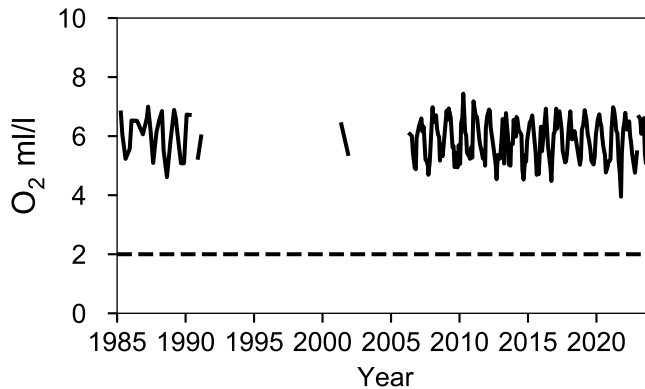
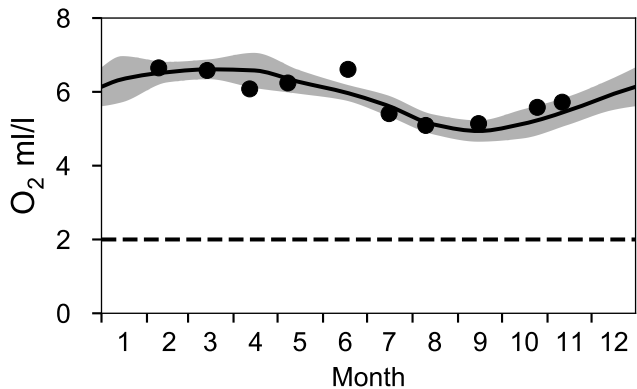
STATION Å13 SURFACE WATER (0-10 m)

Annual Cycles

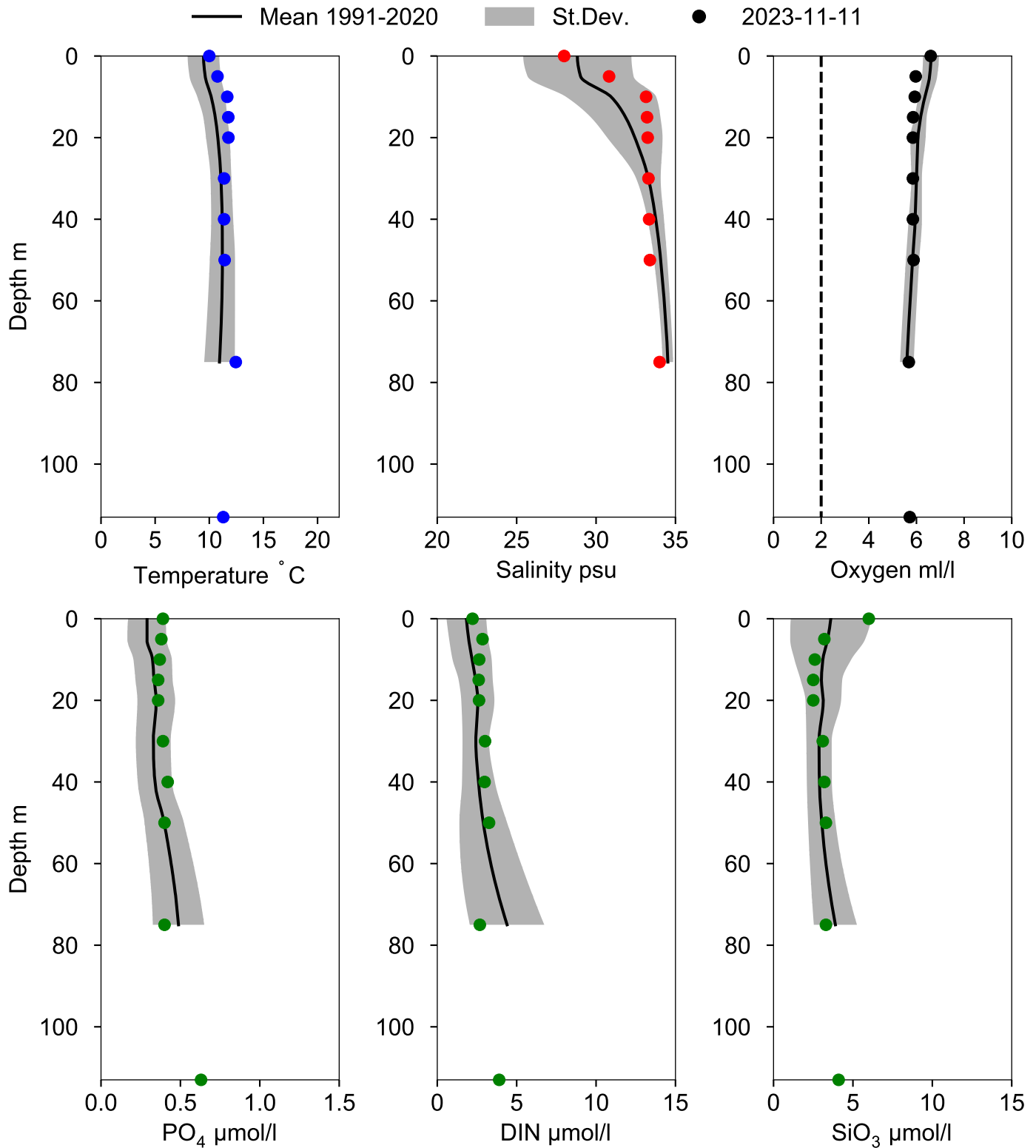
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 82 m)



Vertical profiles Å13 November



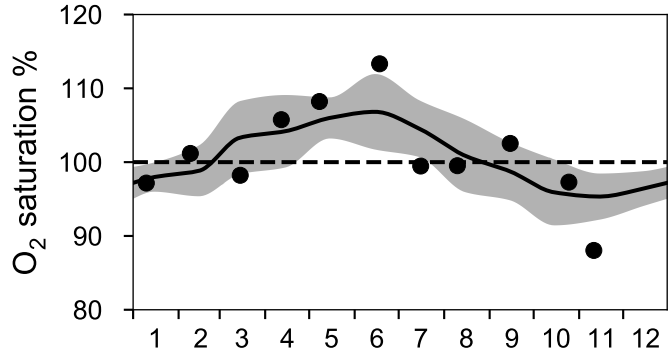
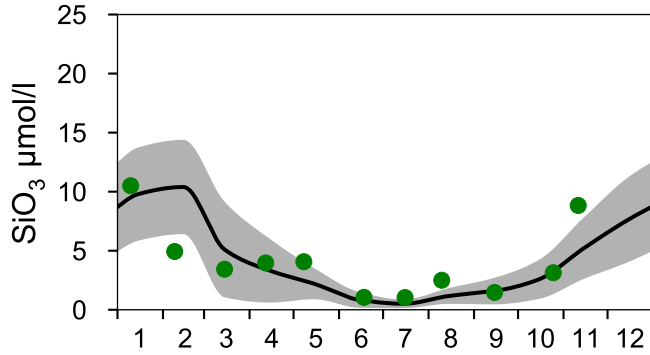
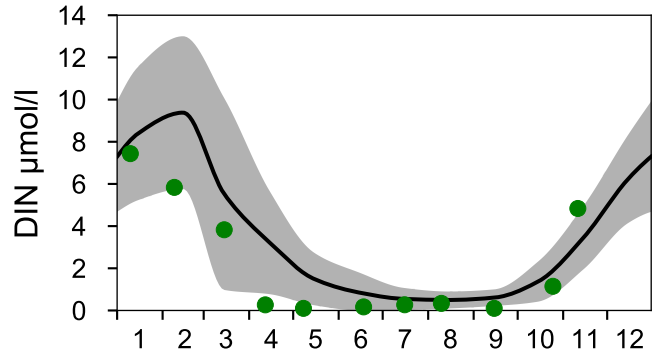
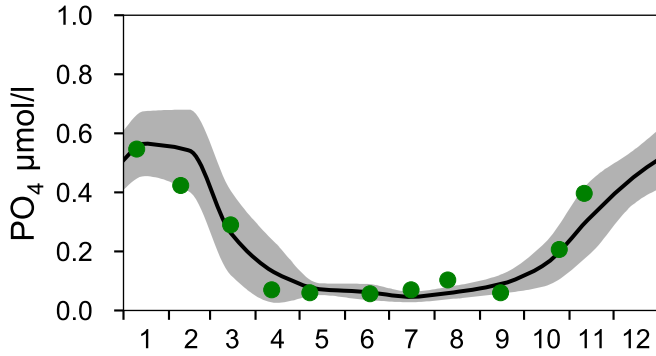
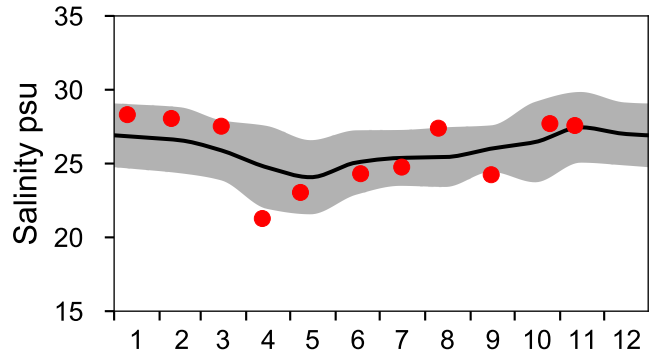
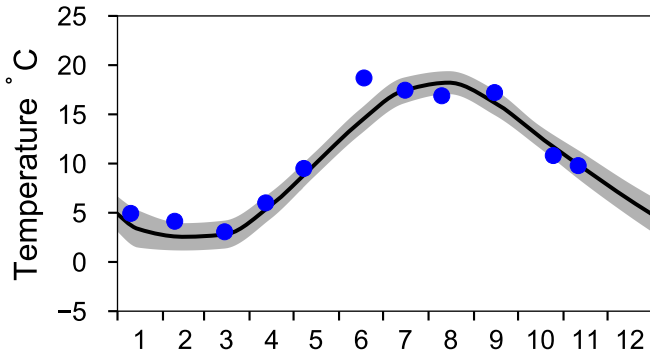
STATION SLÄGGÖ SURFACE WATER (0-10 m)

Annual Cycles

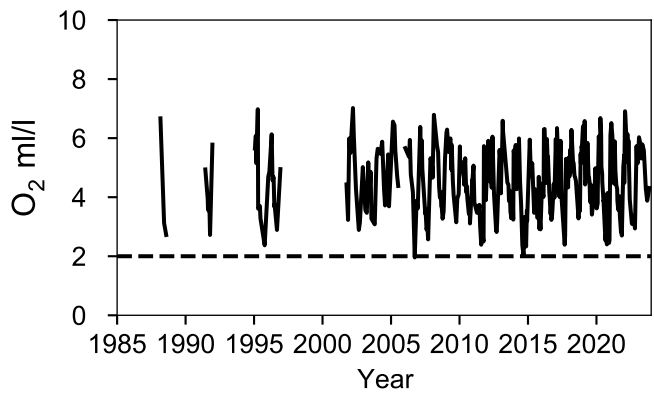
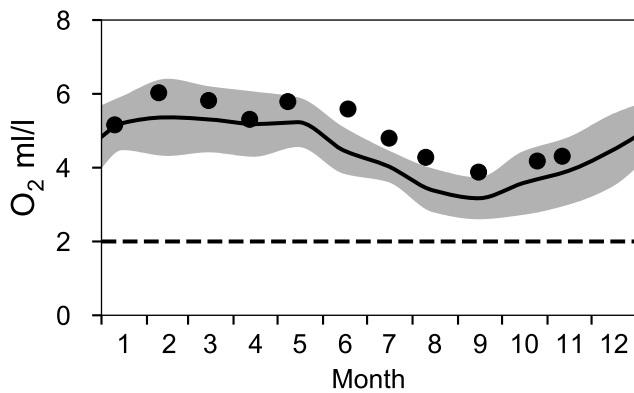
— Mean 1991-2020

■ St.Dev.

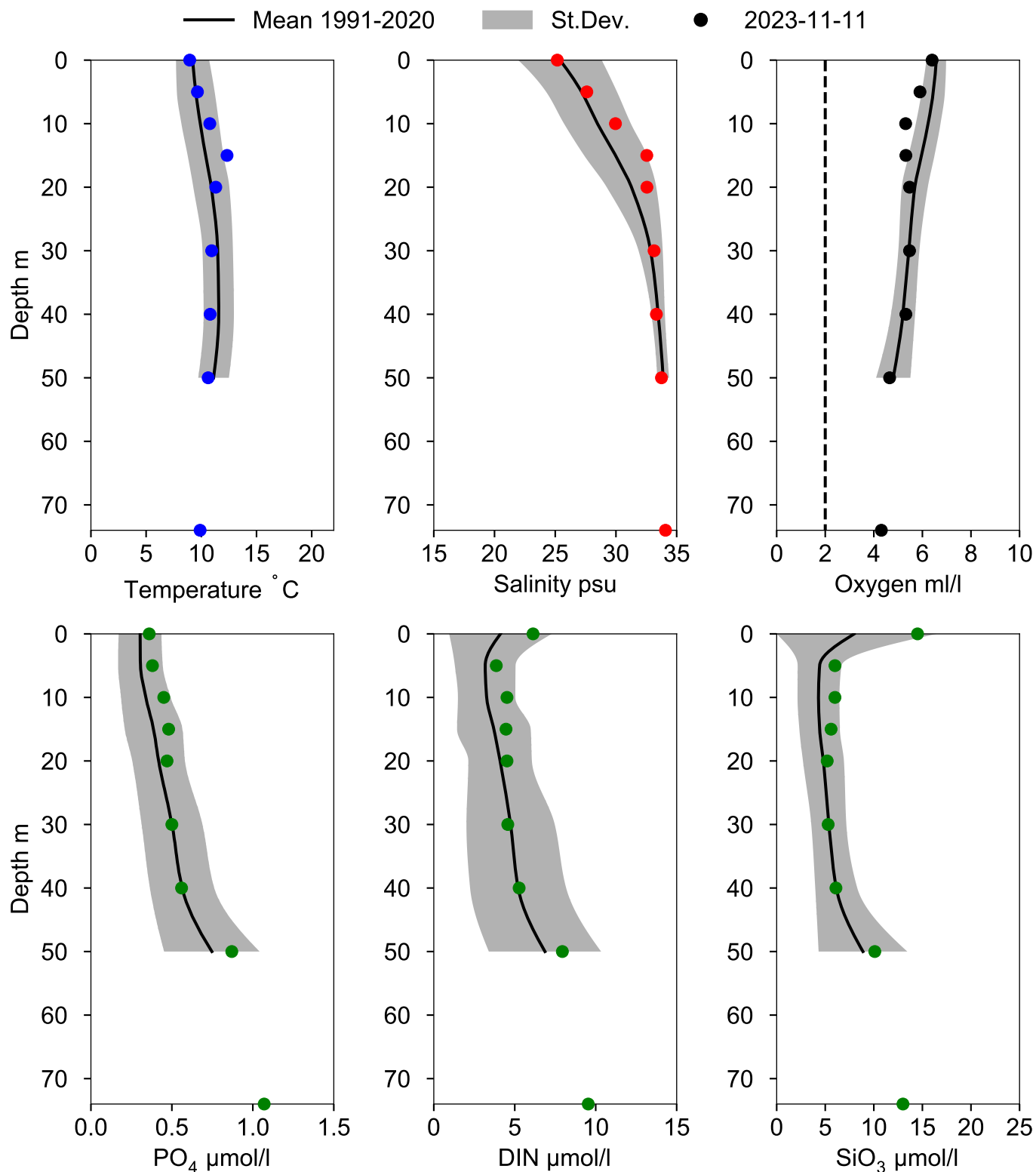
● 2023



OXYGEN IN BOTTOM WATER (depth >= 64 m)



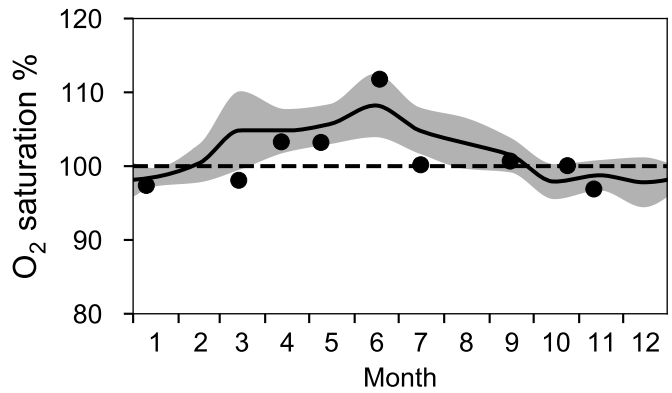
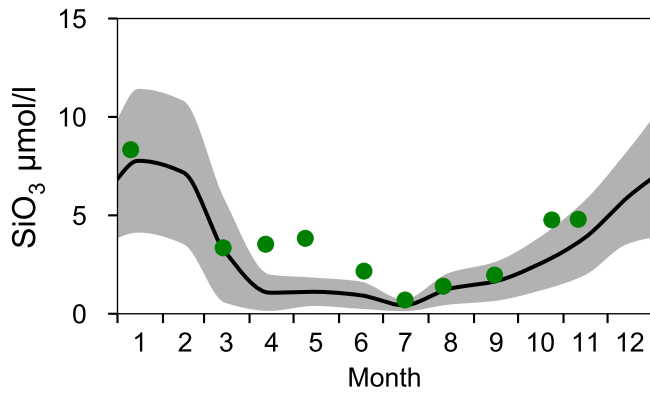
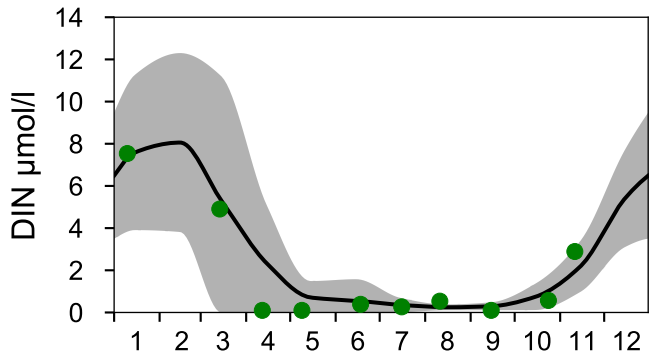
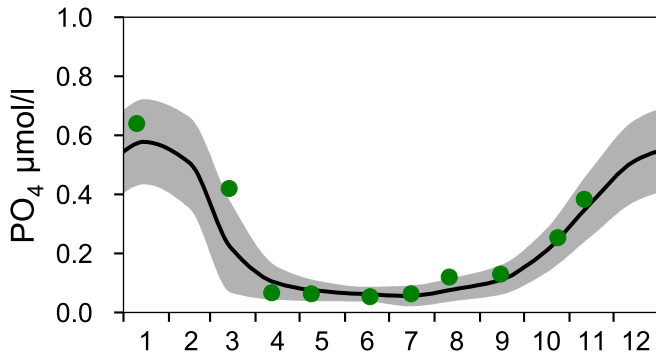
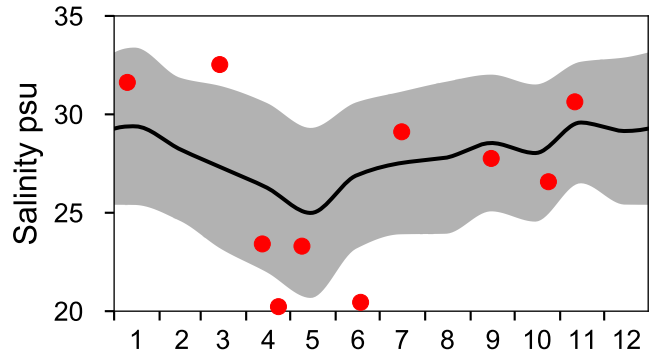
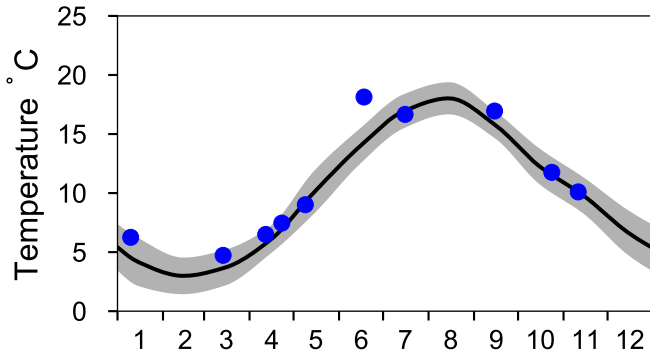
Vertical profiles SLÄGGÖ November



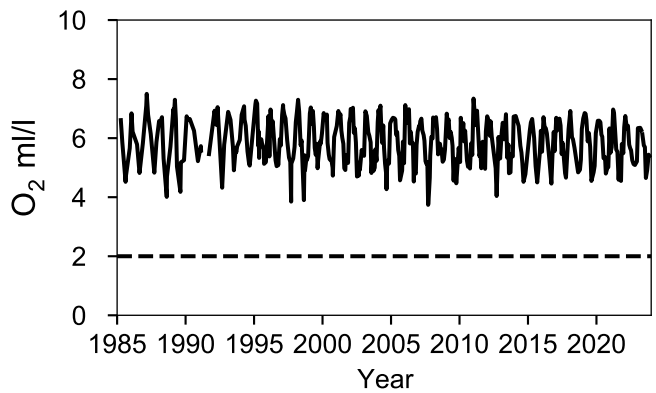
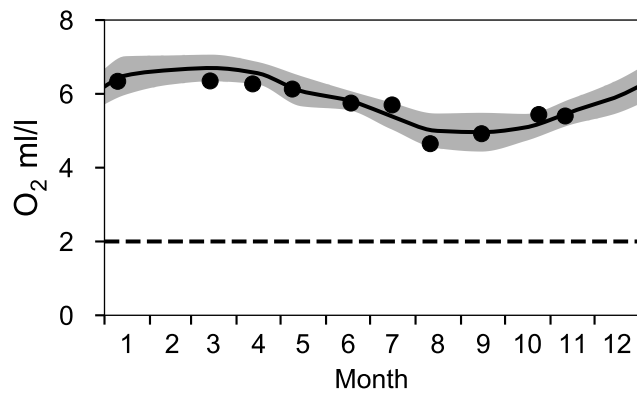
STATION P2 SURFACE WATER (0-10 m)

Annual Cycles

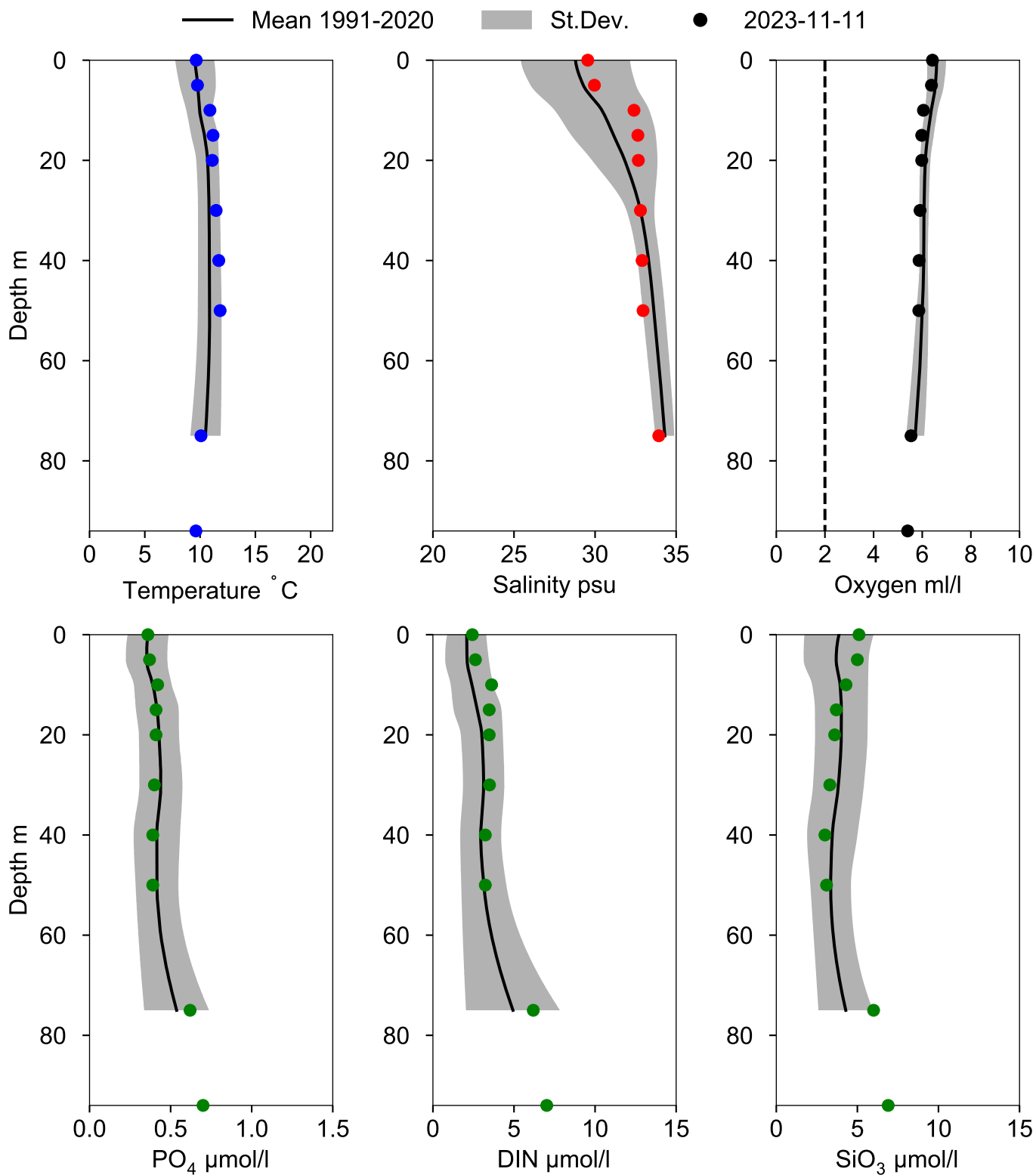
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 75 m)



