

Rapport från SMHIs utsjöexpedition med R/V Aranda



Expeditionens varaktighet: 2014-12-06 - 2014-12-14
Undersökningsområde: Skagerrak, Kattegatt, Öresund och egentliga Östersjön
Uppdragsgivare: SMHI samt Havs- och Vattenmyndigheten

SAMMANFATTNING

Under expeditionen, vilken ingick i det svenska havsövervakningsprogrammet, besöktes Skagerrak, Kattegatt, Öresund och egentliga Östersjön. Denna rapport är baserad på preliminära, endast delvis kvalitetskontrollerade data.

Temperaturen i ytvattnet låg fortsatt över det normala, dock ej lika markant som under novemberexpeditionen. Närsalterna i ytvattnet uppvisade för årstiden i stort sett normala värden, förutom silikat i egentliga Östersjön. I Bornholmsbassängen och Hanöbukten förekom akut syrebrist (<2 ml/l) från djup överstigande 70 meter. I östra Gotlandsbassängen förekom helt syrefria förhållanden från djup överstigande 125 meter (vid BY20 redan från 90 m) och akut syrebrist från 70 -80 meters djup. I västra Gotlandsbassängen är syresituationen fortfarande allvarlig då akut syrebrist redan förekom från djup överstigande 70 meter och svavelväte från 80-90 meters djup.

Nästa ordinarie expedition är planerad till vecka 2 i januari 2015.

PRELIMINÄRA RESULTAT

Expeditionen genomfördes ombord det finska forskningsfartyget Aranda och startade i Åbo den 6:e december och avslutades i Helsingfors den 14:e. Vindarna under expedition var i huvudsak friska till hårda mellan 15 och 20 m/s kring i huvudsak från sydväst. Lufttemperaturen varierade mellan 5-6°C.

Under expeditionen pågick ett inflöde till Östersjön. Genom Öresund strömmade ca 40 km³ in i Östersjön under det att expeditionen pågick.

Skagerrak

Temperaturen i ytlagret hade, från föregående mättillfälle med rekordhöga temperaturer, nu sjunkit till för årstiden normala värden ca 7°C. Dock förekom fortfarande ett stort temperaturöverskott på djup mellan 20 och 50 meter. På 30 meters djup uppmättes temperaturer på drygt 12°C, vilket är ca 3 grader högre än normalt. Salthalten i ytlagret var lägre än normalt, ca 25 psu. Vid stationen P2 i sydost var dock både temperatur och salthalt högre än normalt och vattnet homogent från ytan ned till ett djup på 70 meter. Salthalten låg här på 32.5 psu och temperaturen på 8.9°C.

Fosfat samt oorganiskt kväve (nitrit + nitrat) uppvisade halter typiska för årstiden medan koncentrationerna av silikat låg över det normala. Fosfathalterna låg på 0.45 µmol/l, nitrit + nitrat på ca 3.3 µmol/l, medan silikatkoncentrationerna låg i intervallet 6.5 – 7 µmol/l.

Fluorescensmätningar visade på viss planktonaktivitet, i ytlagret.

Det lägsta syrevärdet i bottenvattnet, 3.2 ml/l, uppmättes vid stationen Släggö, i Gullmarfjordens mynning, vilket dock är en höjning med ca 1 ml/l från föregående mättillfälle i november.

Kattegatt och Öresund

I detta område låg ytvattentemperaturen fortfarande över det normala, med värden kring 7°C mot normala 5. Termoklin och haloklin återfanns båda på djup mellan 15 och 20 meter. Salthalten i Kattegatts ytvatten var normal ca 23 psu, medan den i Öresund lågt högt över det normala, 22 psu. Halterna av fosfat och oorganiskt kväve uppvisade värden typiska för årstiden, medan silikatkoncentrationerna var högre än normalt. Fosfat låg kring 0.5 µmol/l, oorganiskt kväve ca. 3.5 µmol/l, medan silikathalterna låg i intervallet 7 – 10.6 µmol/l.

Fluorescensmätningar visade på viss planktonaktivitet, i ytlagret.

De lägsta syrehalterna i bottenvattnet uppmättes vid W Landskrona i Öresund, 4.36 ml/l.

Egentliga Östersjön

Vattentemperaturen i ytlagret låg fortfarande över det normala i hela området, varierande mellan 6.6 och 8.9°C. Salthalten i ytvattnet var normal i större delen av området, mellan 6.5 och 8.6 psu. I östra Gotlandsbassängen, vid BY15 var ytsalthalten fortsatt lägre än normalt ca 6.8 psu. Haloklinen återfanns på omkring 60 till 80 meters djup i norra, västra och östra Gotlandsbassängerna, medan den låg grundare i de södra delarna, på djup mellan 30 och 60 meter.

Närsalterna uppvisade i stort sett normala halter för årstiden i ytlagret, fosfathalterna låg i intervallet 0.44 – 0.56 µmol/l, medan halterna av oorganiskt kväve (nitrit + nitrat) varierade från 1.24 till 2.63 µmol/l. Silikat uppvisade något förhöjda halter i de norra och centrala delarna, medan koncentrationerna i de södra delarna var lägre än normalt. Halterna varierade mellan 6.3 och 14.6 µmol/l.

Fluorescensmätningar visade att planktonaktiviteten var låg i hela området.



Under expeditionen pågick ett inflöde till Östersjön. Mellan den 2:e och 15:e december strömmade det in totalt 40 km³ genom Öresund. Effekterna av detta inflöde syntes dock endast vid stationerna i Arkonabassängen där syrehalten i bottenvattnet var hög, 6-7 ml/l. Akut syrebrist förekom i Bornholmsbassängen och Hanöbukten från 70 meters djup.

I de centrala delarna av östra Gotlandsbassängen noterades akut syrebrist från 70 - 80 meters djup och svavelväte i djup överstigande 125 meter. Vid stationen BY20, i norra delen, förekom svavelväte redan på 90 meters djup. I västra Gotlandsbassängen var syresituationen allvarlig då akut syrebrist förekom från djup överstigande 70-80 meter och svavelväte från 80-90 meters djup.

DELTAGARE

Namn

Lars Andersson	Expeditionsledare
Örjan Bäck (Lysekil-Helsingfors)	
Daniel Bergman-Sjöstrand	
Martin Hansson (Åbo-Lysekil)	
Johan Håkansson	
Sari Sipilä	
Ilkka Lastumäki	

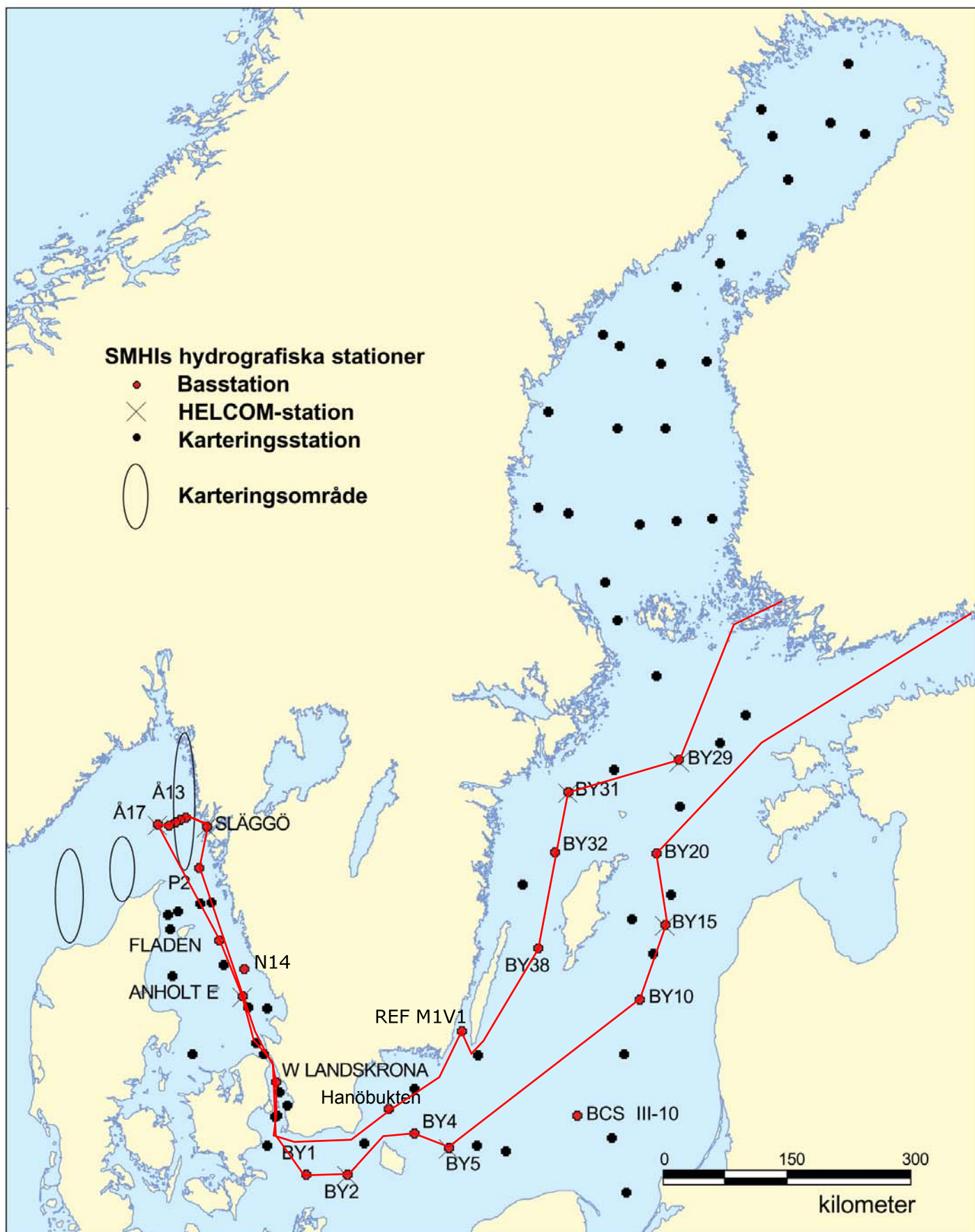
Från

SMHI
SMHI
SMHI
SMHI
SMHI
SMHI
SYKE

BILAGOR

- Färdkarta
- Tabell över stationer, antal parametrar och provtagningsdjup
- Karta över syrehalter i bottenvattnet
- Vertikalprofiler för basstationer
- Månadsmedelvärdesplottar för ytvatten

TRACKCHART
Country: Sweden
Ship: R/V ARANDA
Date: 20141206-201413
Series: 0772-0797



Date: 2014-12-13
Time: 16:57

Ser no	Stat code	P r o j	Station-----	Lat-----	Lon-----	Date yyyymmdd	Time hhmm utc	Bottom depth m	Secchi depth m	Wind di ve	Air temp C	Air pres hPa	WCSI elec aoae hd	C t	PPCPZZT Hrhhhoor Cilyooa motPBw PrP l	No de	T e a ml pi n	P o h y g	O x 2 P P	H o o N N	P t n N N	N t t N N	T A s k o	S h l i u	L i u o m	P l o 0 C	T 0 0 C C	C o m m		
0772	BPNX35BAS	BY29		N5853	E2019	20141206	1700	175		30 7	5.0	1012	9990	x	--x----	16	x x	- x	x x	x x	x x	x x	x -	x -	-	-	-	-	x	
0773	BPNX37BAS	BY31	LANDSORTSDJ	N5835	E1814	20141206	2340	445		25 8	4.4	1013	9990	x	--xx---	23	- x	x x	x x	x x	x x	x x	x x	x -	-	-	-	-	x	
0774	BPWX38BAS	BY32	NORRKÖPINGSDJ	N5801	E1759	20141207	0725	201		23 8	4.5	1012	9990	x	-xx----	17	x x	- x	x x	x x	x x	x x	x x	-	-	-	-	-	x	
0775	BPWX45BAS	BY38	KARLSÖDJ	N5707	E1740	20141207	1500	110		22 15	6.6	1010	2740	x	--x----	14	x x	- x	x x	x x	x x	x x	- x	x -	-	-	-	-	x	
0776	BPWX00EXT	4.5 NO ÖLANDS SÖDRA		N5610.06	E1638.64	20141207	2140	59		21 17	6.1	1008	9990	-	-----	1	x x	- x	-	-	-	-	-	-	-	-	-	-	x	
0777	BPWK01BAS	REF M1V1		N5622.25	E1612.1	20141207	2320	20		21 10	5.2	1005	9990	x	-xxx---	5	x x	x x	- x	x x	x x	x x	x x	-	-	-	-	-	x	
0778	BPSH05BAS	HANÖBUKTEN		N5537	E1452	20141208	0700	79	8	26 10	6.2	1007	2830	x	--x----	11	x x	- x	- x	x x	x x	x x	- x	-	-	-	-	-	-	
0779	SOCX39BAS	W LANDSKRONA		N5552.0	E1245.0	20141208	1725	51		23 8	5.0	1010	9990	x	--x----	9	- x	- x	- x	x x	x x	x x	- x	-	-	-	-	-	x	
0780	KAEX29BAS	ANHOLT E		N5640.0	E1207.0	20141208	2355	62		25 7	5.3	1013	9990	x	-xxx---	10	x x	x x	- x	x x	x x	x x	x x	x -	-	-	-	-	x	
0781	KANX25BAS	FLADEN		N5711.5	E1140	20141209	0410	85		24 9	5.7	1014	9990	x	--x----	12	x x	- x	- x	x x	x x	x x	- x	-	-	-	-	-	-	
0782	SKEX00EXT	SKAGERAK E		N5801.65	E1050.25	20141209	0850	206	12	25 5	6.3	1016	1130	x	-----	14	-	-	-	-	-	-	-	-	-	-	-	-	x	
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0788	FIBG27BAS	SLÄGGÖ		N5815.5	E1126.0	20141209	1907	74		21 15	6.2	1012	9990	x	-xxx---	9	x x	- x	- x	x x	x x	x x	- x	-	-	-	-	-	-	x
0789	SKEX23BAS	P2		N5752	E1118	201412																								

Bottom water oxygen concentration (ml/l)

Country: Finland

Ship : Aranda

Date : 20141206-20141212

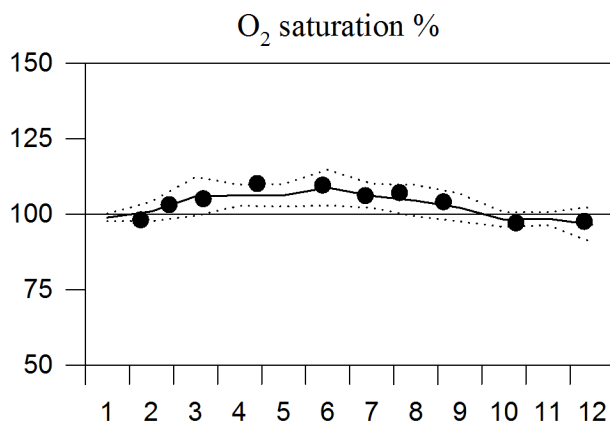
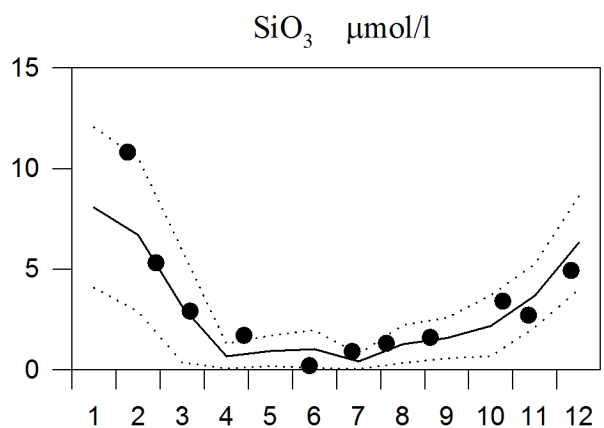
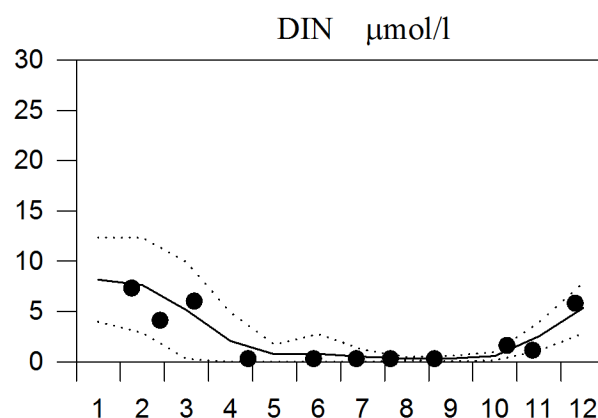
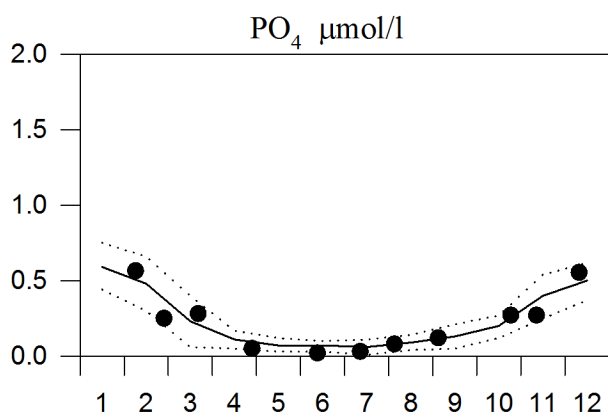
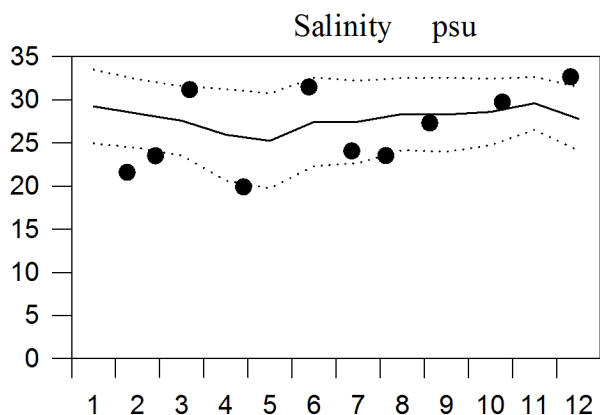
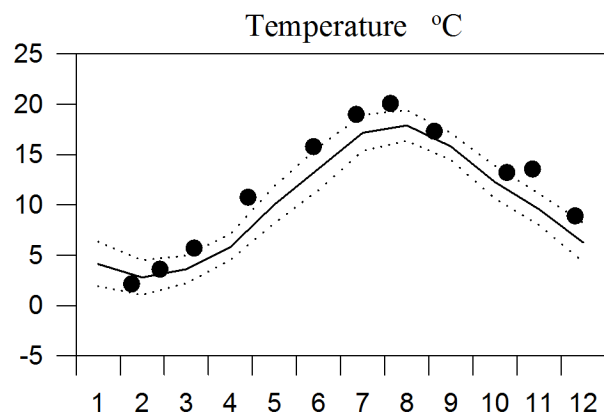
Series : 0772-0797



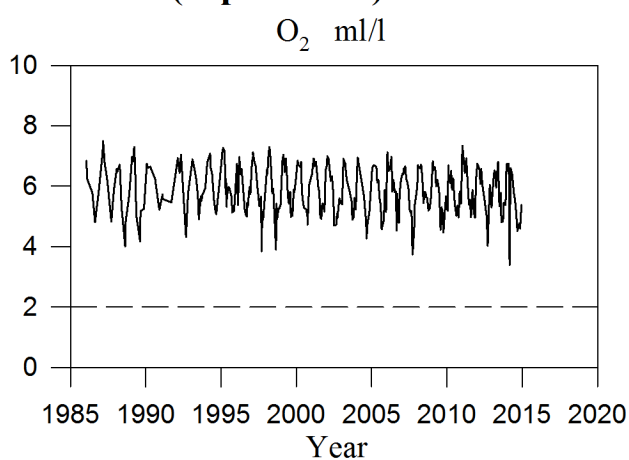
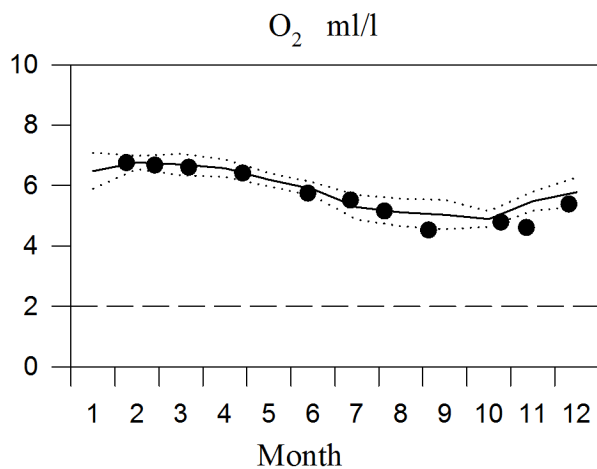
STATION P2 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

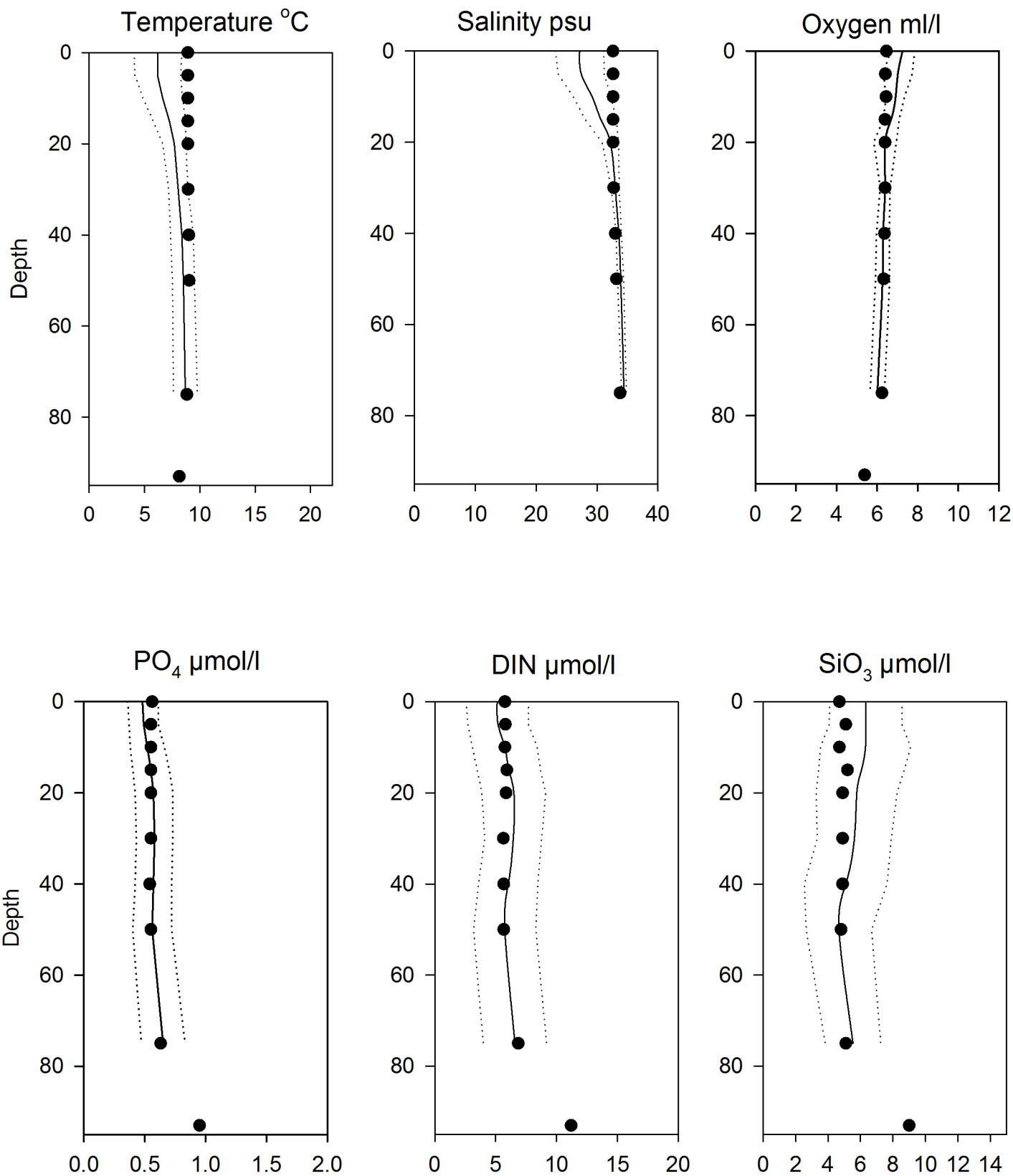


OXYGEN IN BOTTOM WATER (depth >75m)



Vertical profiles P2 December

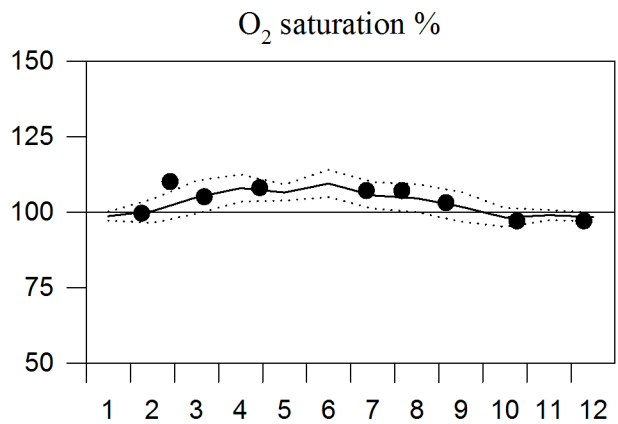
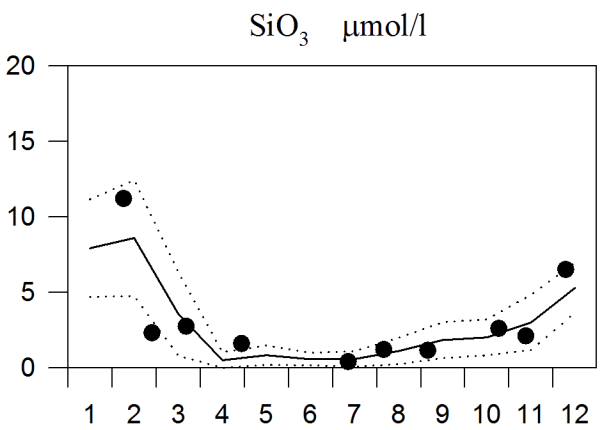
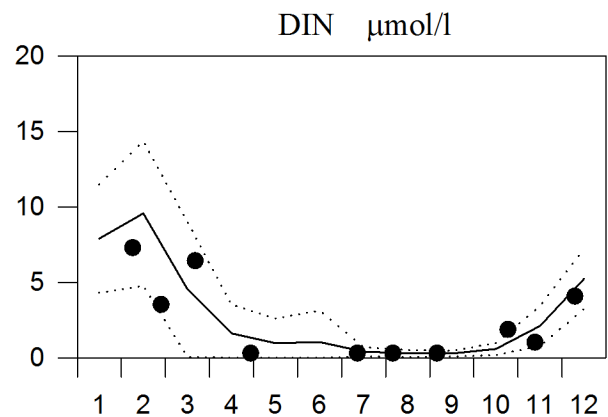
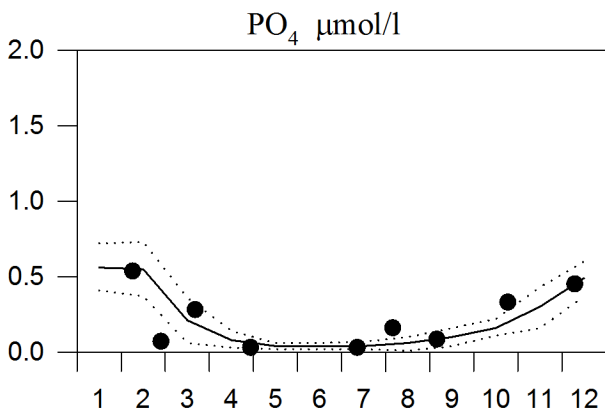
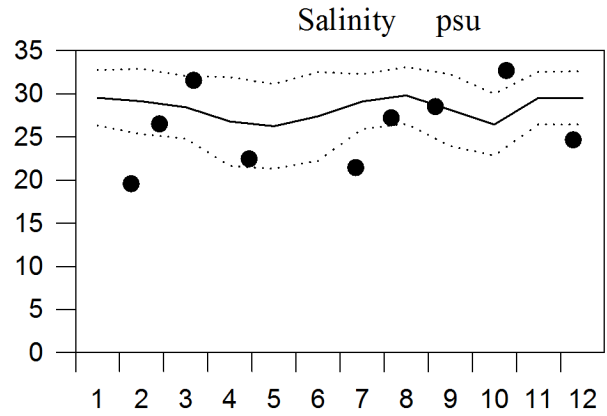
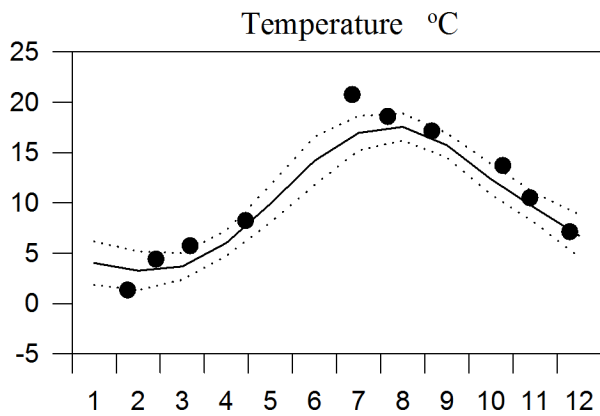
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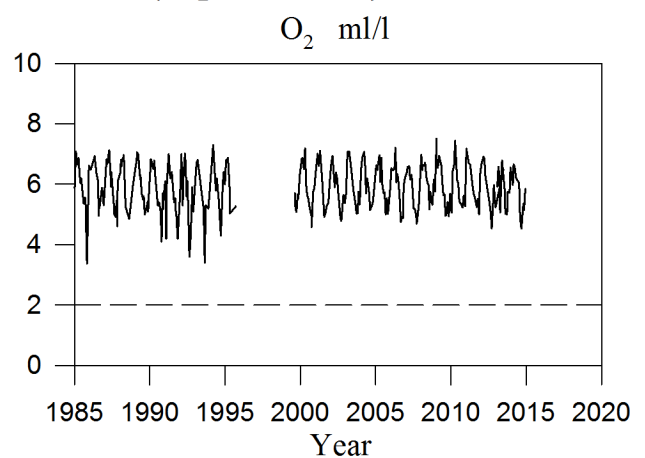
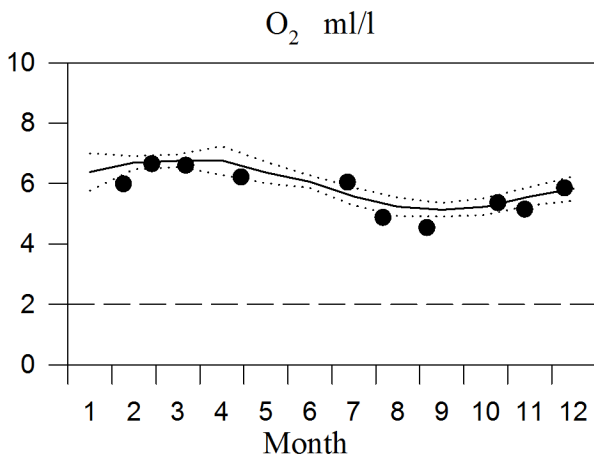
STATION Å13 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