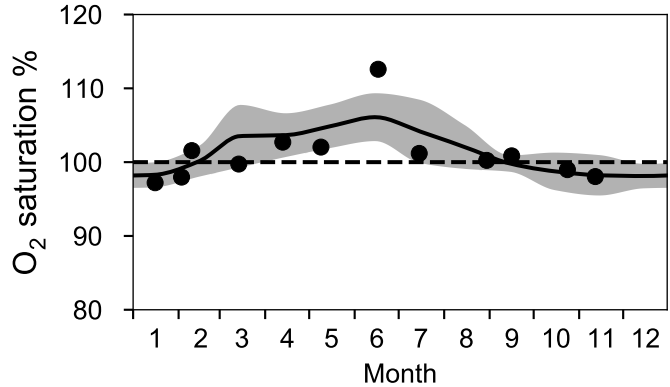
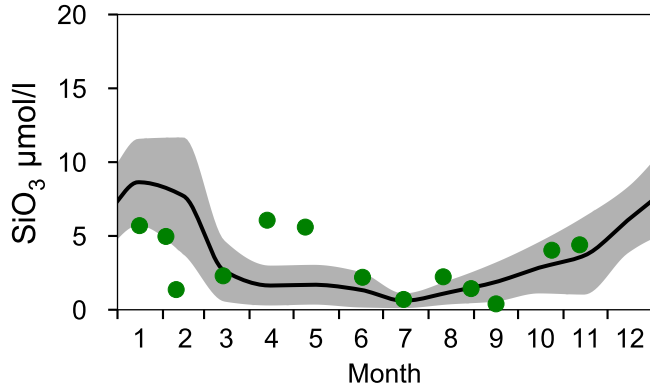
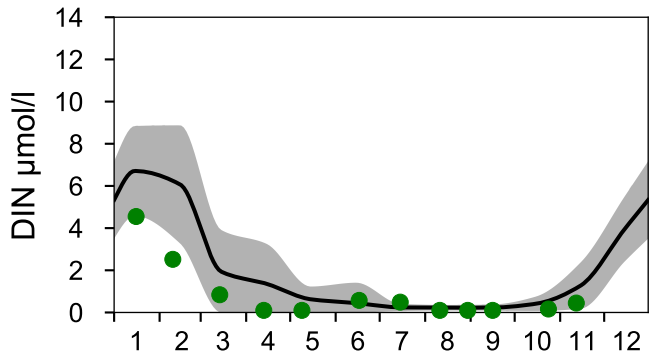
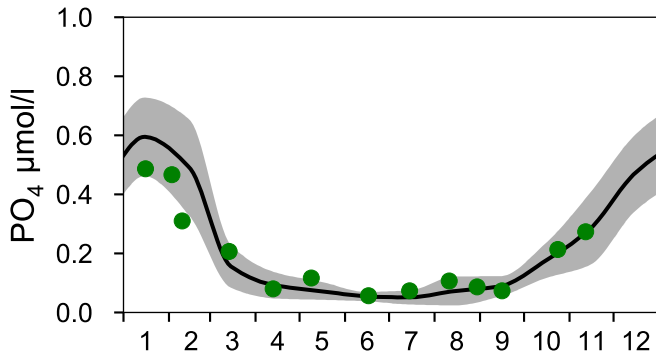
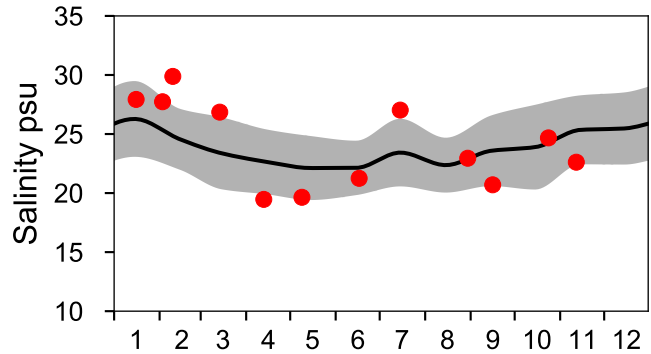
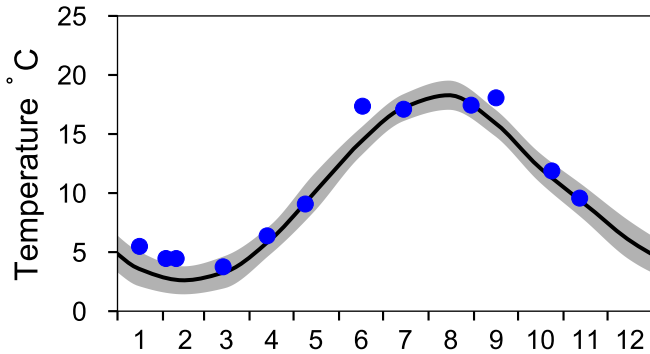
Vertical profiles P2 November



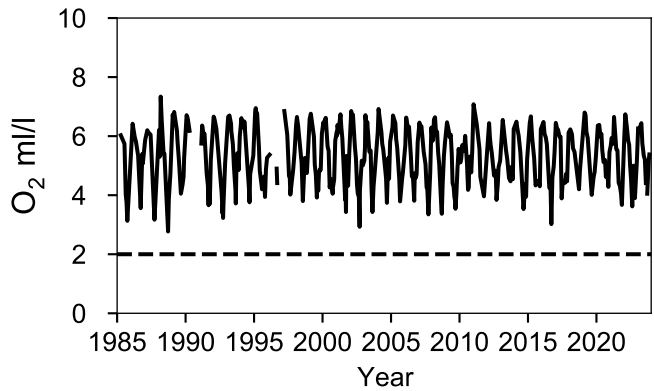
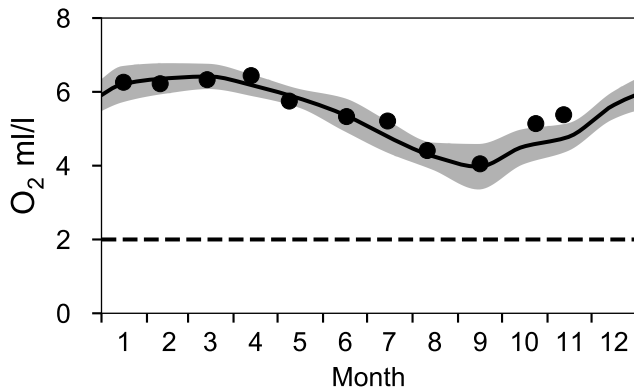
STATION FLADEN SURFACE WATER (0-10 m)

Annual Cycles

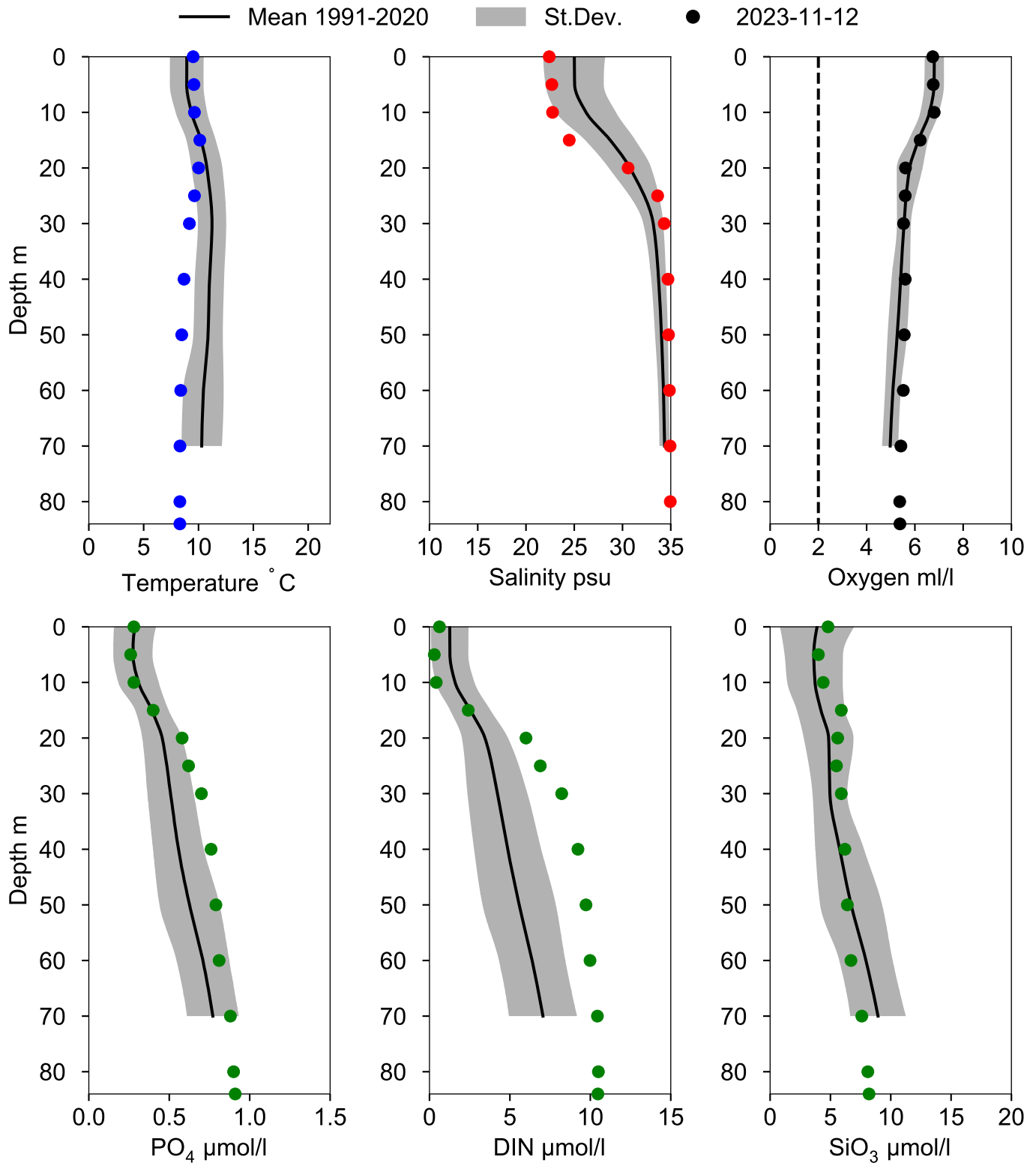
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 74 m)



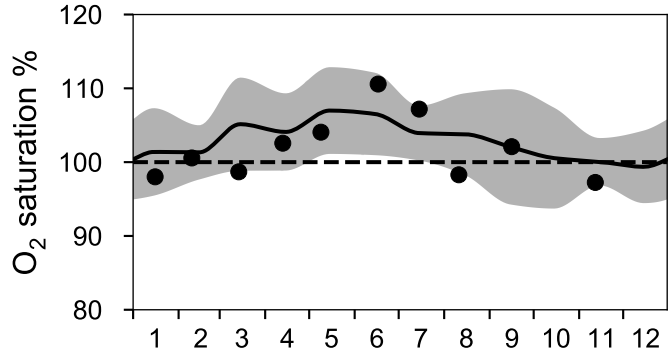
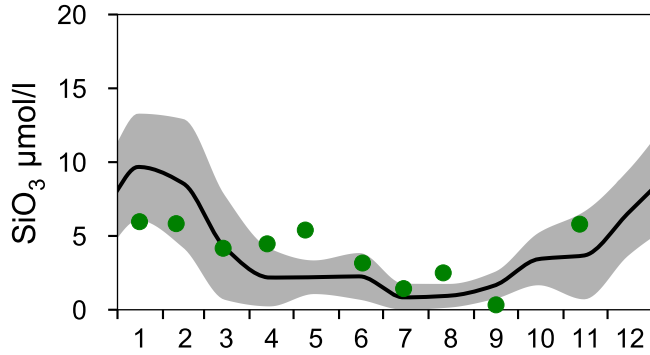
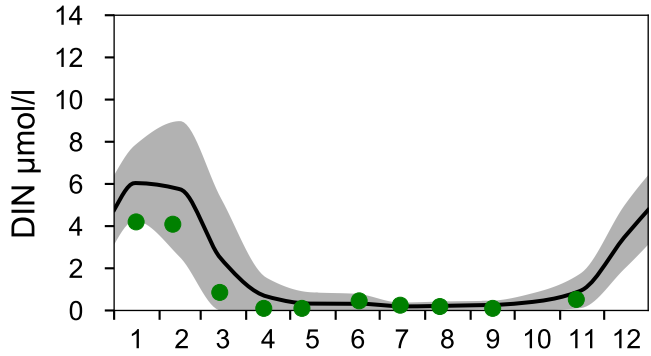
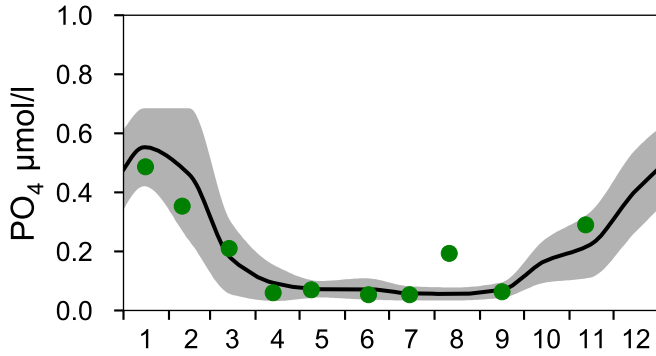
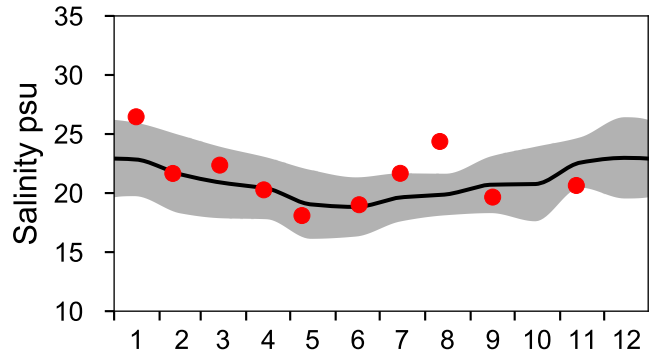
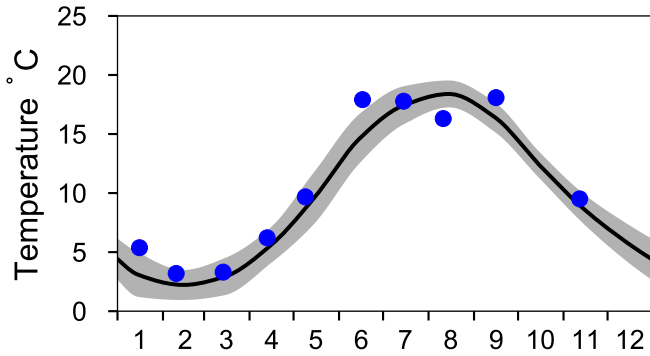
Vertical profiles FLADEN November



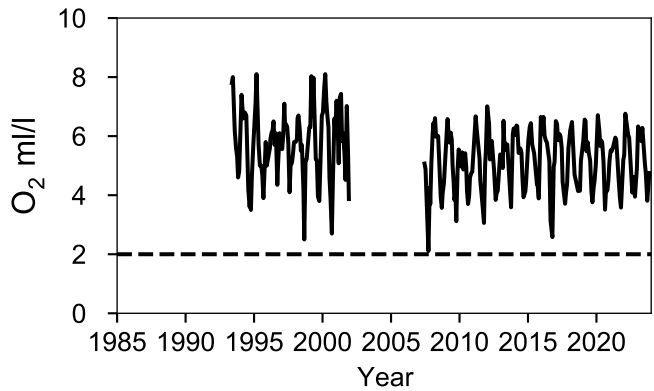
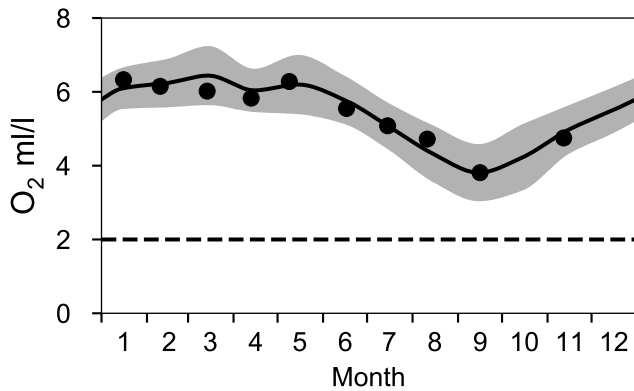
STATION N14 FALKENBERG SURFACE WATER (0-10 m)

Annual Cycles

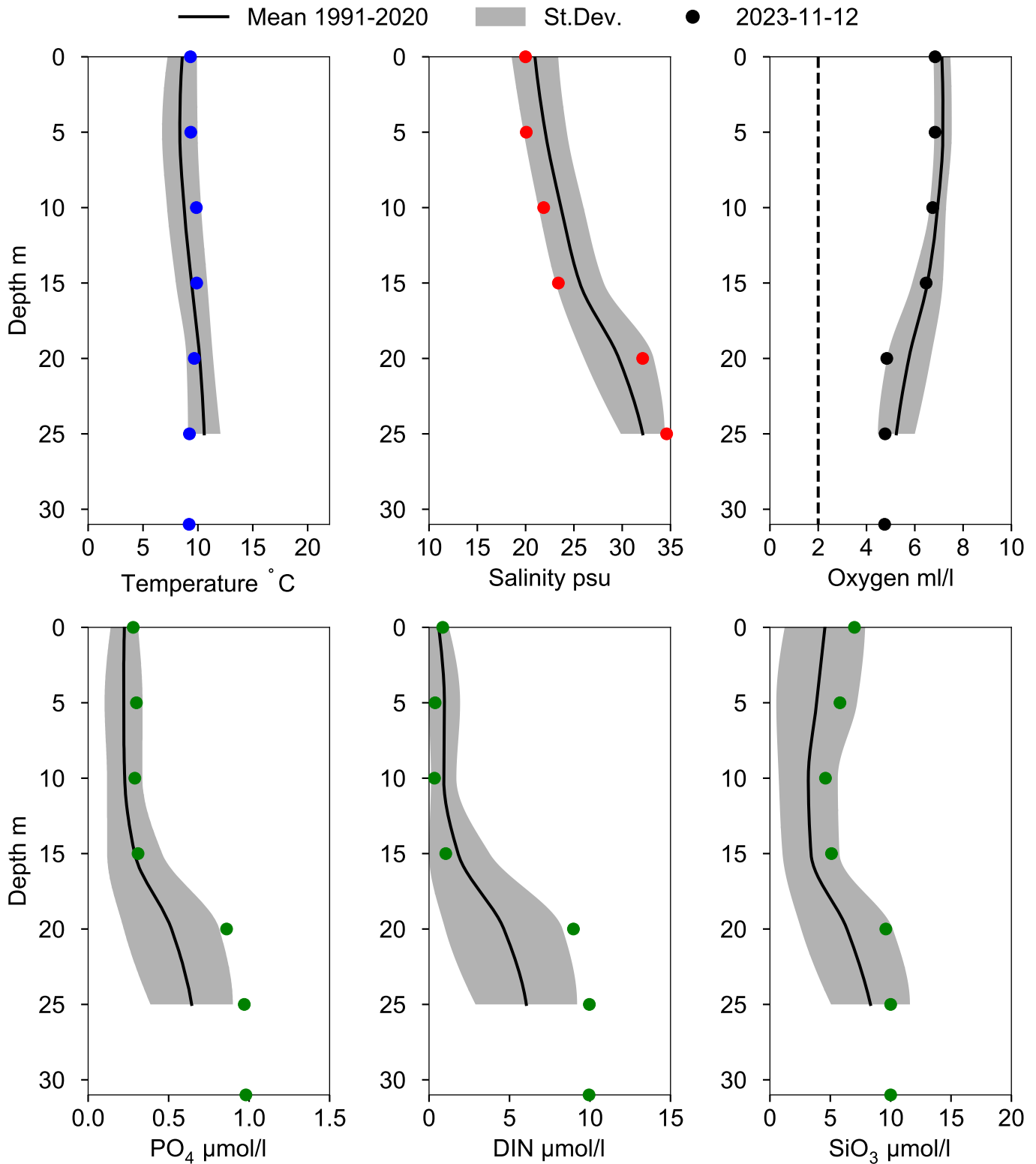
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 25 m)



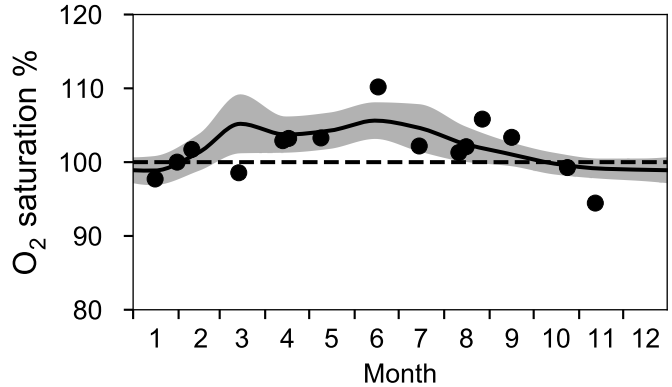
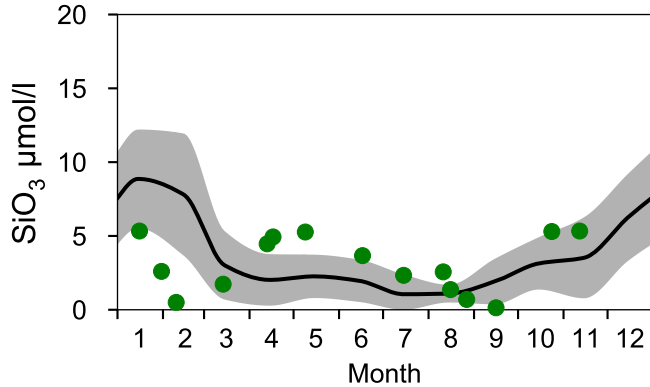
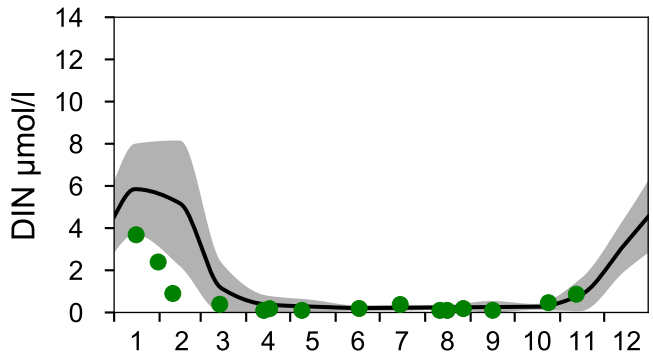
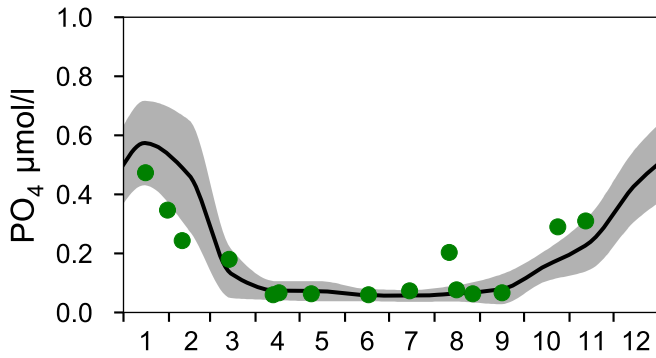
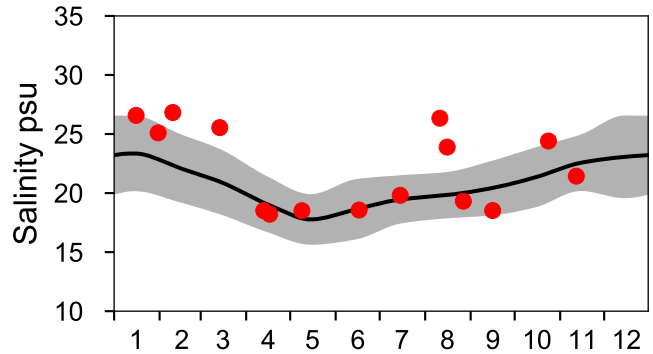
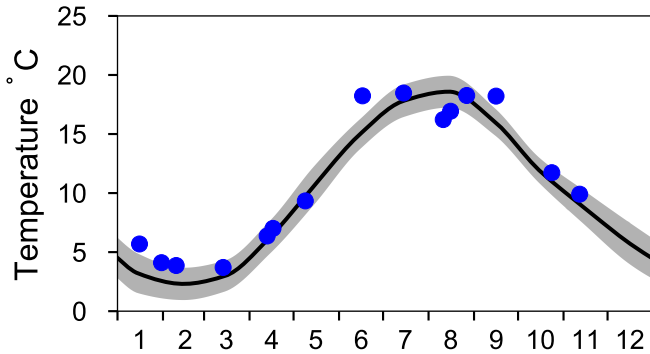
Vertical profiles N14 FALKENBERG November



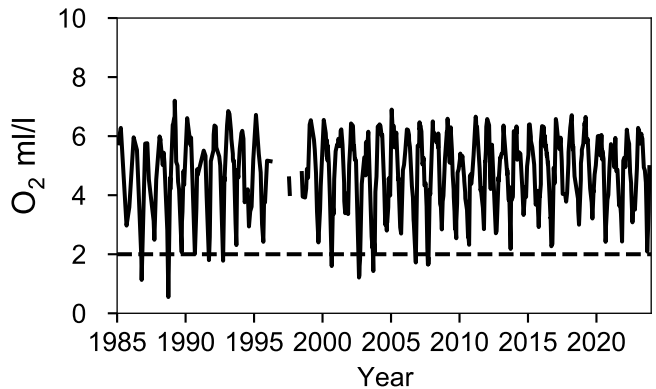
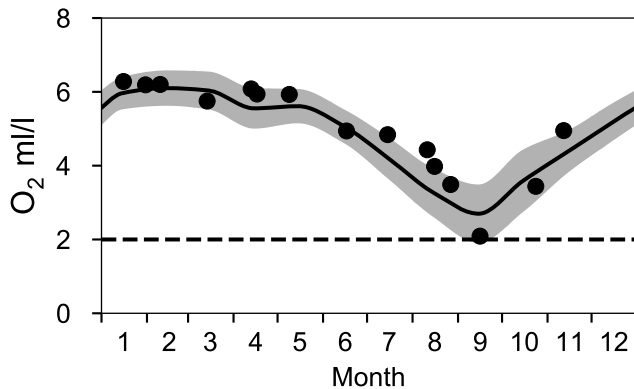
STATION ANHOLT E SURFACE WATER (0-10 m)

Annual Cycles

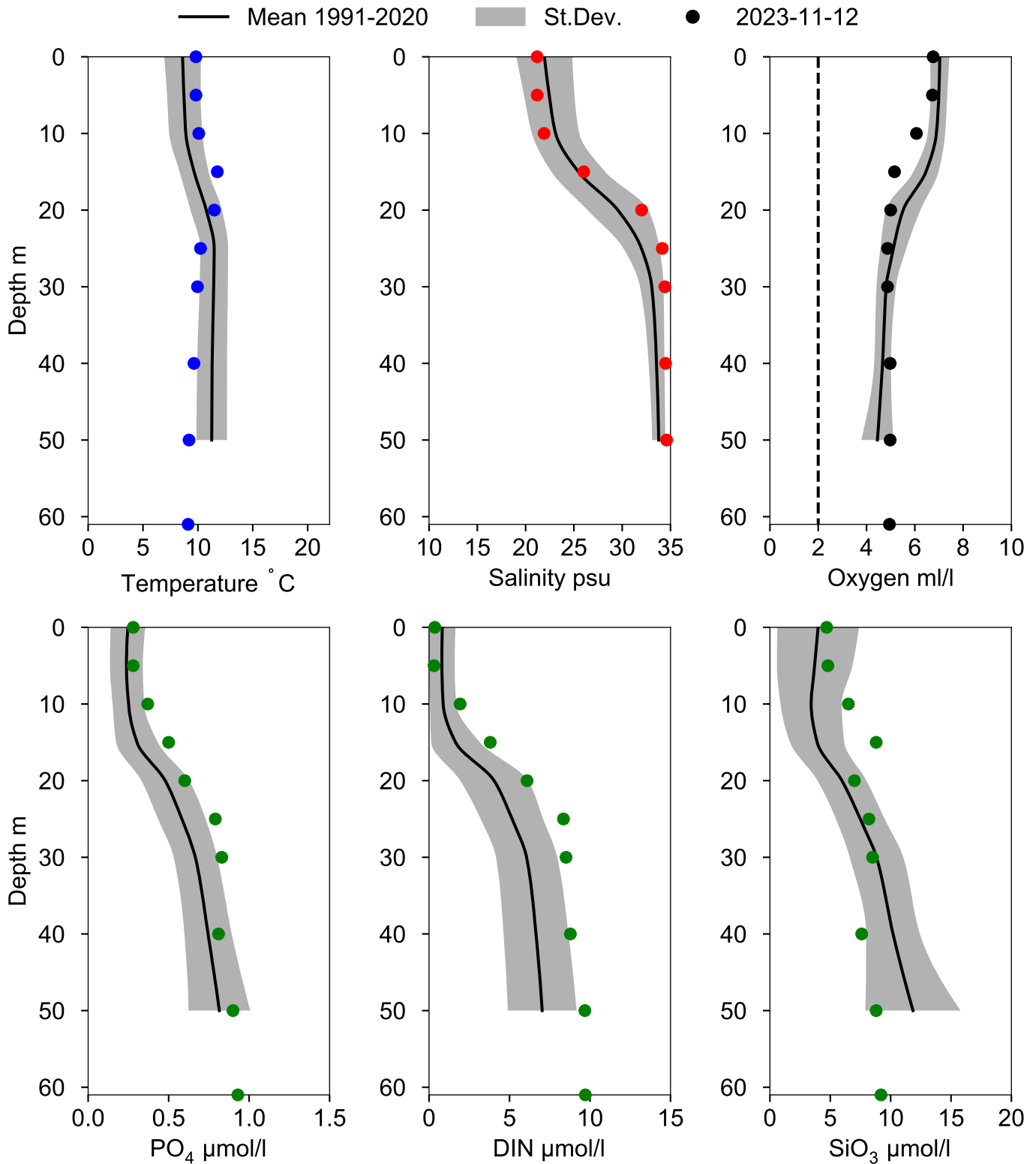
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 52 m)



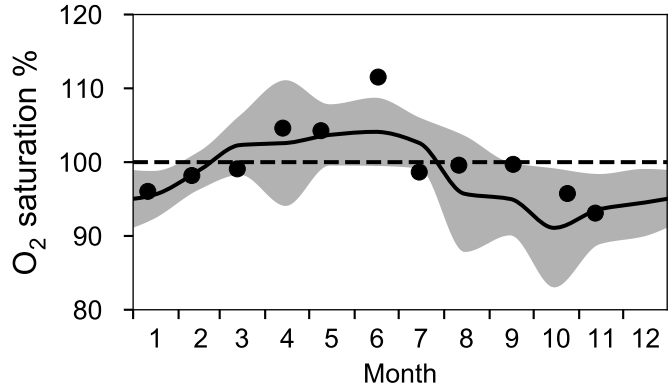
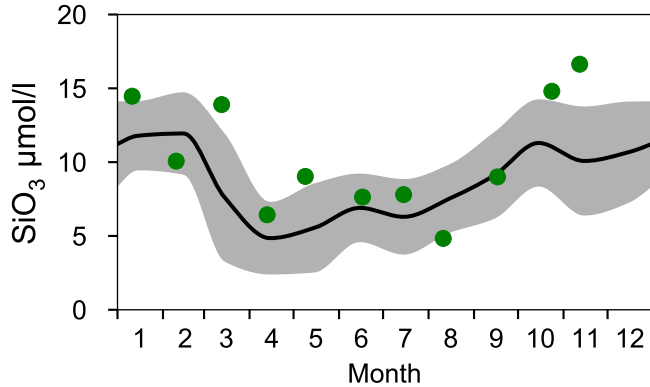
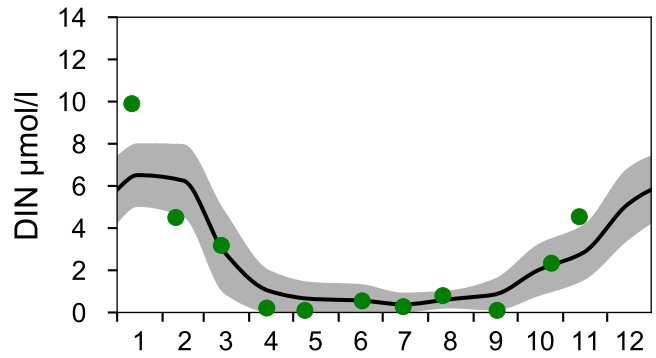
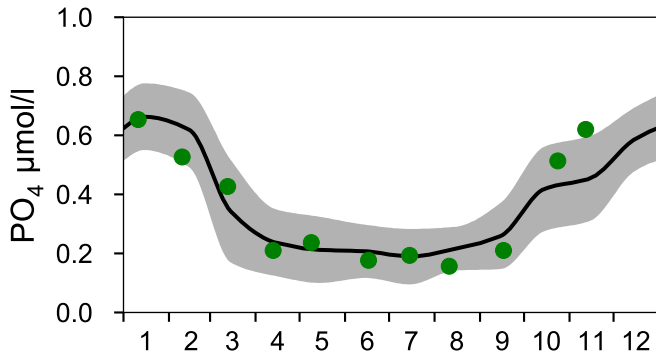
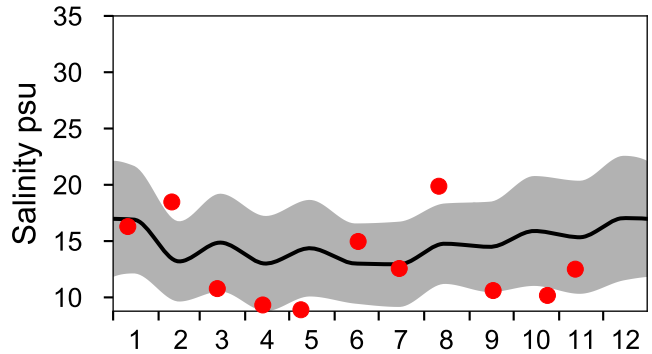
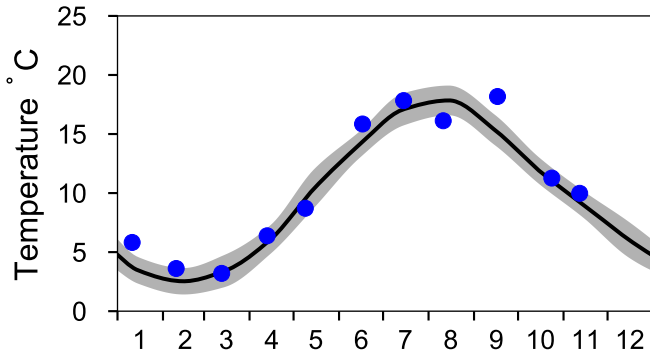
Vertical profiles ANHOLT E November



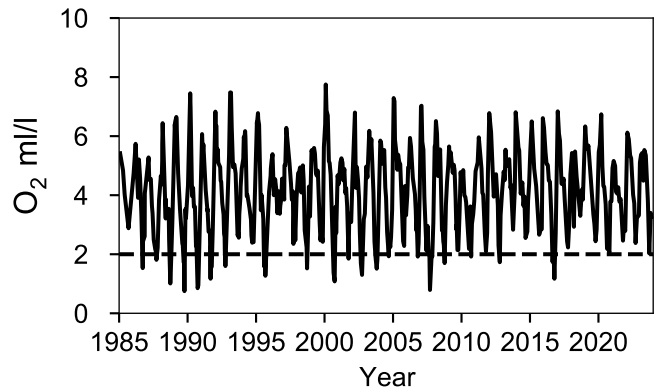
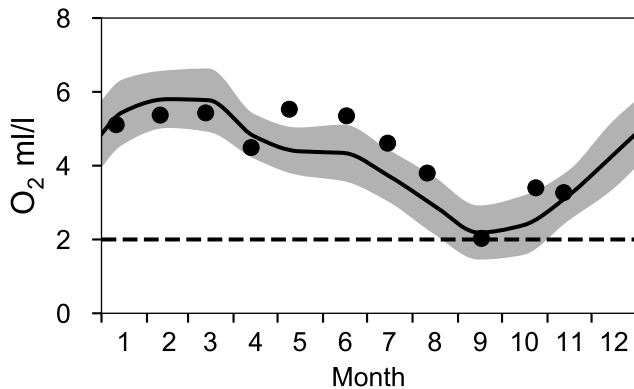
STATION W LANDSKRONA SURFACE WATER (0-10 m)

Annual Cycles

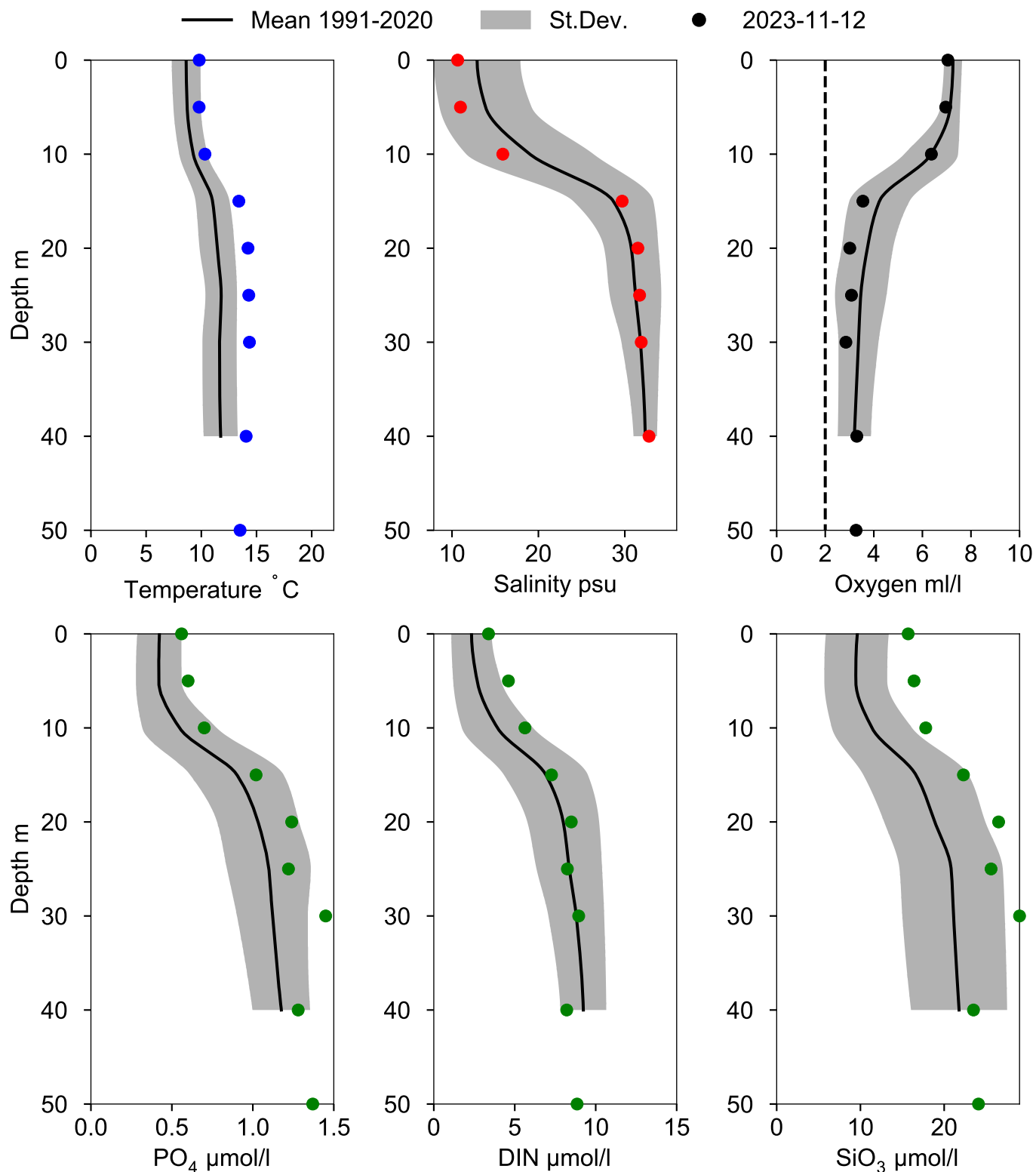
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 40 m)



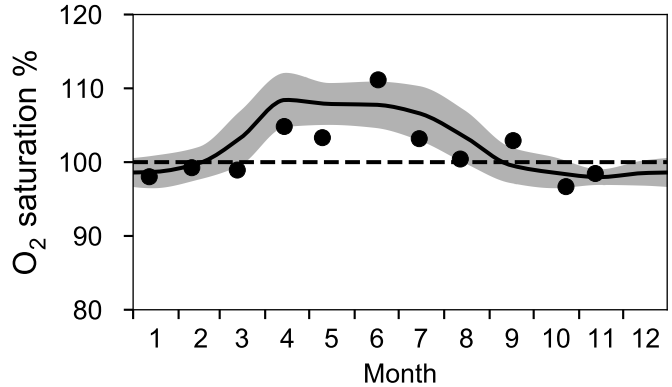
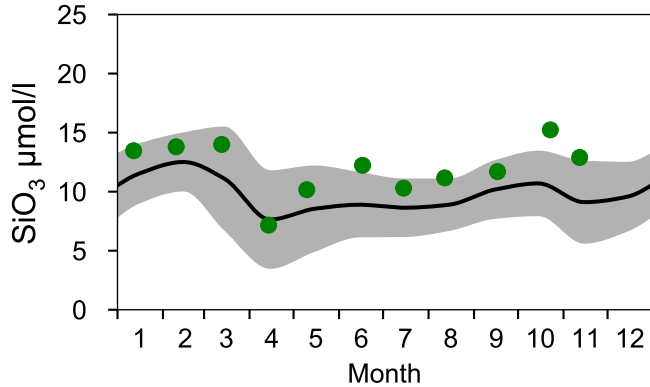
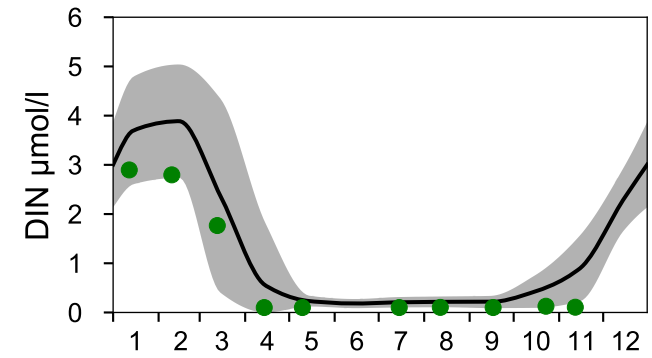
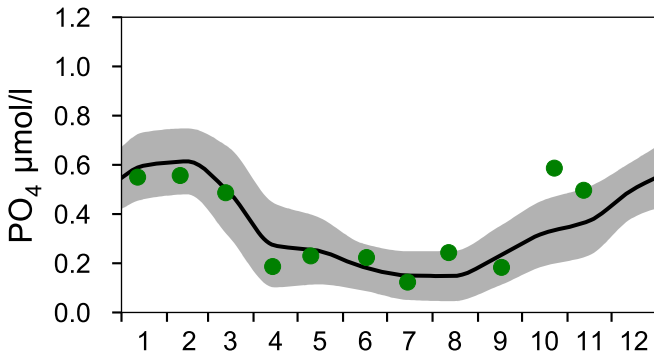
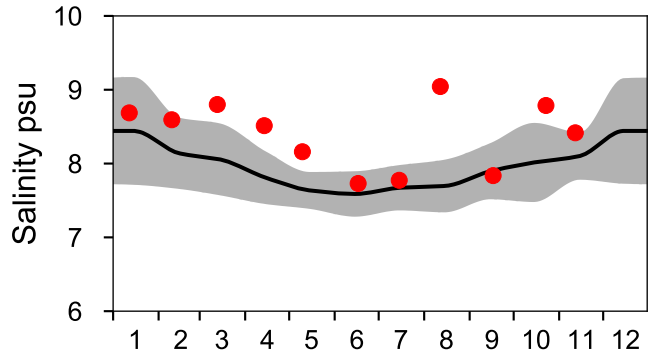
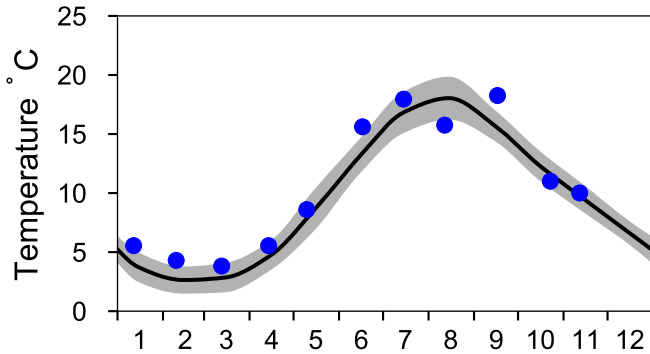
Vertical profiles W LANDSKRONA November



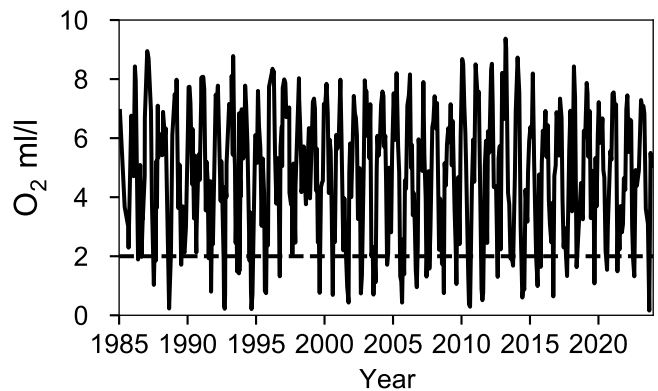
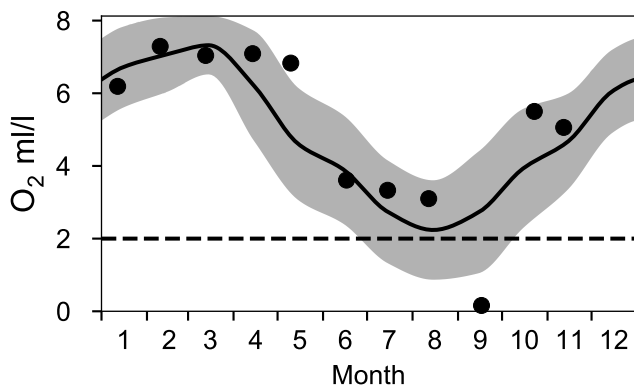
STATION BY1 SURFACE WATER (0-10 m)

Annual Cycles

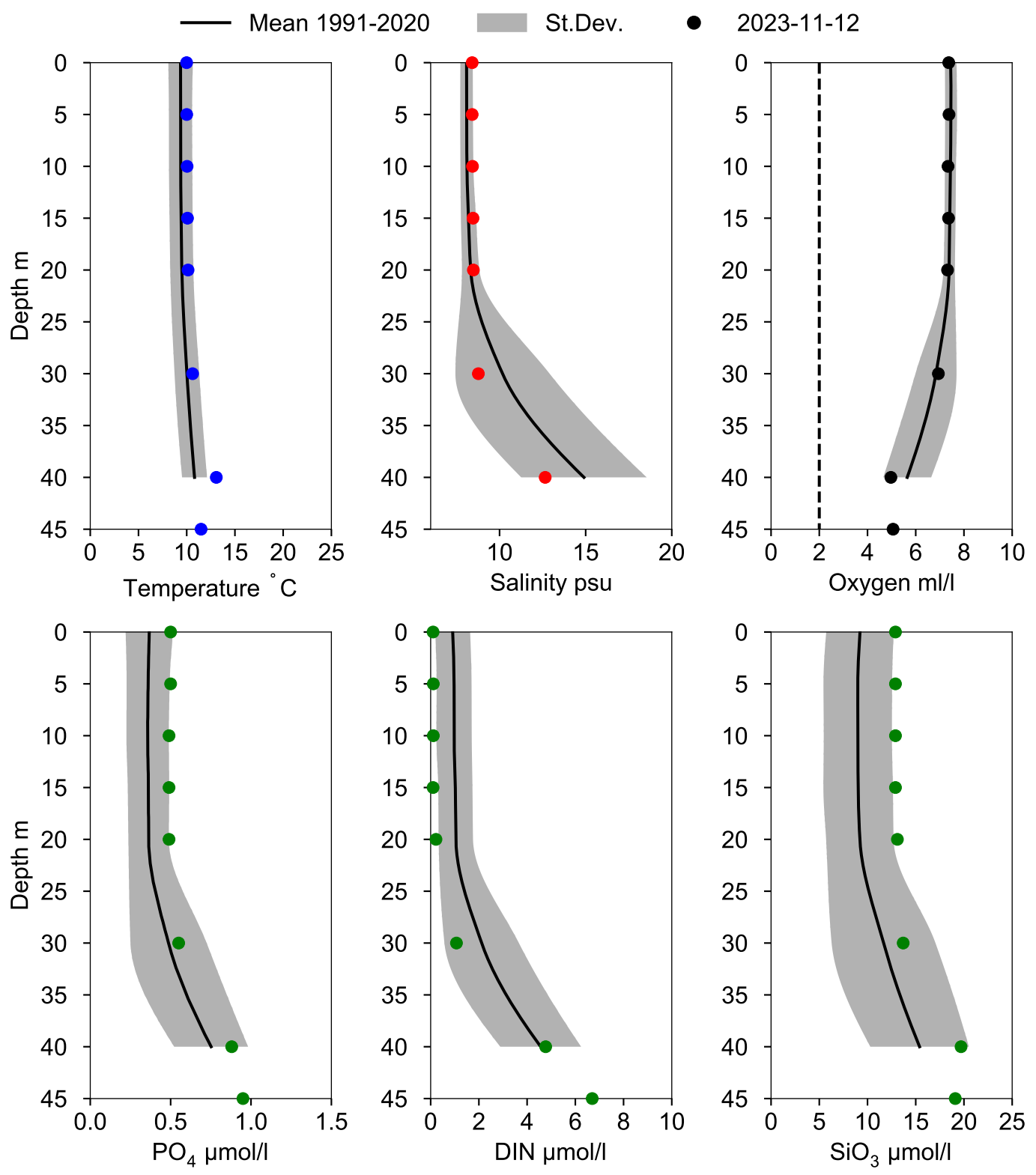
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 39 m)