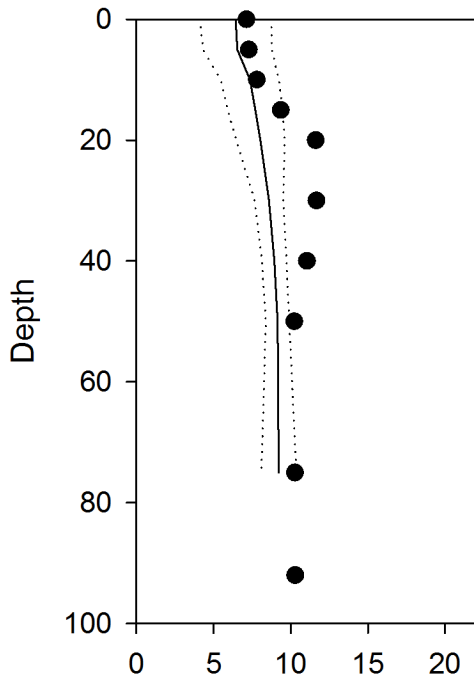
OXYGEN IN BOTTOM WATER (depth >=75m)



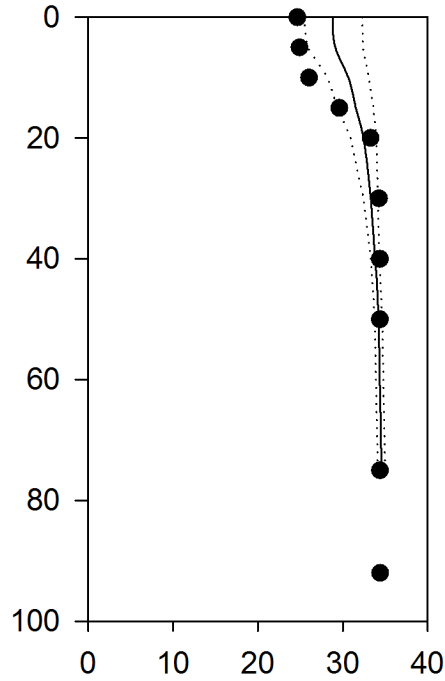
Vertical profiles Å13 December

— Mean 1996-2010 St.Dev. ● 2014

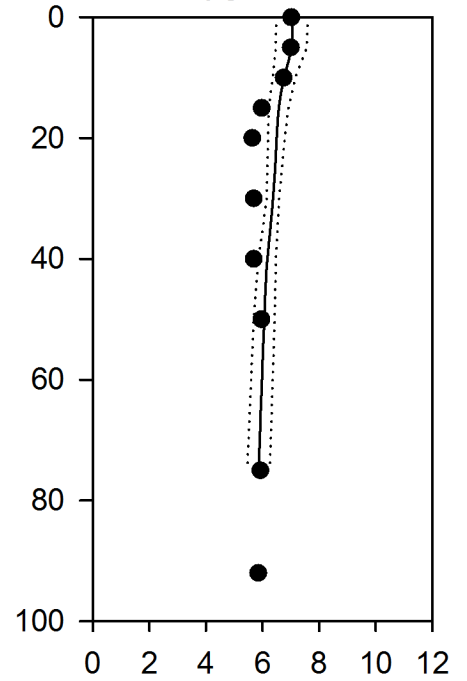
Temperature °C



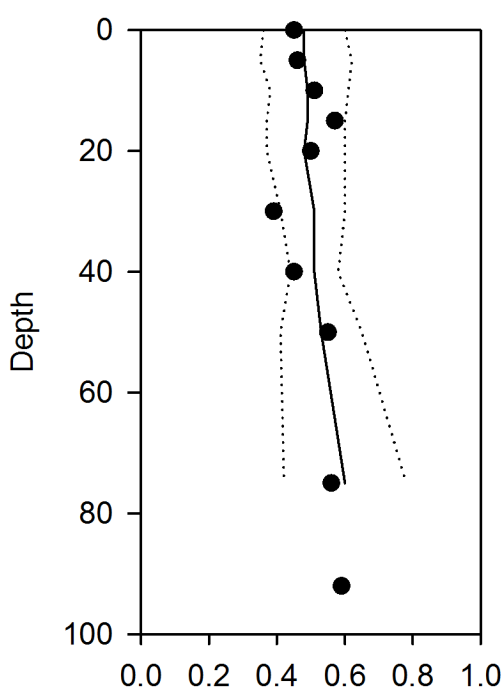
Salinity psu



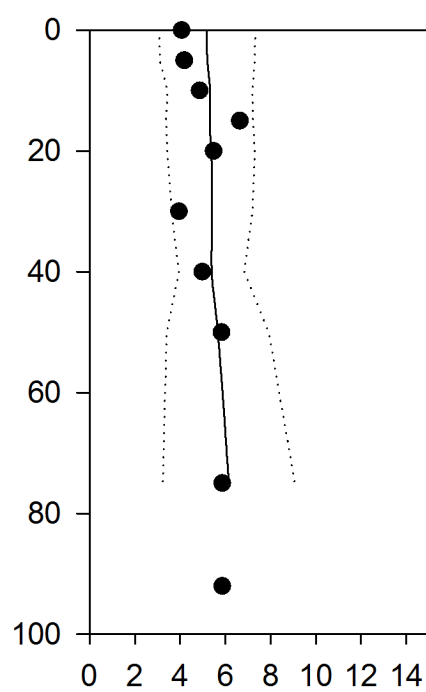
Oxygen ml/l



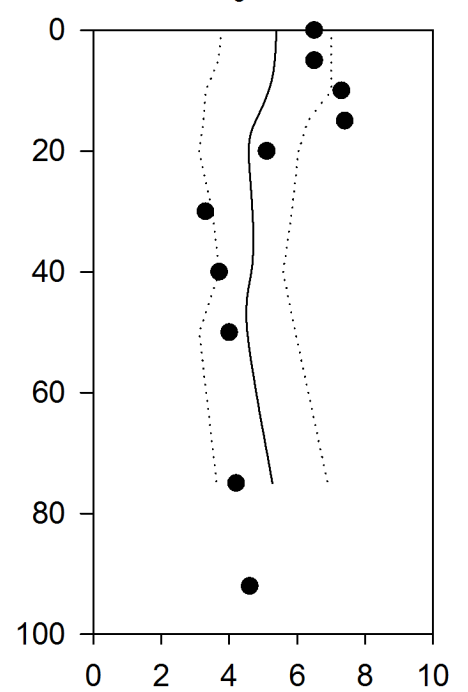
PO₄ µmol/l



DIN µmol/l



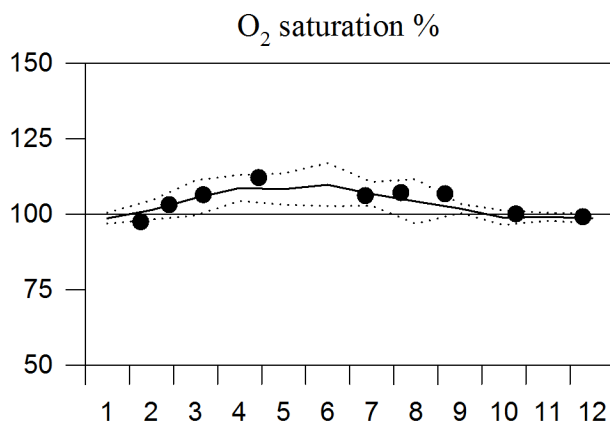
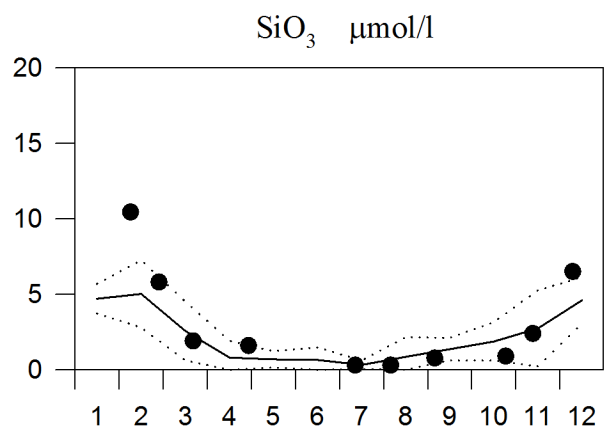
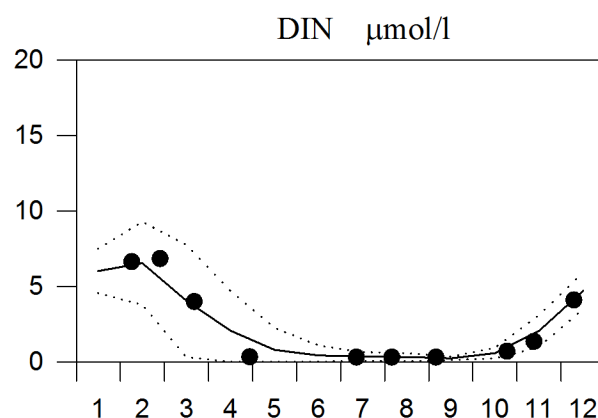
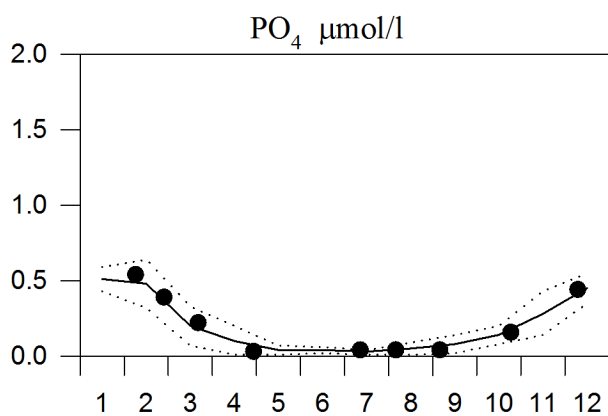
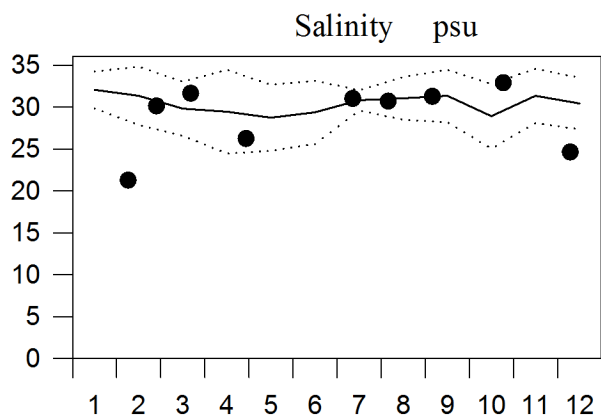
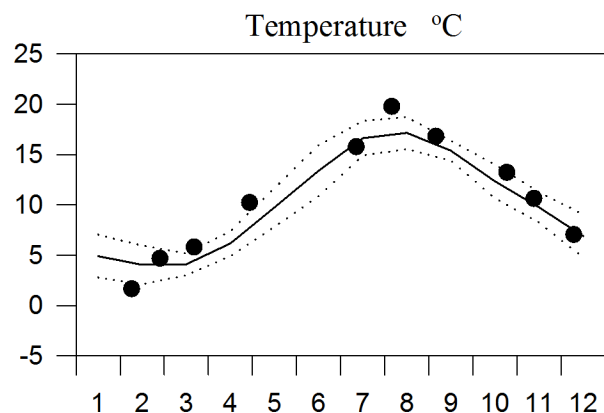
SiO₃ µmol/l



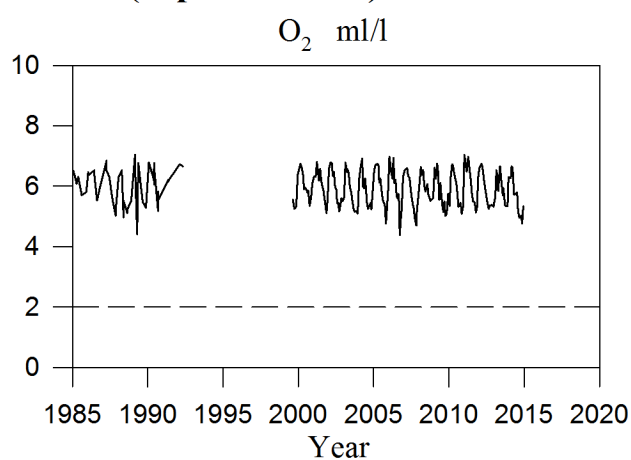
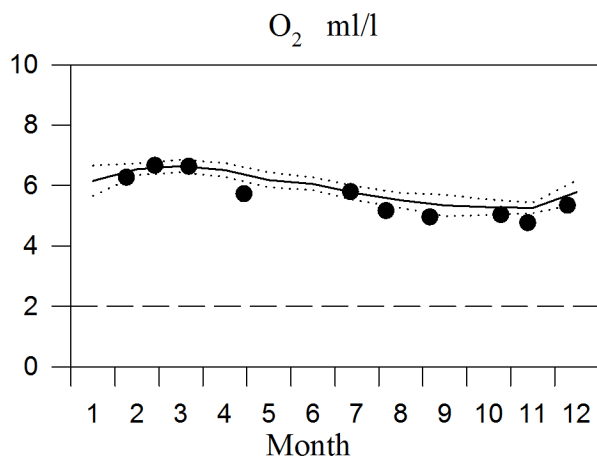
STATION Å15 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



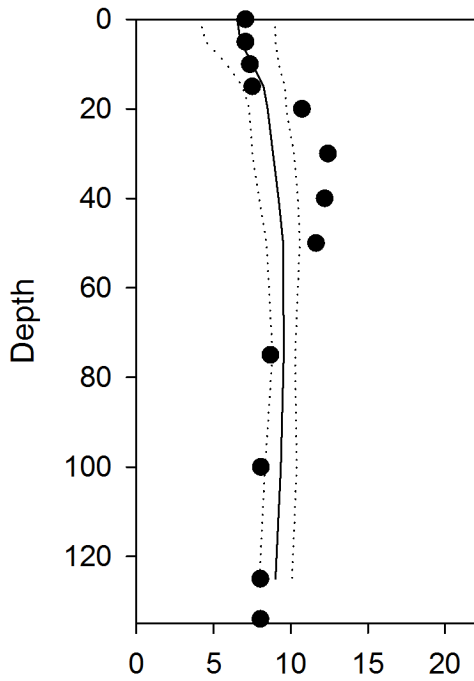
OXYGEN IN BOTTOM WATER (depth >=125m)



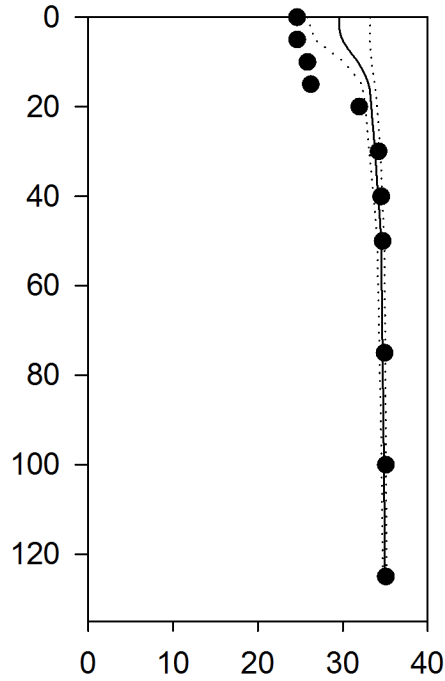
Vertical profiles Å15 December

— Mean 1996-2010 St.Dev. ● 2014

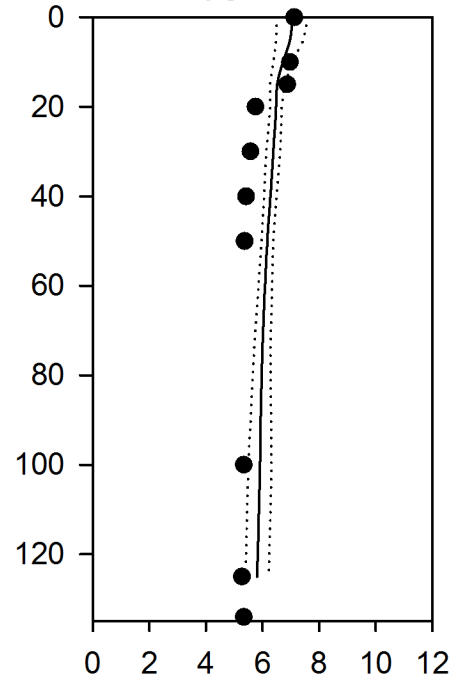
Temperature °C



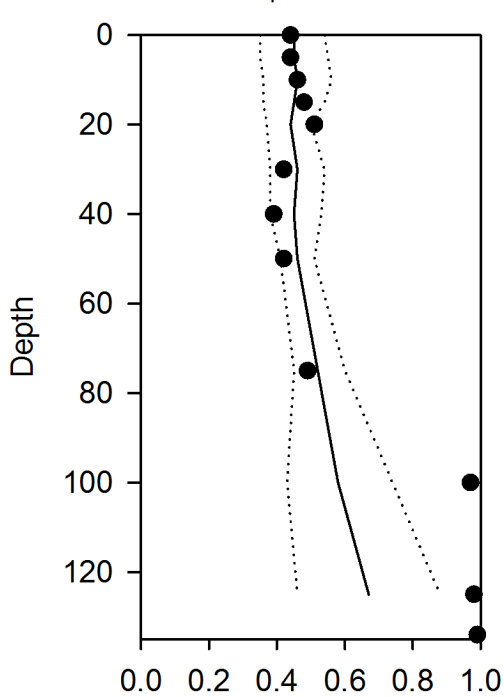
Salinity psu



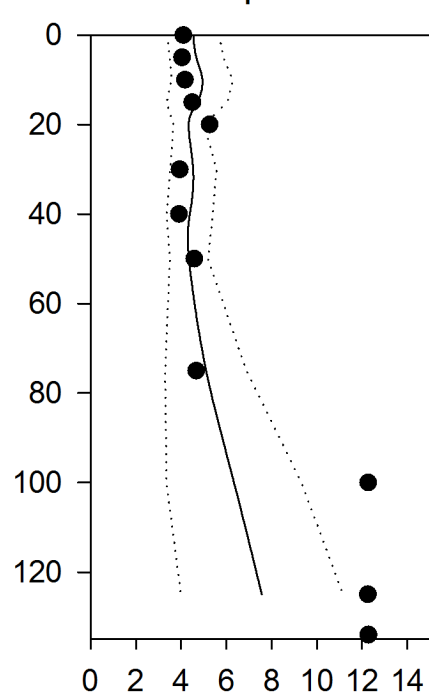
Oxygen ml/l



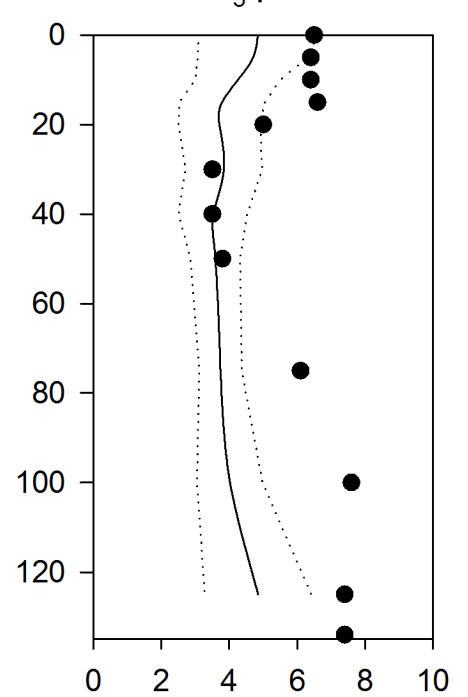
PO₄ μmol/l



DIN μmol/l



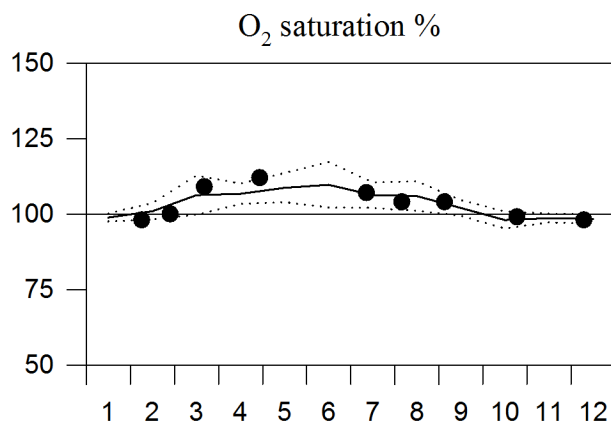
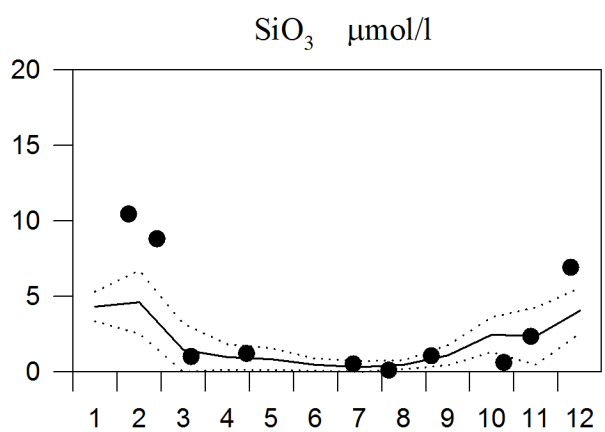
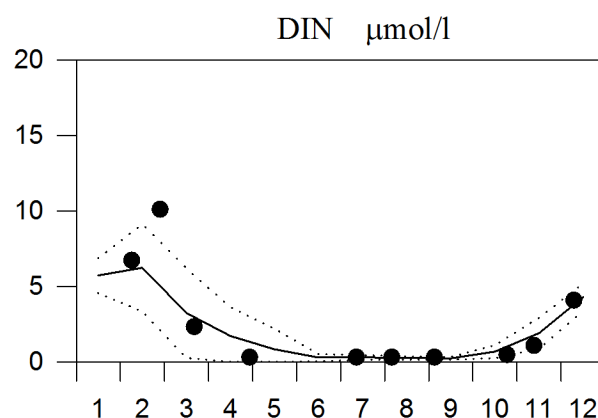
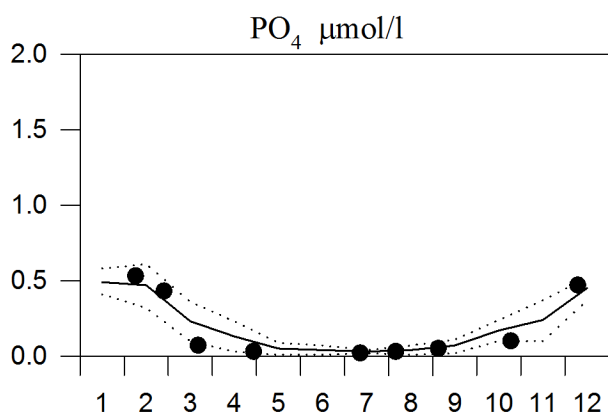
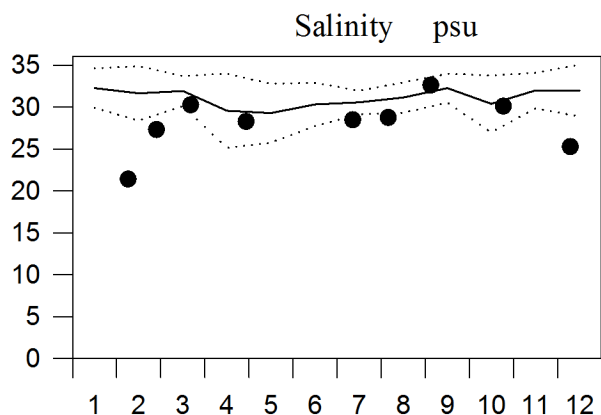
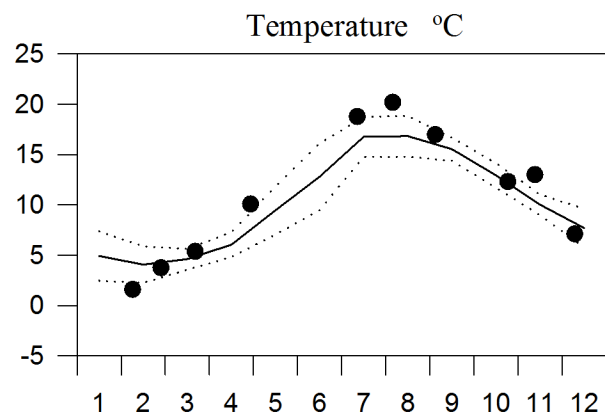
SiO₃ μmol/l



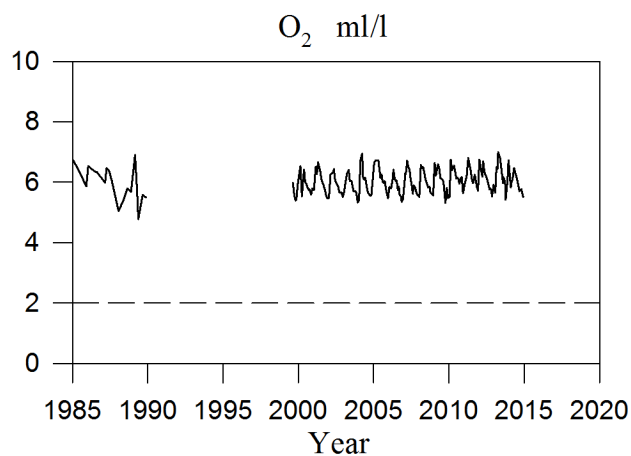
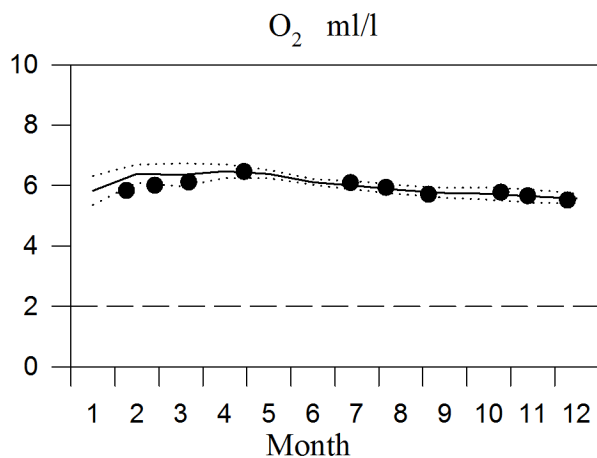
STATION Å17 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



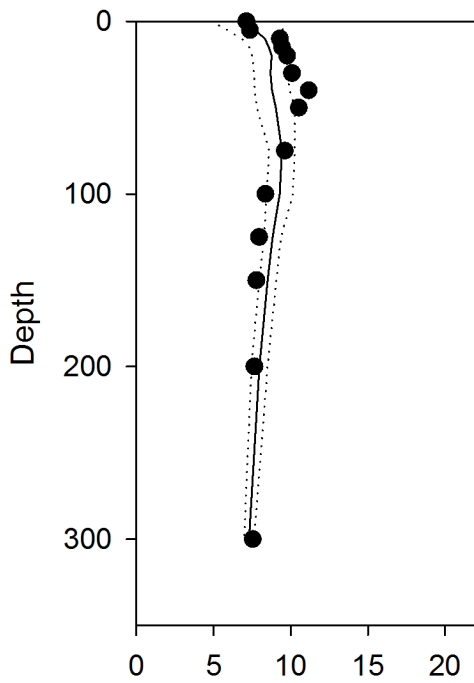
OXYGEN IN BOTTOM WATER (depth = 300m)



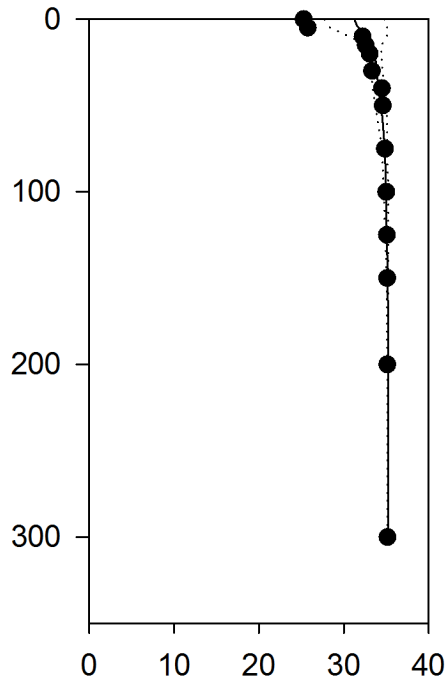
Vertical profiles Å17 December

— Mean 1996-2010 St.Dev. ● 2014

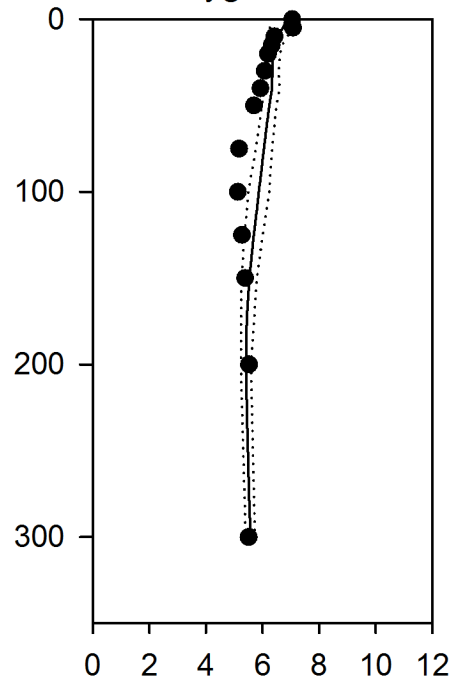
Temperature °C



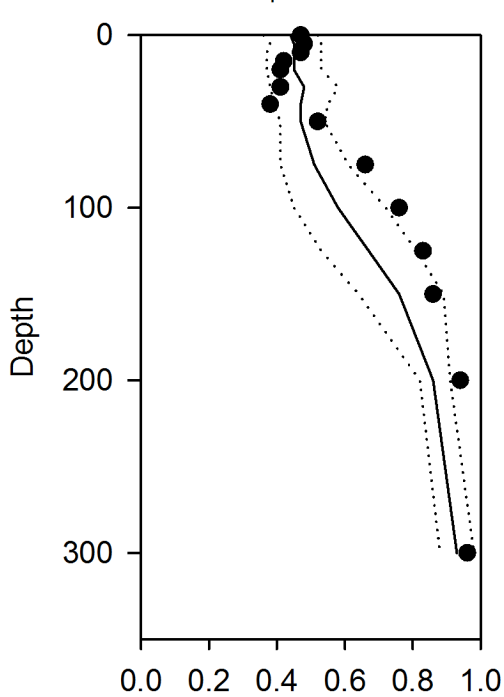
Salinity psu



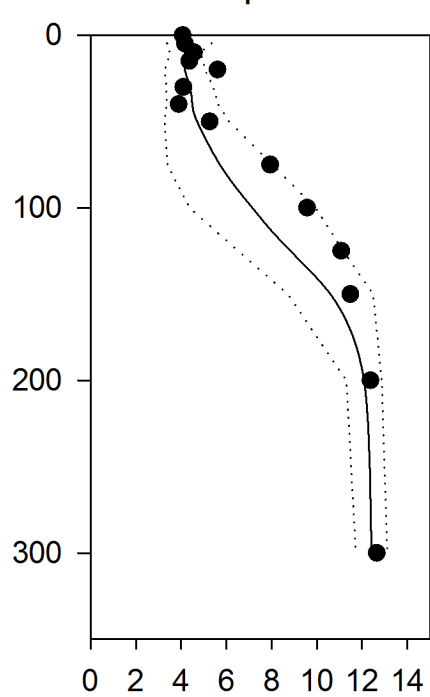
Oxygen ml/l



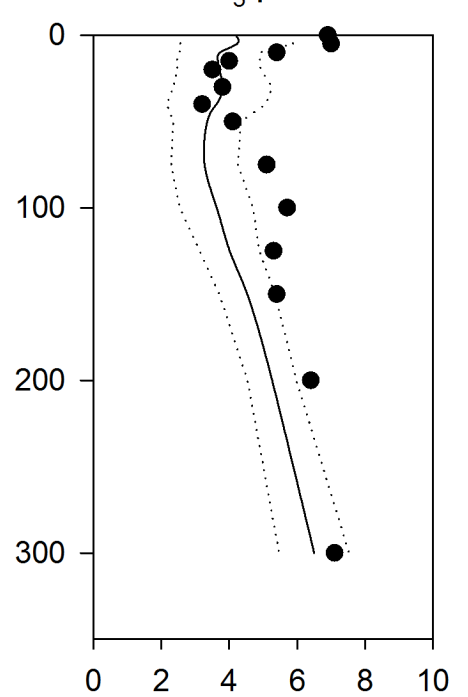
PO₄ µmol/l



DIN µmol/l



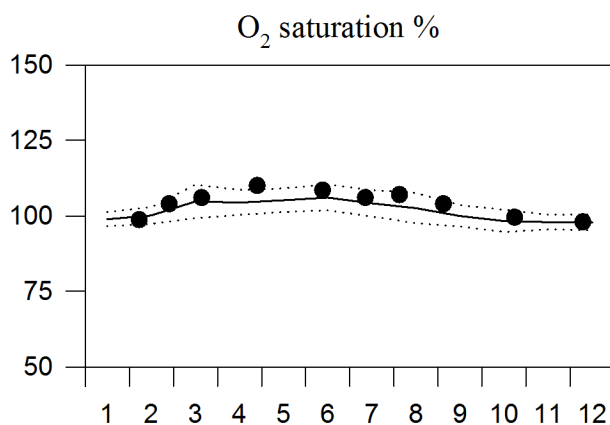
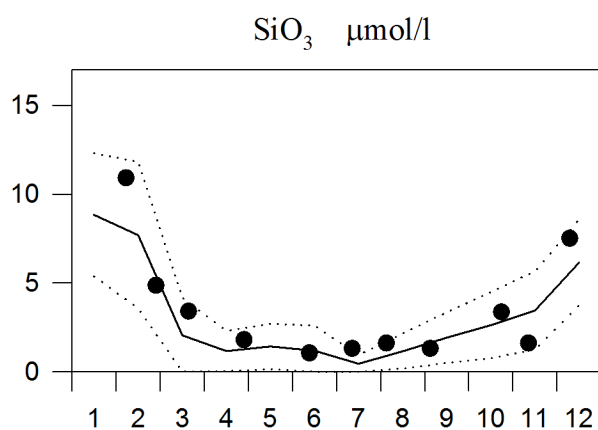
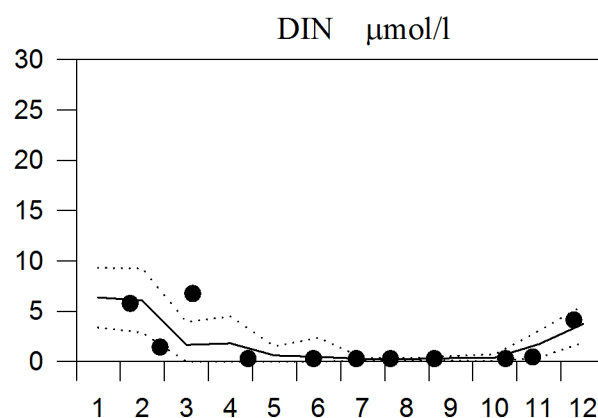
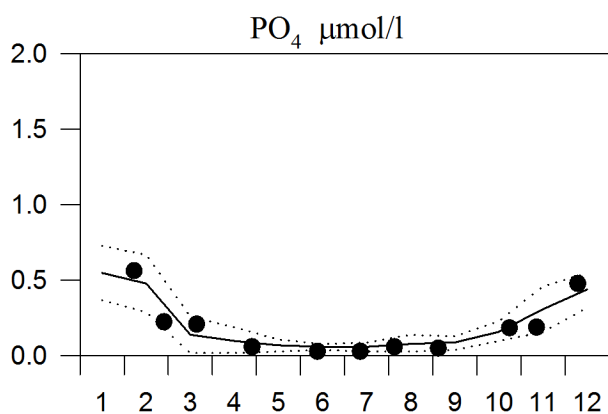
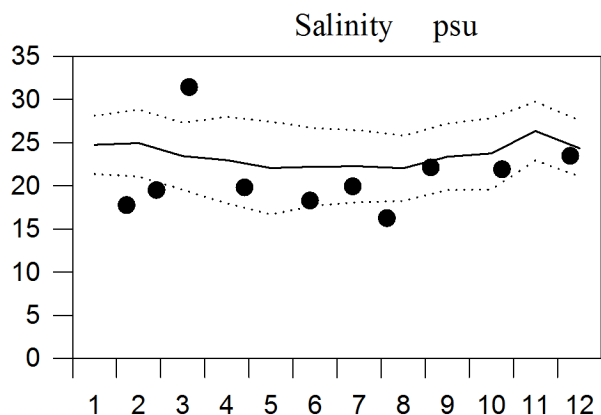
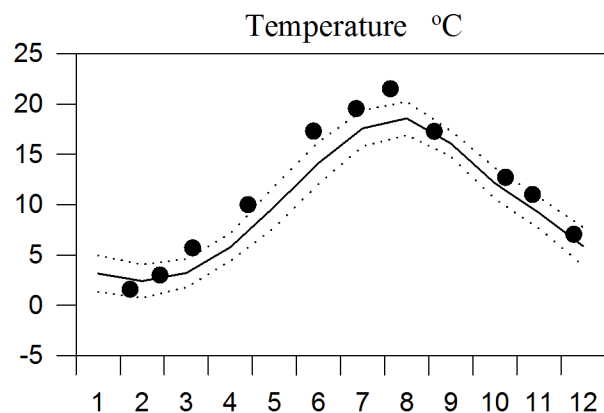
SiO₃ µmol/l



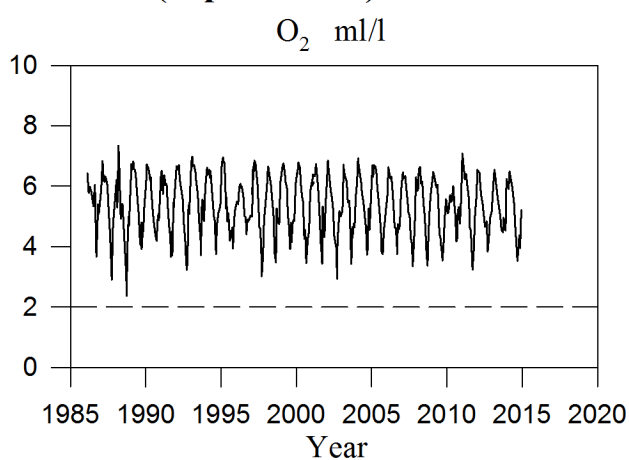
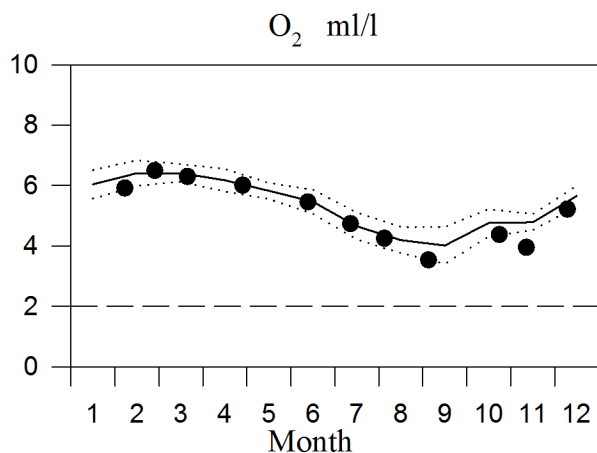
STATION FLADEN SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

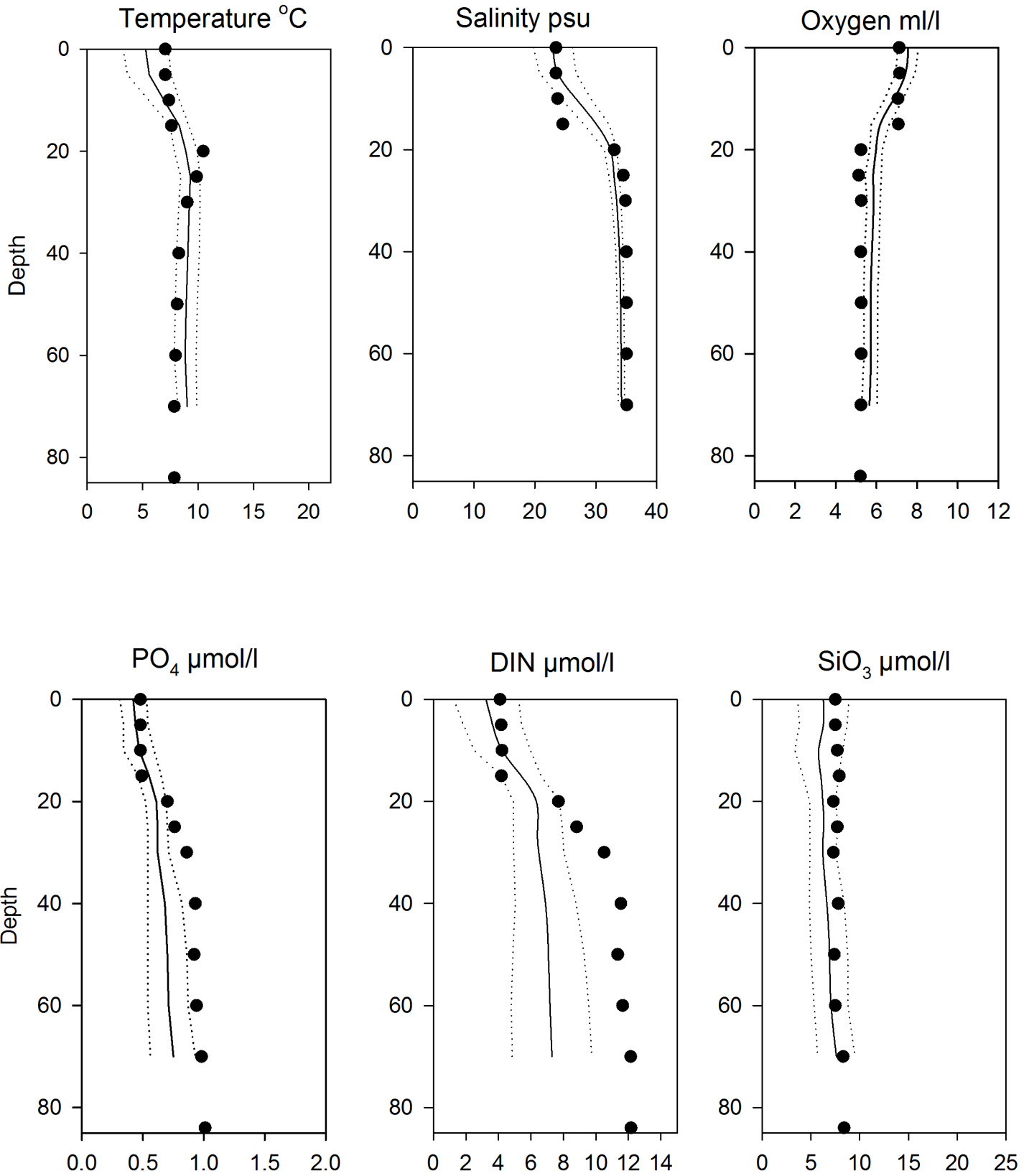


OXYGEN IN BOTTOM WATER (depth > 70m)



Vertical profiles Fladen December

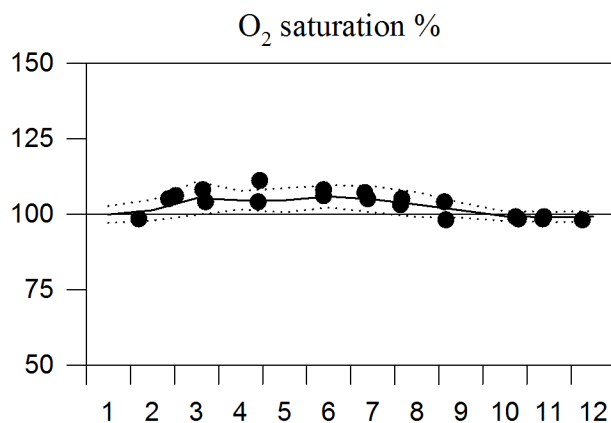
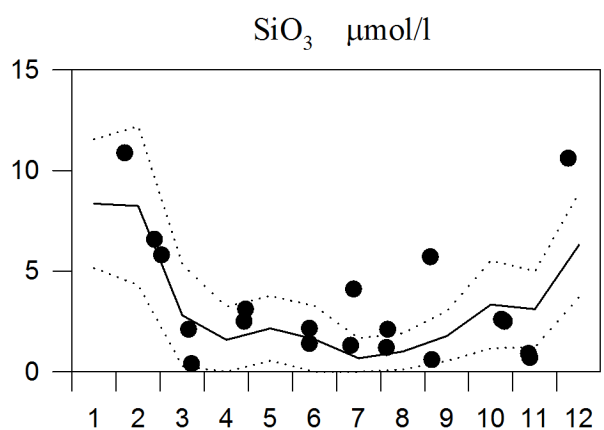
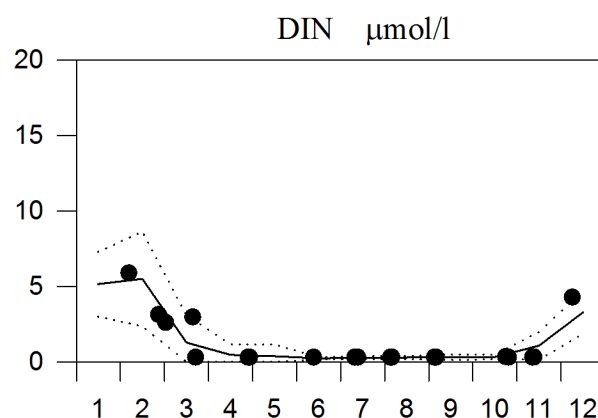
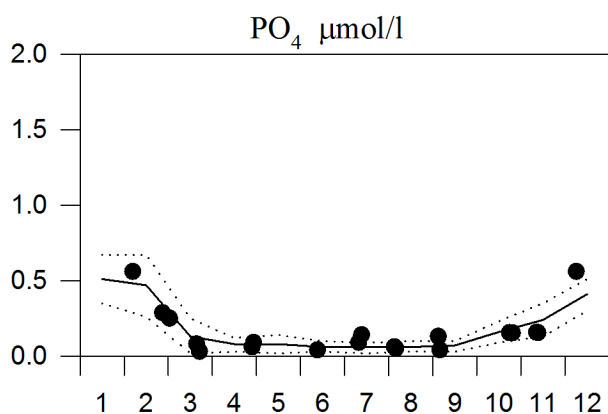
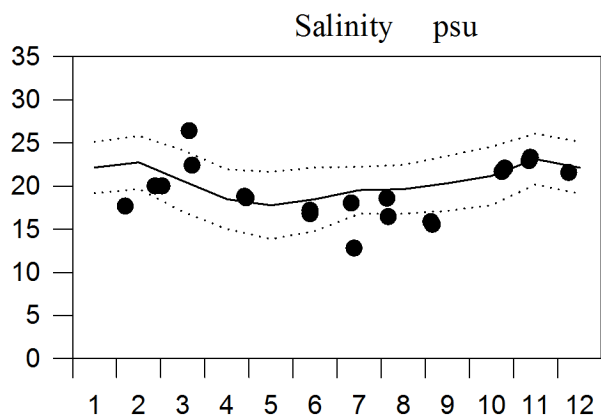
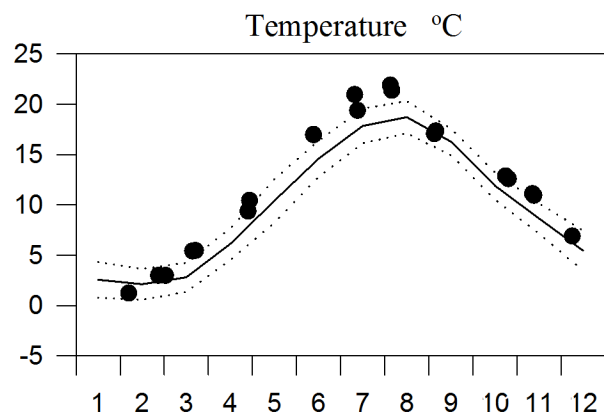
— Mean 1996-2010 St.Dev. ● 2014



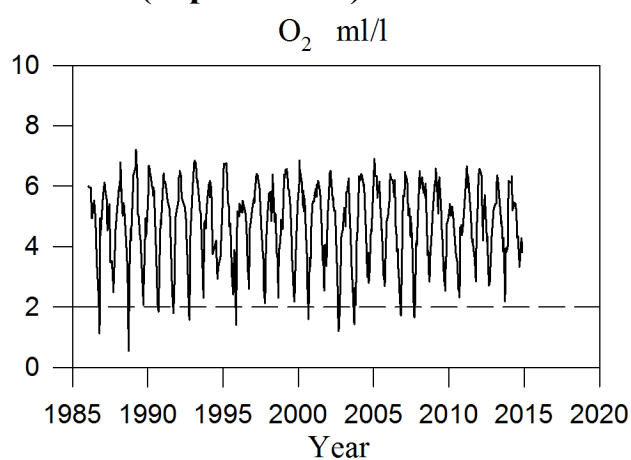
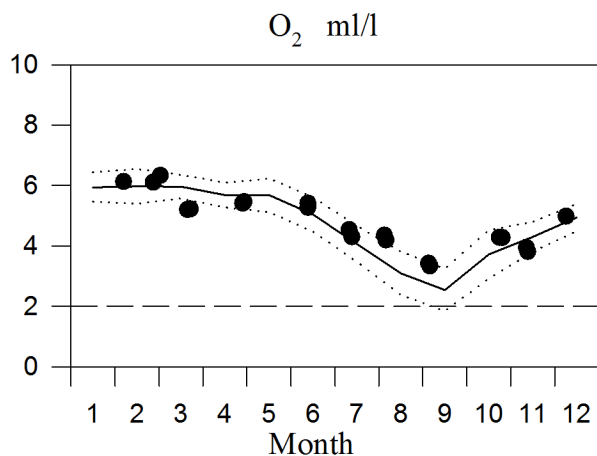
STATION ANHOLT E SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

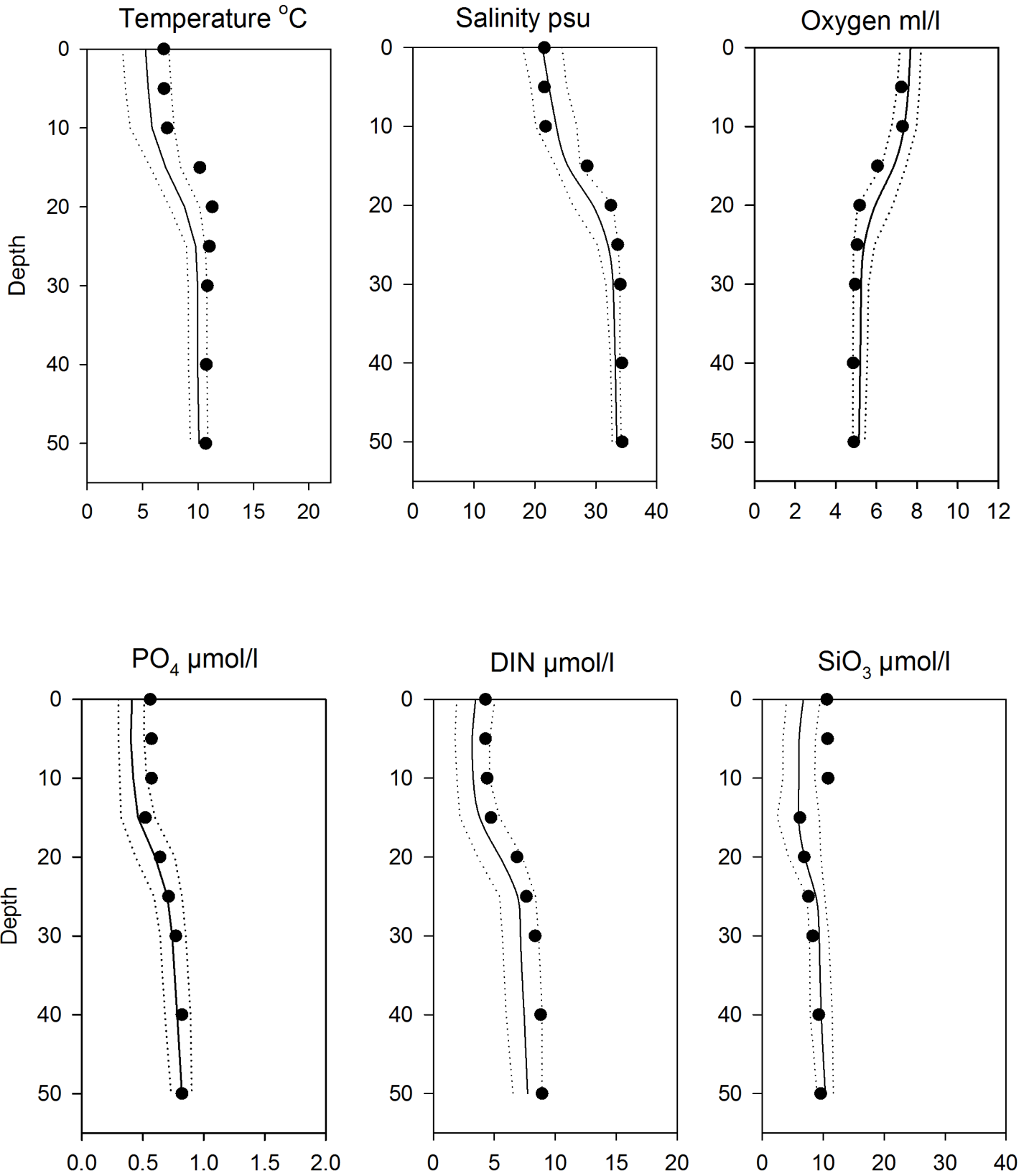


OXYGEN IN BOTTOM WATER (depth > 50m)



Vertical profiles Anholt E December

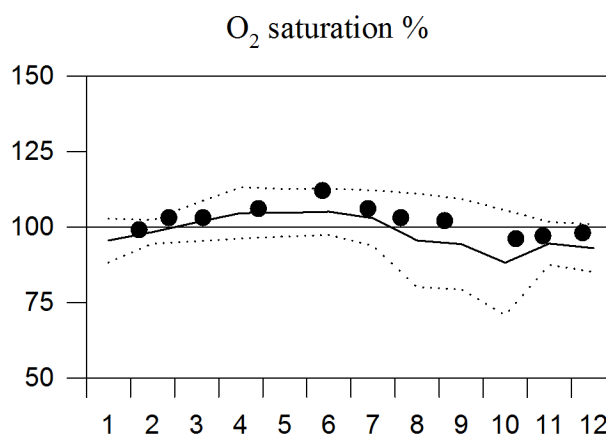
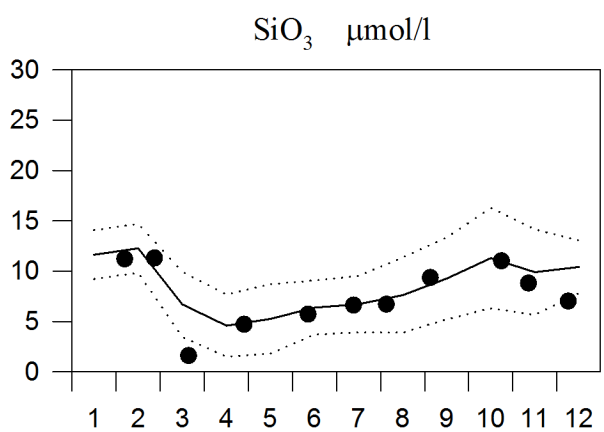
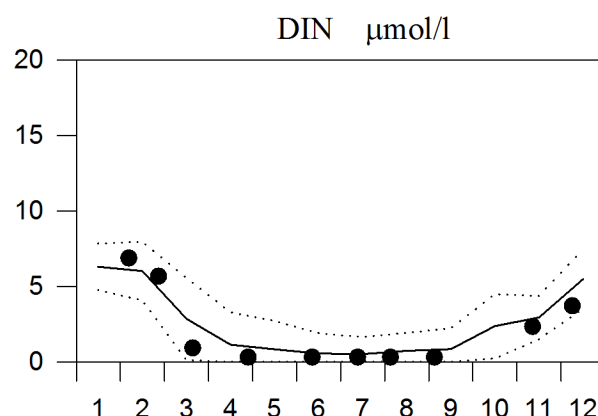
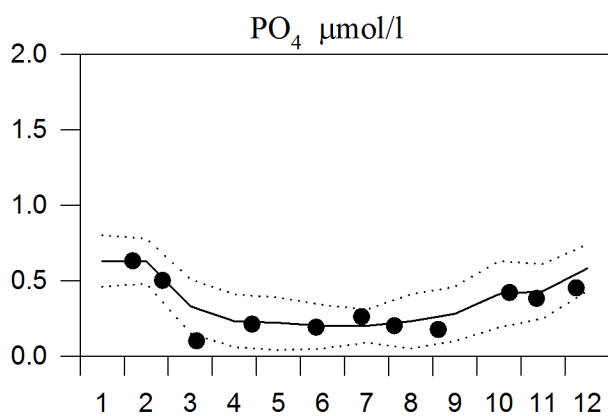
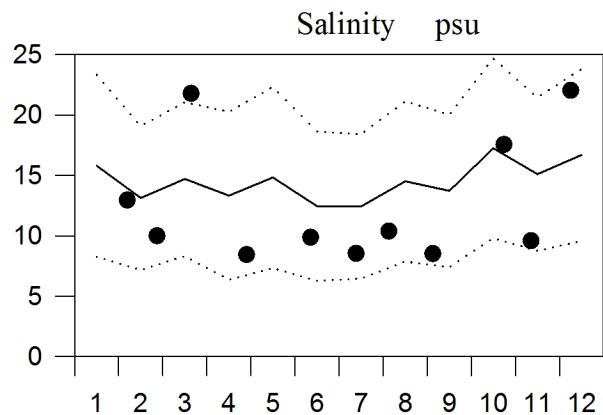
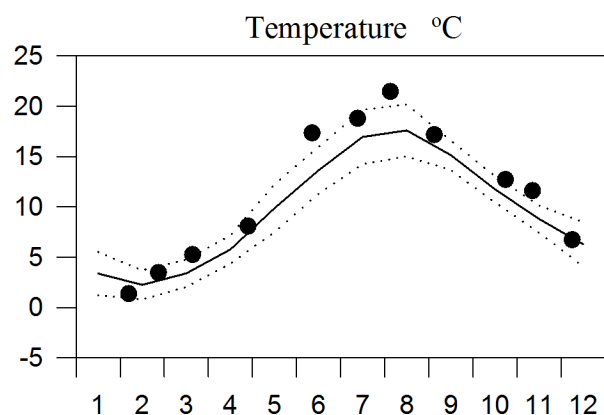
— Mean 1996-2010 St.Dev. ● 2014



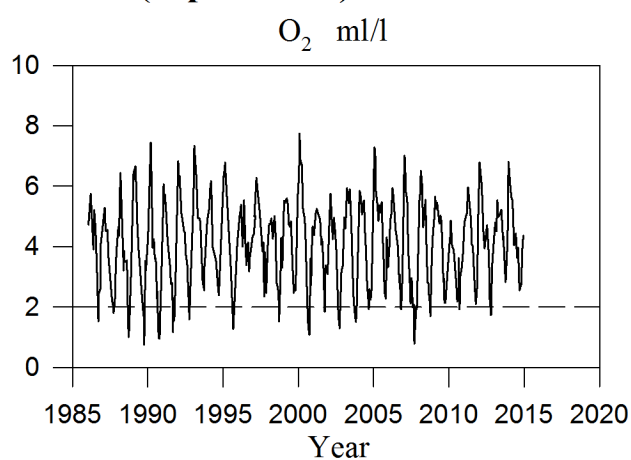
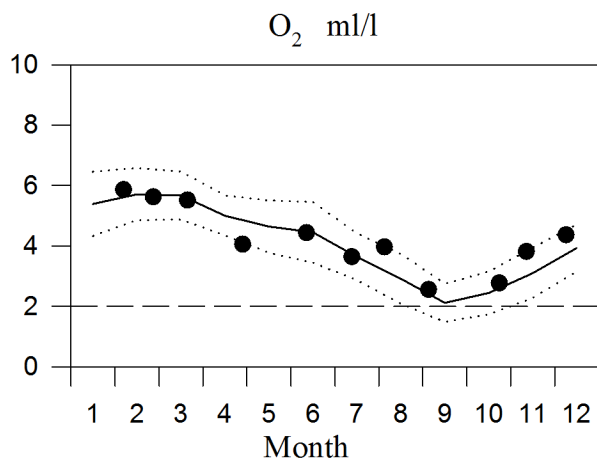
STATION W LANDSKRONA SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

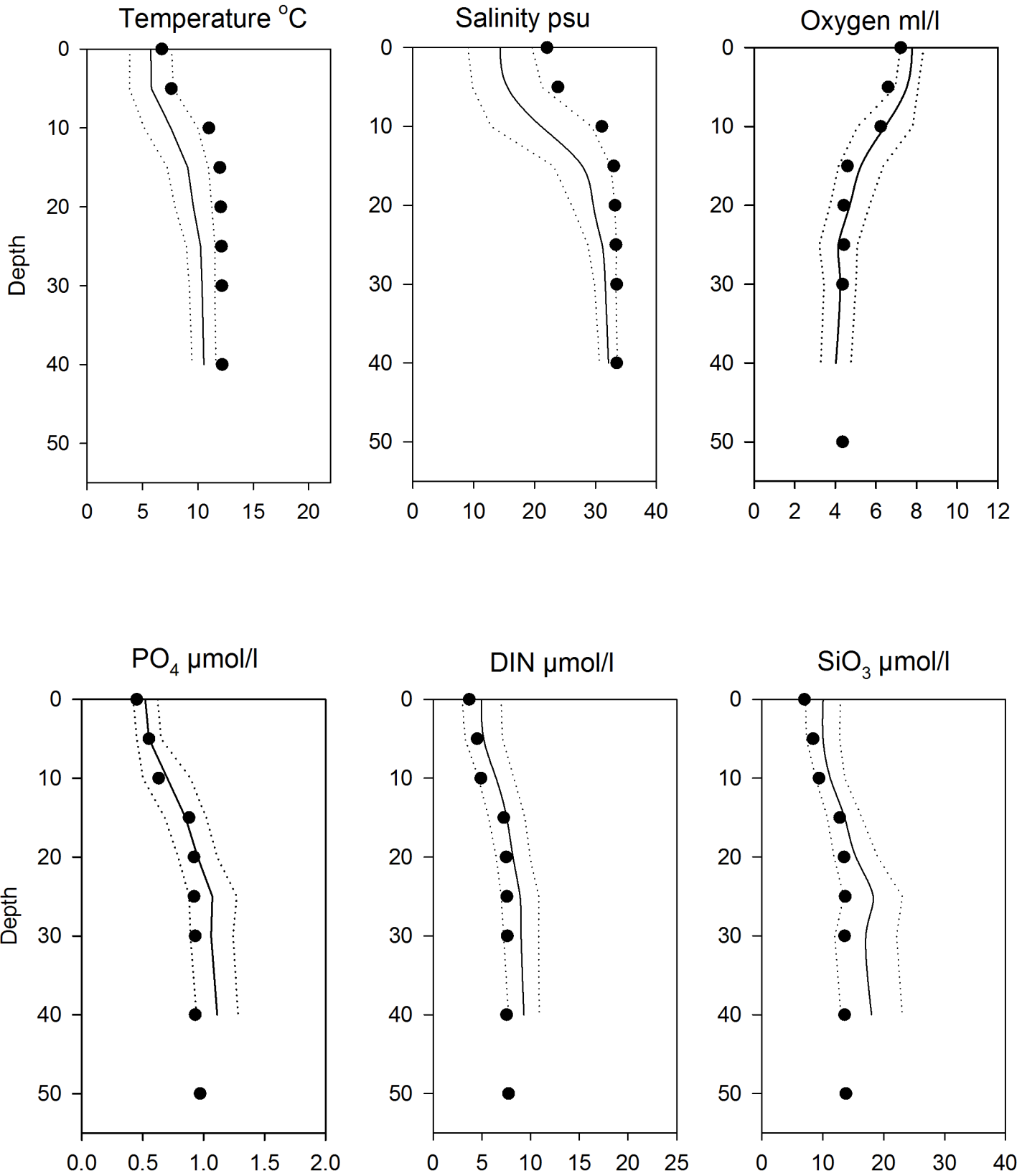


OXYGEN IN BOTTOM WATER (depth >40m)