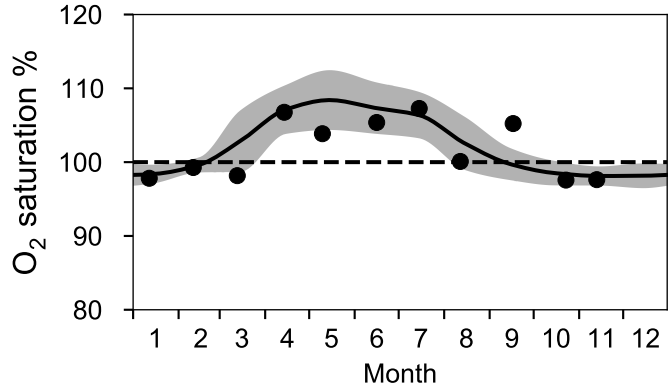
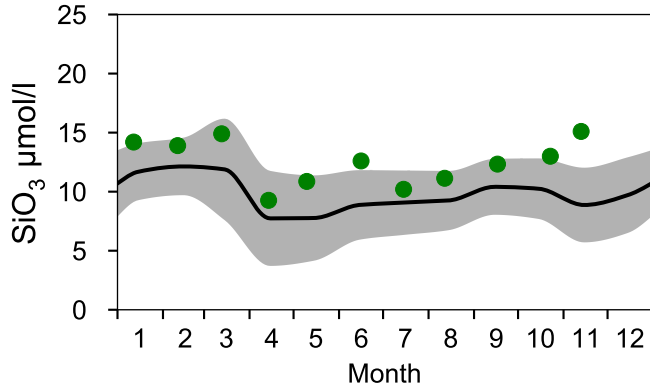
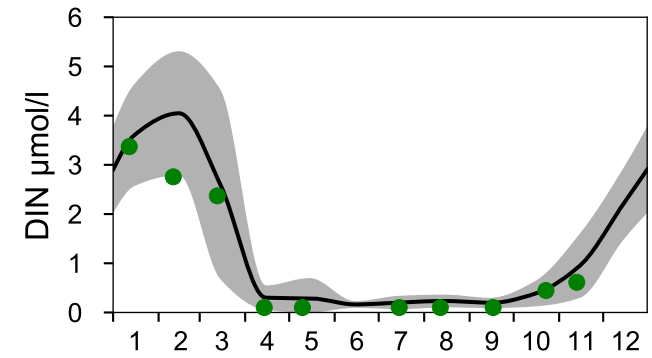
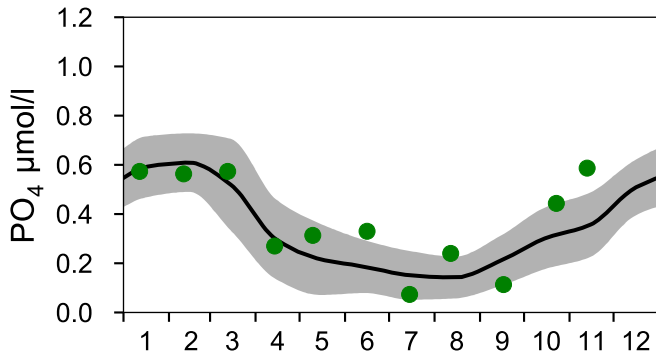
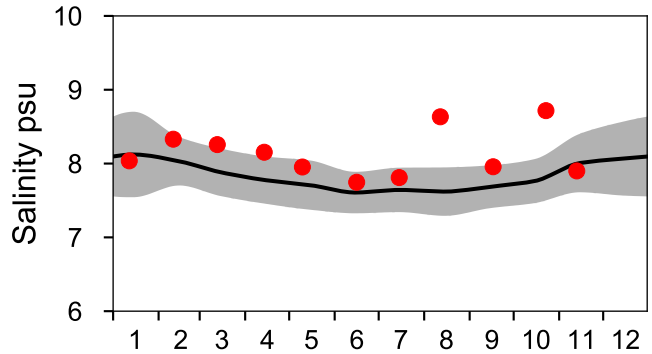
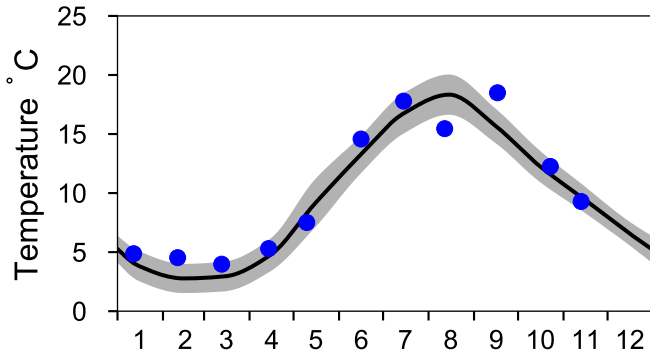
Vertical profiles BY1 November



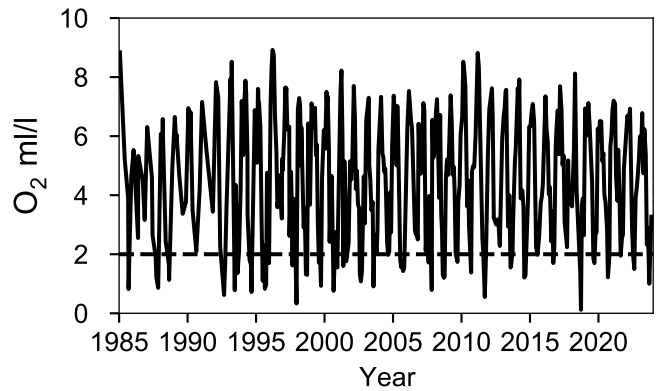
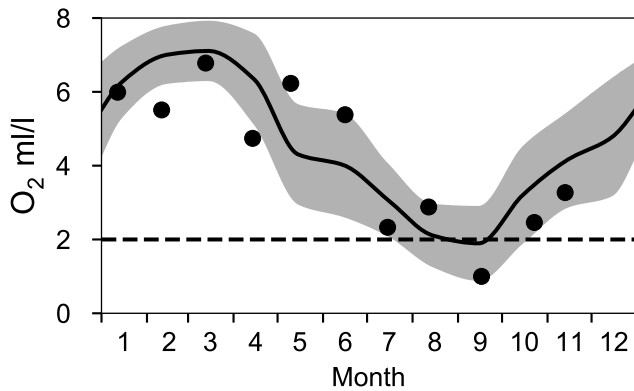
STATION BY2 ARKONA SURFACE WATER (0-10 m)

Annual Cycles

— Mean 1991-2020 St.Dev. ● 2023

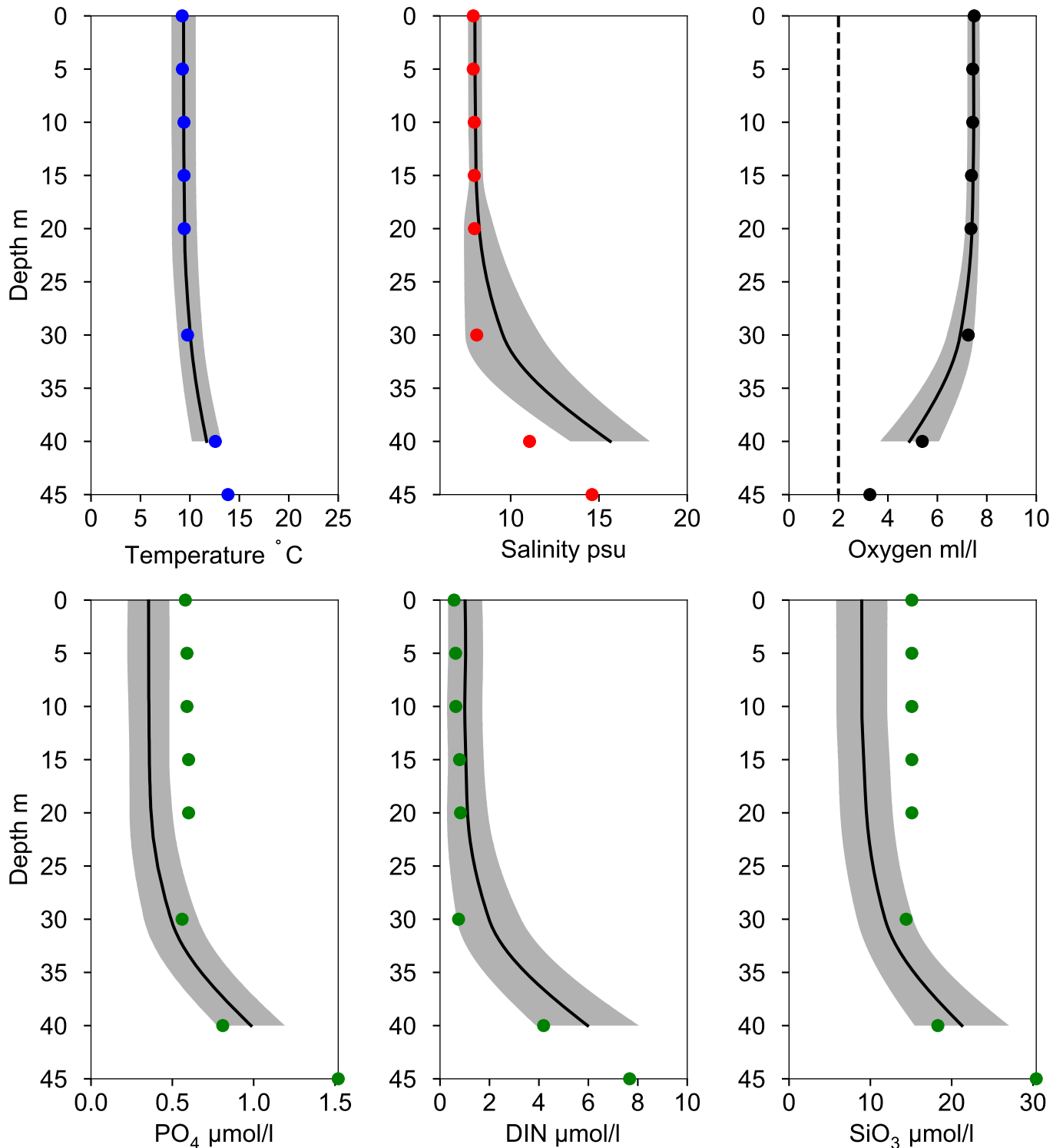


OXYGEN IN BOTTOM WATER (depth >= 40 m)



Vertical profiles BY2 ARKONA November

— Mean 1919-2020 ■ St.Dev. ● 2023-11-13



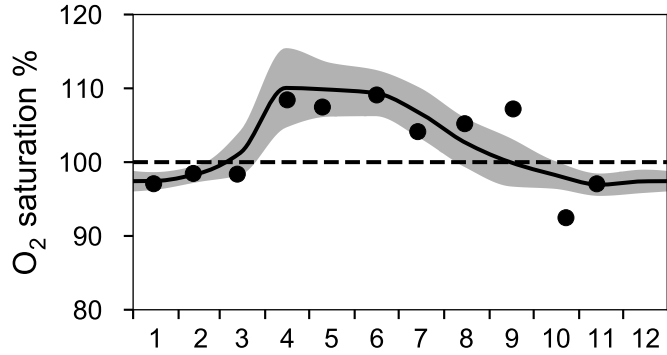
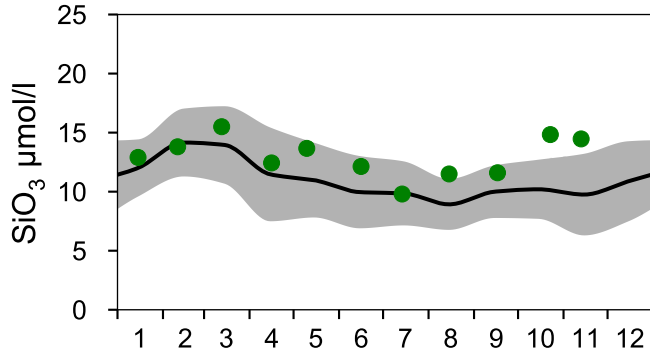
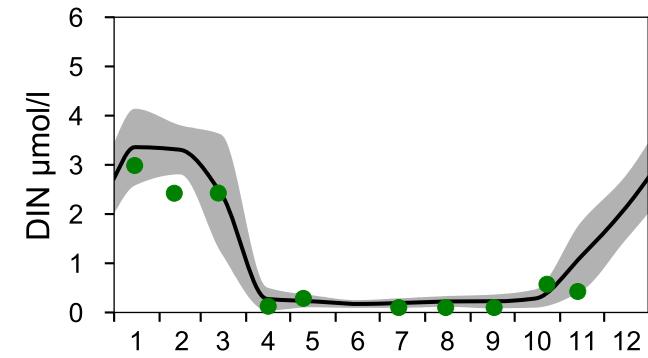
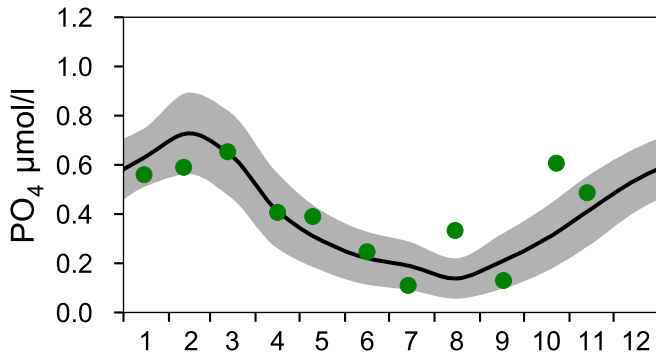
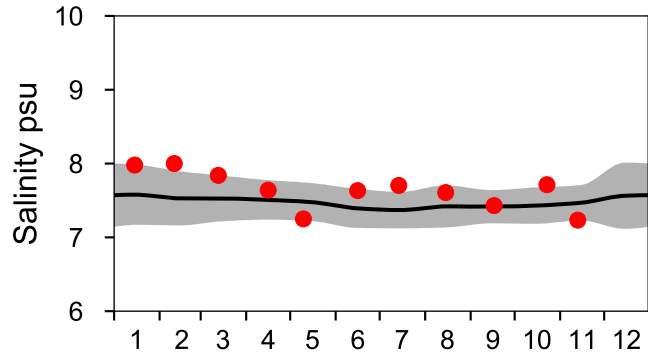
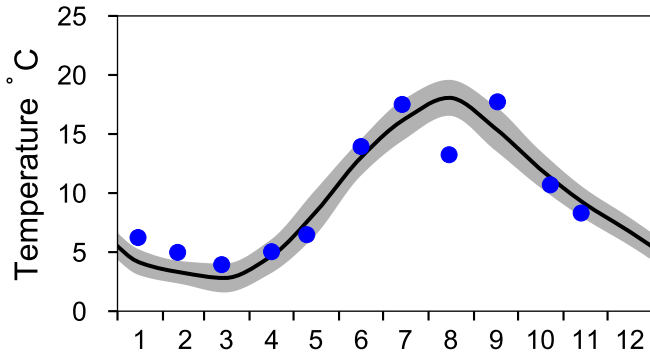
STATION HANÖBUKTEN SURFACE WATER (0-10 m)

Annual Cycles

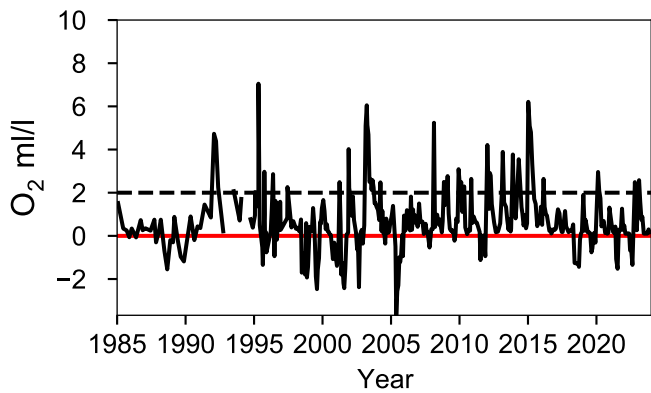
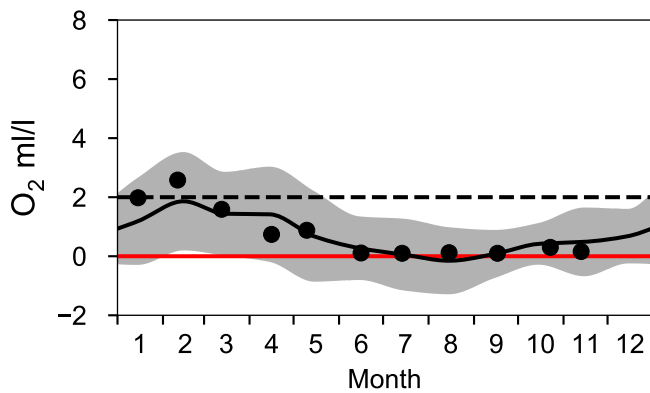
— Mean 1991-2020

■ St.Dev.

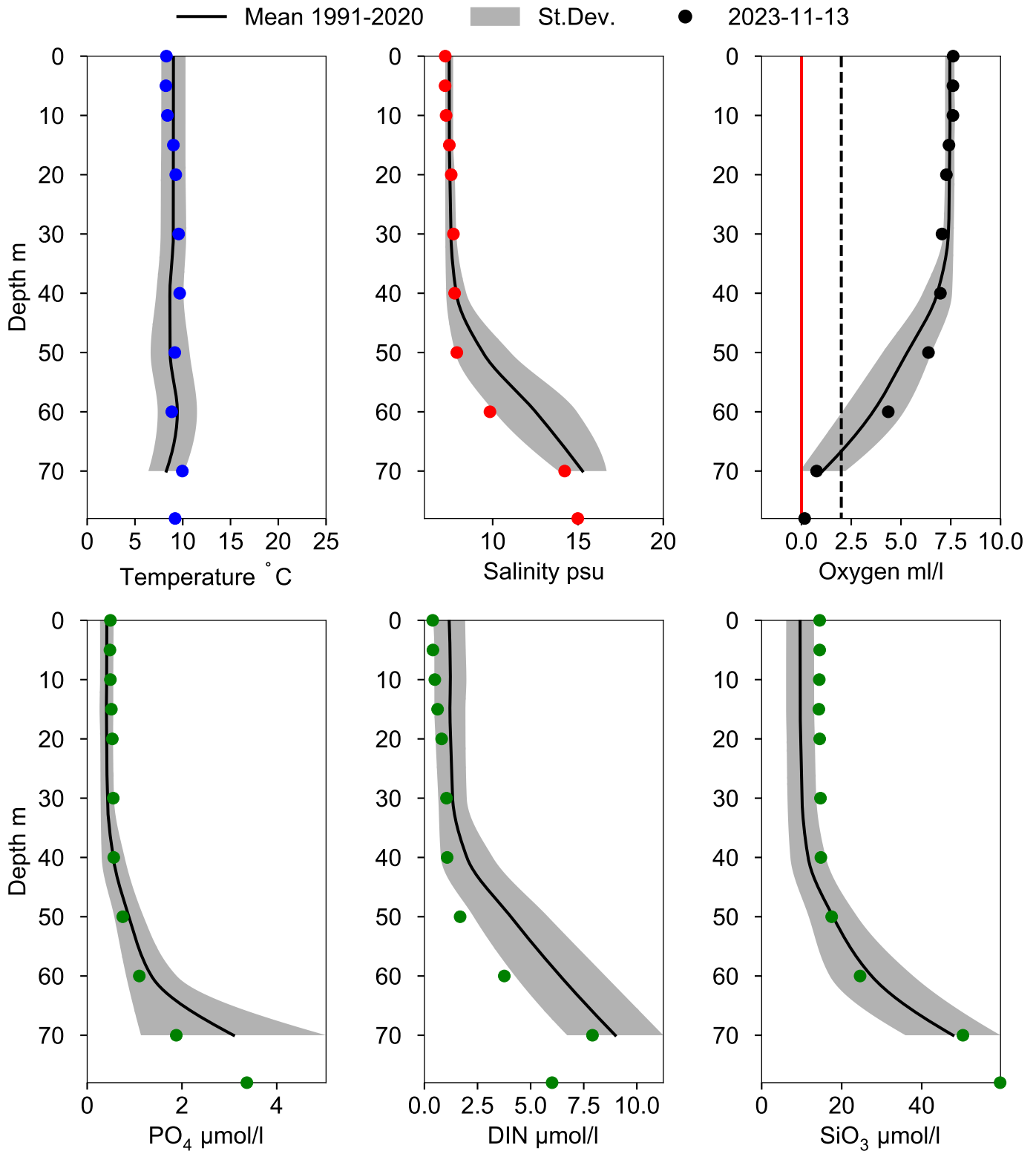
● 2023



OXYGEN IN BOTTOM WATER (depth >= 70 m)



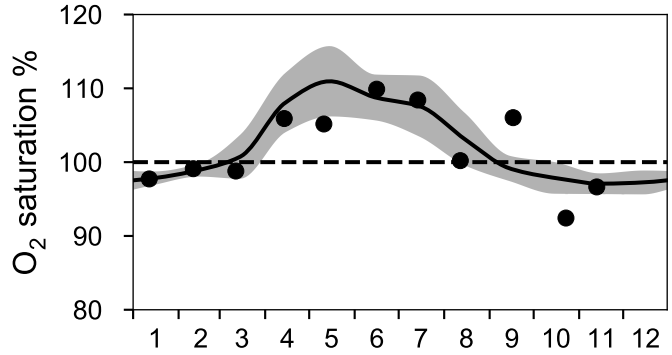
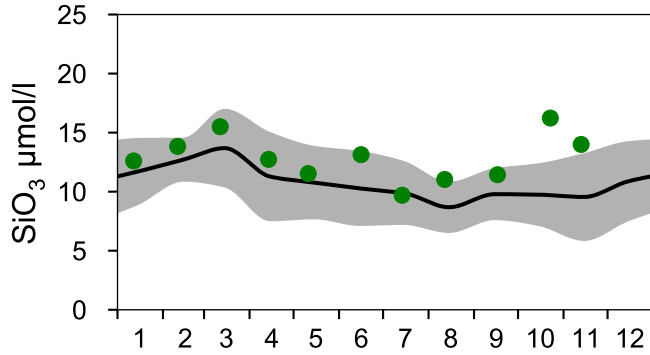
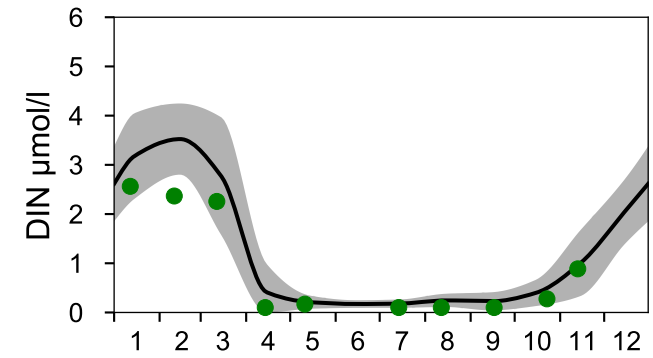
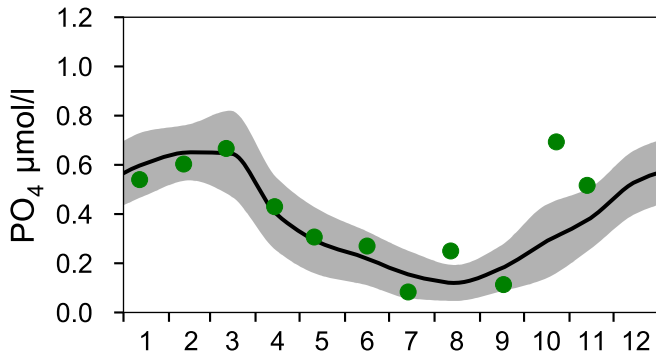
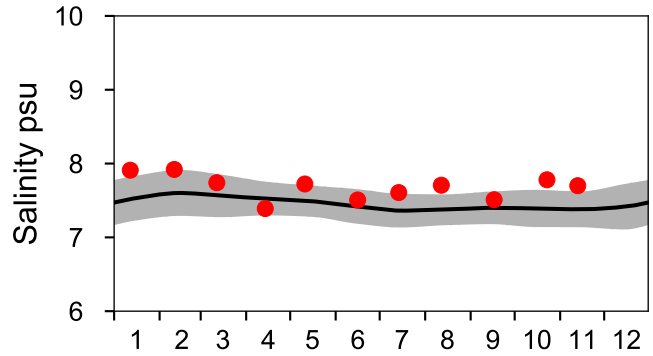
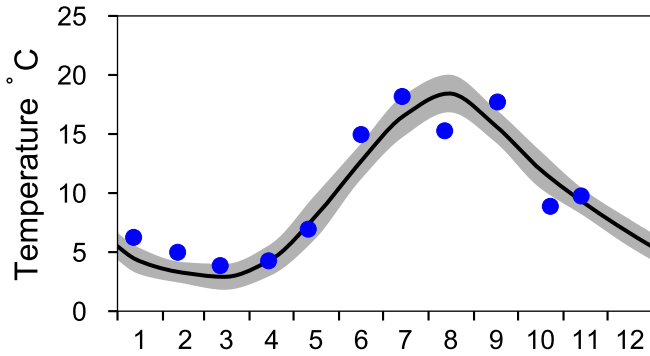
Vertical profiles HANÖBUKTEN November



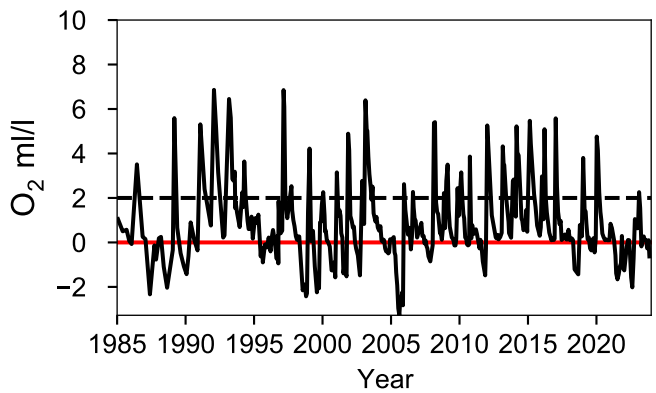
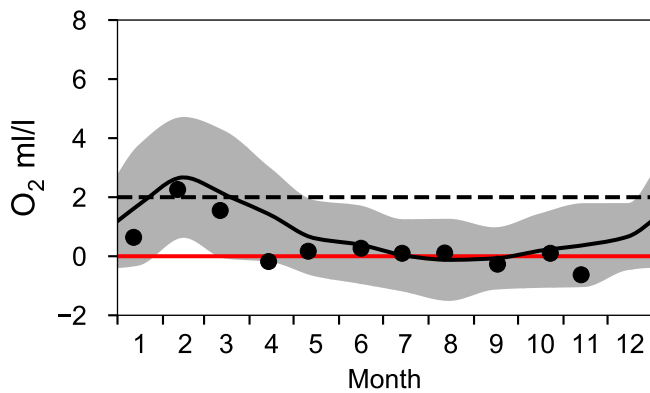
STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