Vertical profiles W Landskrona December

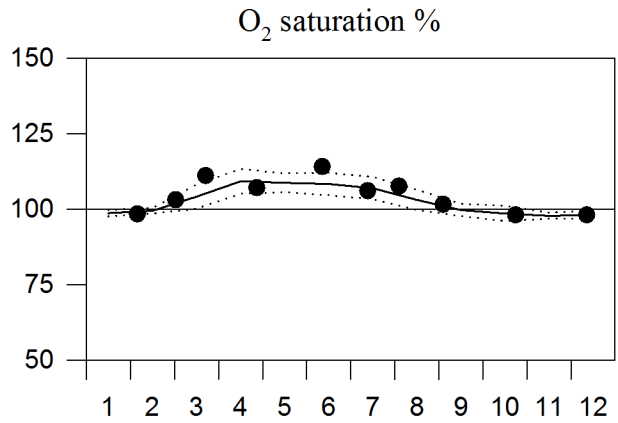
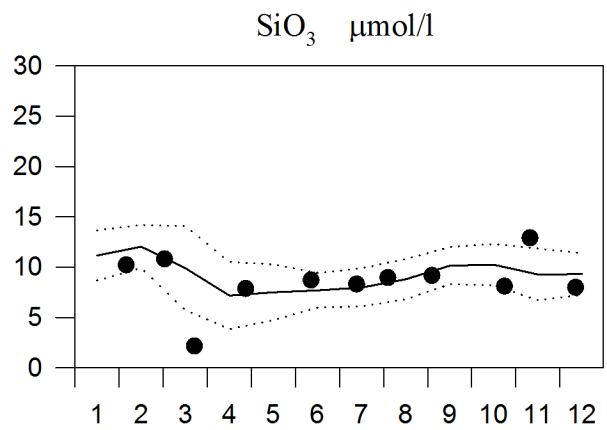
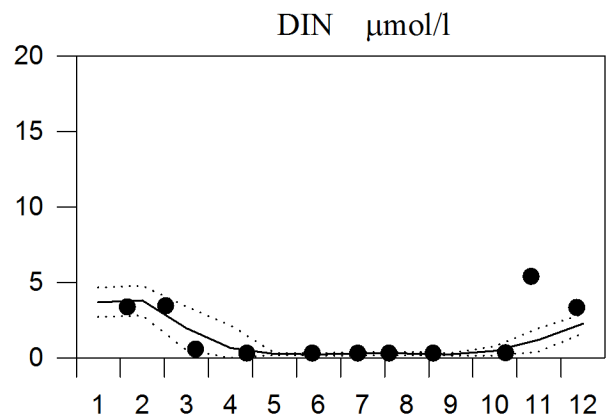
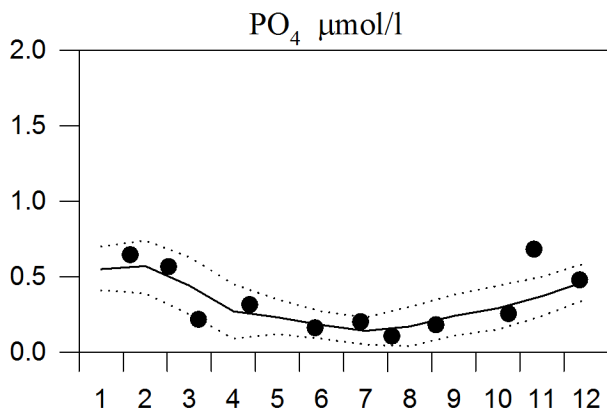
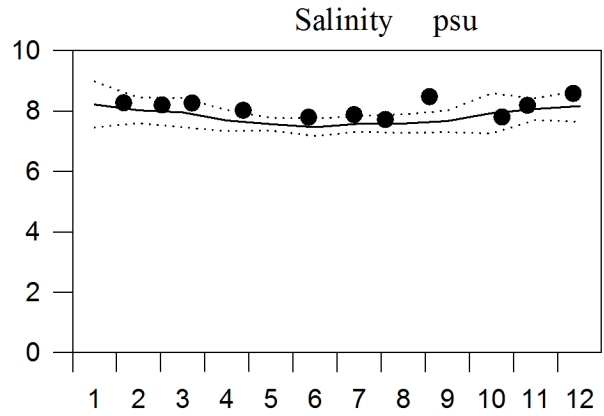
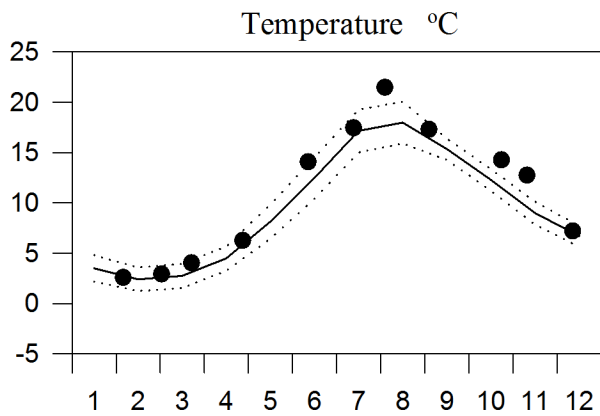
— Mean 1996-2010 St.Dev. ● 2014



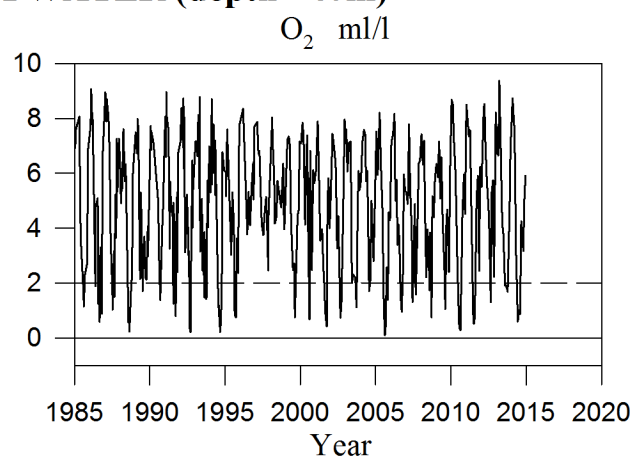
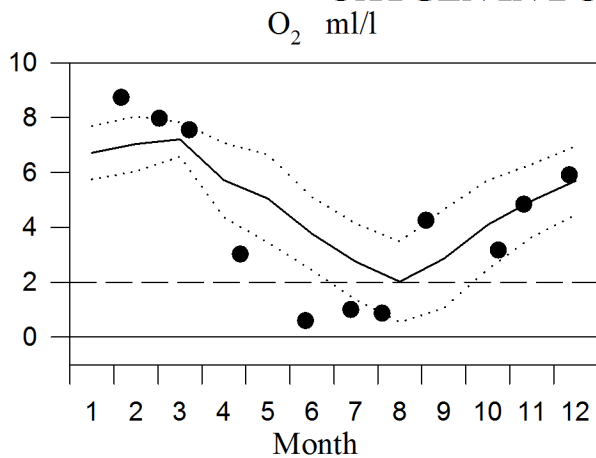
STATION BY1 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

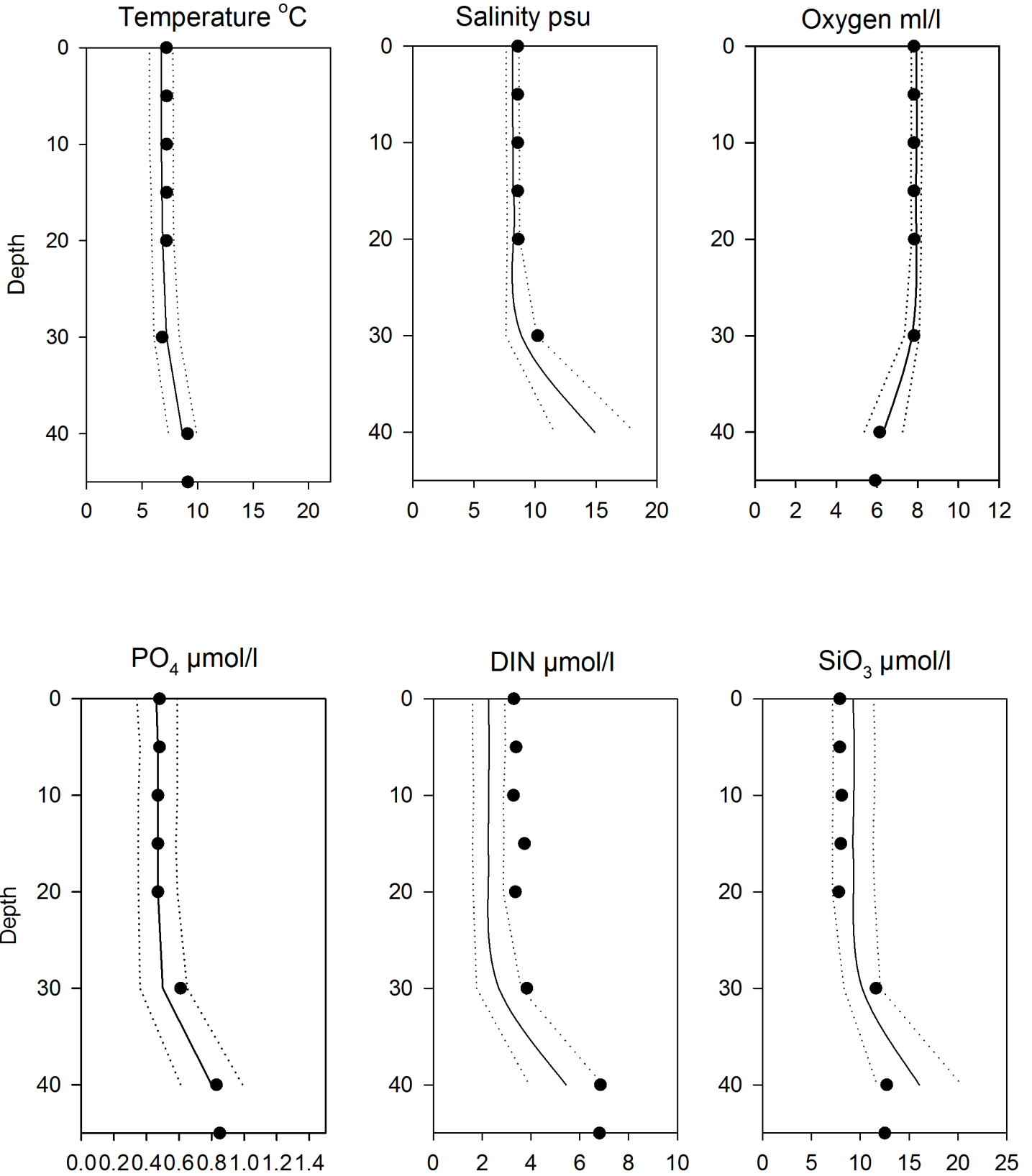


OXYGEN IN BOTTOM WATER (depth >40m)



Vertical profiles BY1 December

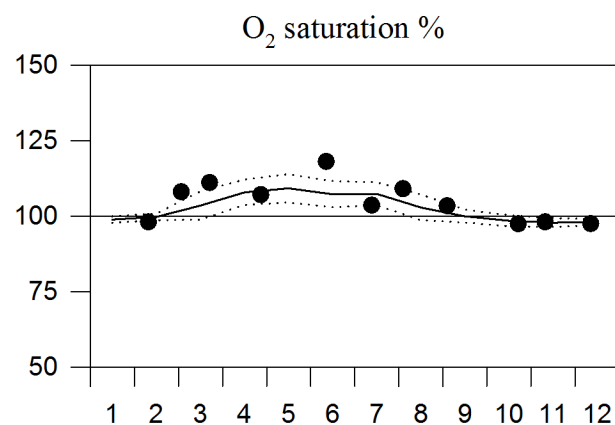
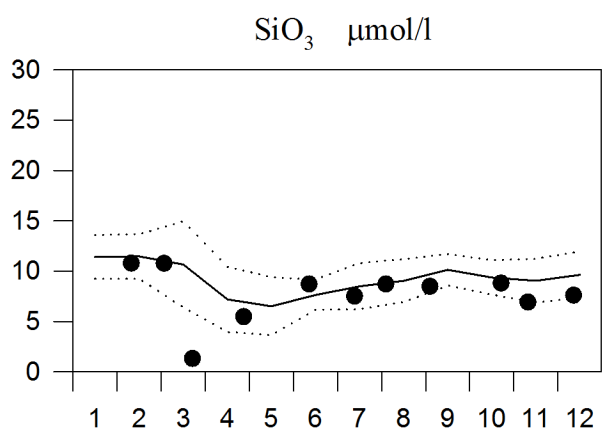
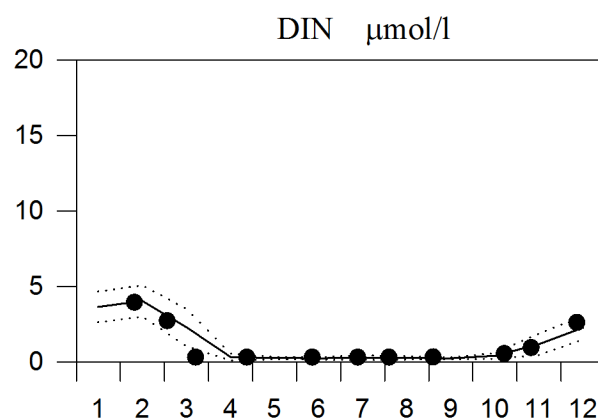
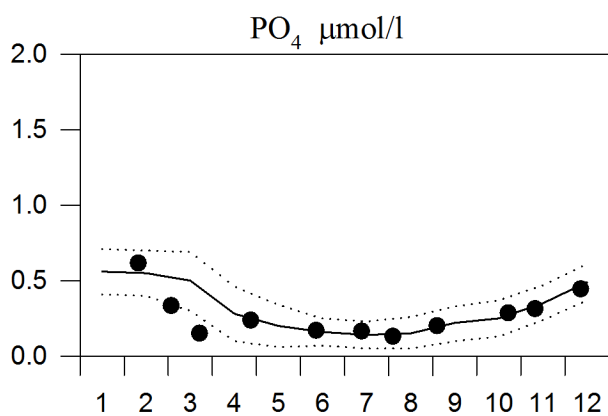
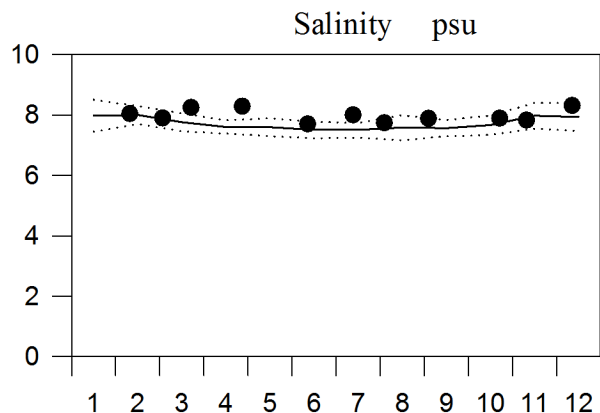
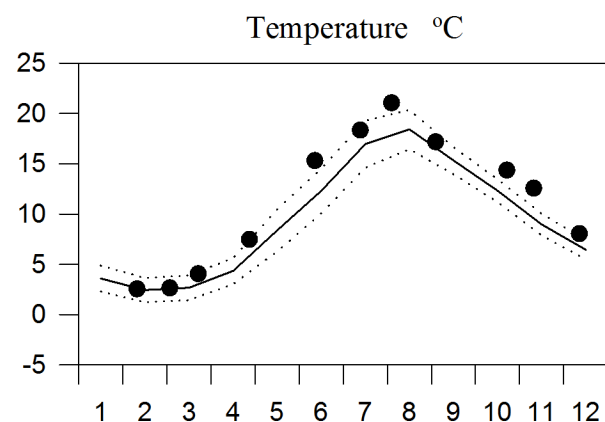
— Mean 1996-2010 St.Dev. ● 2014



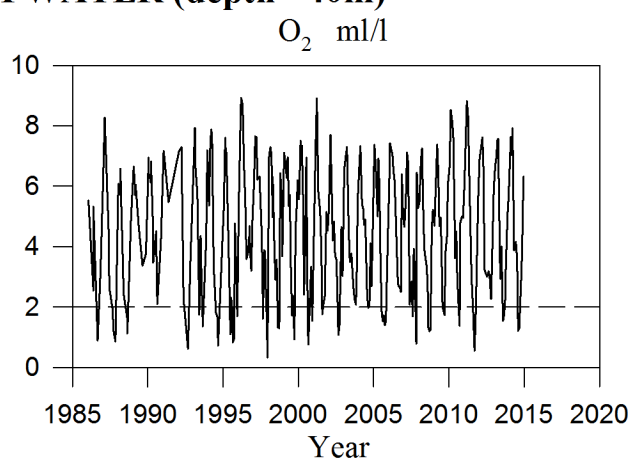
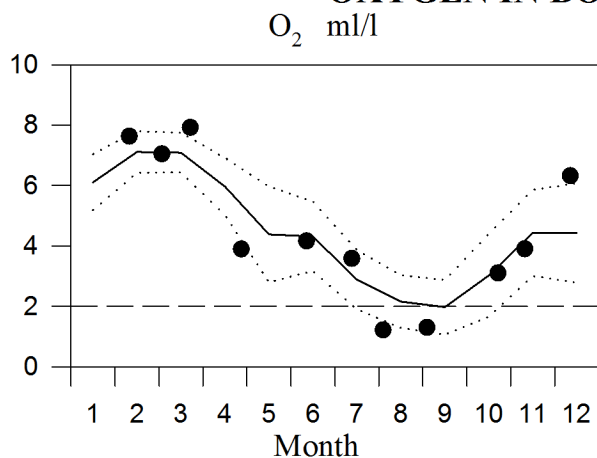
STATION BY2 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

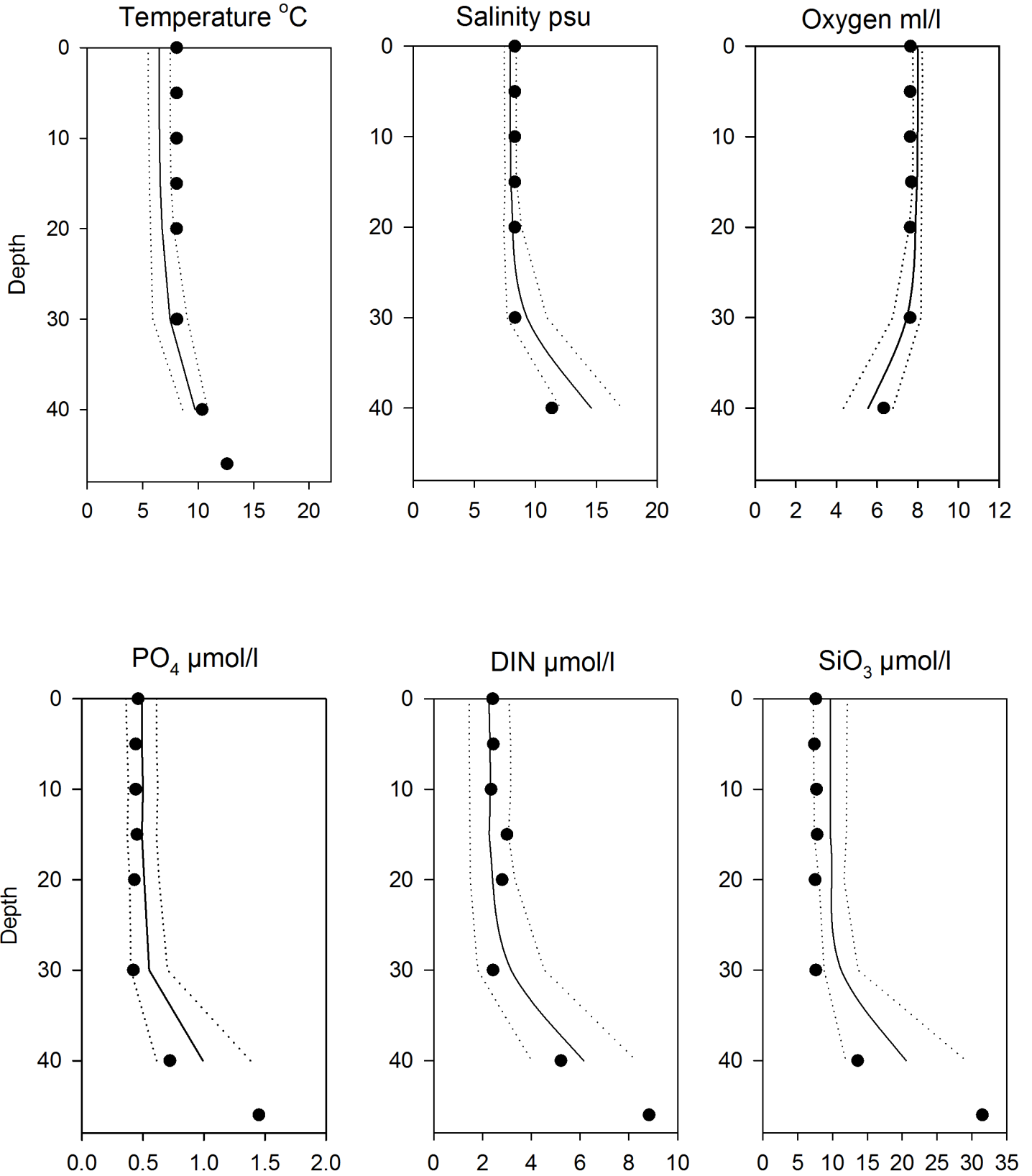


OXYGEN IN BOTTOM WATER (depth >40m)



Vertical profiles BY2 December

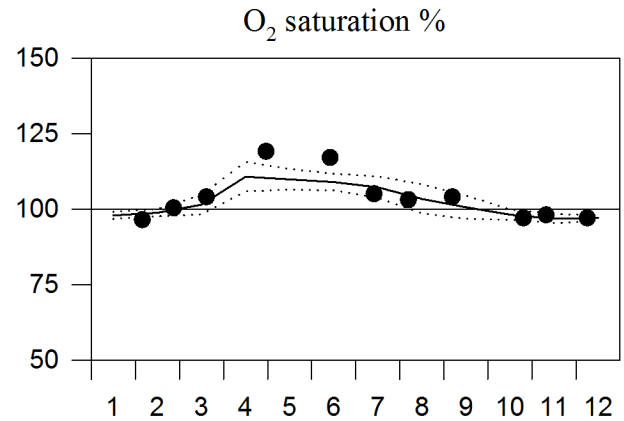
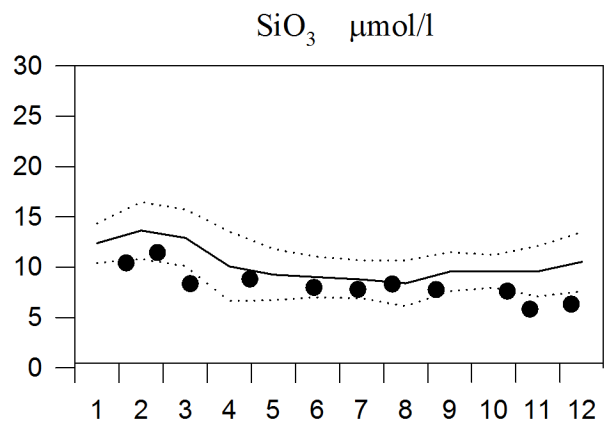
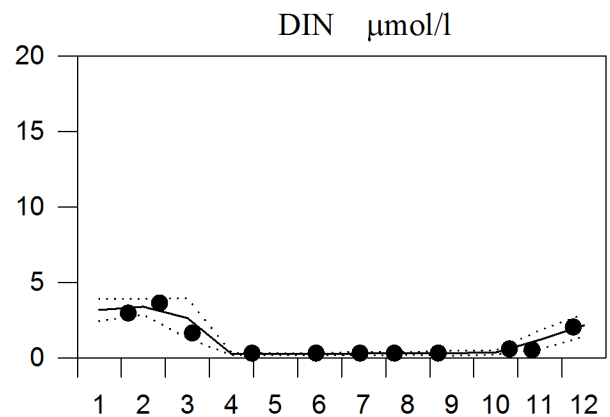
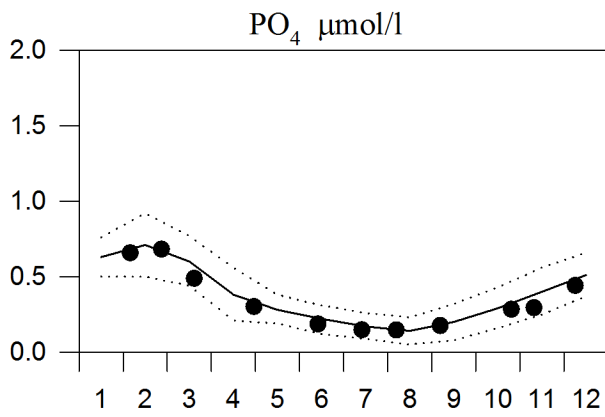
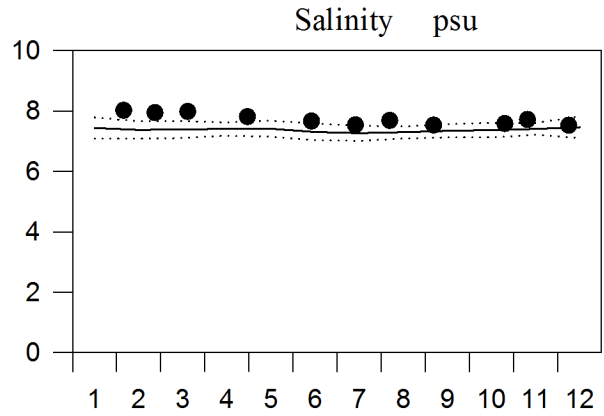
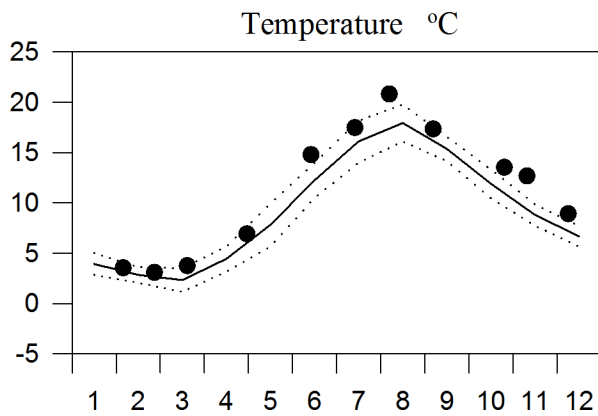
— Mean 1996-2010 St.Dev. ● 2014



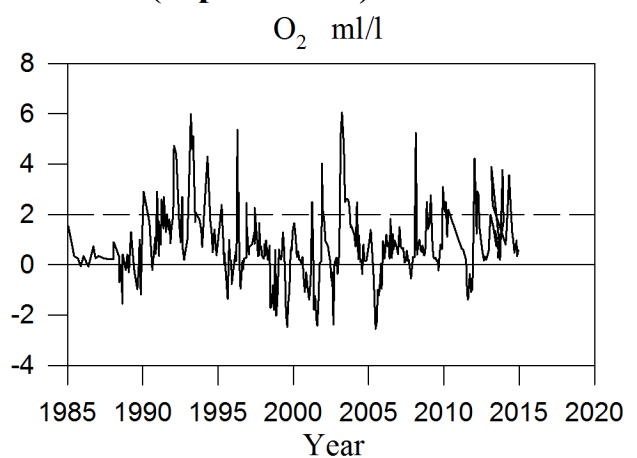
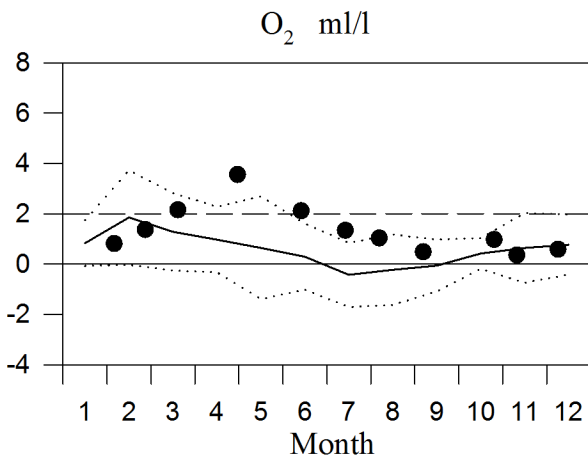
STATION HANÖBUKTEN SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

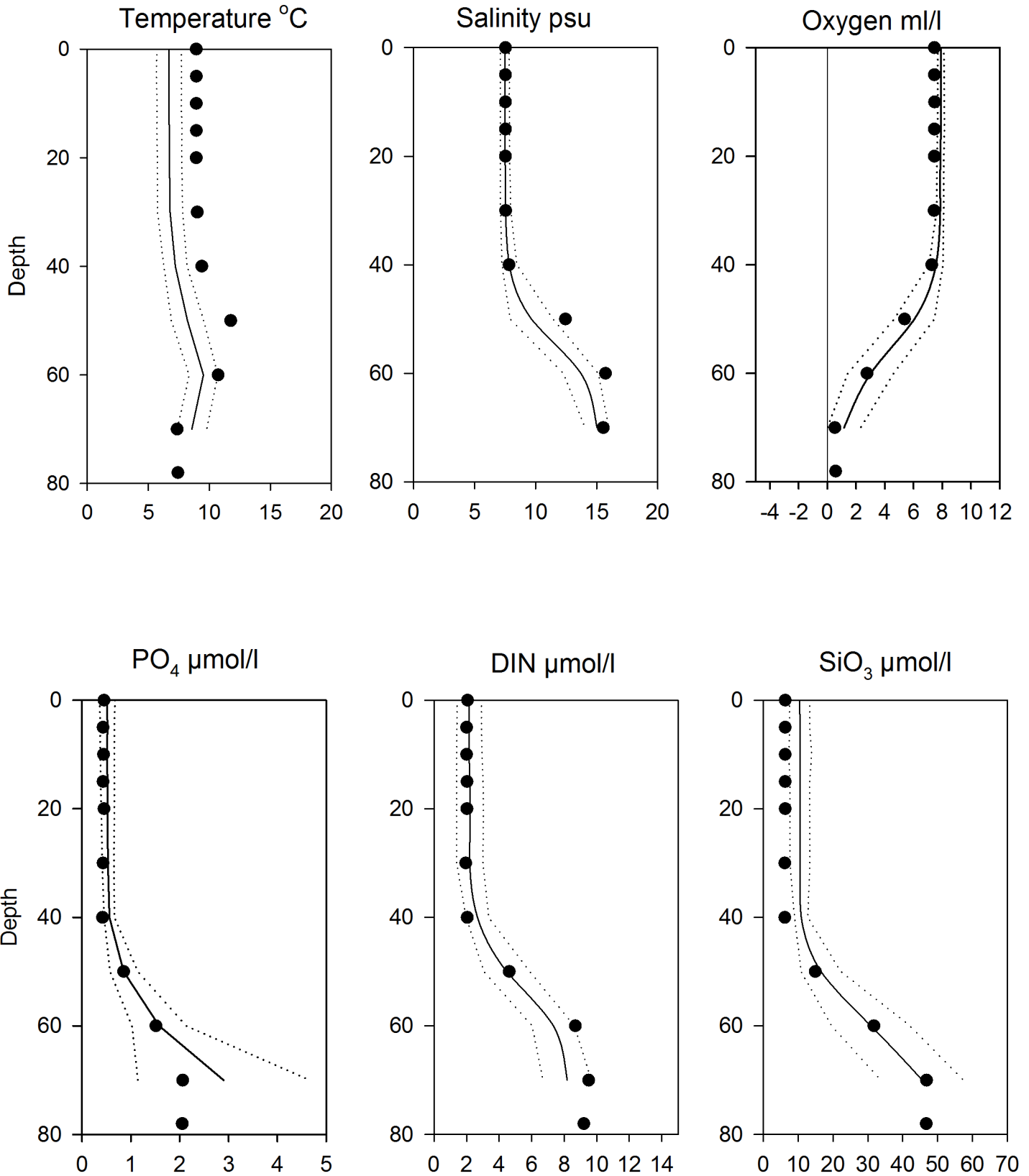


OXYGEN IN BOTTOM WATER (depth > 70m)