Annual Cycles

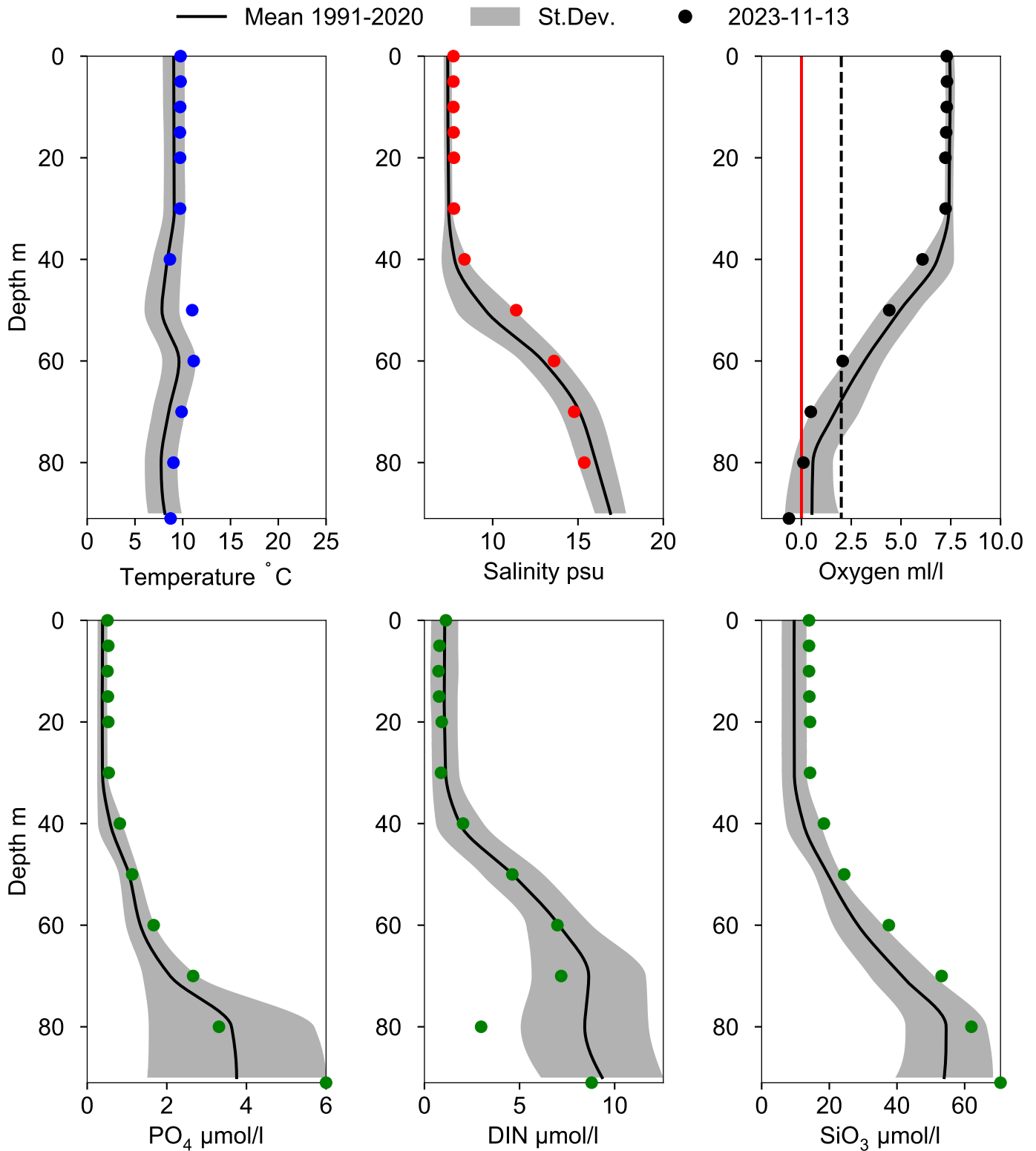
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 80 m)



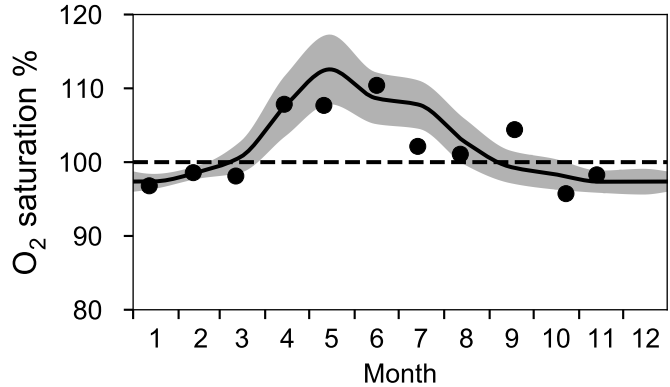
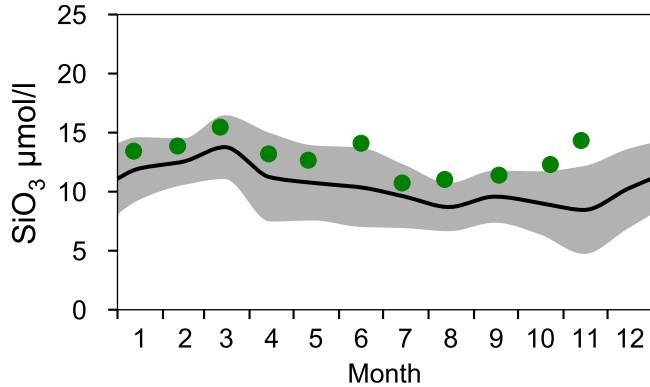
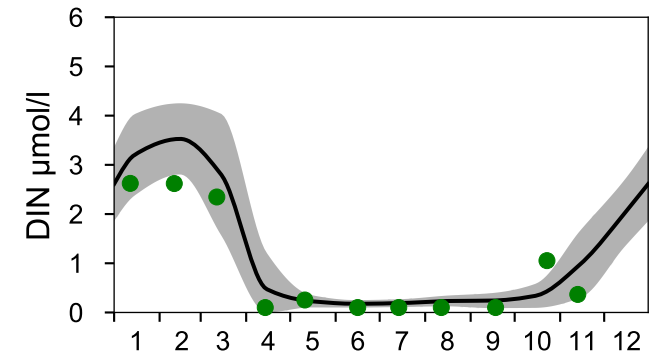
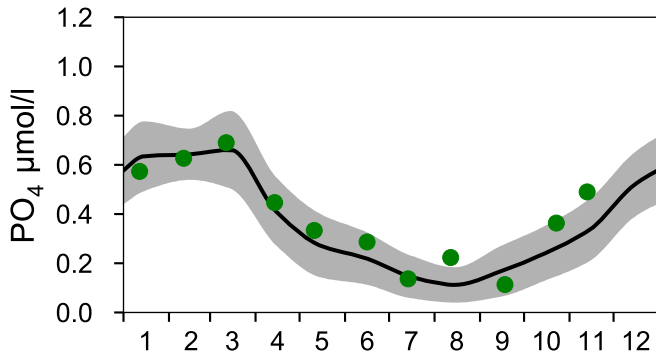
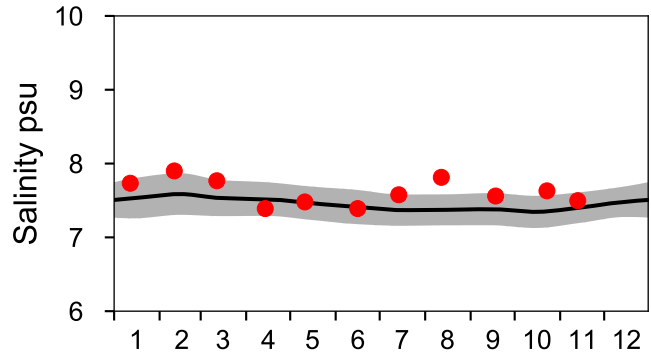
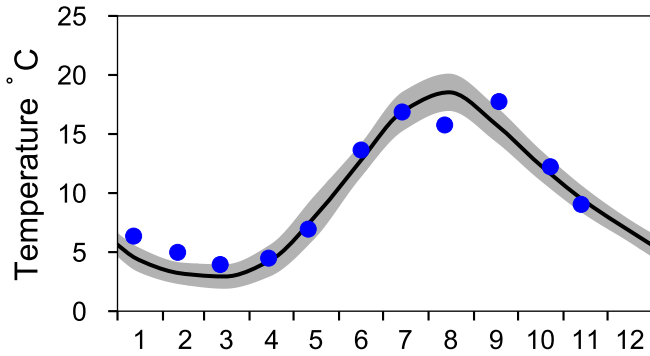
Vertical profiles BY4 CHRISTIANSÖ November



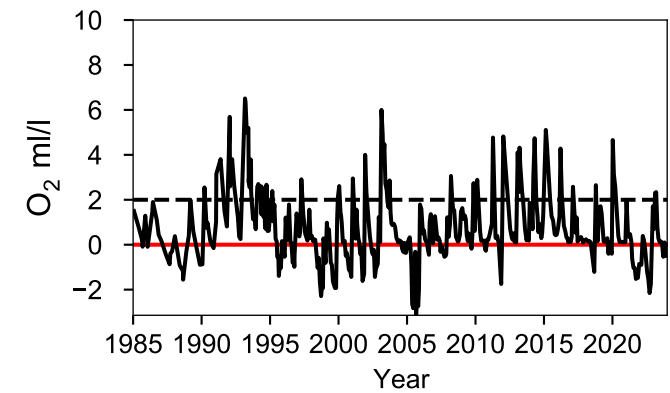
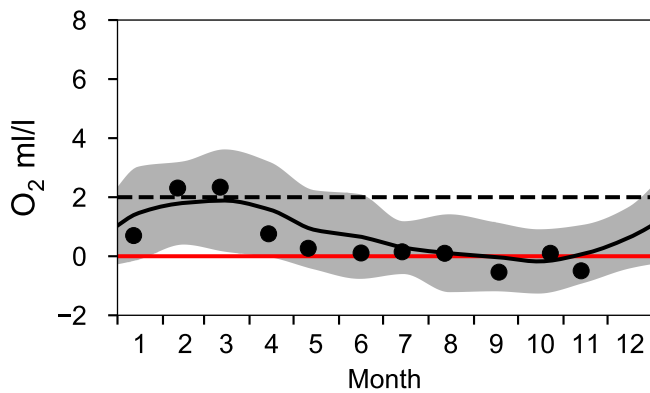
STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

Annual Cycles

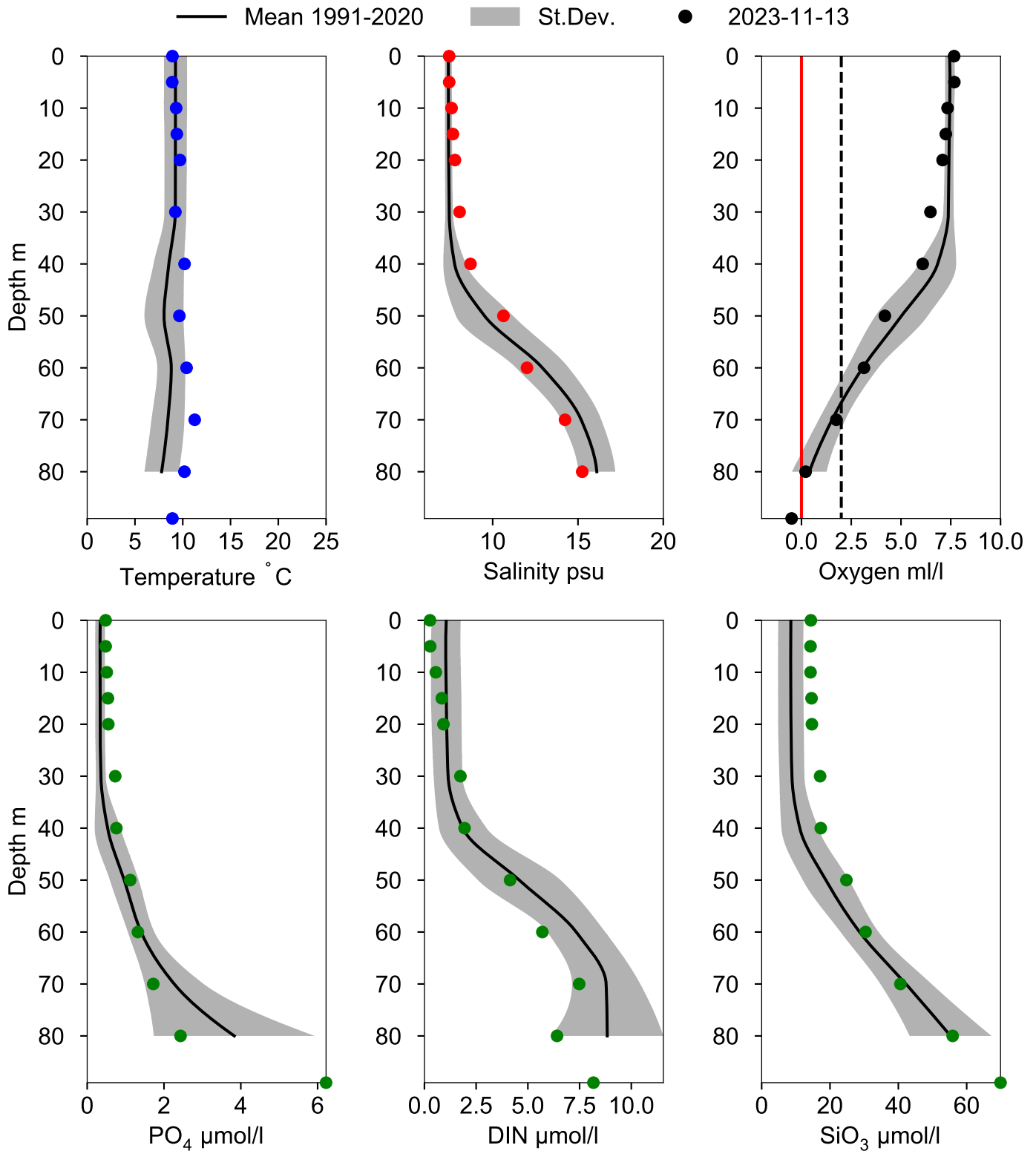
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 80 m)



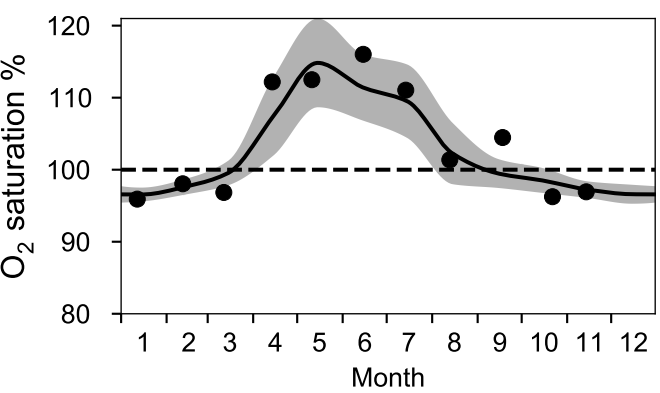
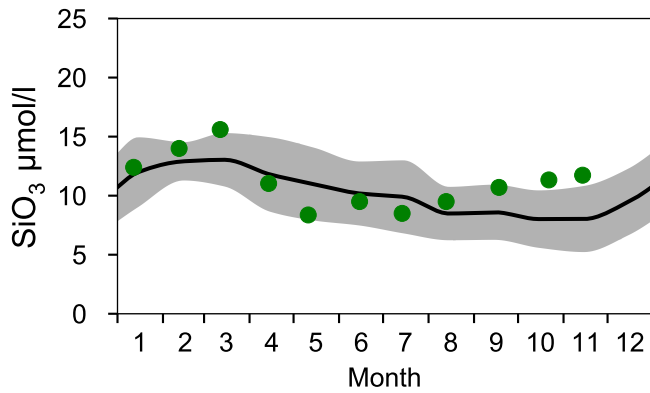
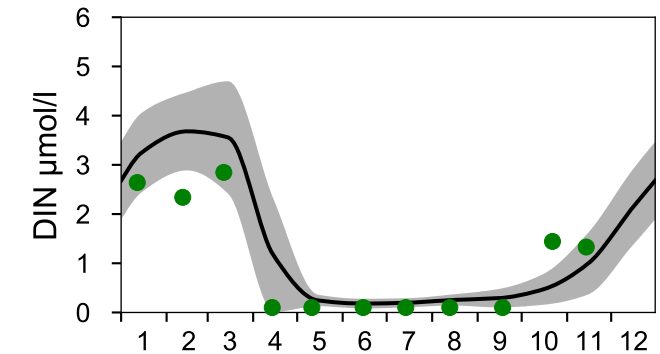
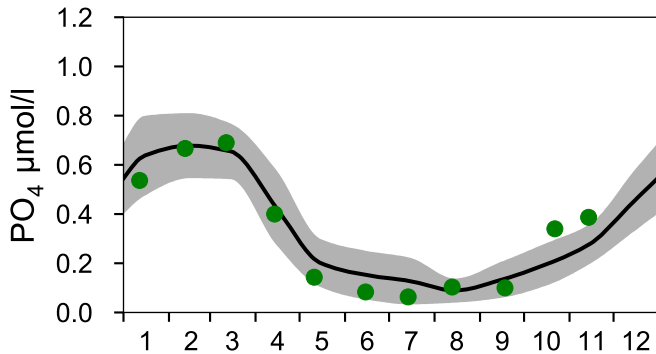
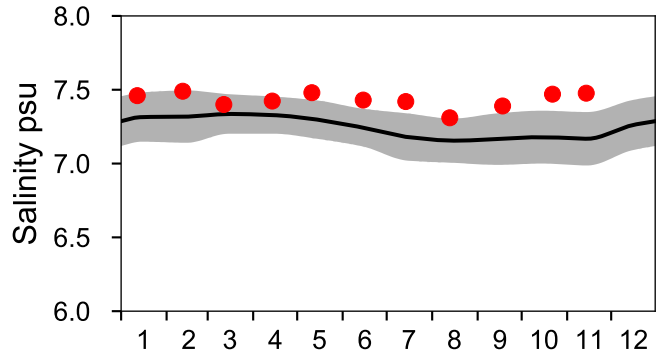
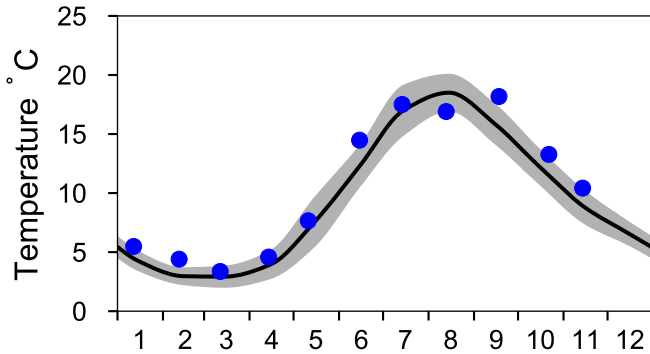
Vertical profiles BY5 BORNHOLMSDJ November



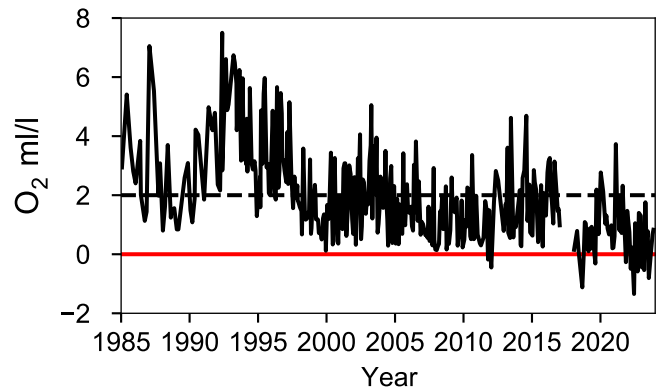
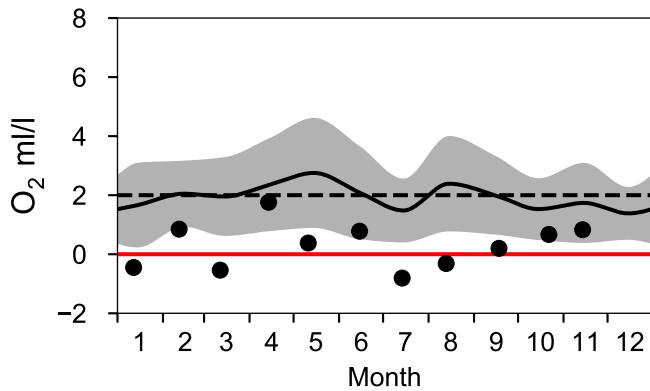
STATION BCS III-10 SURFACE WATER (0-10 m)

Annual Cycles

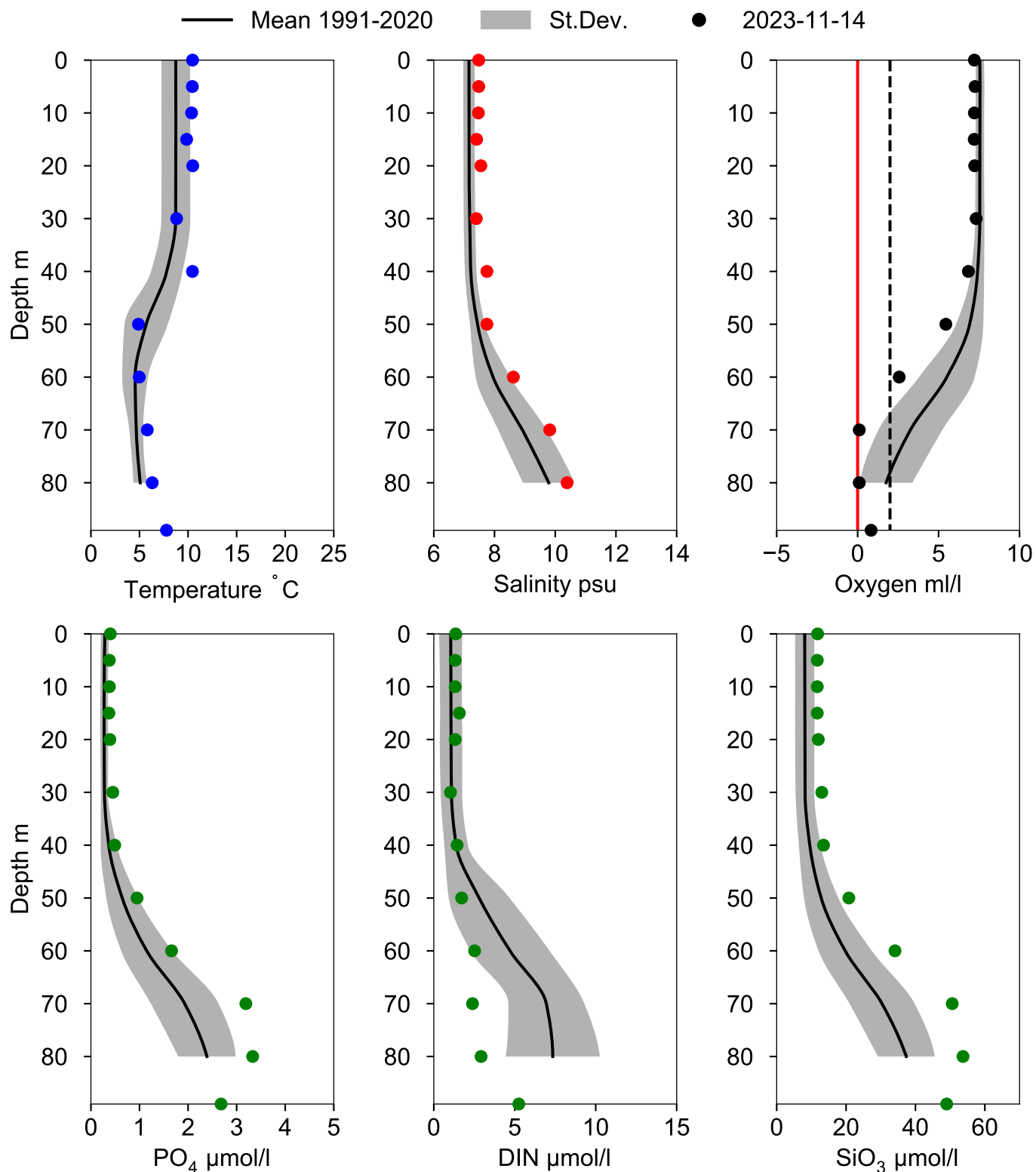
— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 80 m)