Vertical profiles Hanöbukten December

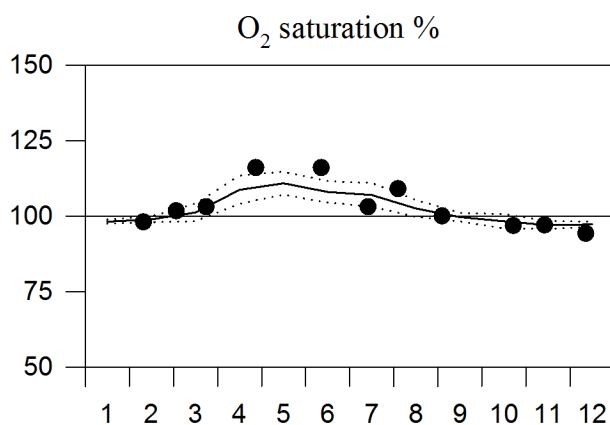
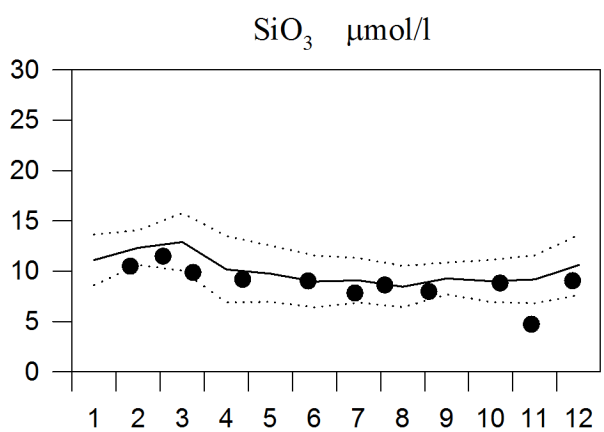
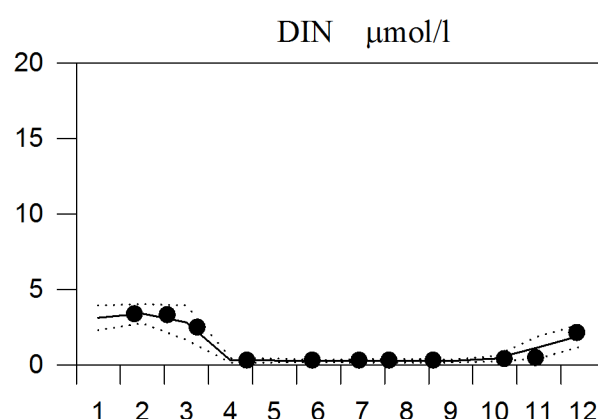
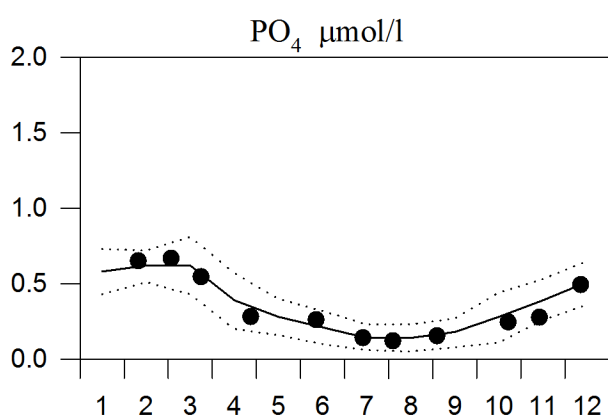
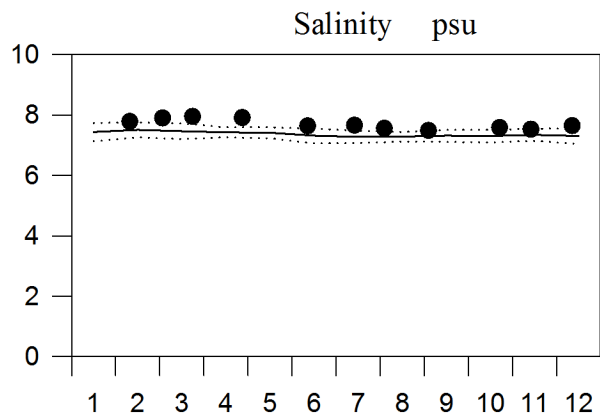
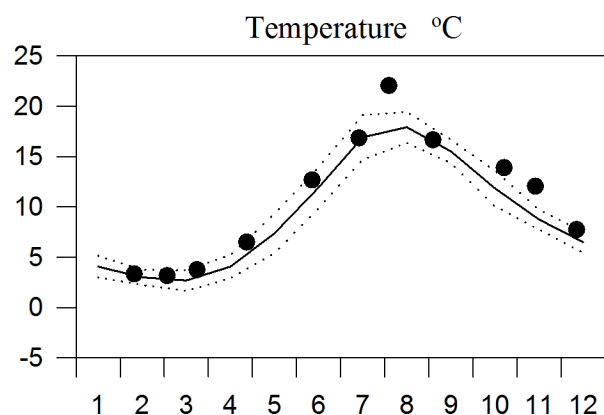
— Mean 1996-2010 St.Dev. ● 2014



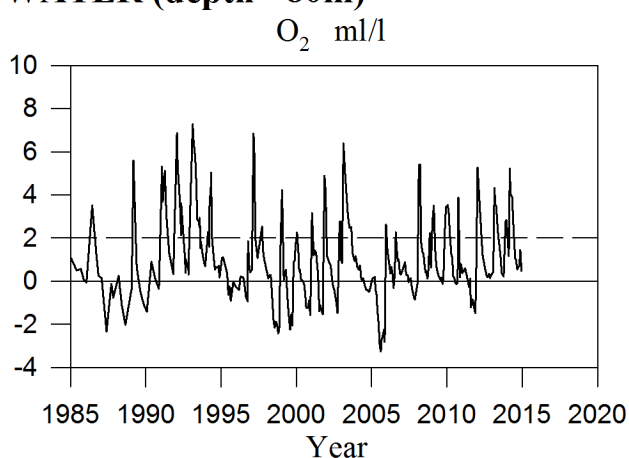
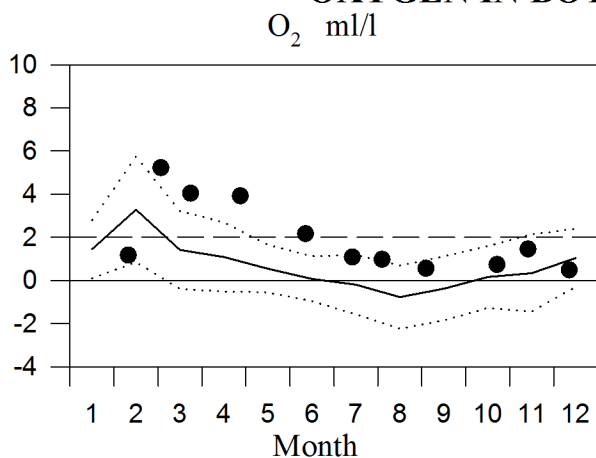
STATION BY4 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

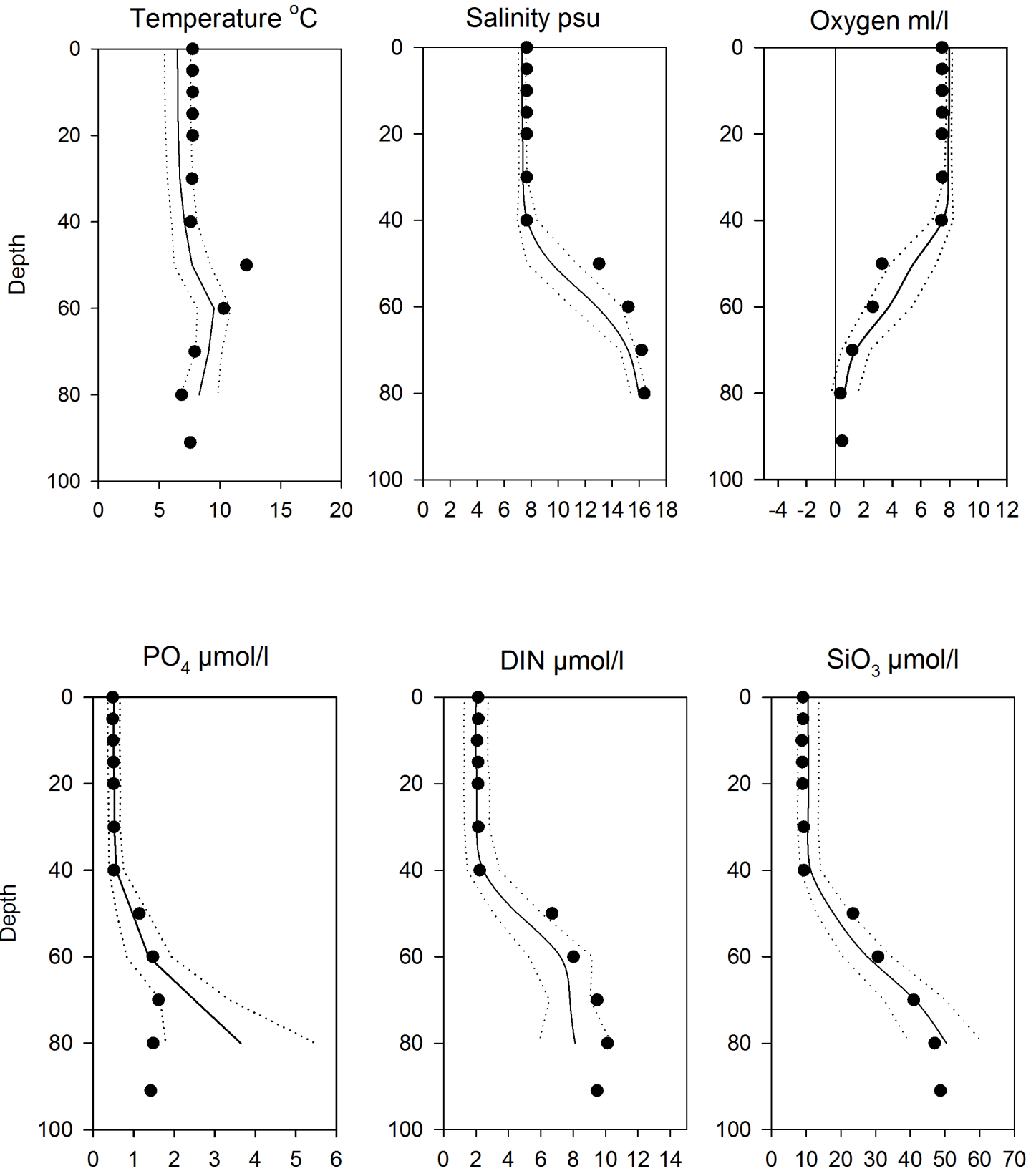


OXYGEN IN BOTTOM WATER (depth >80m)



Vertical profiles BY4 December

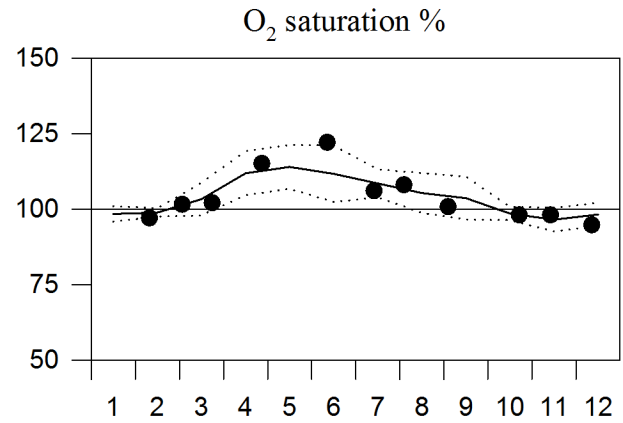
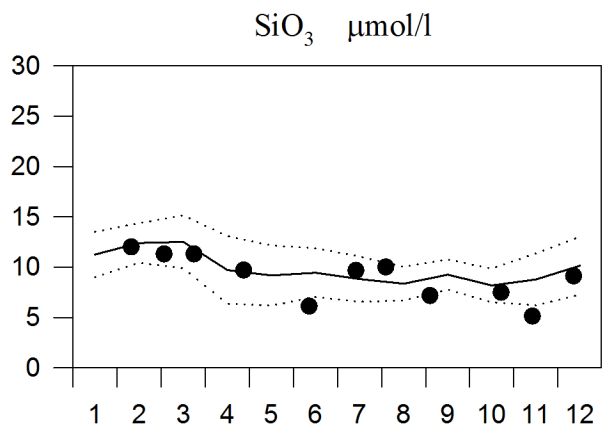
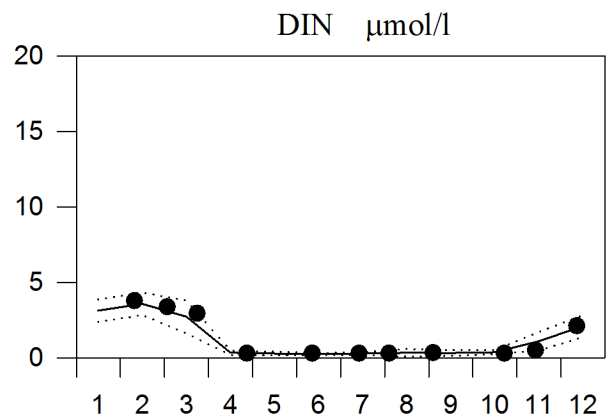
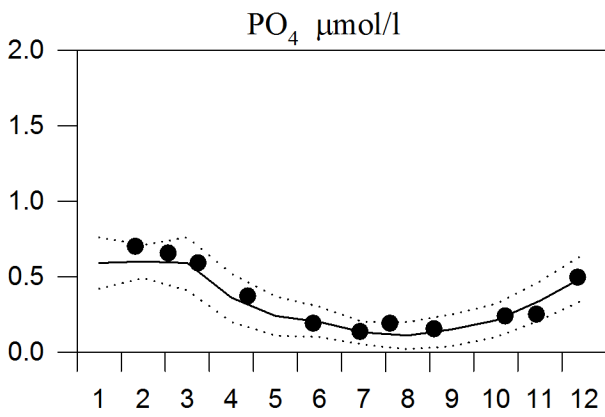
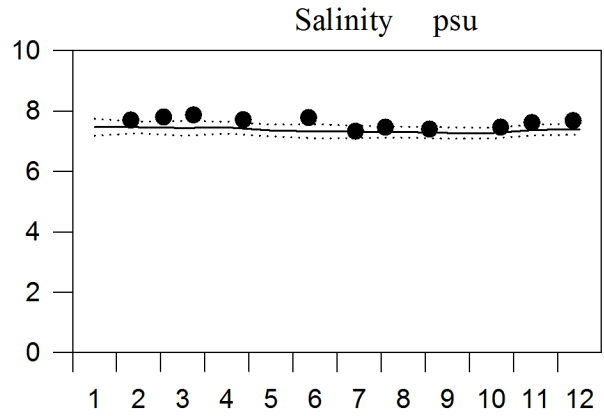
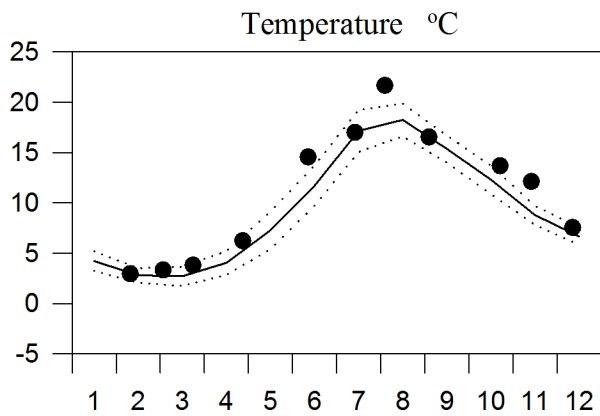
— Mean 1996-2010 St.Dev. ● 2014



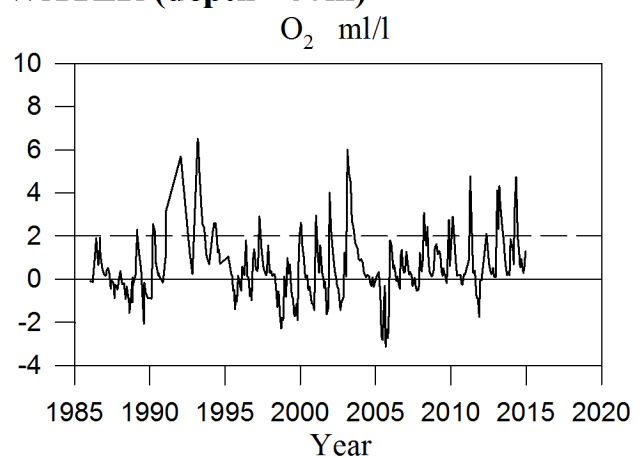
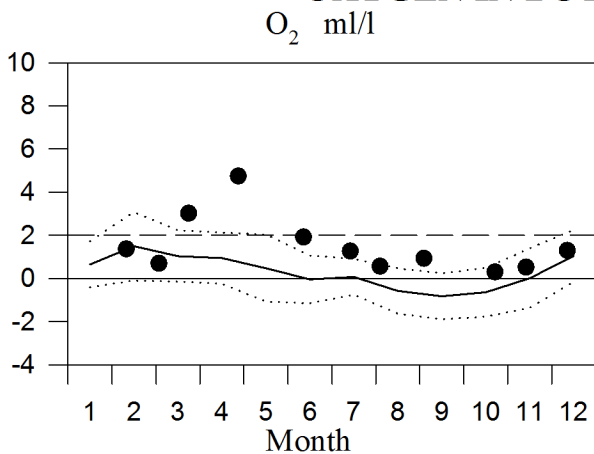
STATION BY5 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

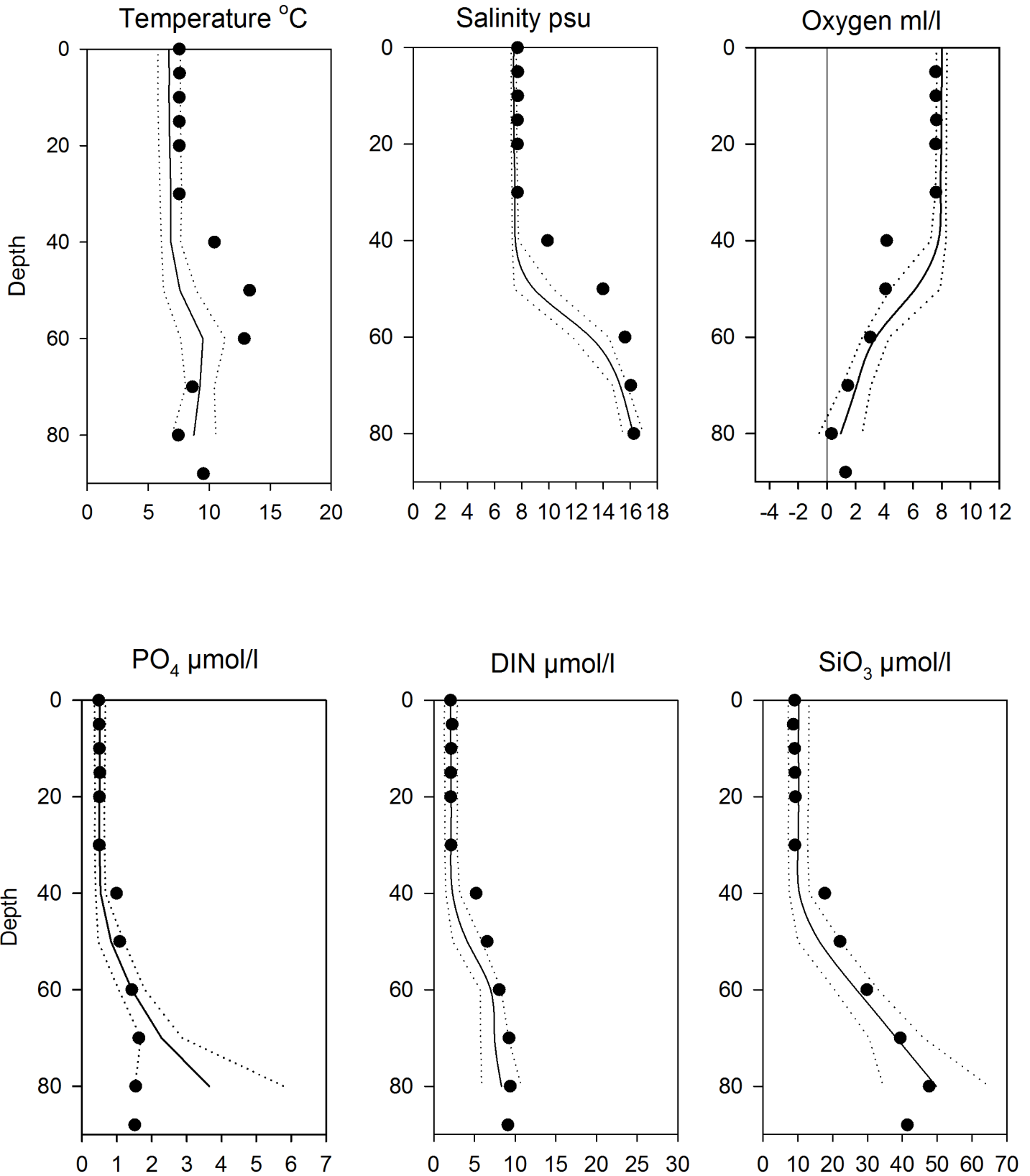


OXYGEN IN BOTTOM WATER (depth >80m)



Vertical profiles BY5 December

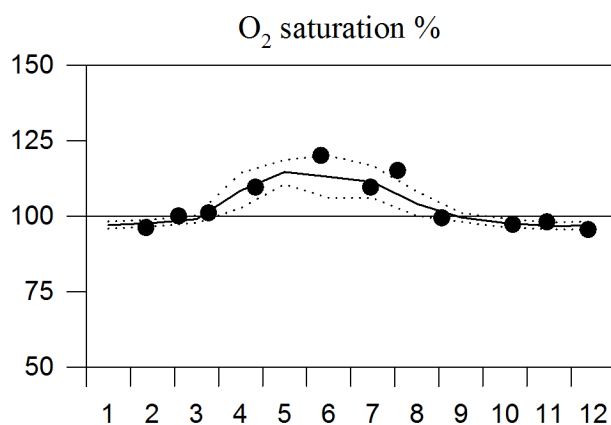
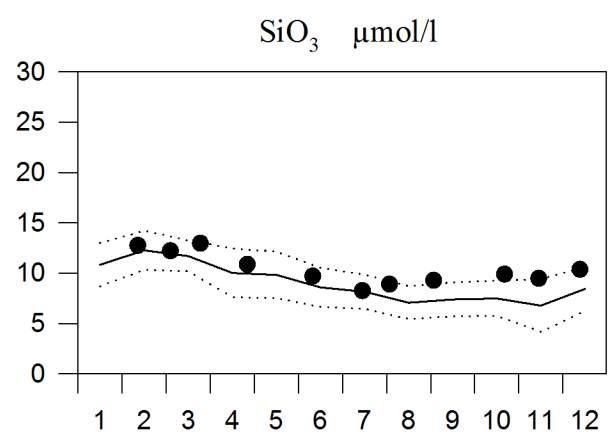
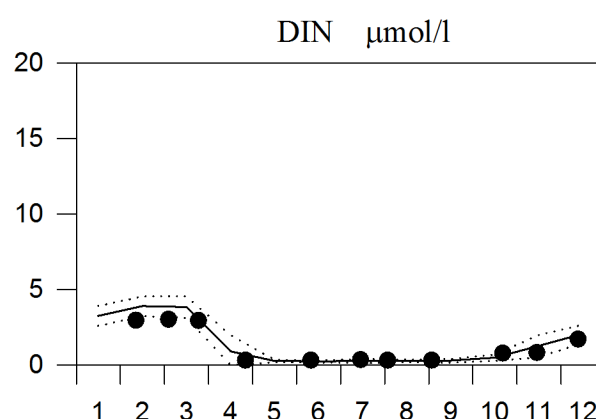
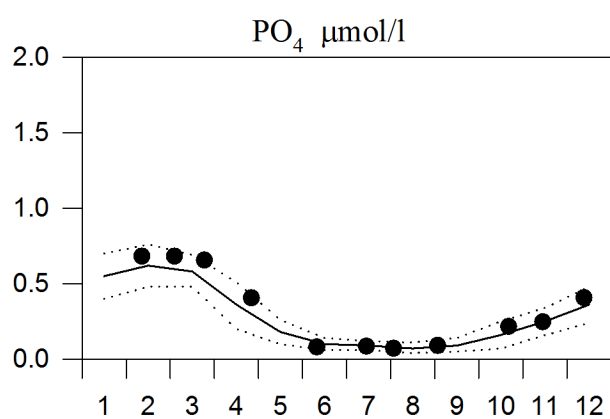
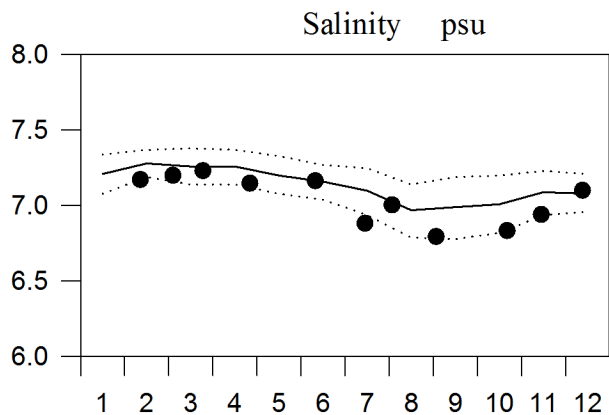
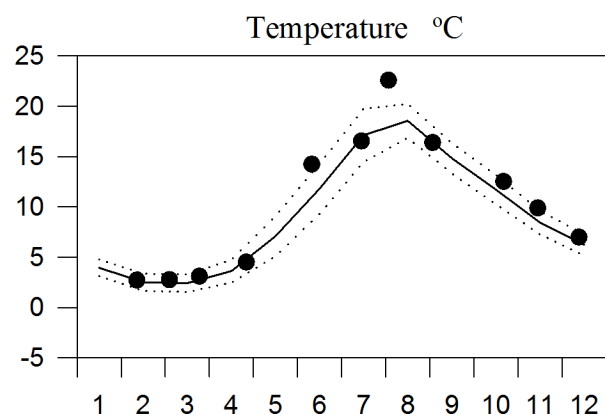
— Mean 1996-2010 St.Dev. ● 2014



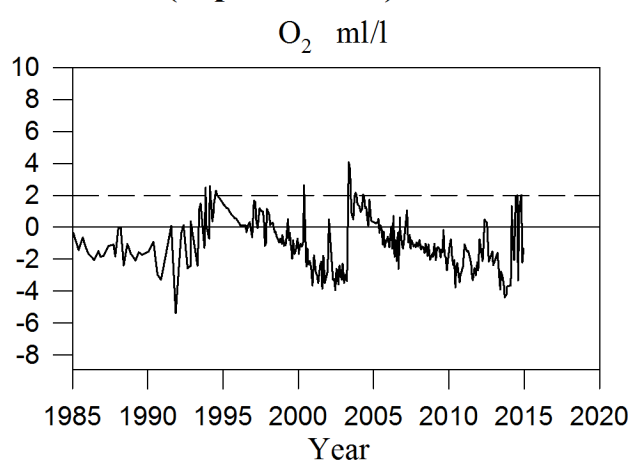
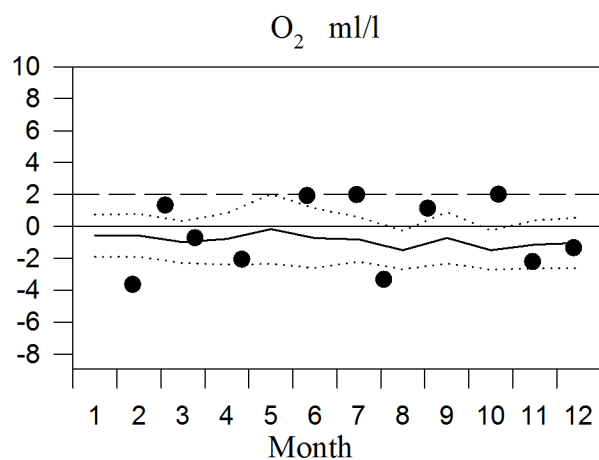
STATION BY10 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

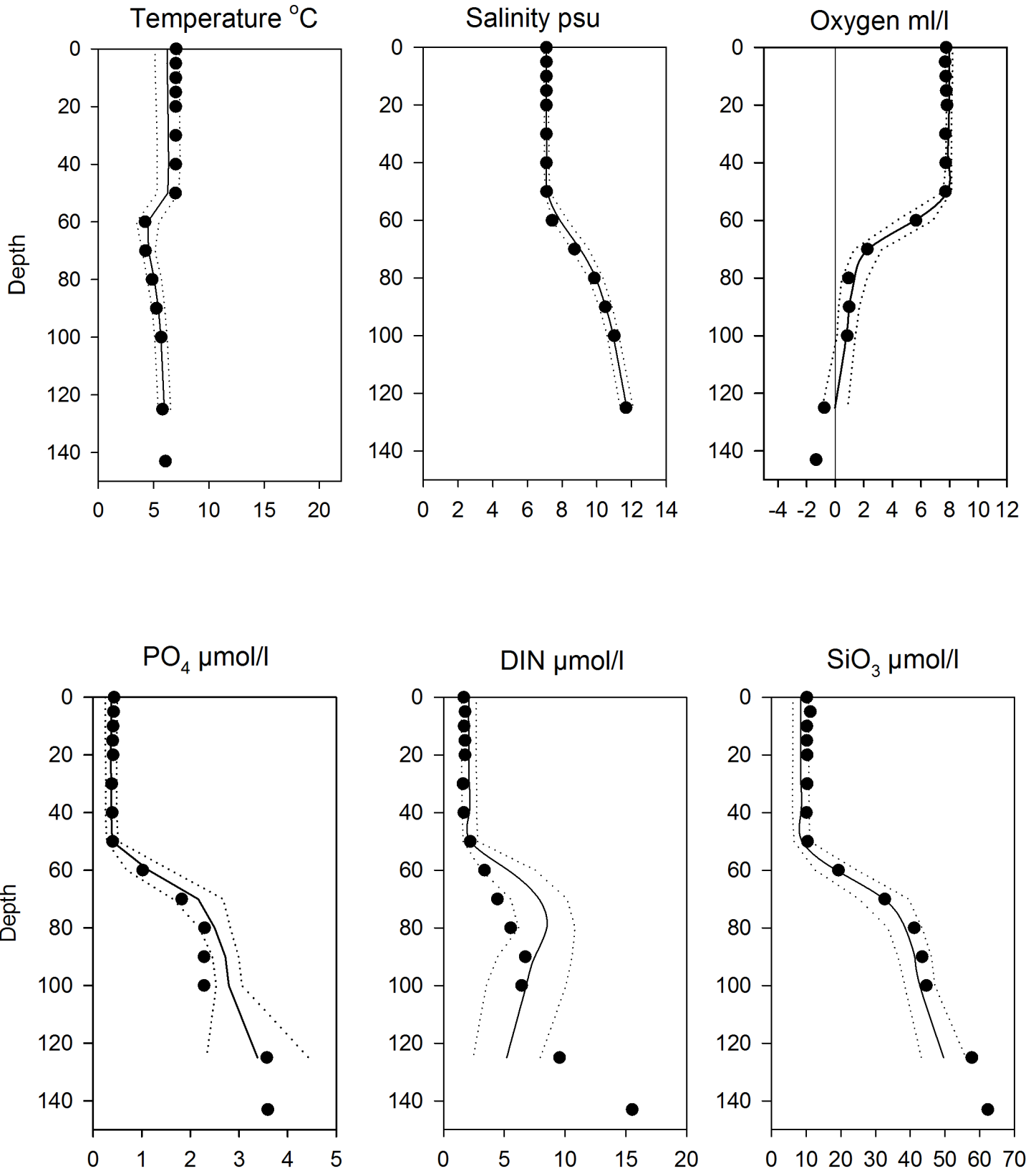


OXYGEN IN BOTTOM WATER (depth >125m)