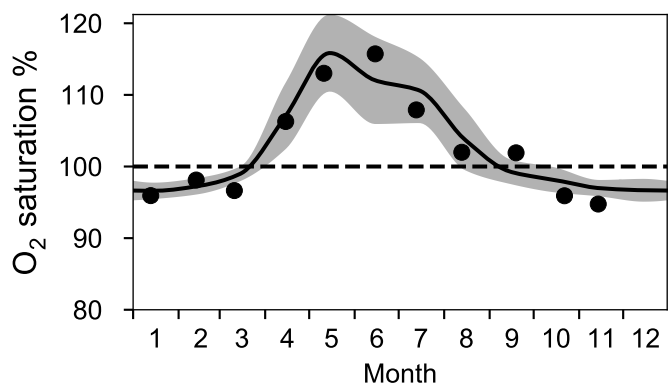
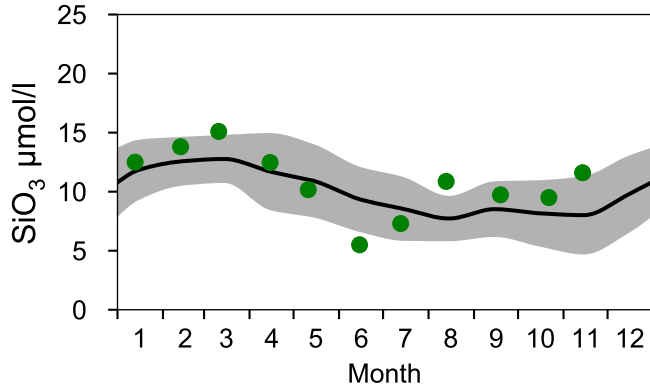
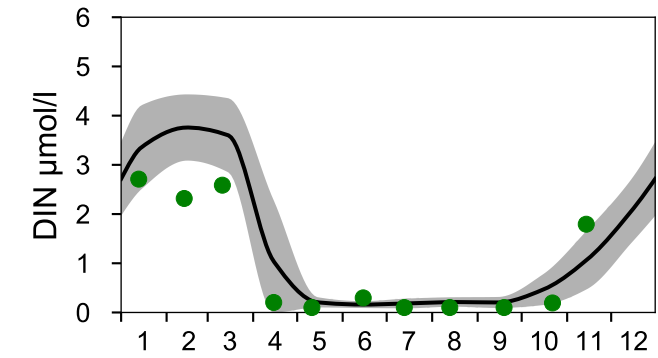
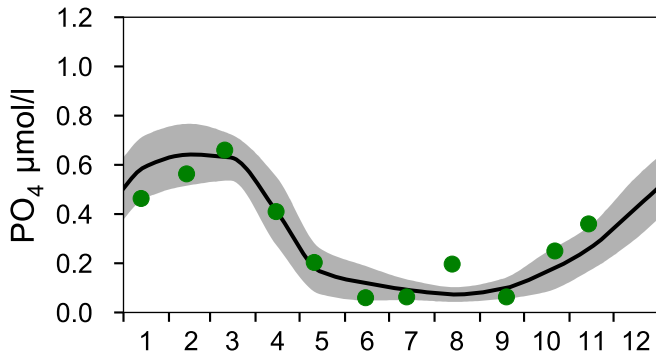
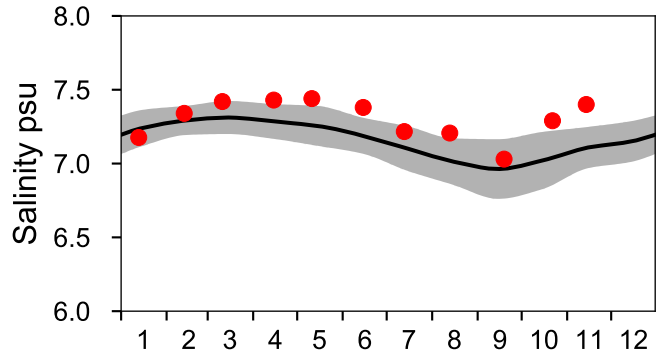
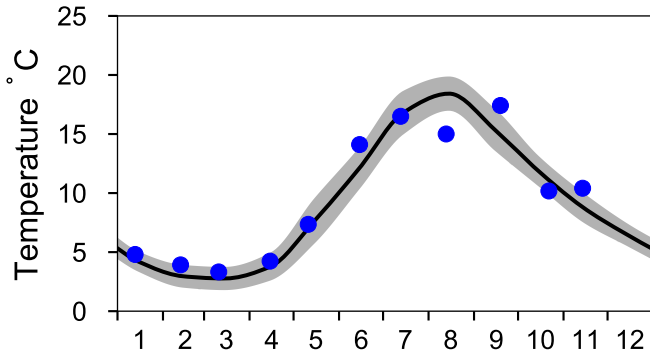
Vertical profiles BCS III-10 November



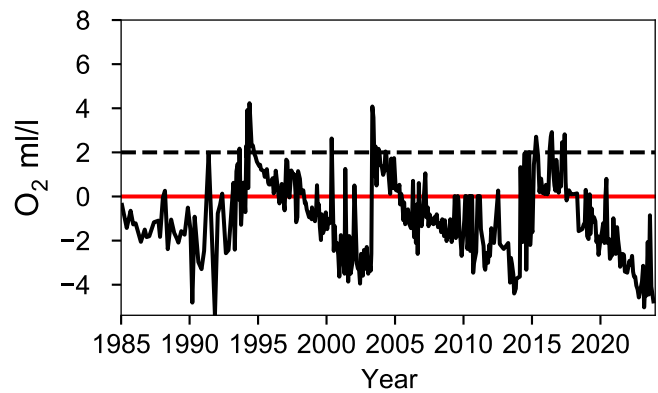
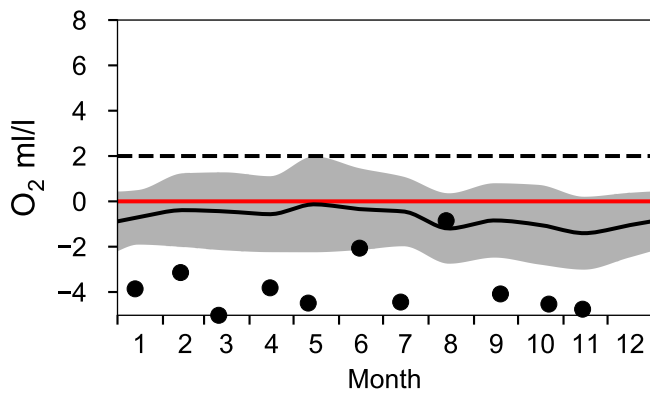
STATION BY10 SURFACE WATER (0-10 m)

Annual Cycles

— Mean 1991-2020 St.Dev. ● 2023

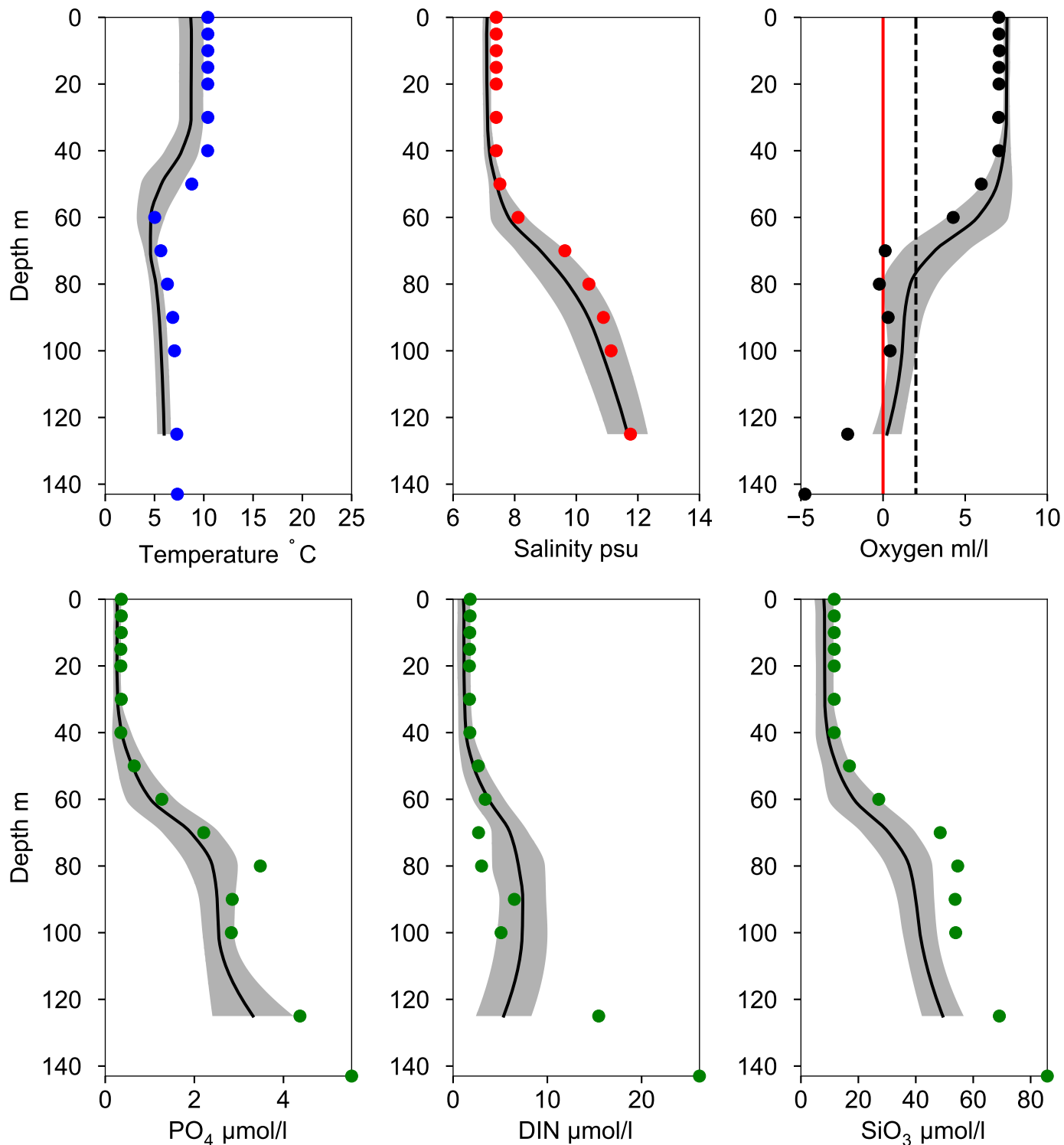


OXYGEN IN BOTTOM WATER (depth >= 125 m)



Vertical profiles BY10 November

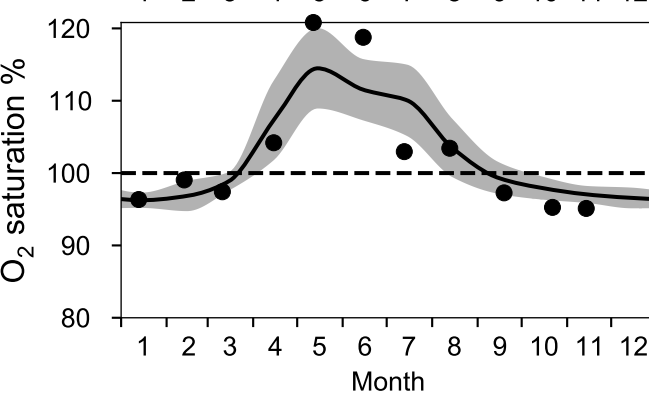
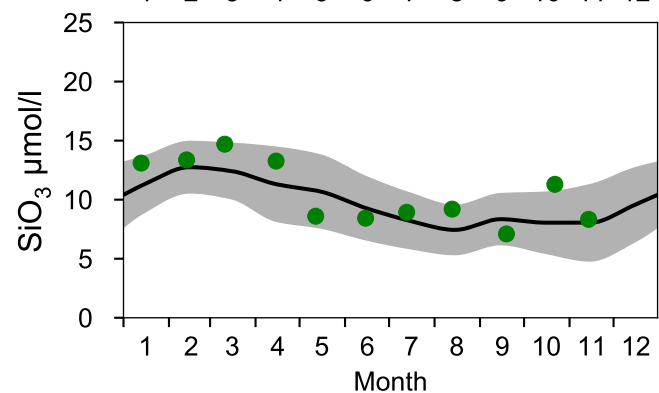
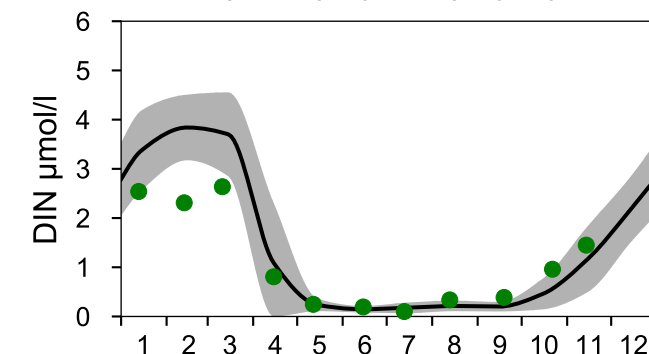
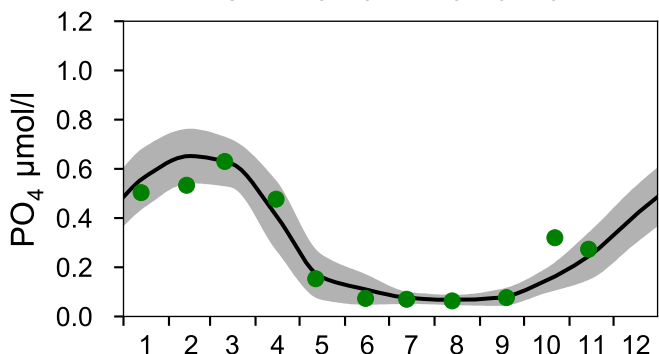
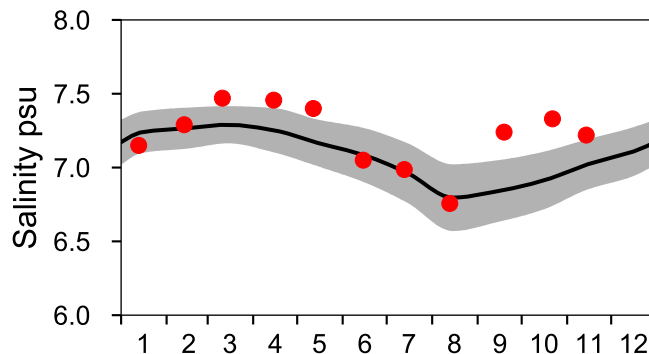
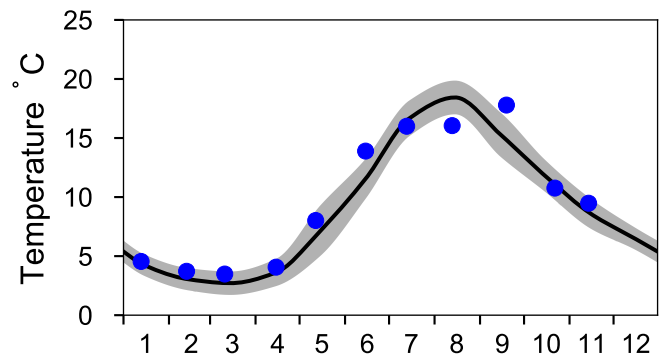
— Mean 1991-2020 ■ St.Dev. ● 2023-11-14



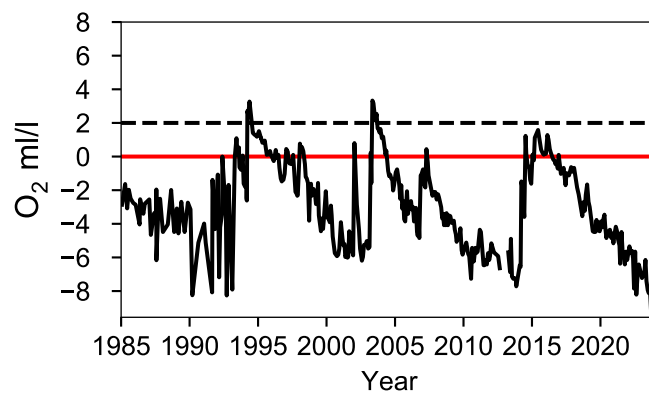
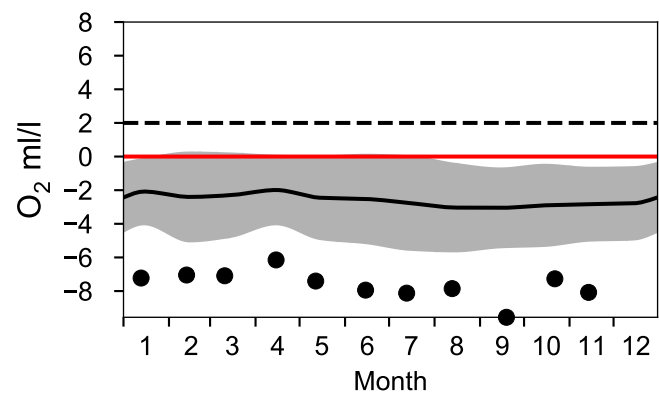
STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

Annual Cycles

— Mean 1991-2020 St.Dev. ● 2023

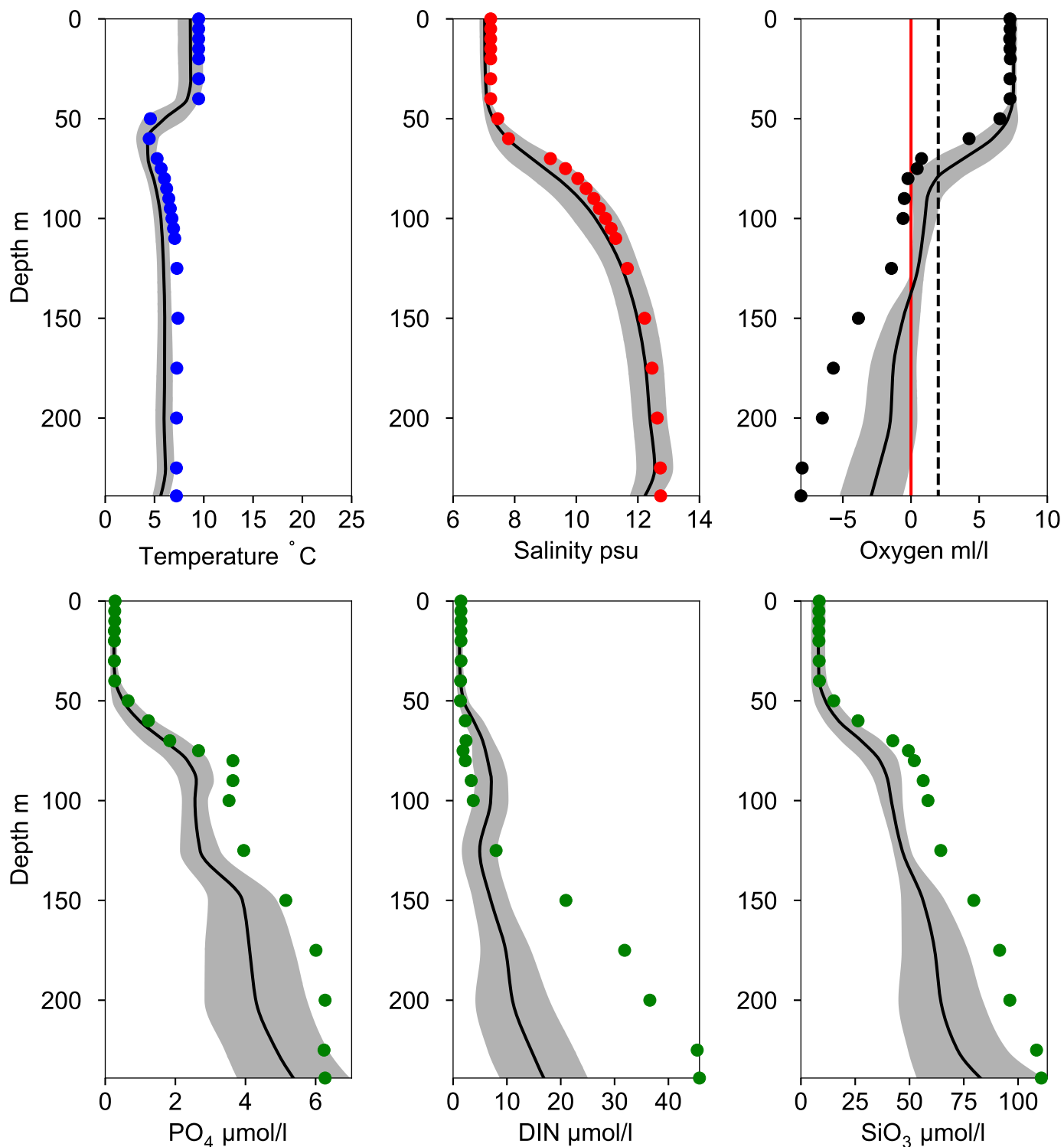


OXYGEN IN BOTTOM WATER (depth >= 225 m)



Vertical profiles BY15 GOTLANDSDJ November

— Mean 1919-2020 St.Dev. ● 2023-11-14



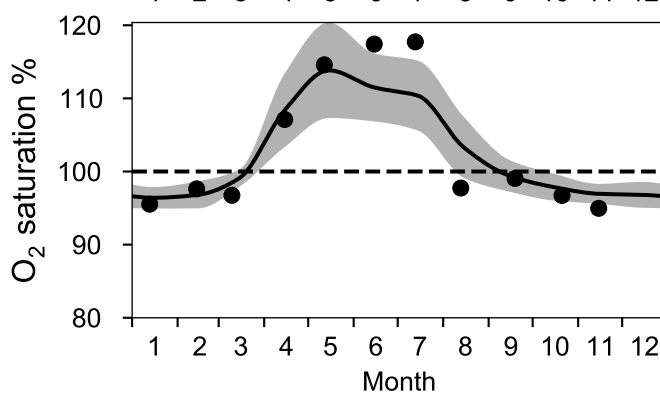
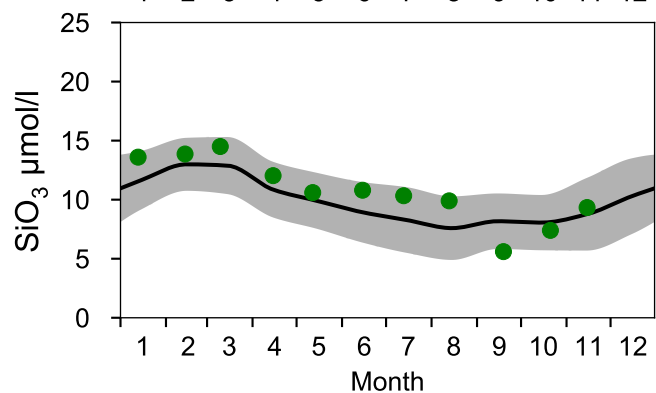
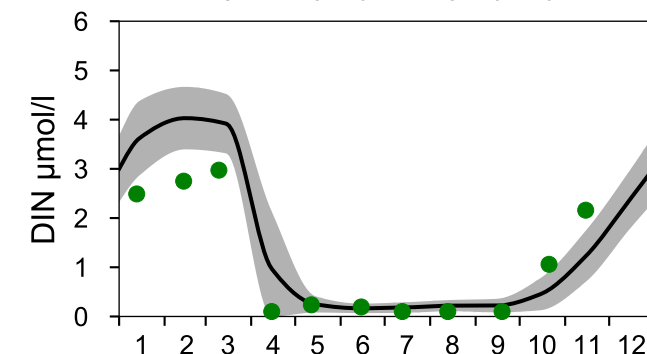
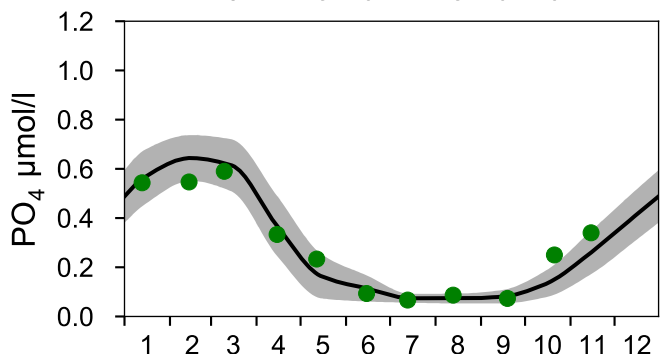
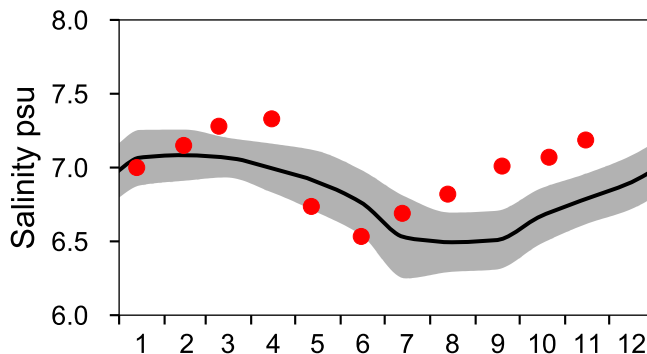
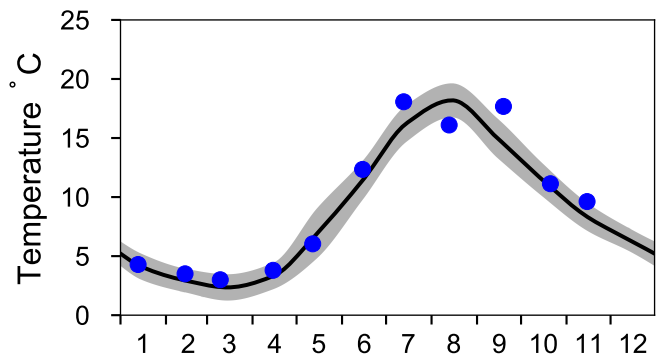
STATION BY20 FÄRÖDJ SURFACE WATER (0-10 m)

Annual Cycles

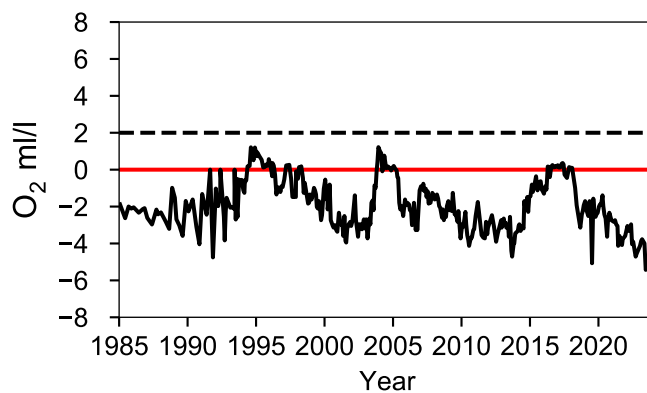
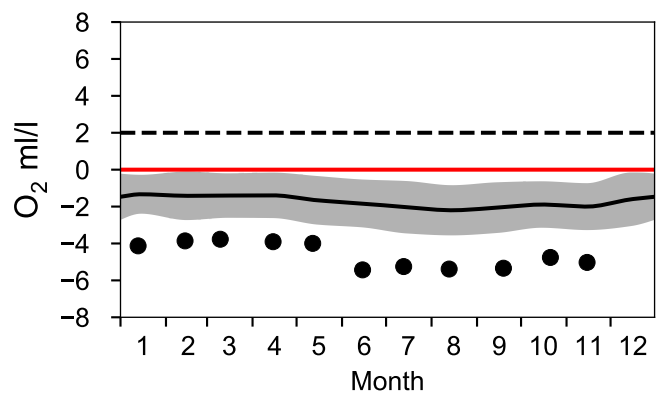
— Mean 1991-2020

■ St.Dev.

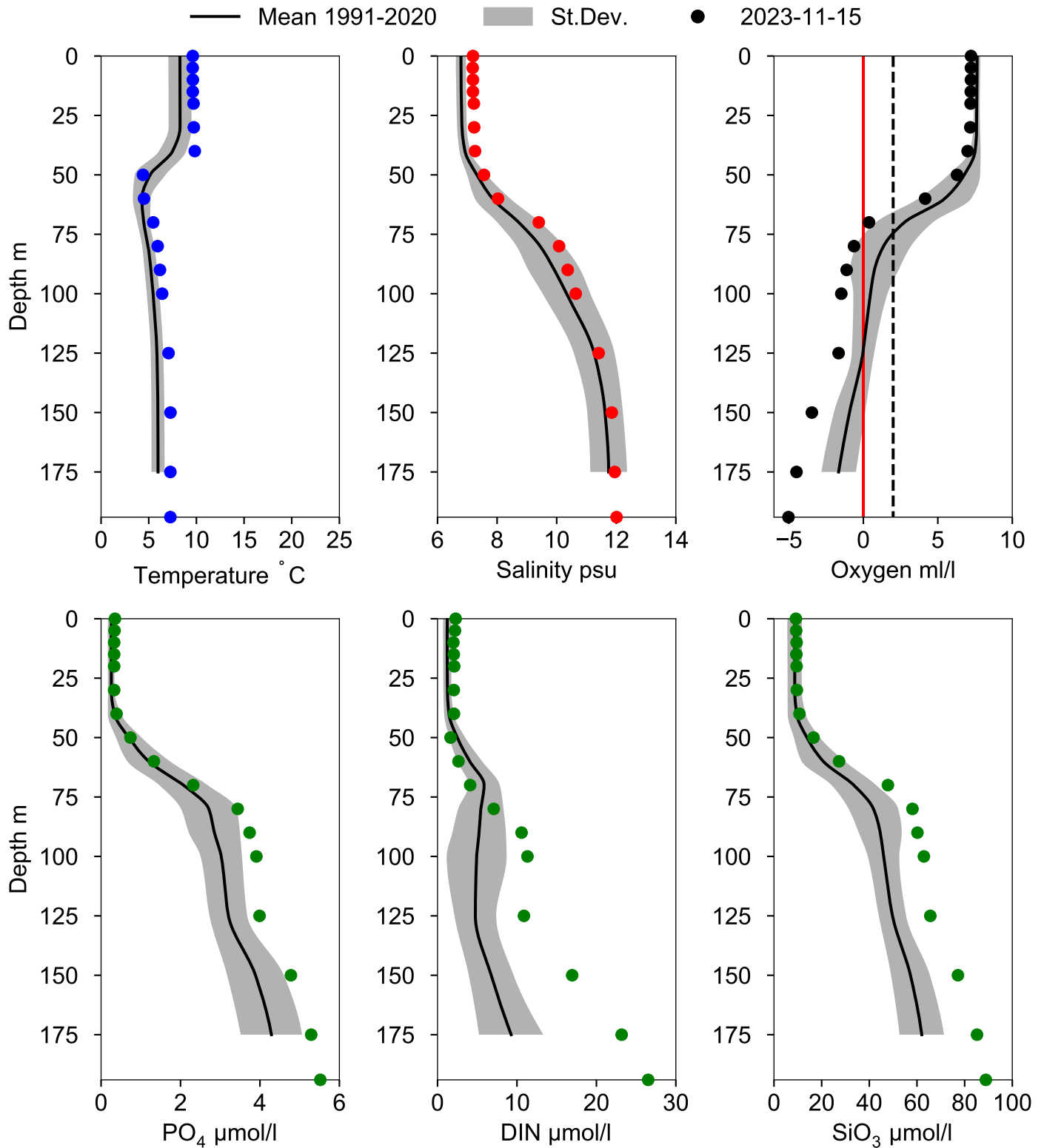
● 2023



OXYGEN IN BOTTOM WATER (depth >= 175 m)



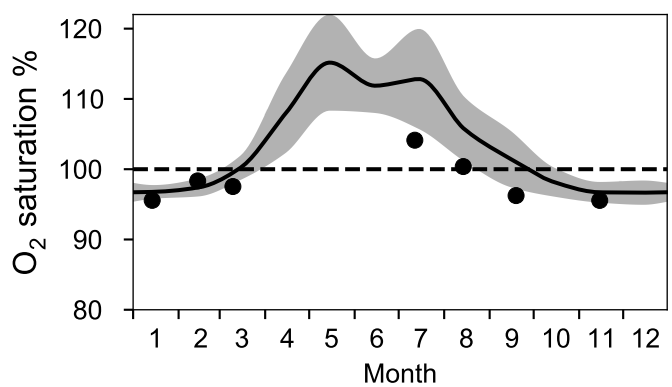
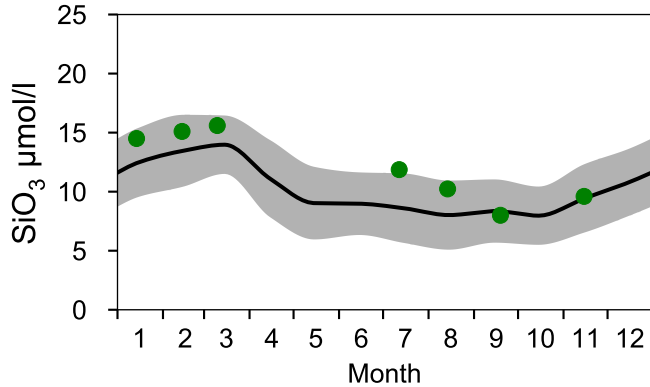
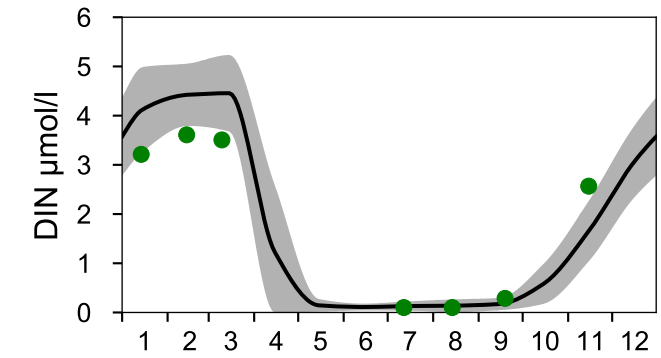
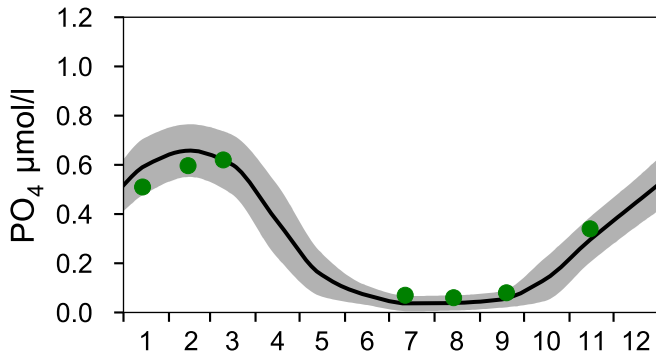
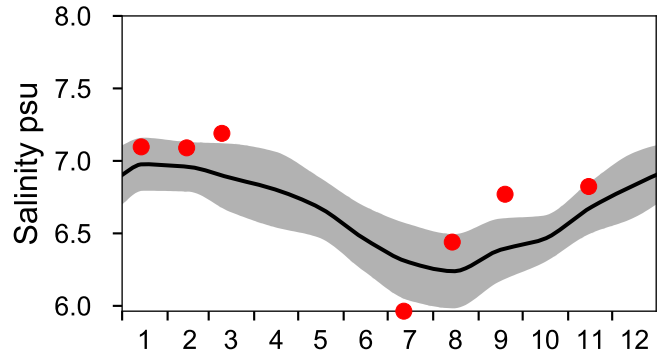
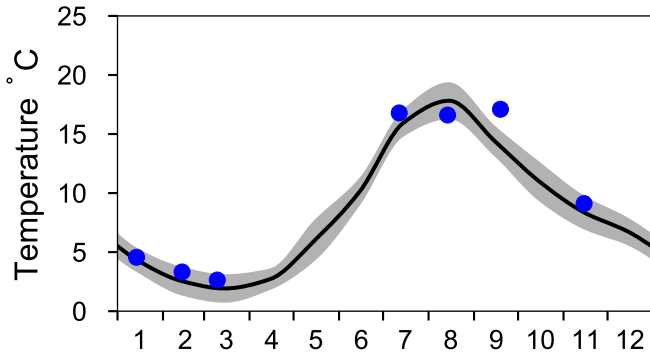
Vertical profiles BY20 FÅRÖDJ November



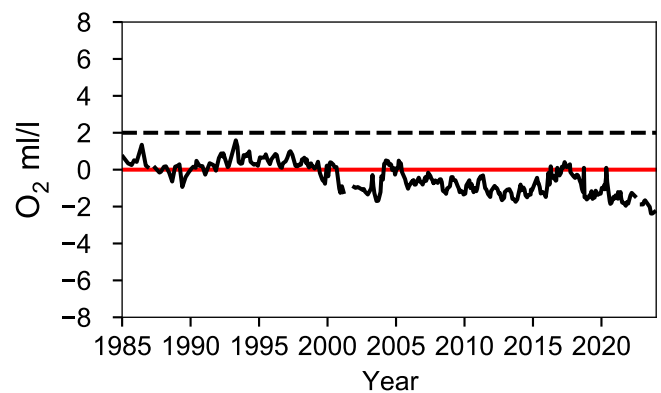
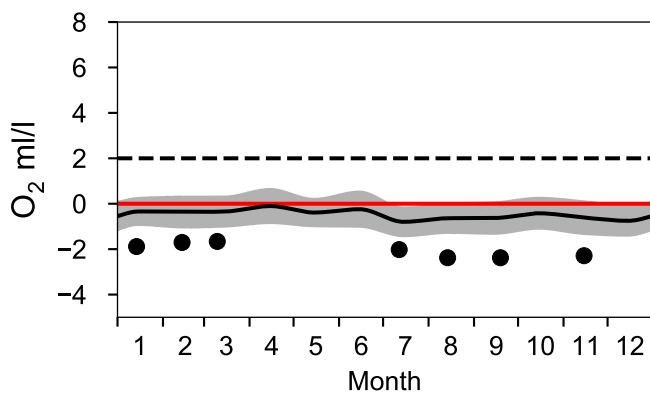
STATION BY29 / LL19 SURFACE WATER (0-10 m)

Annual Cycles

— Mean 1991-2020 St.Dev. ● 2023

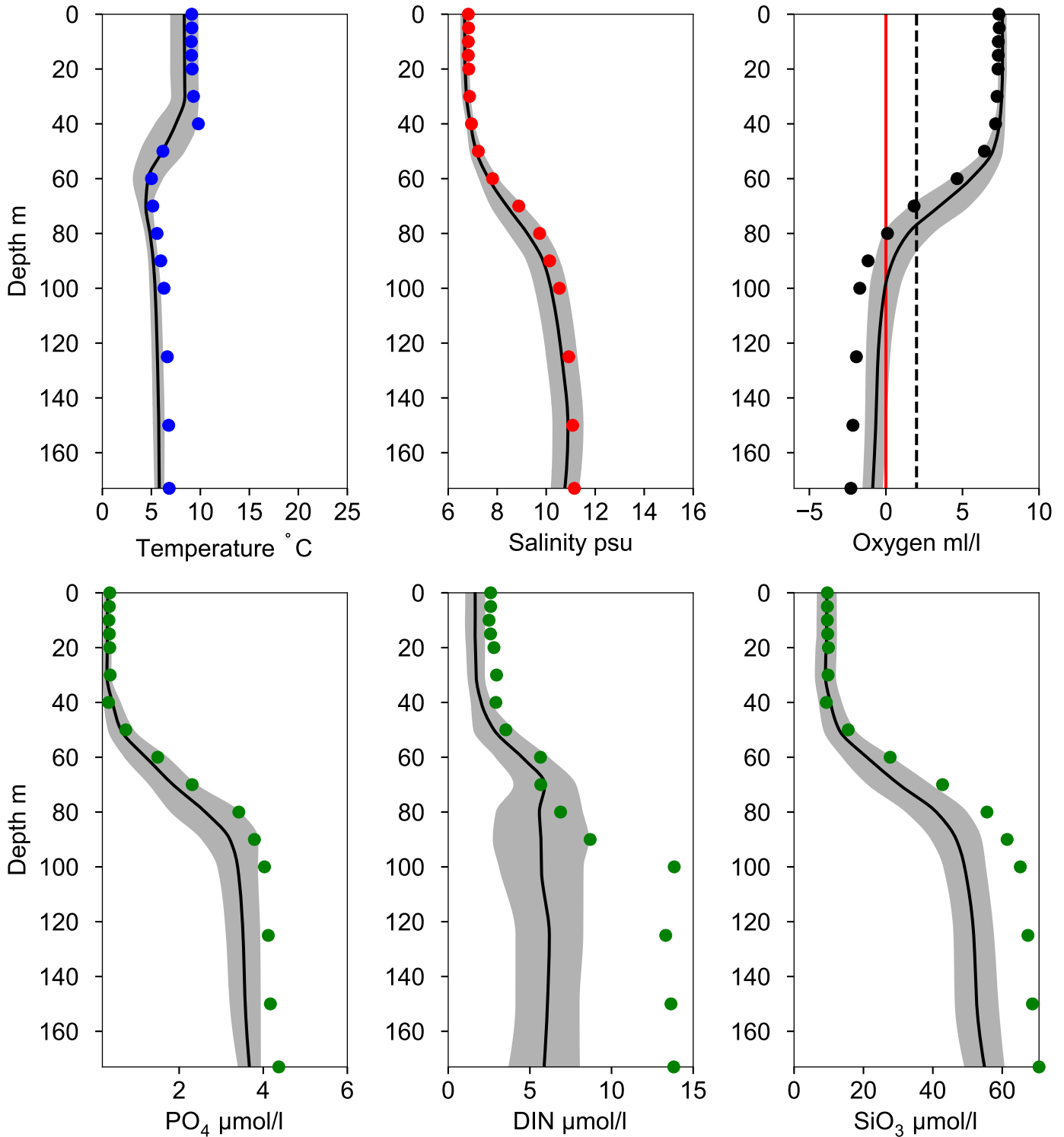


OXYGEN IN BOTTOM WATER (depth >= 150 m)



Vertical profiles BY29 / LL19 November

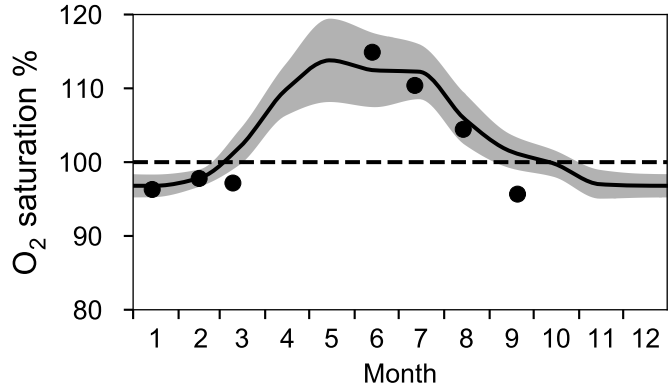
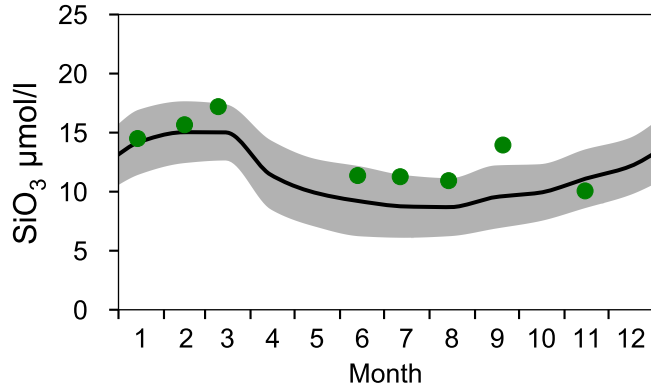
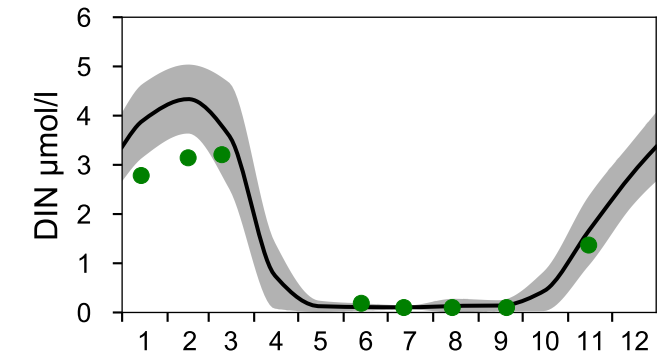
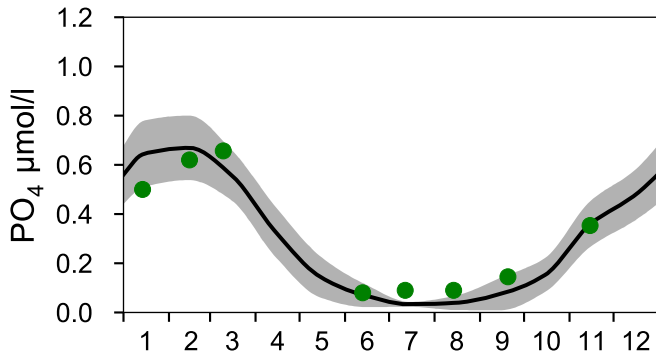
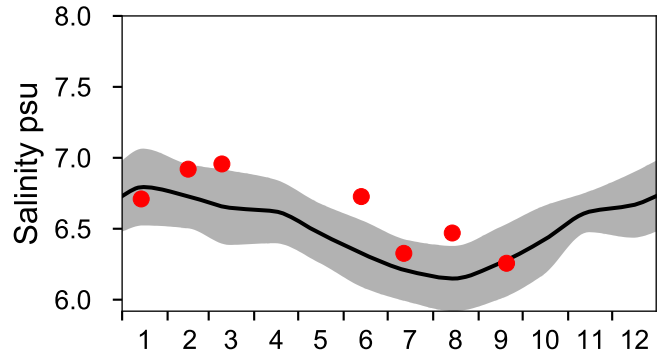
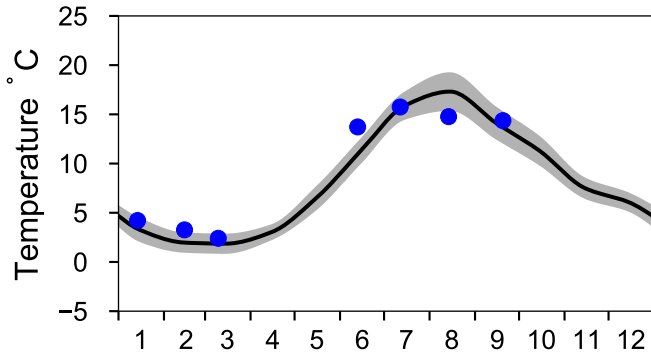
— Mean 1991-2020 St.Dev. ● 2023-11-15



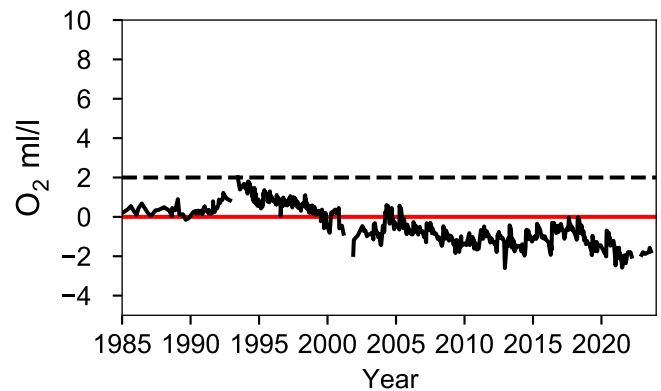
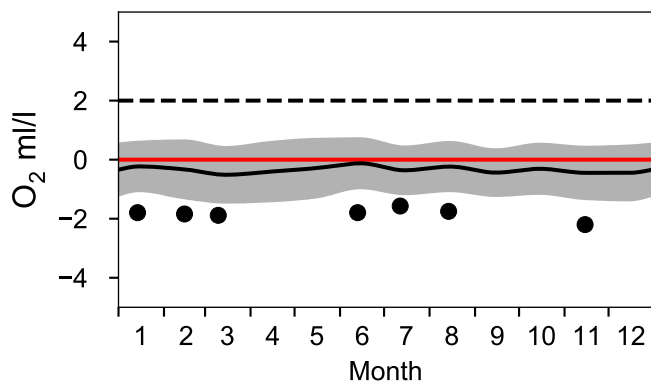
STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

Annual Cycles

— Mean 1991-2020 St.Dev. ● 2023

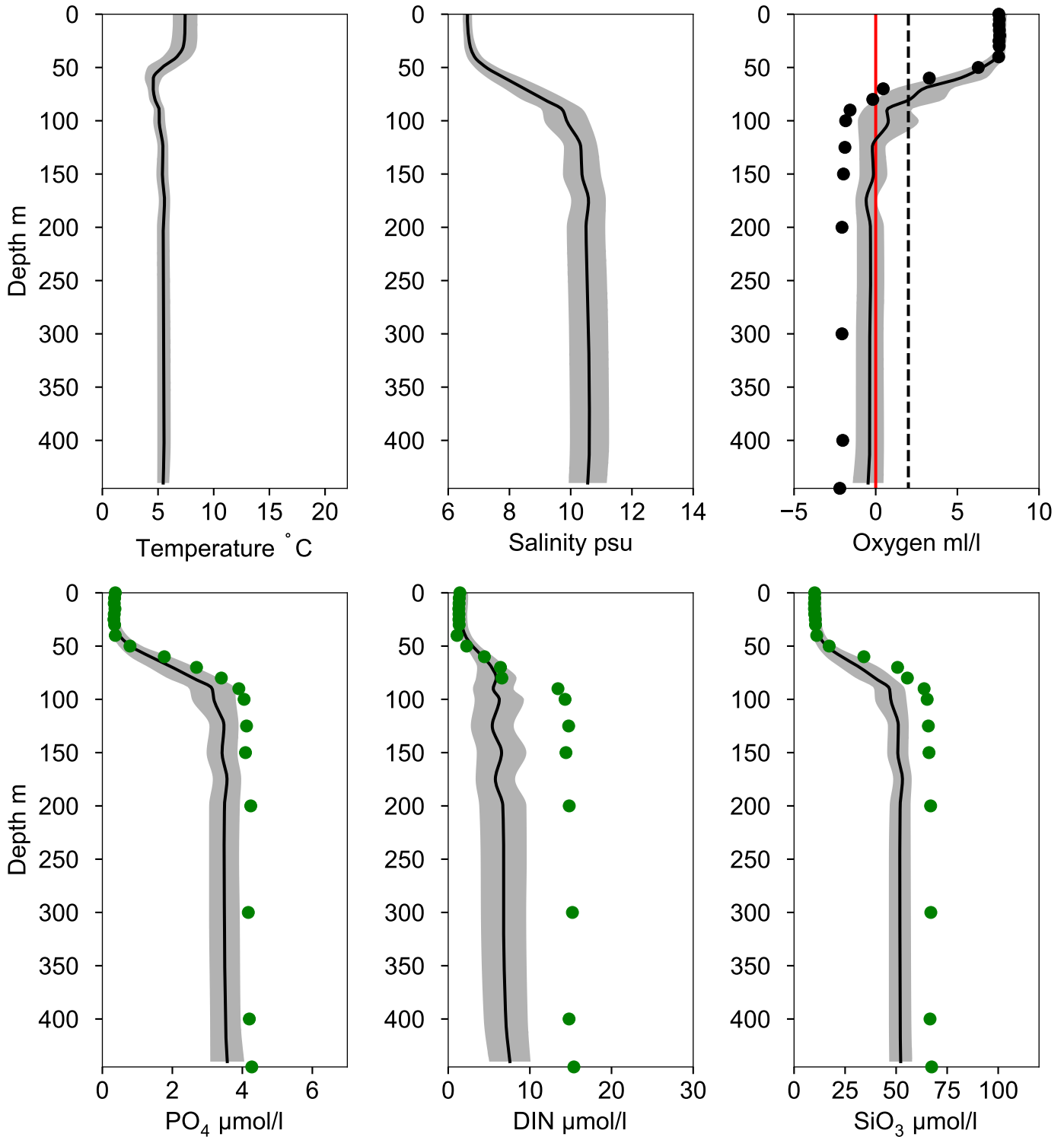


OXYGEN IN BOTTOM WATER (depth >= 419 m)