Vertical profiles BY10 December

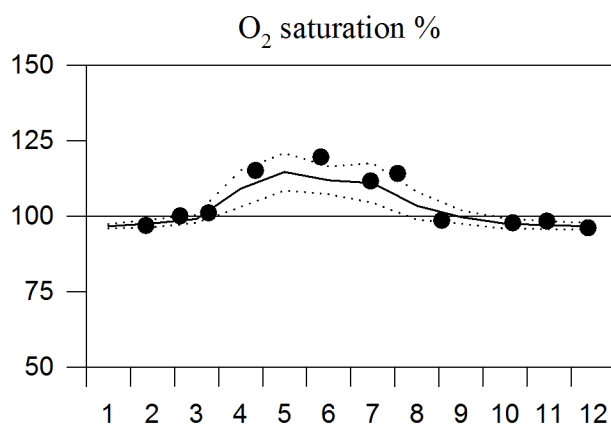
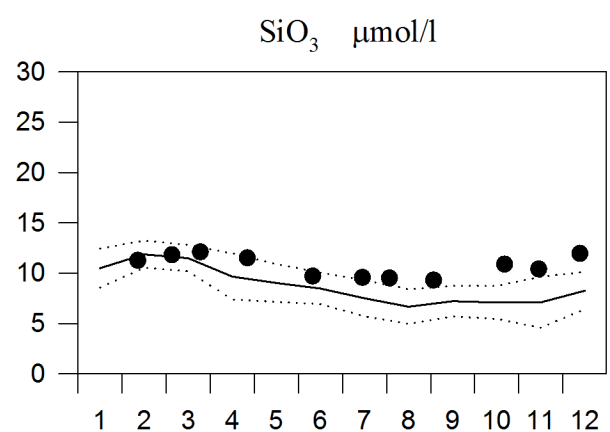
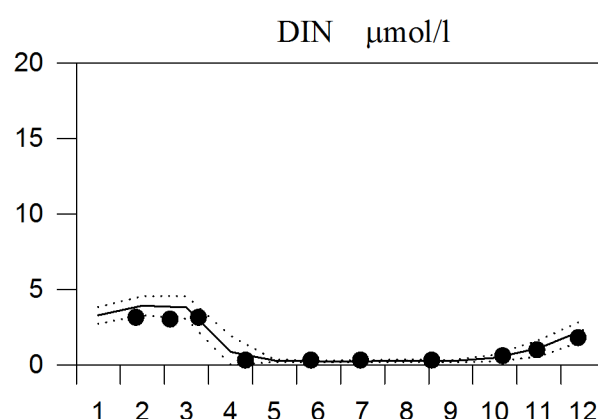
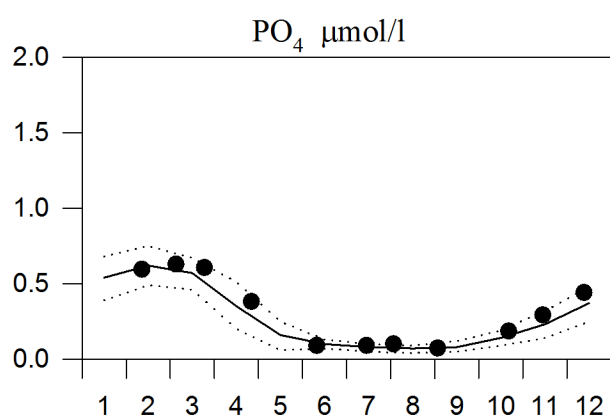
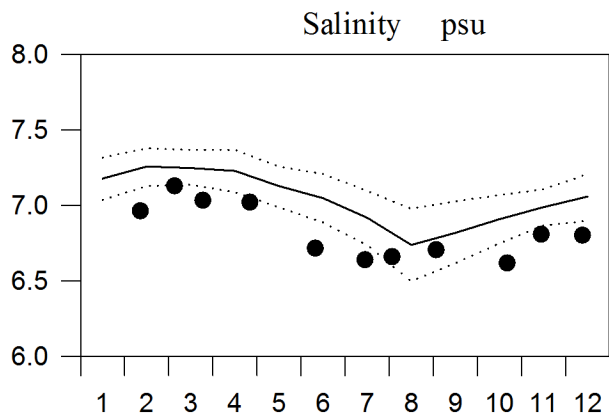
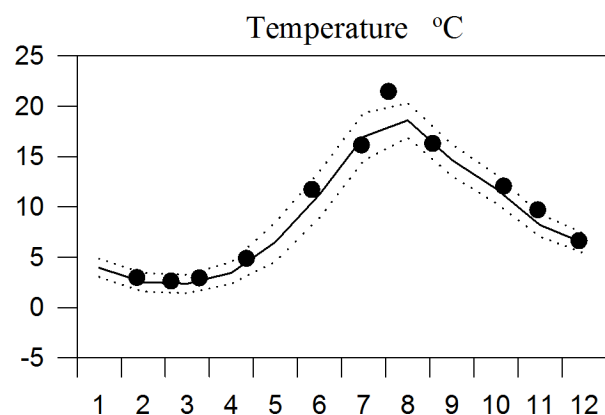
— Mean 1996-2010 St.Dev. ● 2014



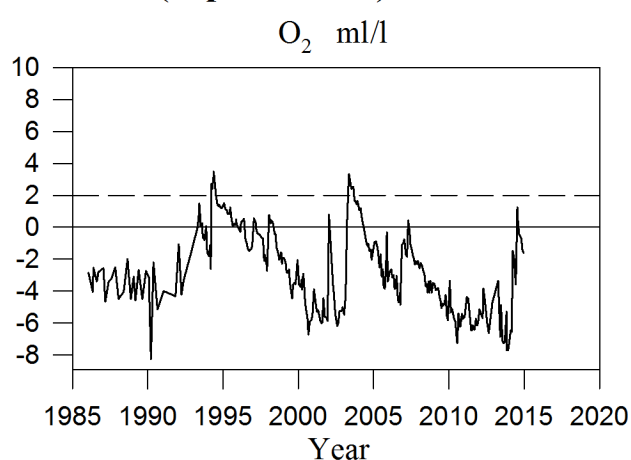
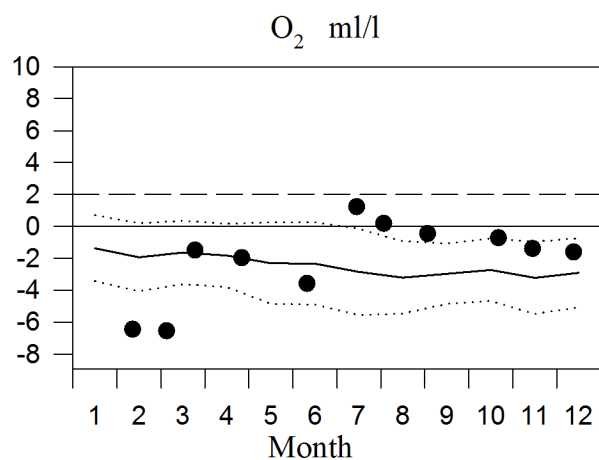
STATION BY15 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



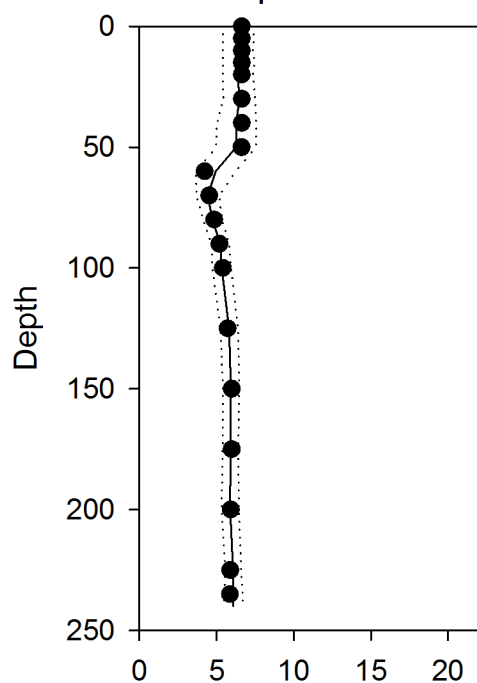
OXYGEN IN BOTTOM WATER (depth >225m)



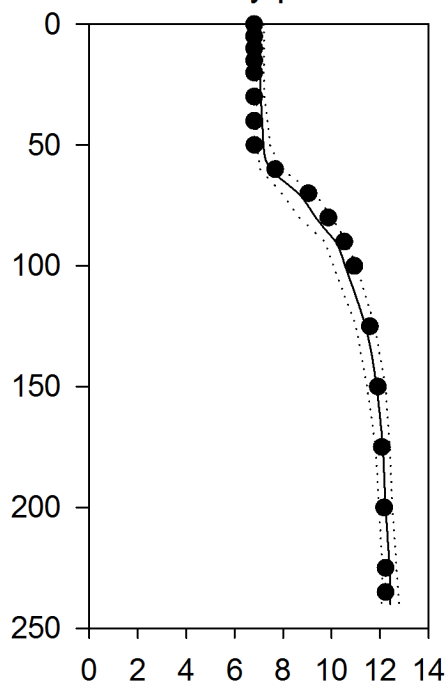
Vertical profiles BY15 December

— Mean 1996-2010 St.Dev. ● 2014

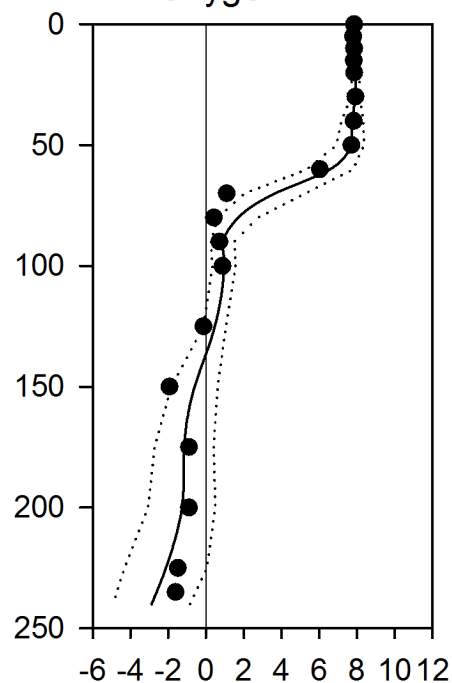
Temperature °C



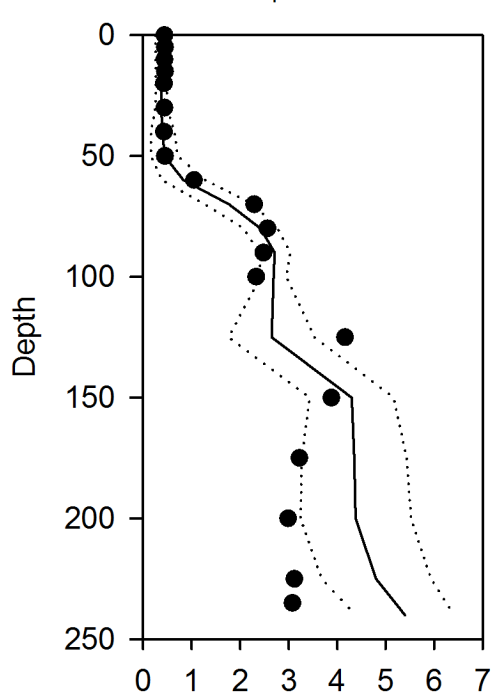
Salinity psu



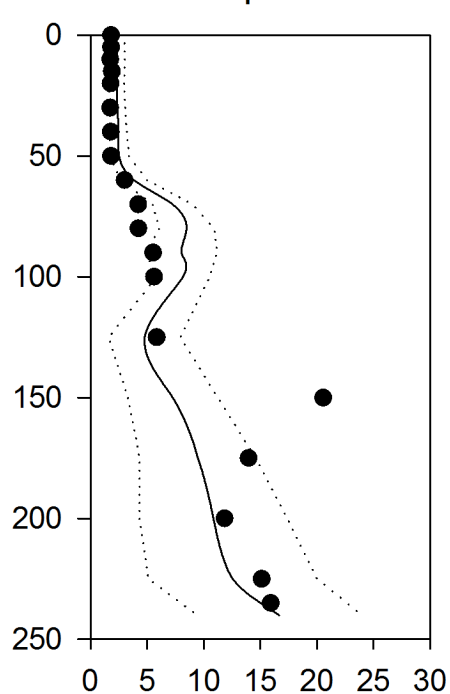
Oxygen ml/l



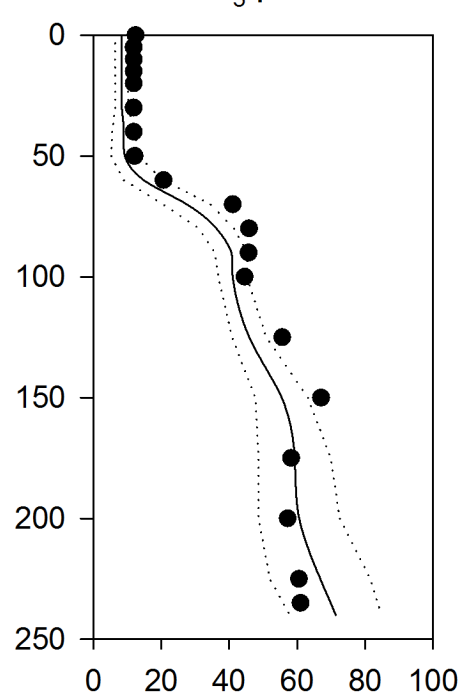
PO₄ μmol/l



DIN μmol/l



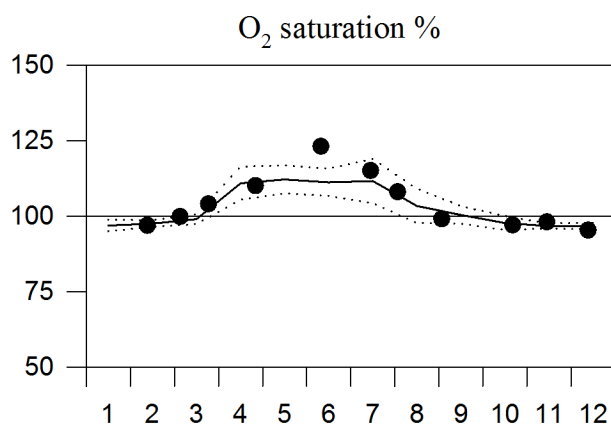
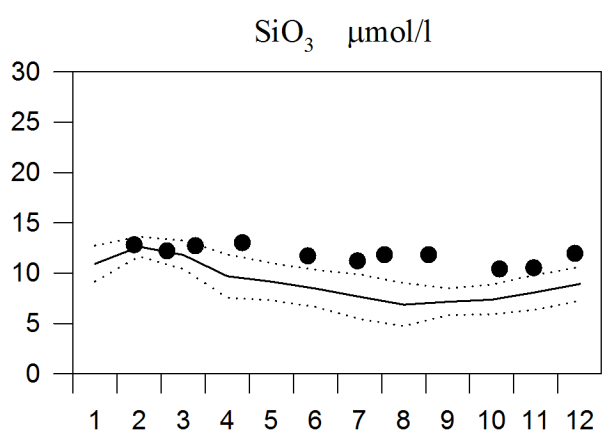
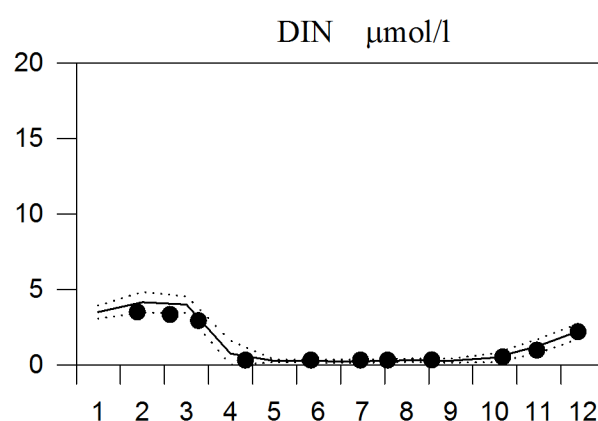
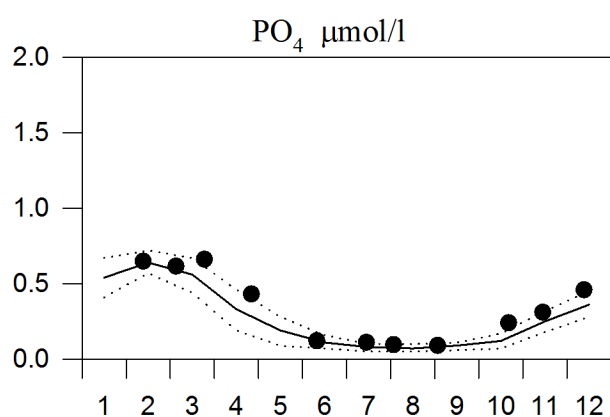
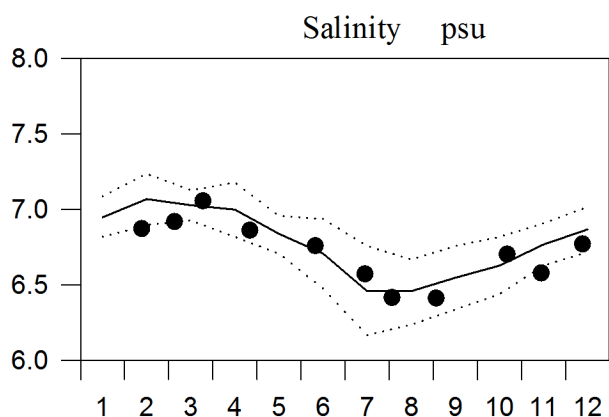
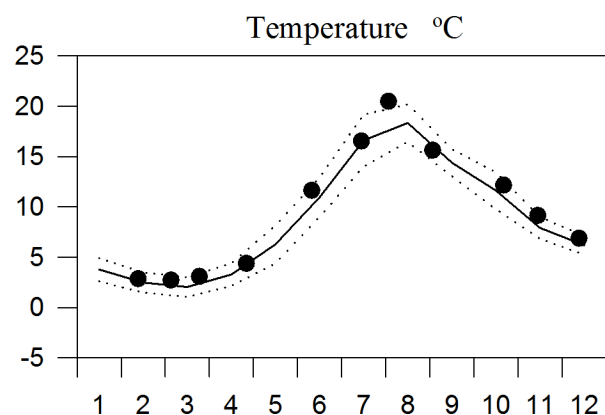
SiO₃ μmol/l



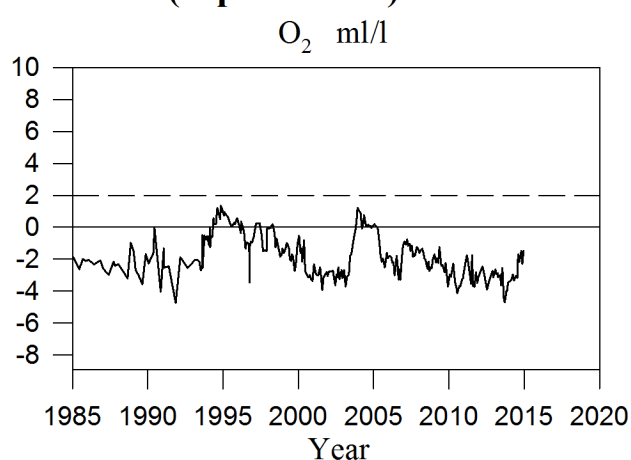
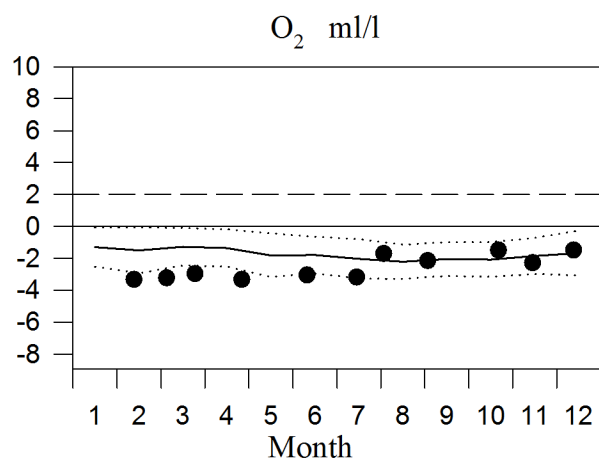
STATION BY20 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



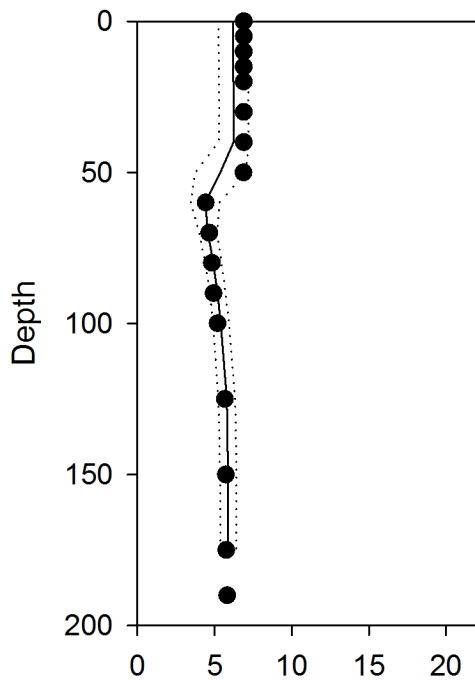
OXYGEN IN BOTTOM WATER (depth >175m)



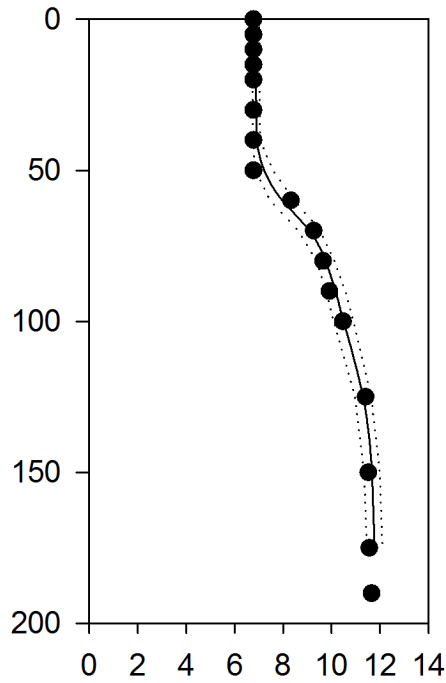
Vertical profiles BY20 December

— Mean 1996-2010 St.Dev. ● 2014

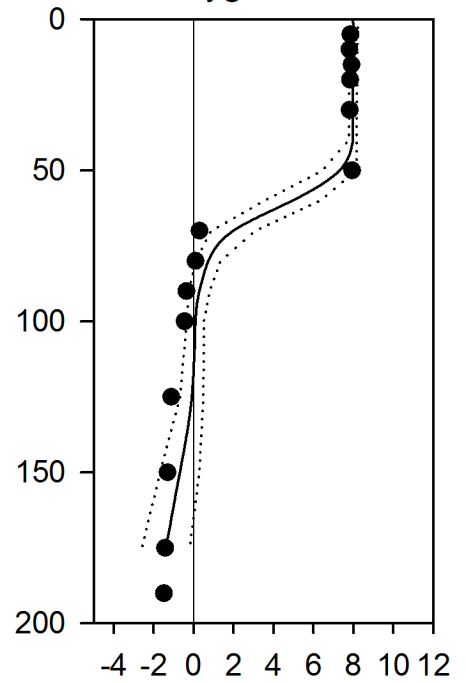
Temperature °C



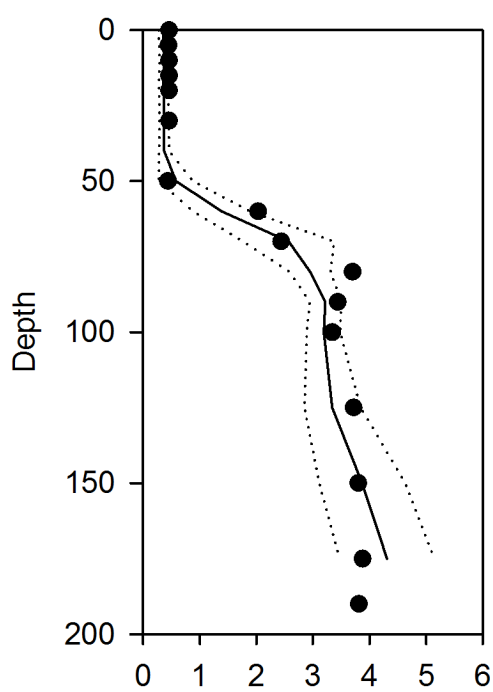
Salinity psu



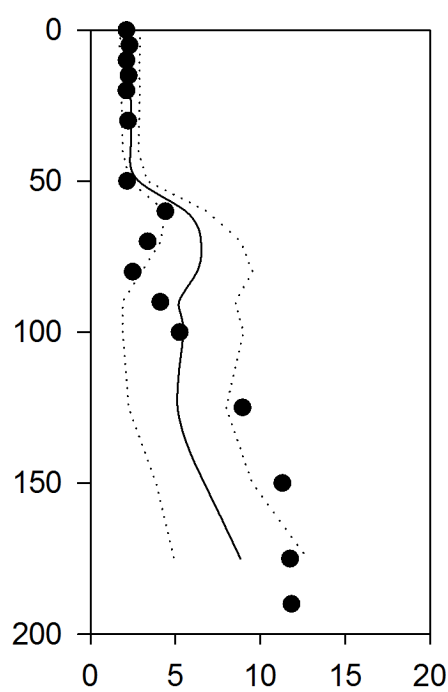
Oxygen ml/l



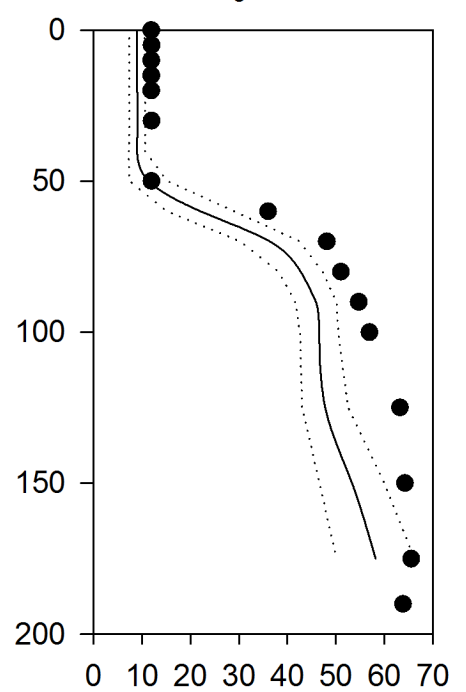
PO₄ μmol/l



DIN μmol/l



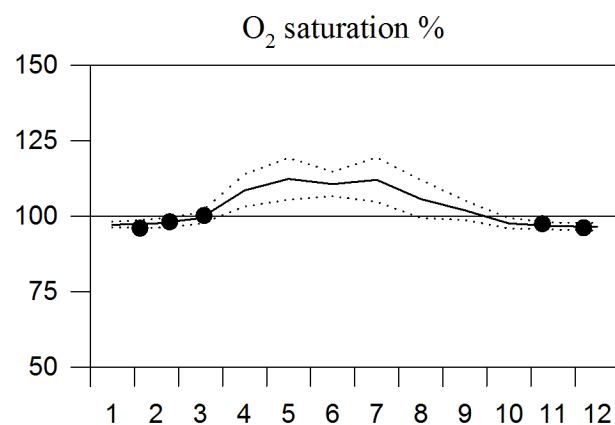
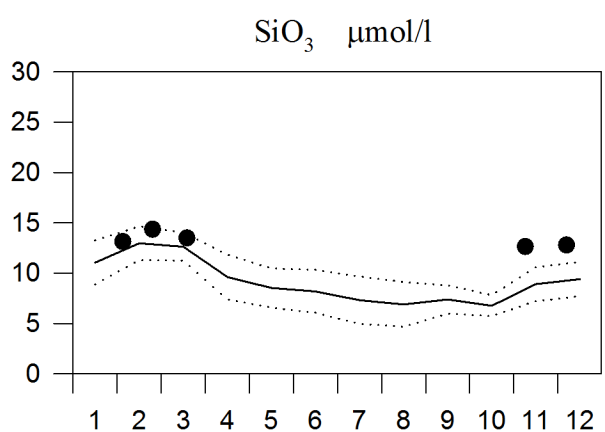
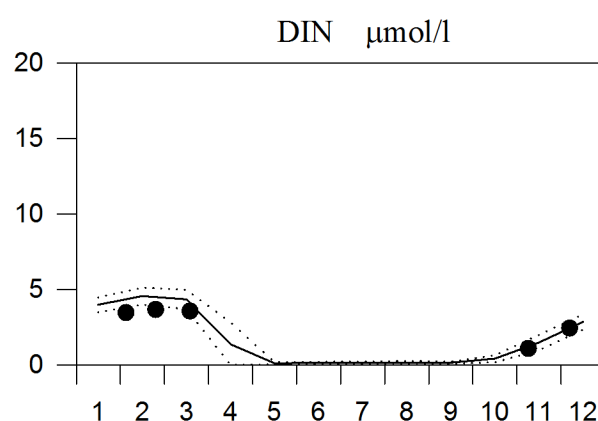
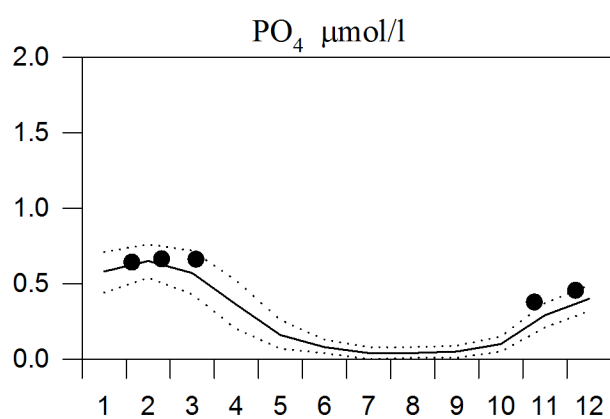
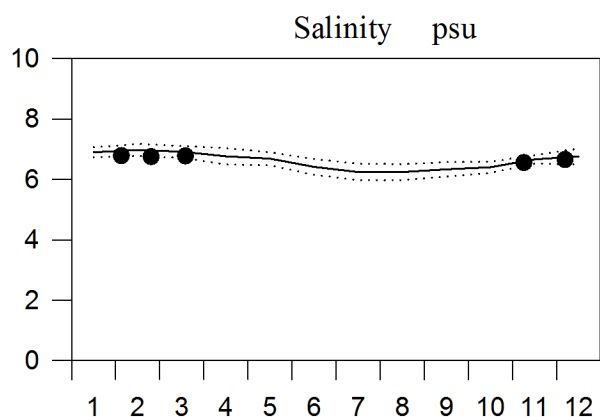
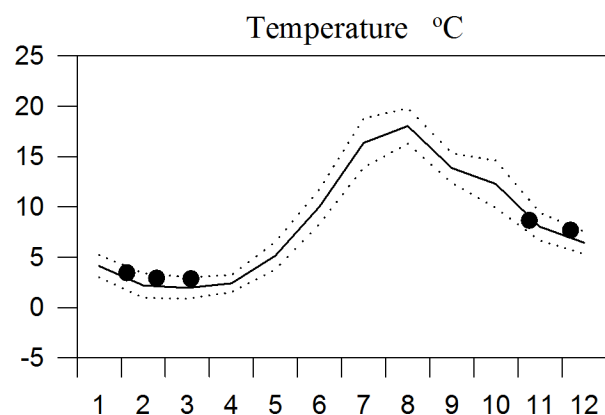
SiO₃ μmol/l



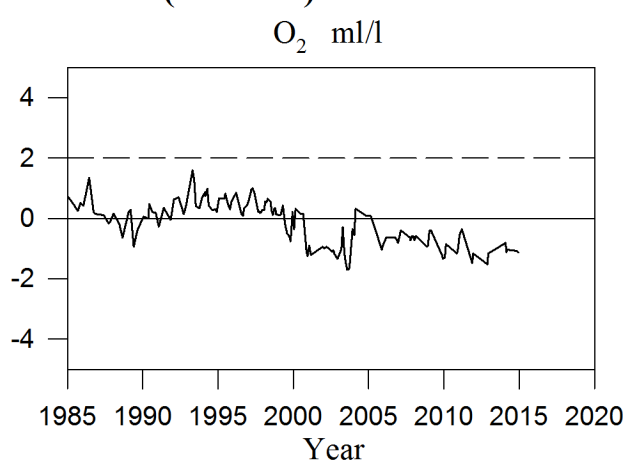
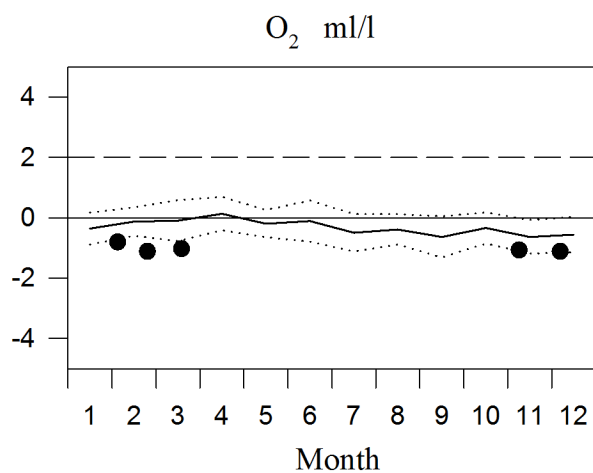
STATION BY29 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



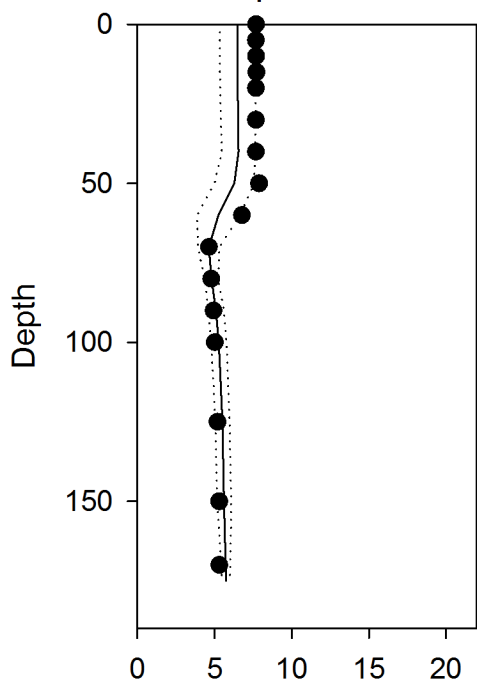
OXYGEN IN BOTTOM WATER (>=150m)



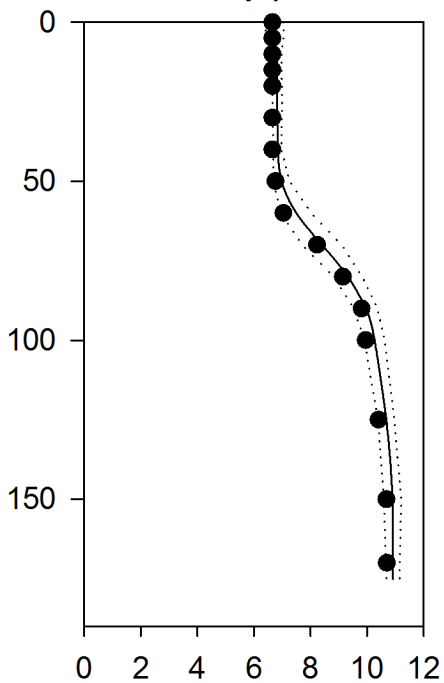
Vertical profiles BY29 December

— Mean 1996-2010 St.Dev. ● 2014

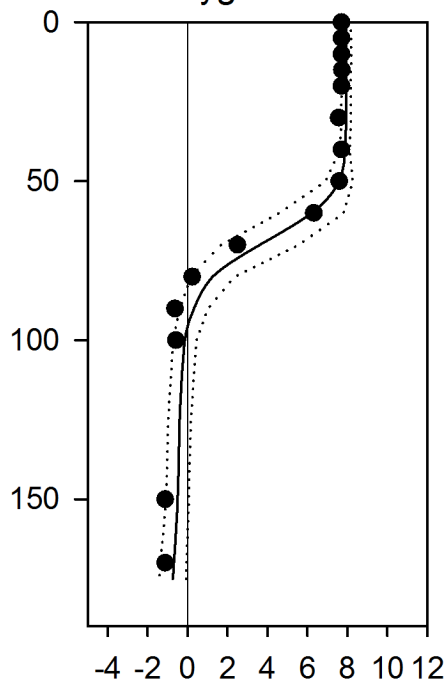
Temperature °C



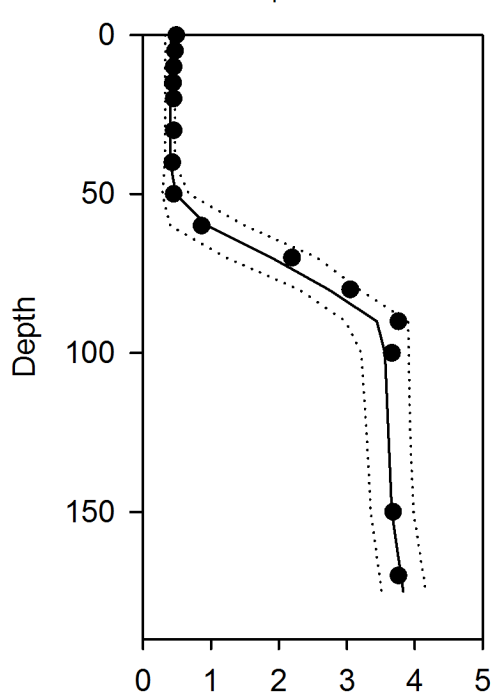
Salinity psu



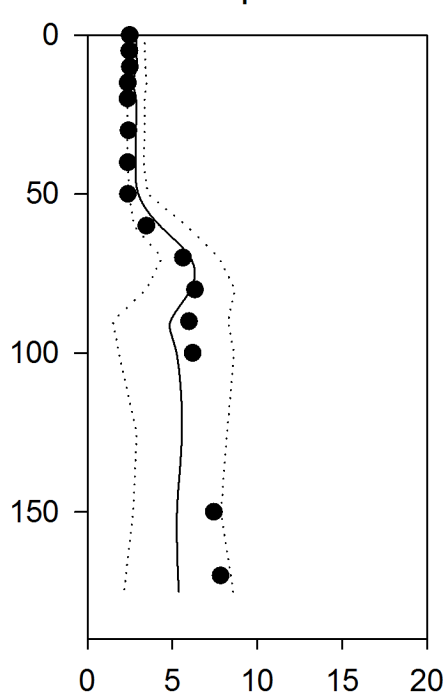
Oxygen ml/l



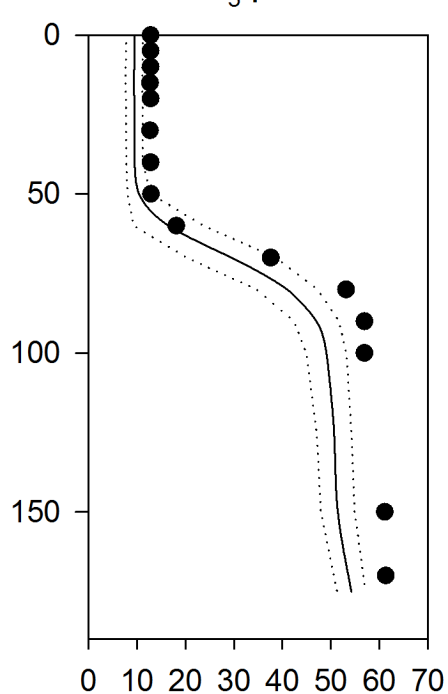
PO₄ μmol/l



DIN μmol/l



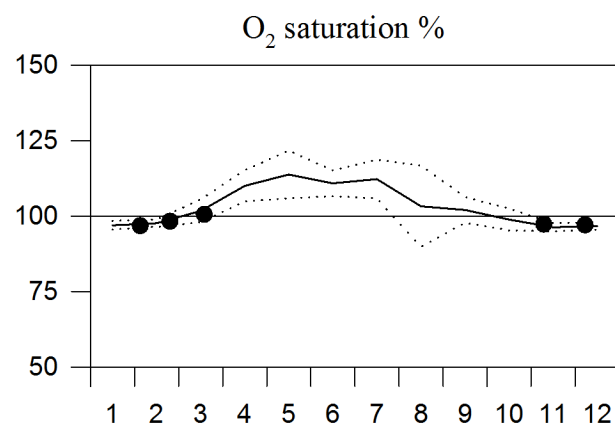
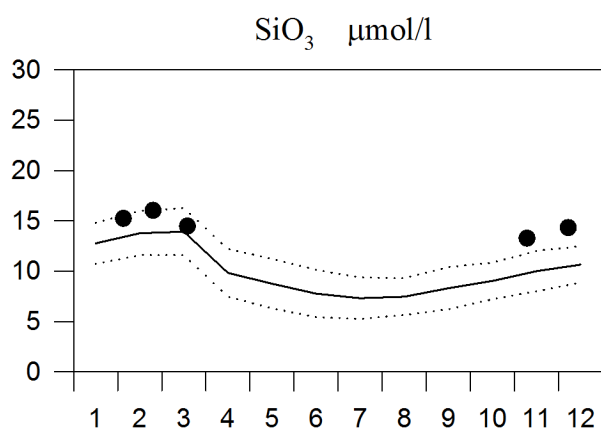
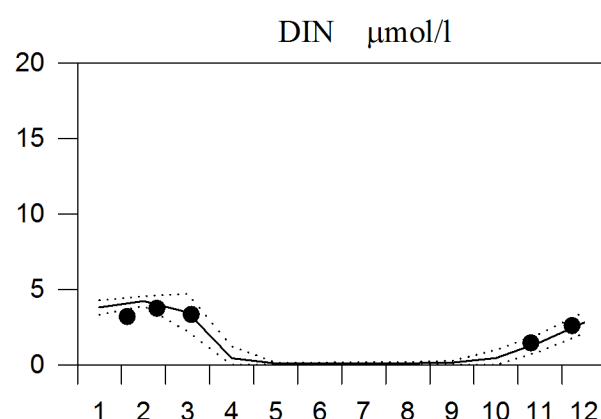
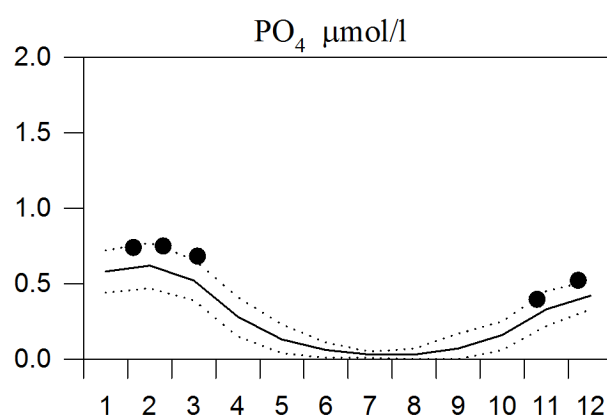
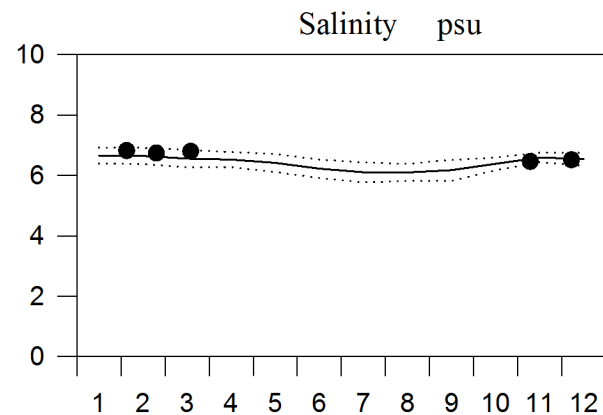
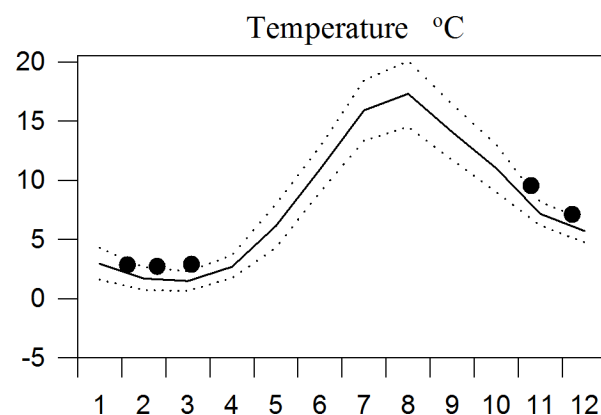
SiO₃ μmol/l



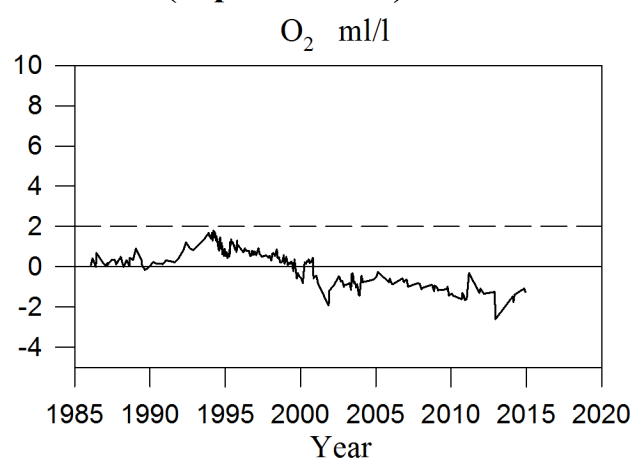
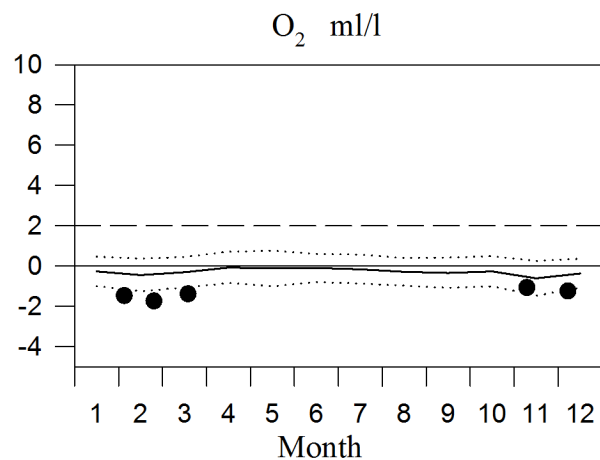
STATION BY31 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



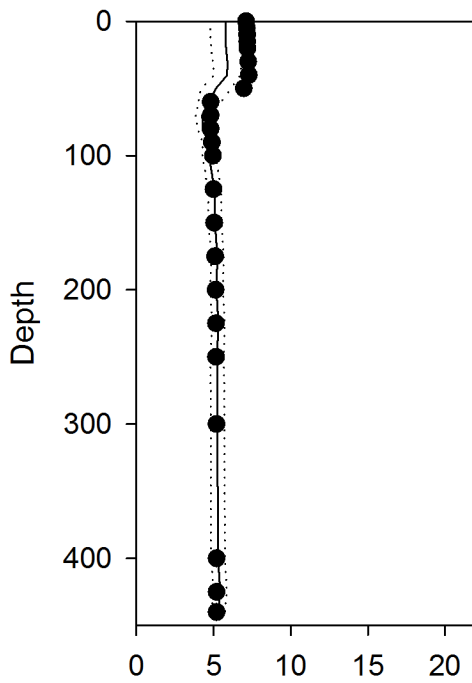
OXYGEN IN BOTTOM WATER (depth = 440m)



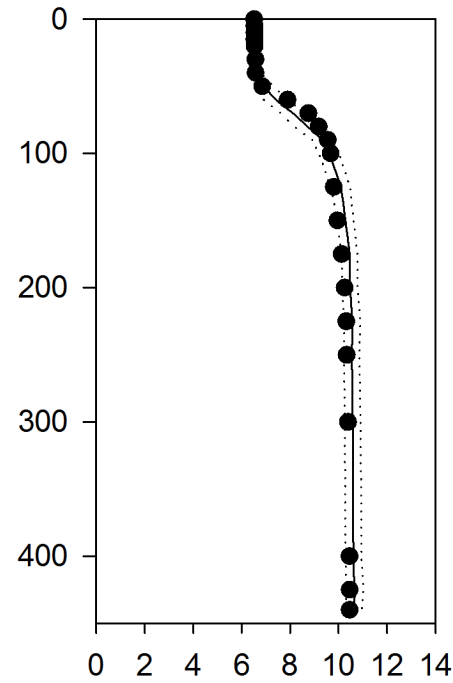
Vertical profiles BY31 December

— Mean 1996-2010 St.Dev. ● 2014

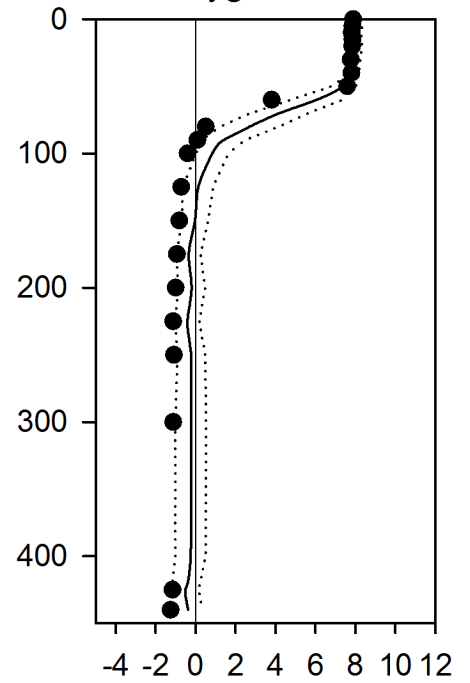
Temperature °C



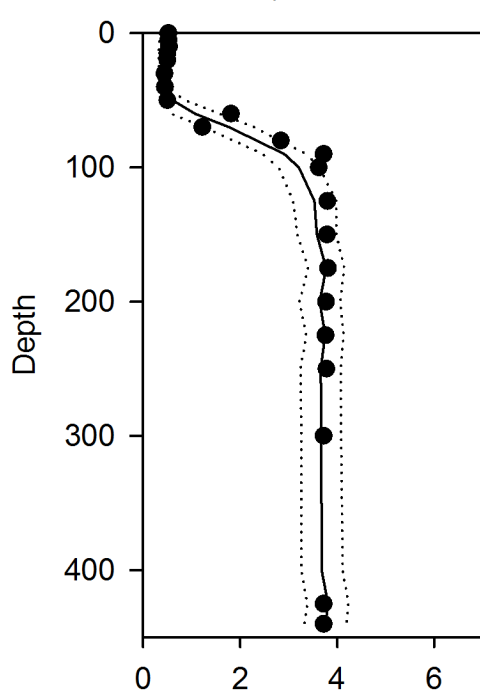
Salinity psu



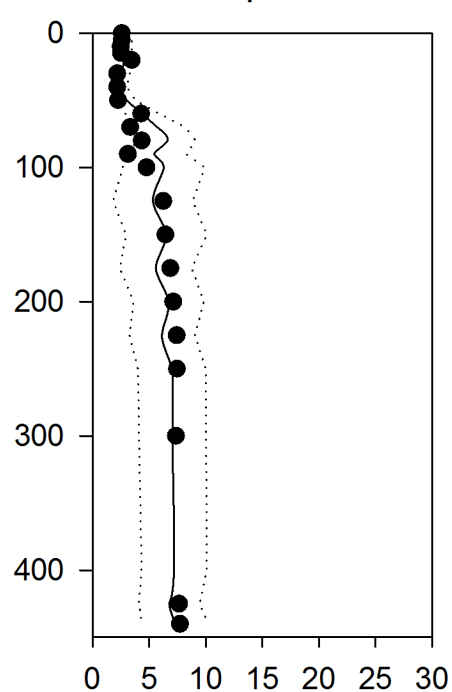
Oxygen ml/l



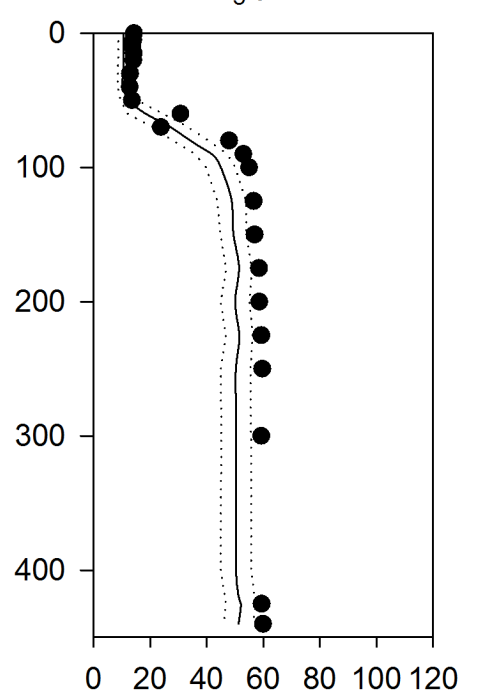
PO₄ μmol/l



DIN μmol/l



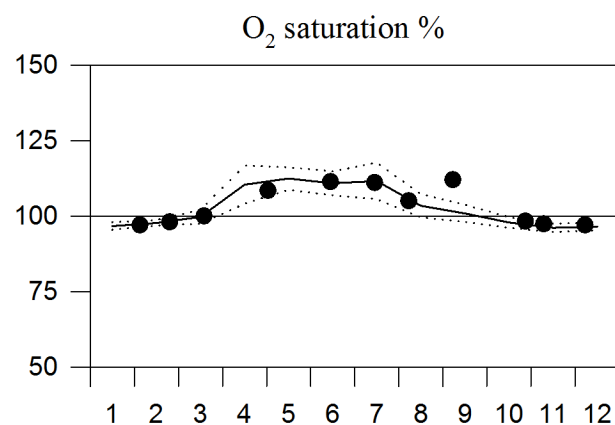
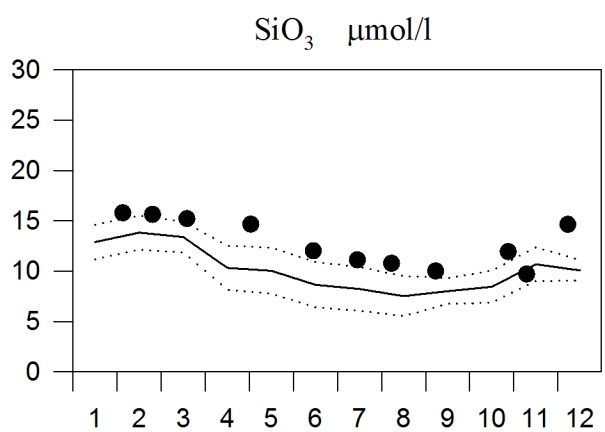
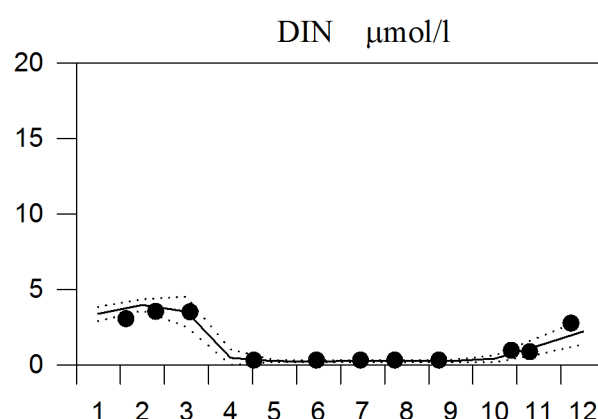
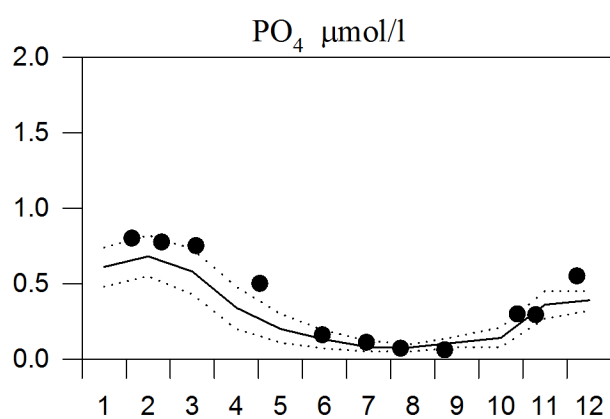
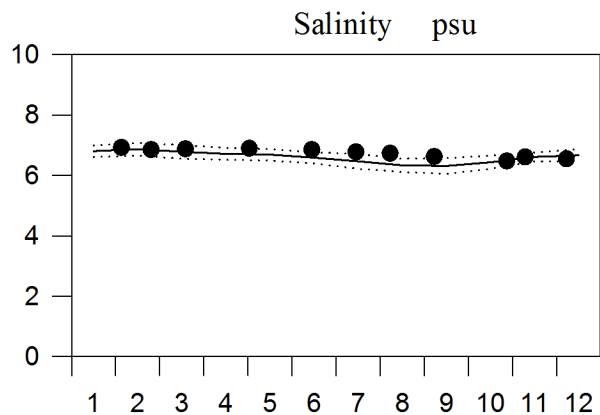
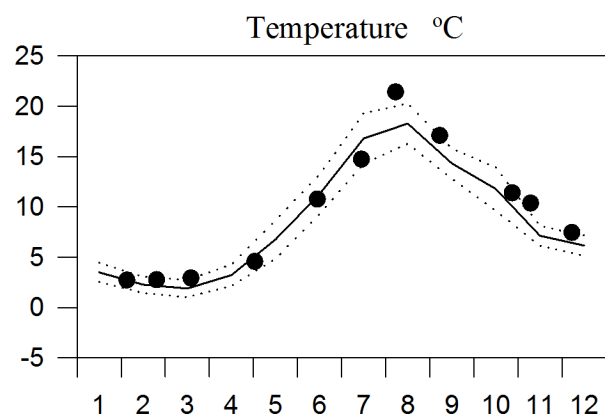
SiO₃ μmol/l



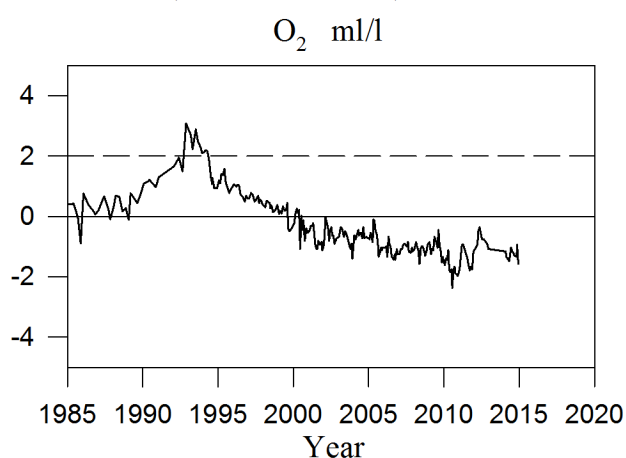
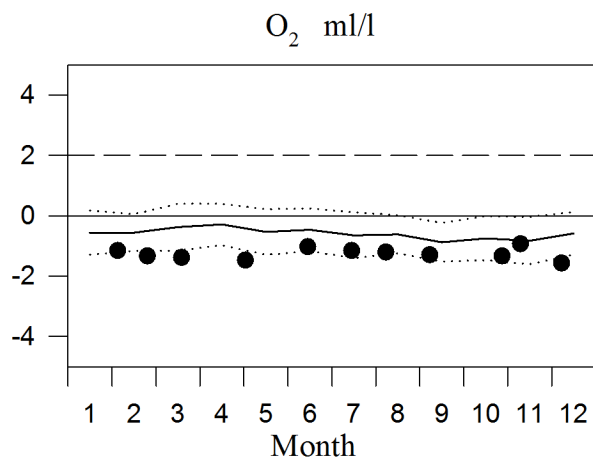
STATION BY32 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



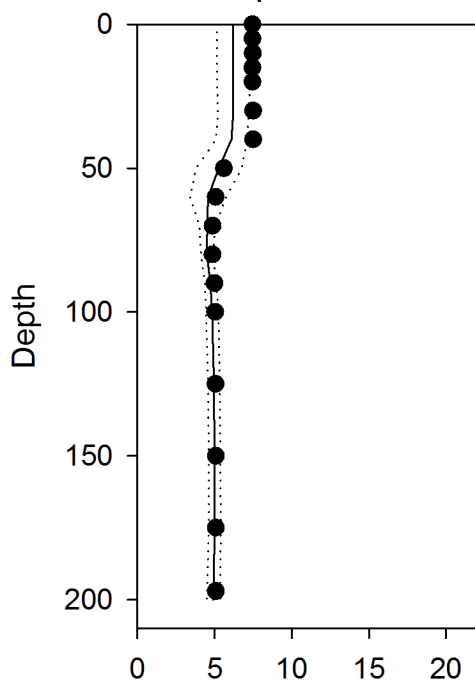
OXYGEN IN BOTTOM WATER (depth > 175m)