Vertical profiles BY31 LANDSORTSDJ November

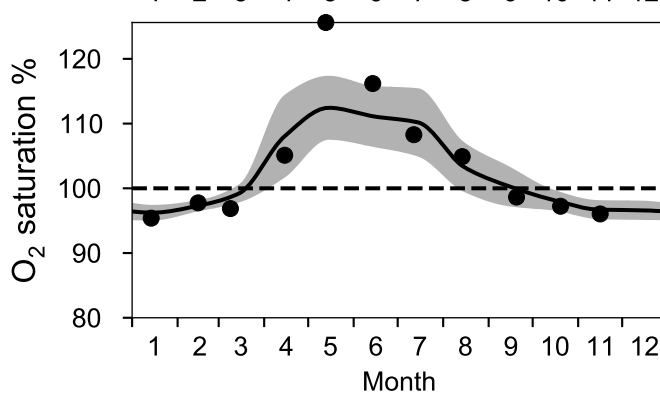
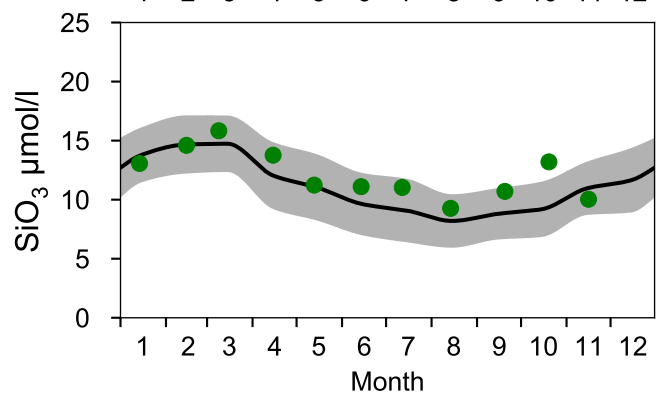
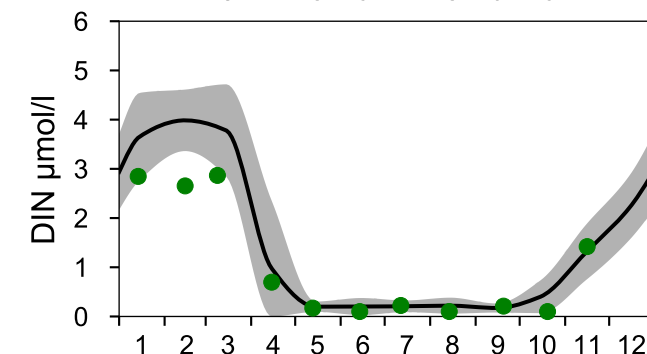
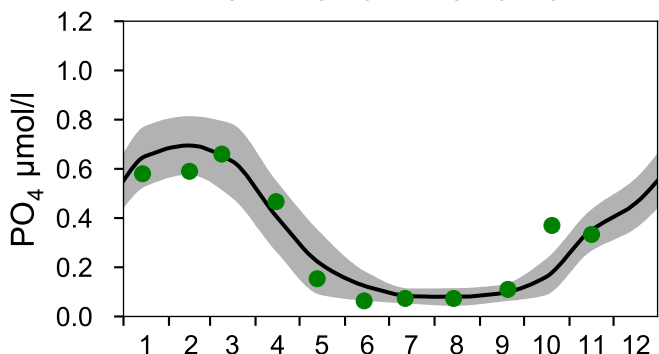
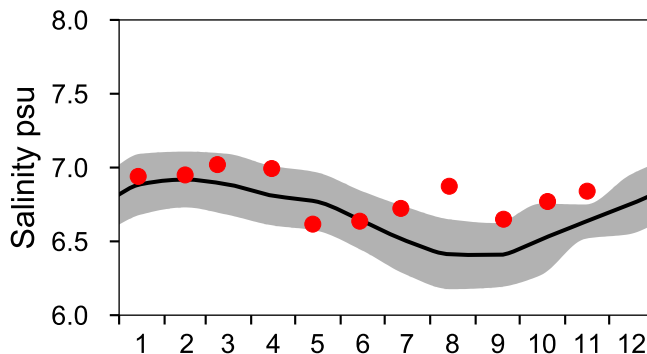
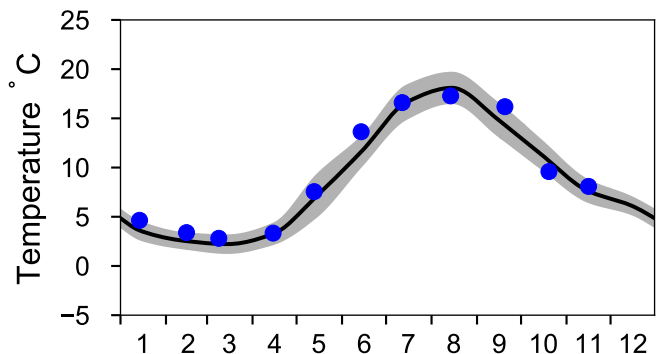
— Mean 1991-2020 St.Dev. ● 2023-11-15



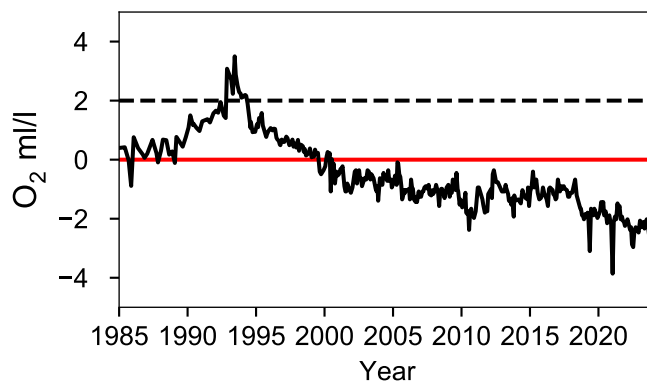
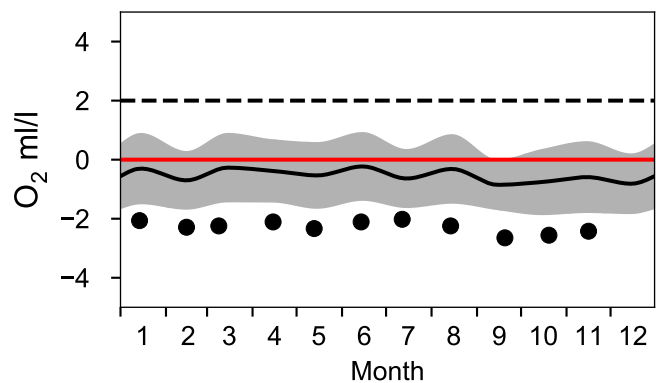
STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

Annual Cycles

— Mean 1991-2020 St.Dev. ● 2023

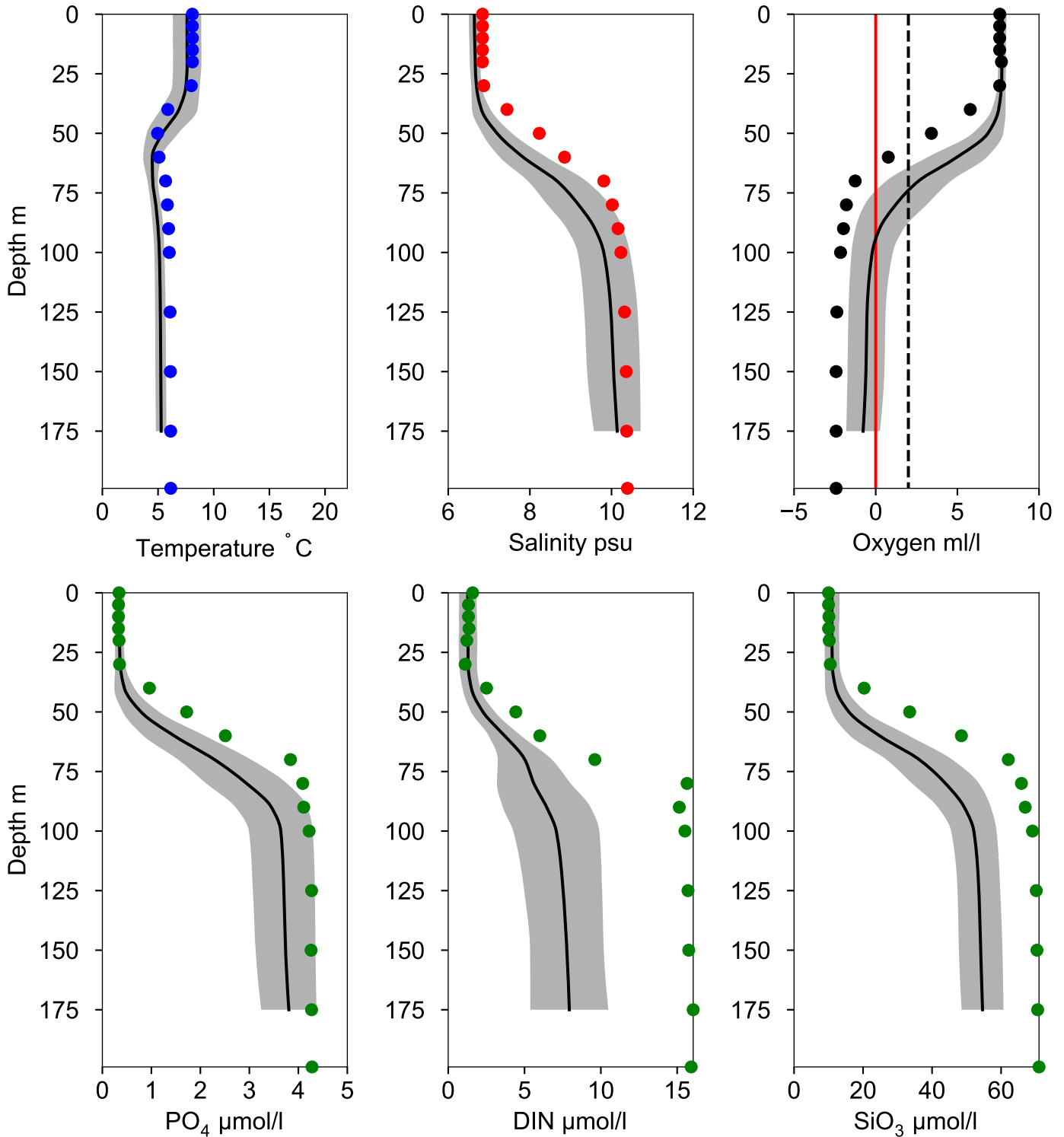


OXYGEN IN BOTTOM WATER (depth >= 175 m)



Vertical profiles BY32 NORRKÖPINGSDJ November

— Mean 1919-2020 St.Dev. ● 2023-11-16



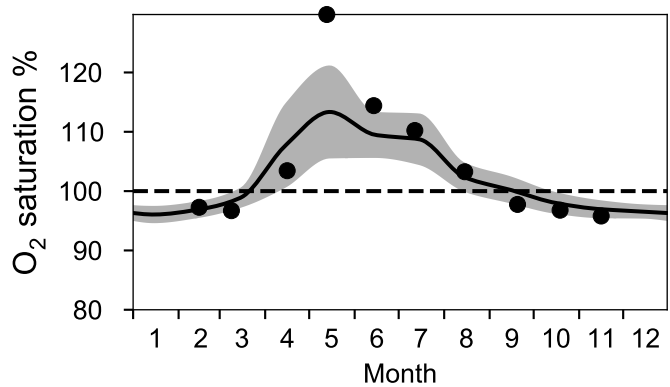
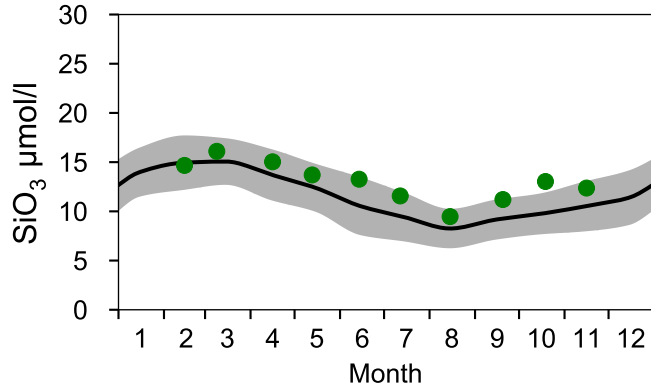
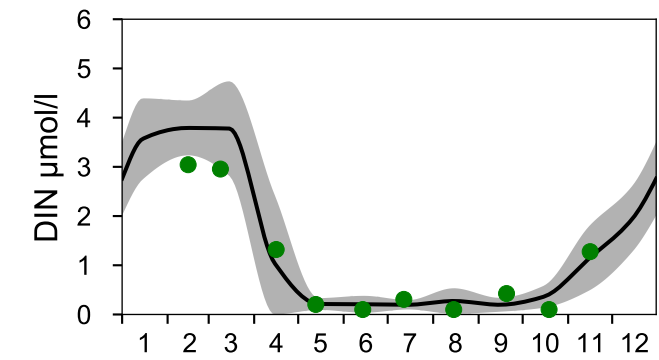
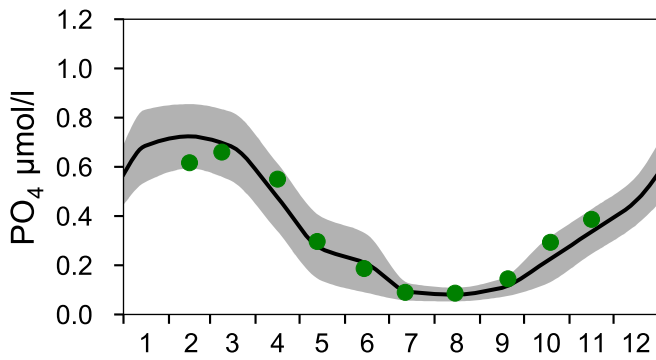
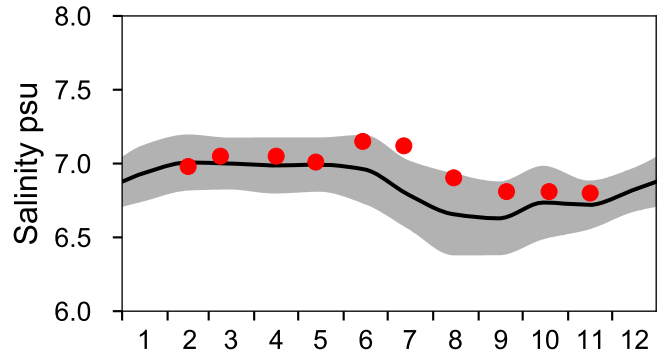
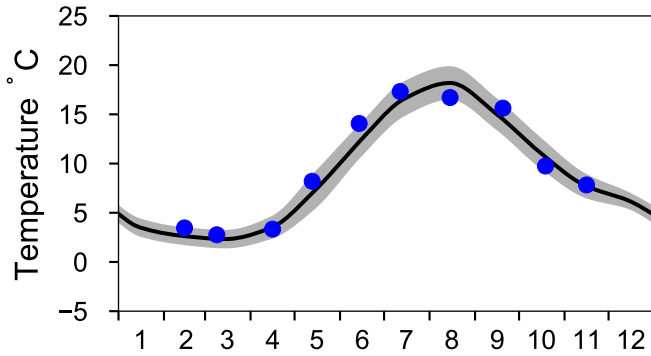
STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

Annual Cycles

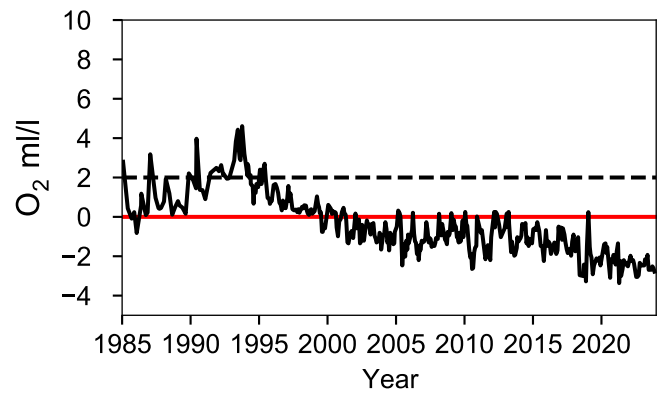
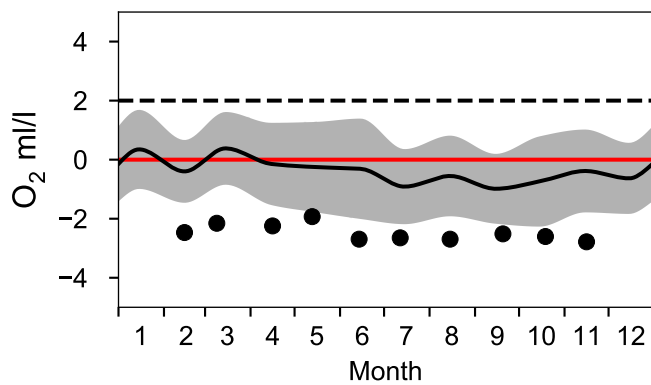
— Mean 1991-2020

■ St.Dev.

● 2023

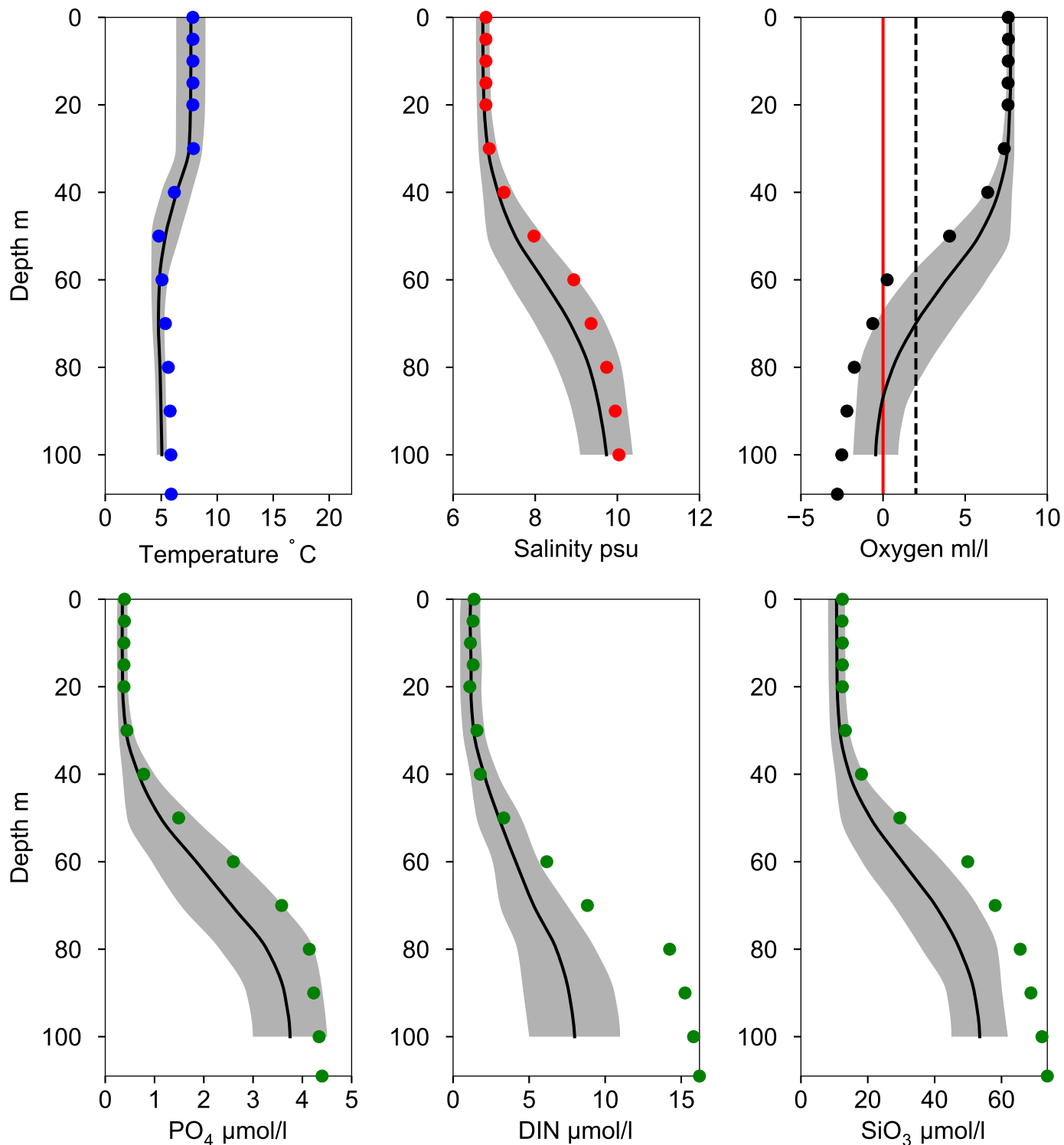


OXYGEN IN BOTTOM WATER (depth >= 100 m)



Vertical profiles BY38 KARLSÖDJ November

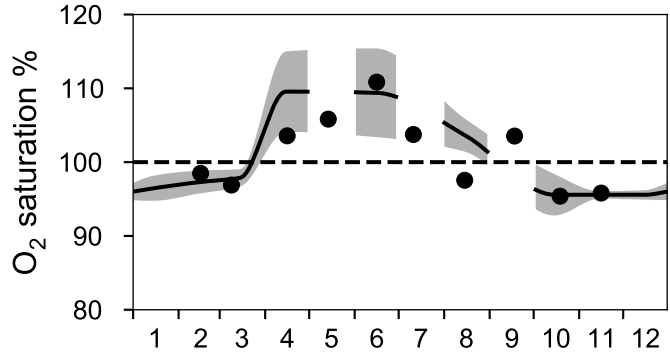
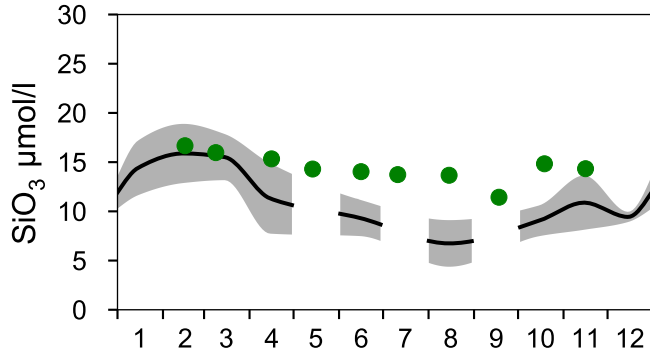
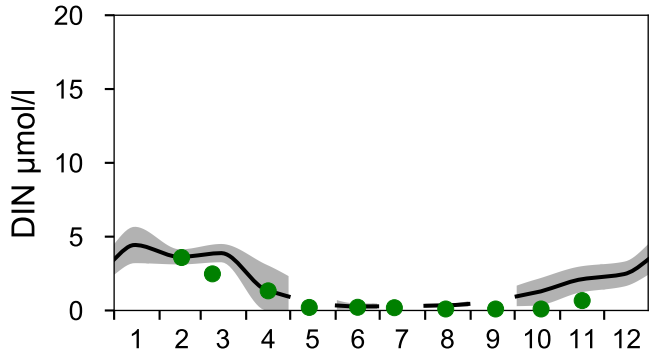
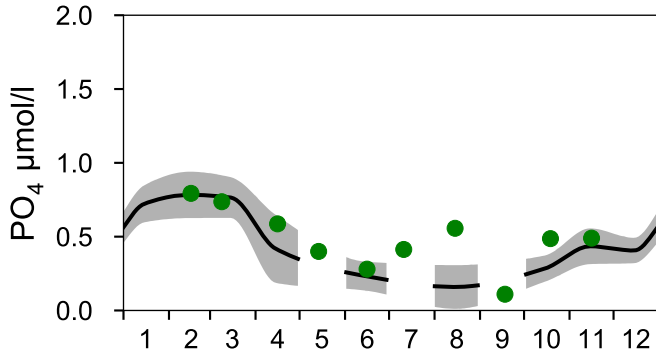
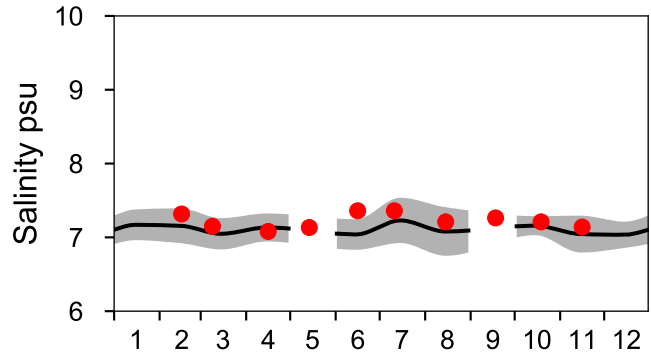
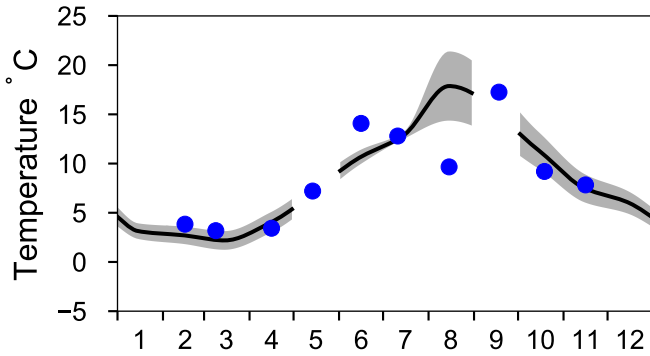
— Mean 1919-2020 ■ St.Dev. ● 2023-11-16



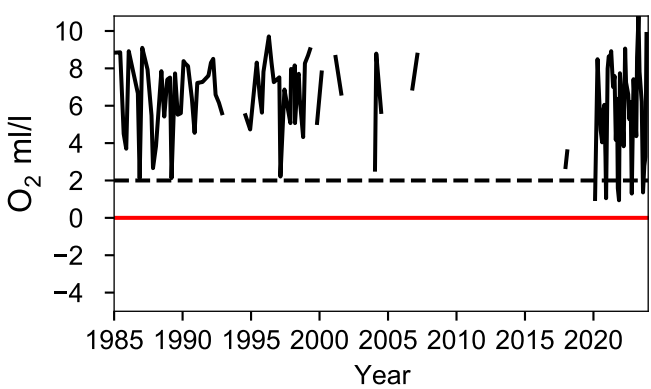
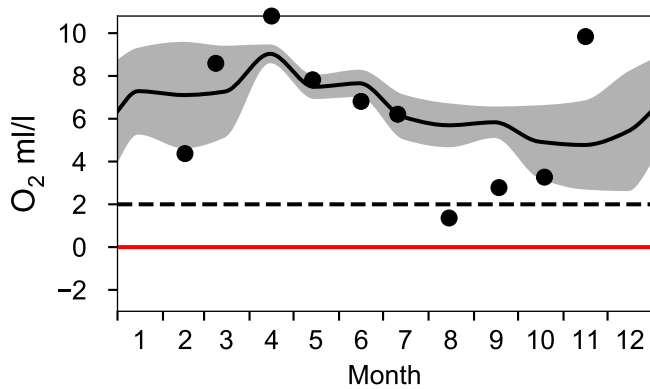
STATION BY39 ÖLANDS S UDDE SURFACE WATER (0-10 m)

Annual Cycles

— Mean 1991-2020 St.Dev. ● 2023



OXYGEN IN BOTTOM WATER (depth >= 40 m)



Vertical profiles BY39 ÖLANDS S UDDE November