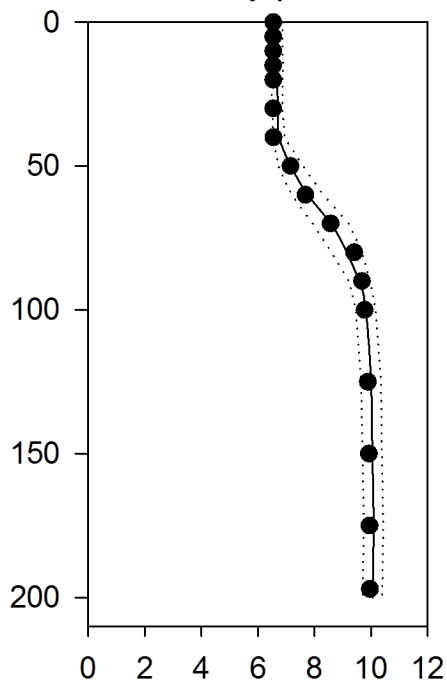
Vertical profiles BY32 December

— Mean 1996-2010 St.Dev. ● 2014

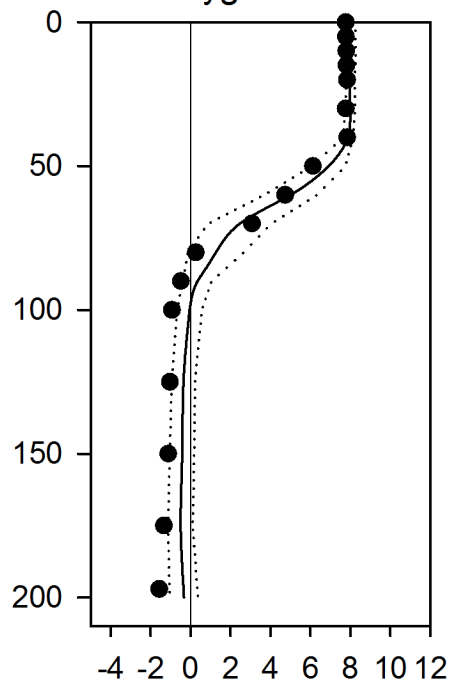
Temperature °C



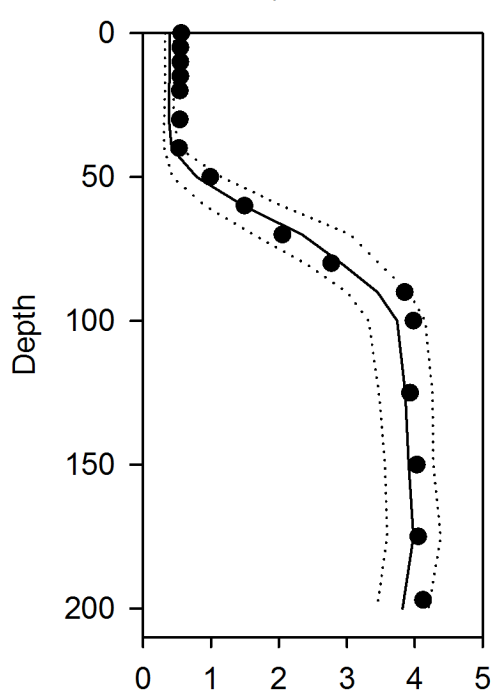
Salinity psu



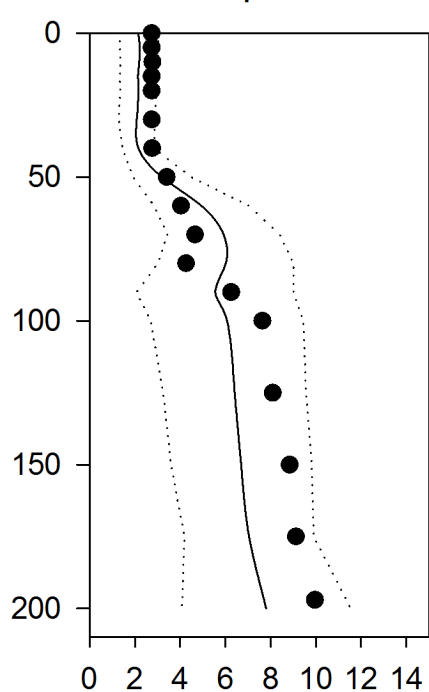
Oxygen ml/l



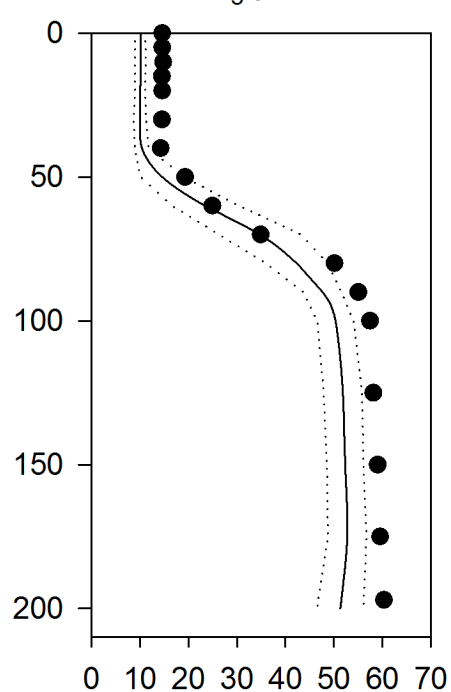
PO₄ μmol/l



DIN μmol/l



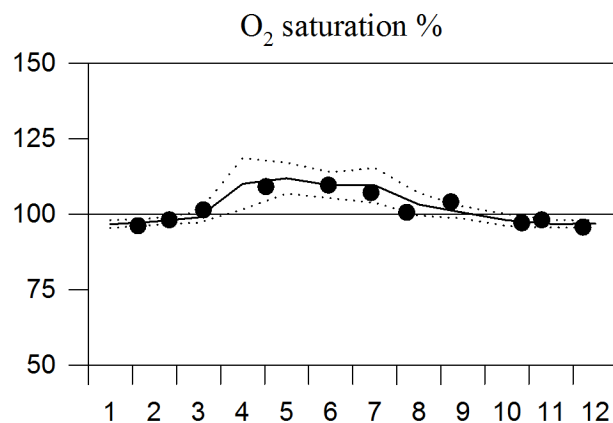
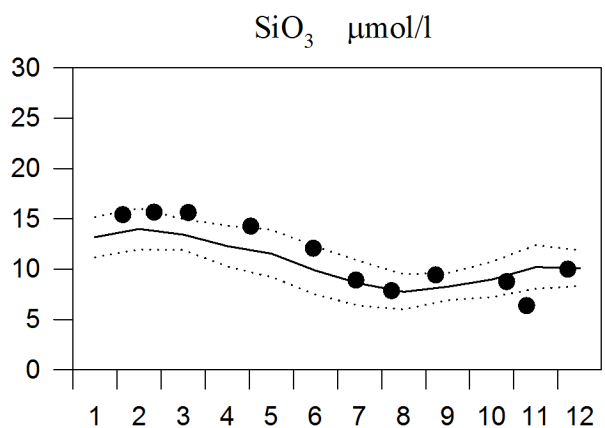
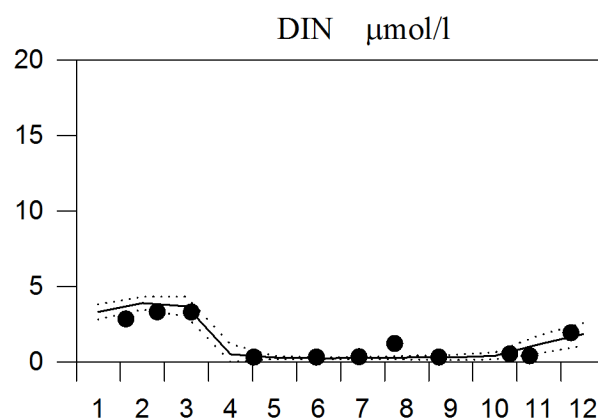
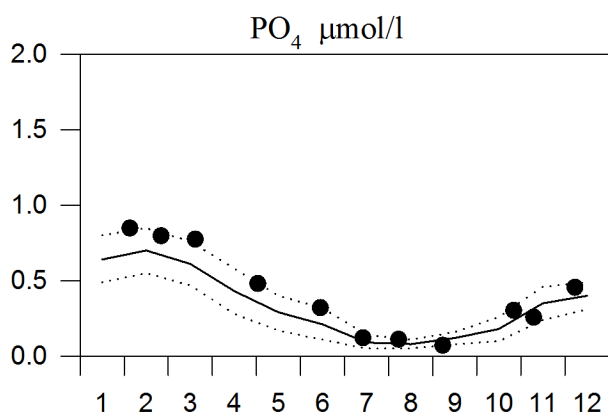
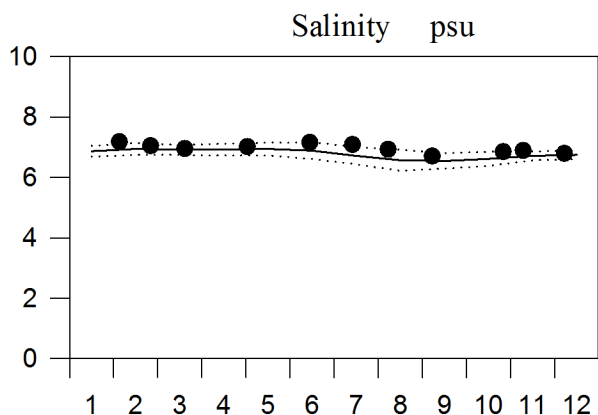
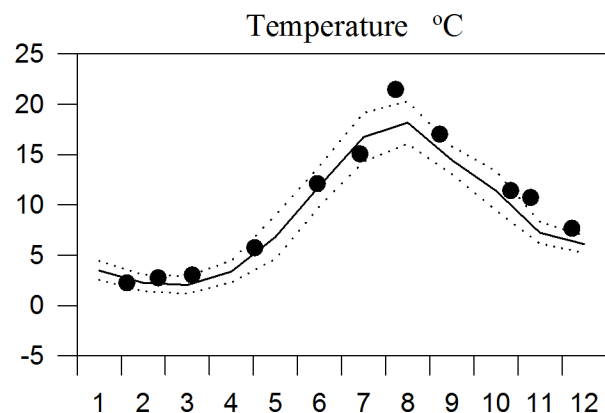
SiO₃ μmol/l



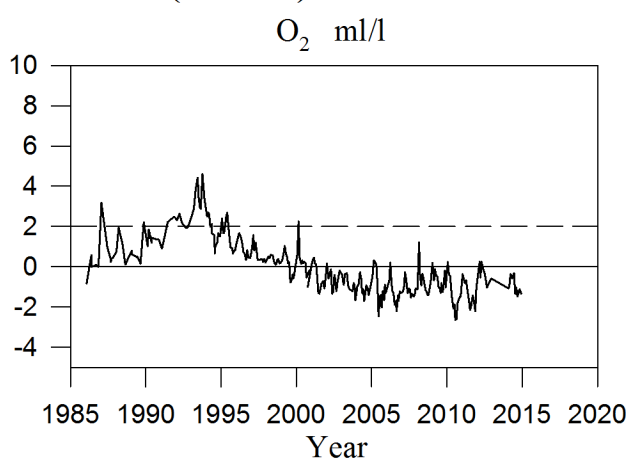
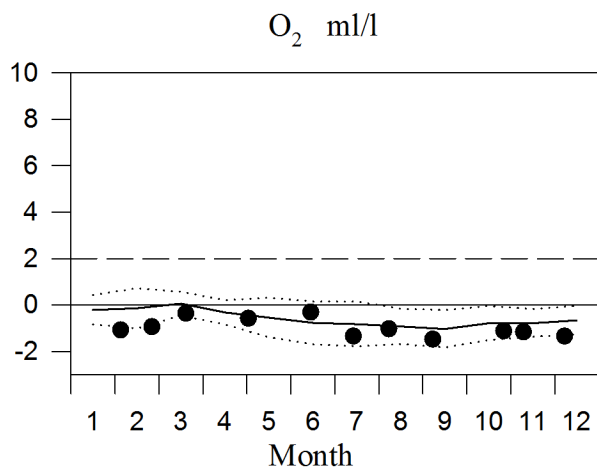
STATION BY38 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

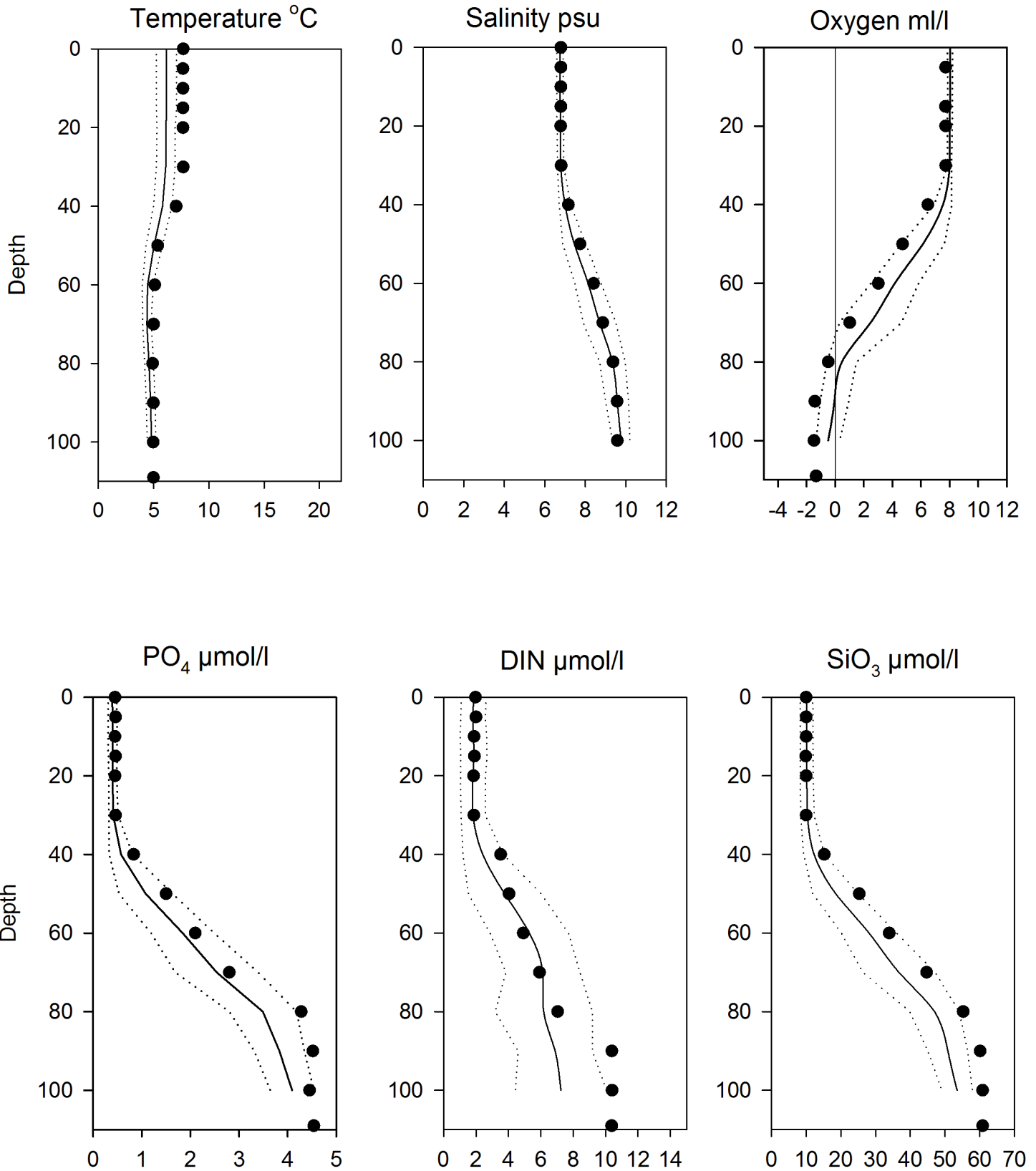


OXYGEN IN BOTTOM WATER (> 100m)



Vertical profiles BY38 December

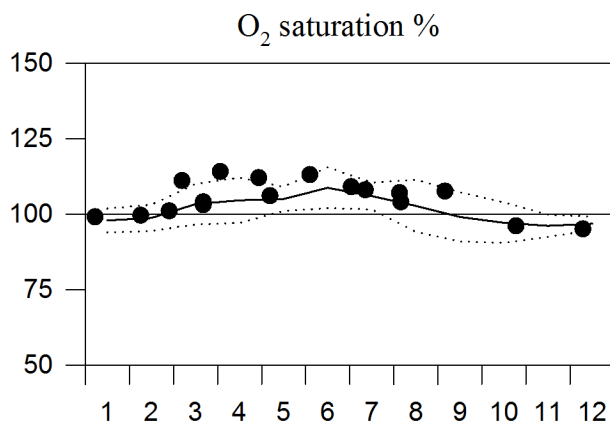
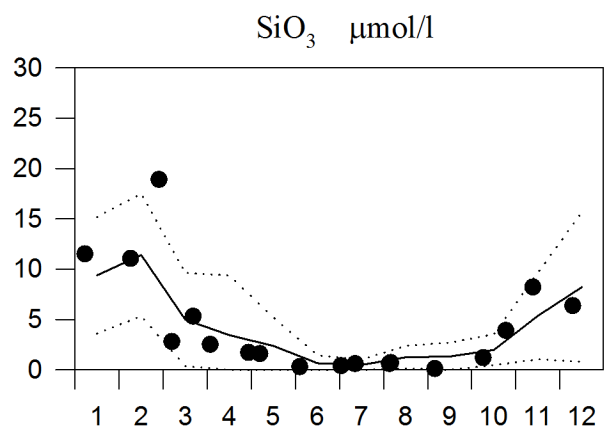
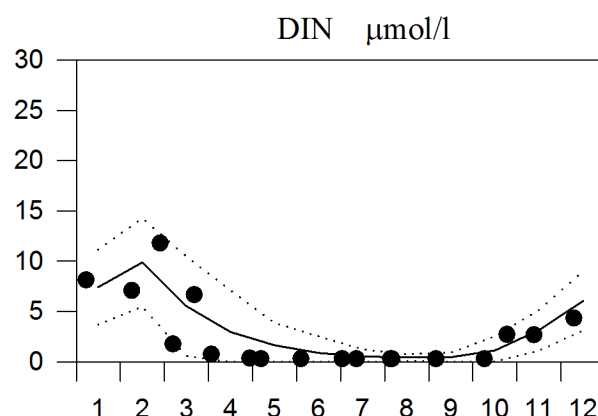
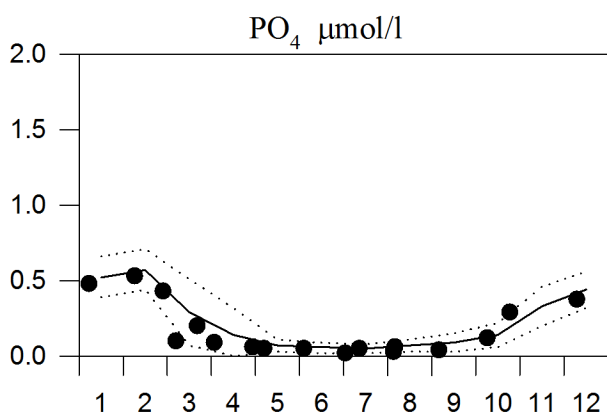
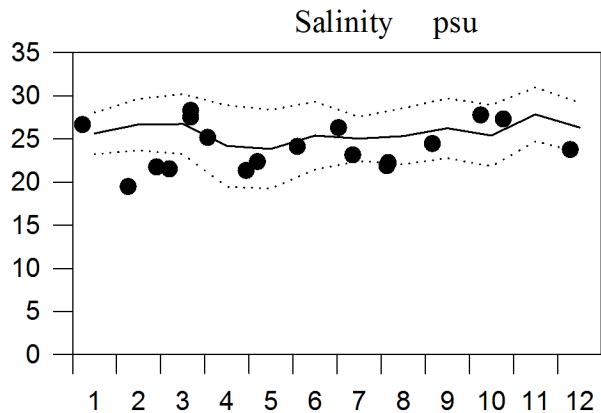
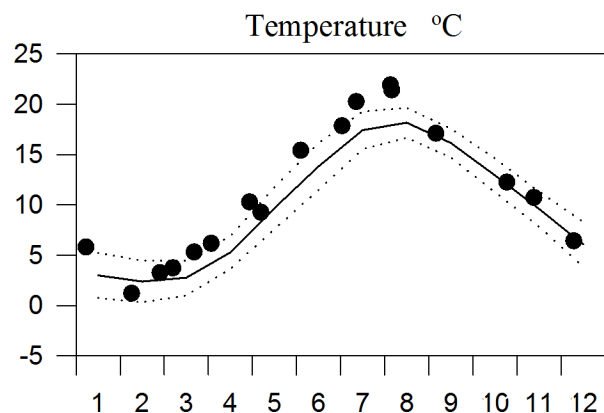
— Mean 1996-2010 St.Dev. ● 2014



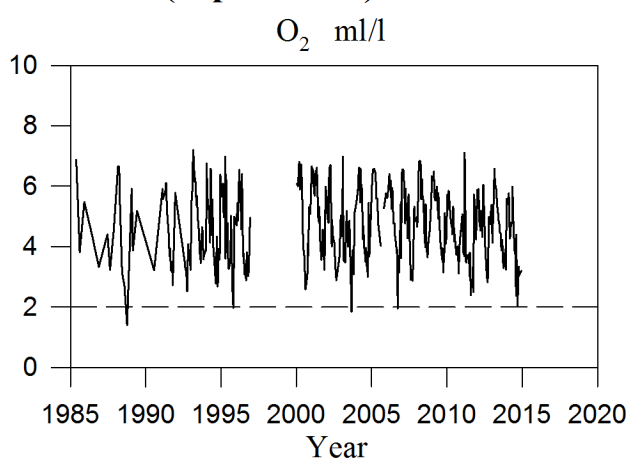
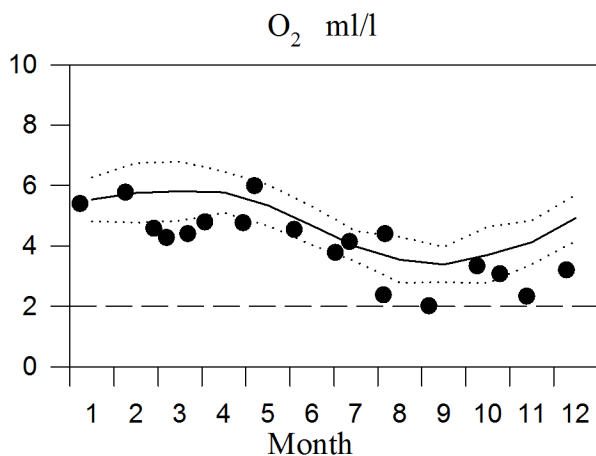
STATION SLÄGGÖ SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014

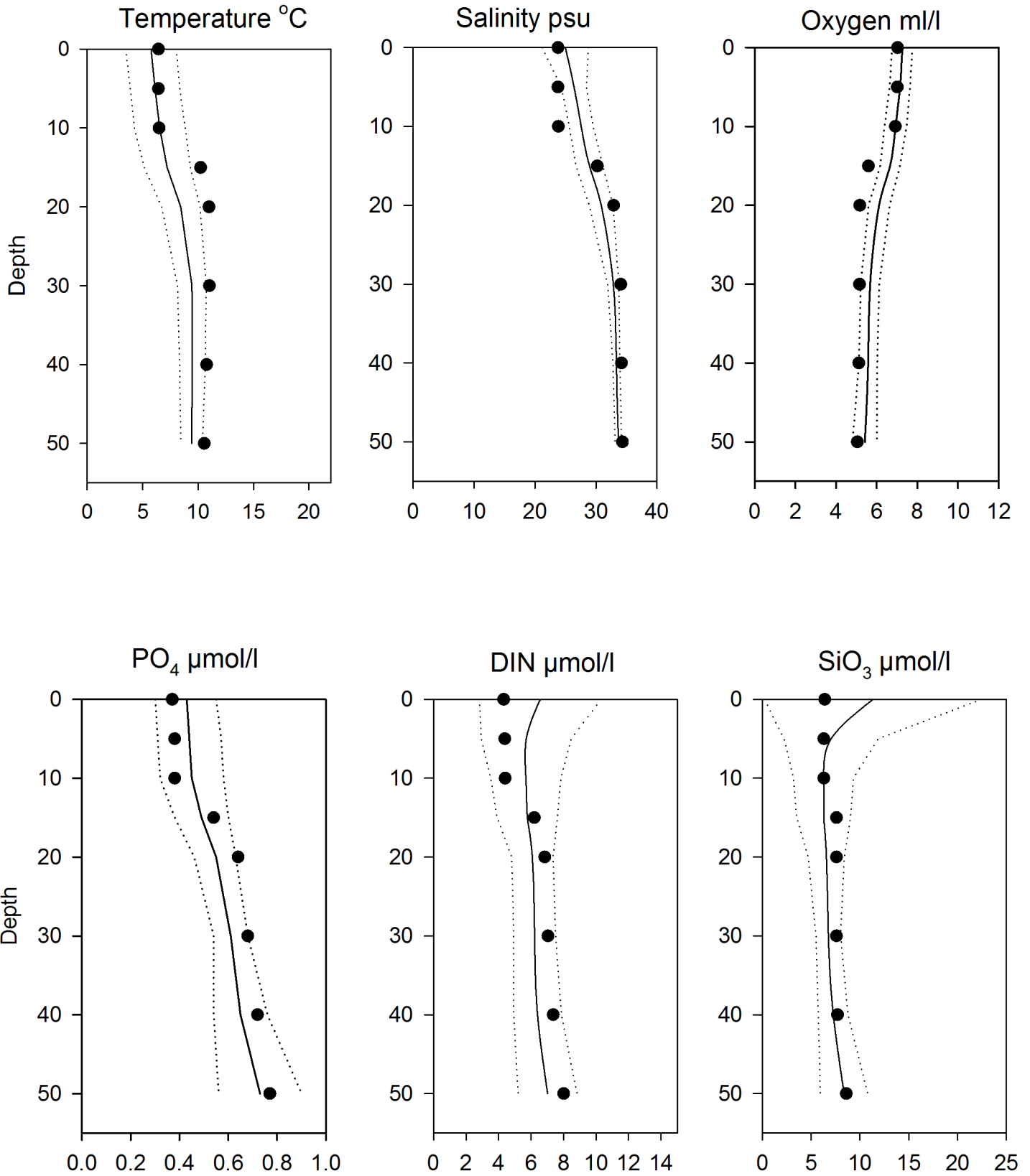


OXYGEN IN BOTTOM WATER (depth >50m)



Vertical profiles Släggö December

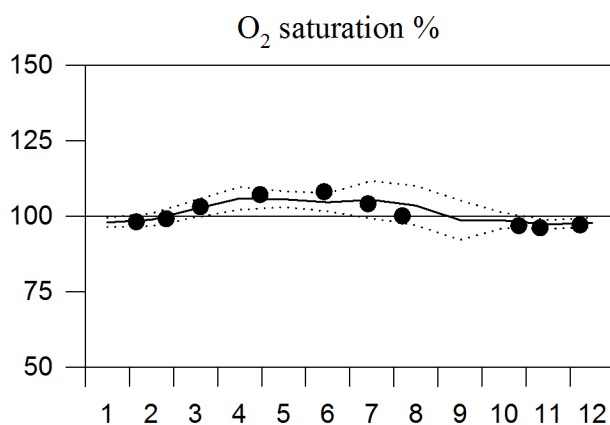
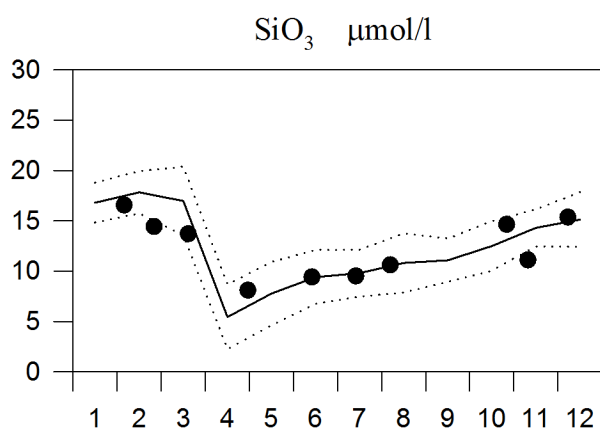
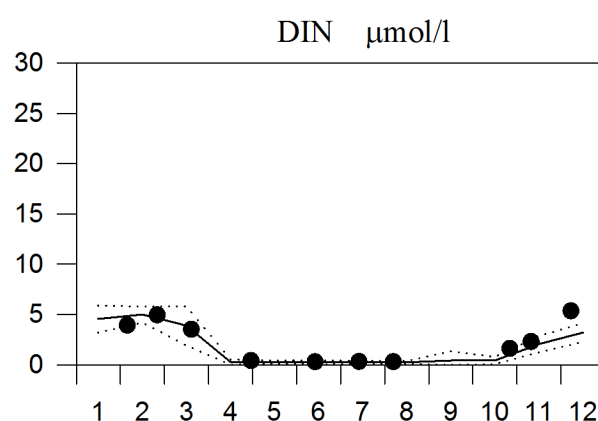
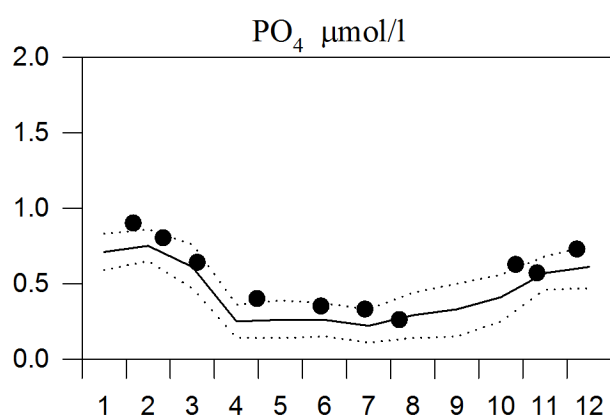
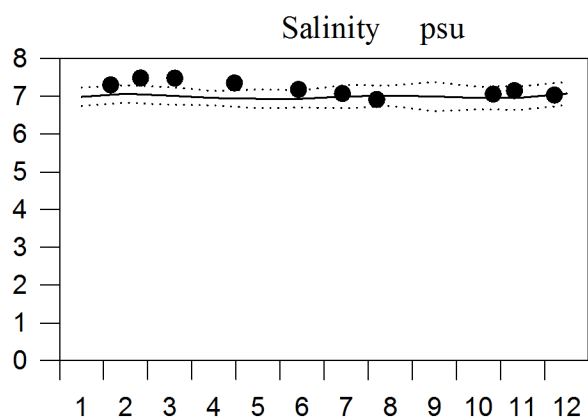
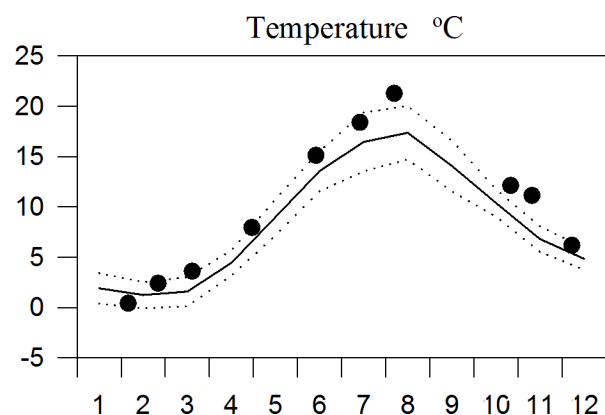
— Mean 1996-2010 St.Dev. ● 2014



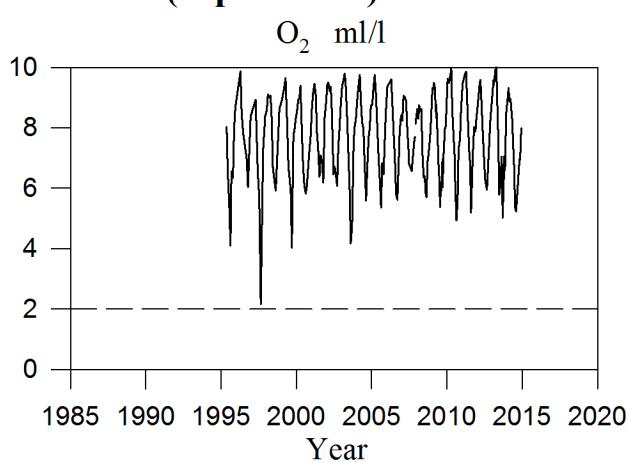
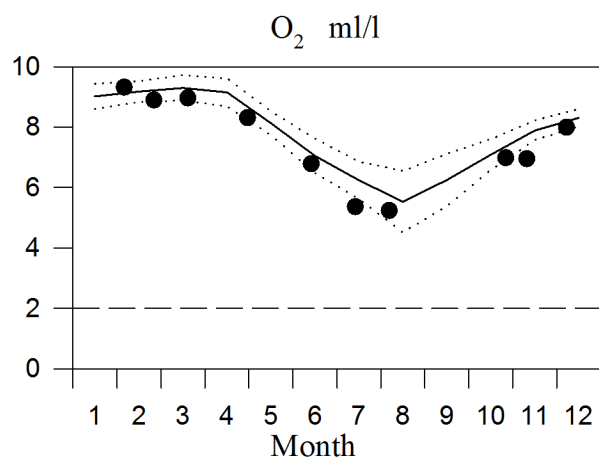
STATION REF M1V1 SURFACE WATER

Annual Cycles

— Mean 1996-2010 St.Dev. ● 2014



OXYGEN IN BOTTOM WATER (depth >15m)



Vertical profiles Ref M1V1 December

— Mean 1996-2010 St.Dev. ● 2014

