

Electronic Supplemental Material (ESM)

Table S1

Site	Water Depth (m)	Distance From Nearest Shoreline (km)
1	12	14.6
2	20	38.7
3	15	8.8
4	24	47.8
5	15	9.5
7	20	10.7
8	14	8.0
9	21	41.2

Location information for each mooring

Table S2

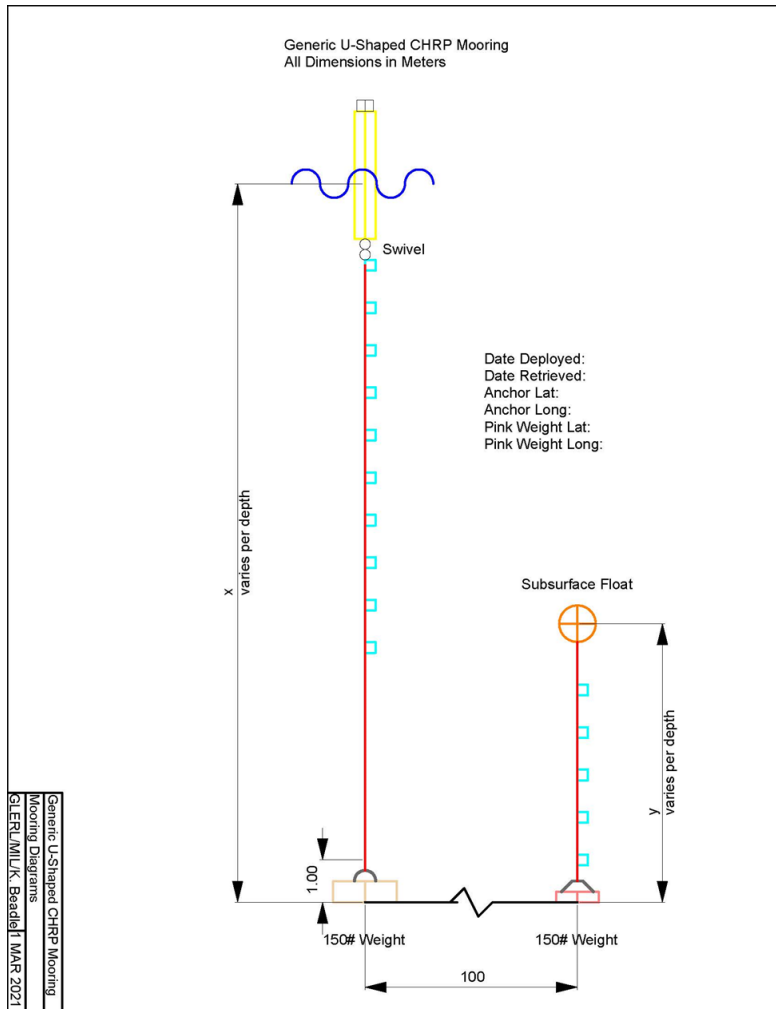
Year	Station	Temperature Sensor Depths (m)	DO Sensor Depths (m)
2017	CHRP1	1, 2, 3, 4, 5, 6, 7, 8, 9.2, 10.2, 11.7	1, 9.2, 10.2, 11.7
2018	CHRP1	9.2, 10.2, 11.7	9.2, 10.2, 11.7
2019	CHRP1	1, 2.5, 3, 3.5, 5, 6, 7, 8, 9.2, 10.2, 11, 11.7	1, 9.2, 10.2, 11.7
2017	CHRP2	2.1, 8, 14, 17	2.1, 8, 14, 17
2018	CHRP2	2.1, 11, 14, 17, 19.5	2.1, 11, 14, 17, 19.5
2019	CHRP2	2.4, 3, 5, 8, 9.5, 11, 12, 13, 14, 15, 16, 17, 18, 19.5	2.4, 8, 11, 14, 17, 19.5
2017	CHRP3	1, 2, 3, 4, 5, 6, 7, 8, 12.4, 13.4, 14.9	1, 12.4, 13.4, 14.9
2018	CHRP3	1, 2, 3, 4, 5, 6, 7, 8, 12.4, 13.4, 14.9	1, 12.4, 13.4, 14.9
2019	CHRP3	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.4, 13.4, 14.9	1, 12.4, 13.4, 14.9
2017	CHRP4	8, 10.5, 13.3, 15, 17.3, 19, 21.3, 23.8	8, 13.3, 17.3, 21.3, 23.8
2018	CHRP4	8, 10.5, 13.3, 15, 19, 21.3, 23.8	8, 13.3, 21.3, 23.8
2019	CHRP4	8, 9, 10.5, 12, 13.3, 15, 16, 17.3, 19, 20, 21.3, 22, 23.8	8, 13.3, 17.3, 21.3, 23.8
2017	CHRP5	2, 3, 4, 5, 6, 7, 8, 12.3, 13.3, 14.8	12.3, 13.3, 14.8
2019	CHRP5	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12.3, 13.3, 14.8	1, 12.3, 13.3, 14.8
2017	CHRP7	8, 11.1, 14.1, 17.1, 19.6	8, 11.1, 14.1, 17.1, 19.6
2018	CHRP7	1, 2, 3, 4, 5, 6, 8, 11.1, 14.1, 17.1, 19.6	1, 8, 11.1, 14.1, 17.1, 19.6
2019	CHRP7	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.1, 12, 13, 14.1, 15, 16	1, 8, 11.1, 14.1
2017	CHRP8	1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13.5	1, 11, 12, 13.5
2018	CHRP8	1, 3, 4, 6, 7, 11, 12, 13.5	1, 11, 12, 13.5
2019	CHRP8	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13.5	1, 11, 12, 13.5
2017	CHRP9	2.5, 11.4, 14.9, 17.9, 20.4	2.5, 11.4, 14.9, 17.9, 20.4
2018	CHRP9	2, 8, 11.4, 14.9, 17.9, 20.4	2, 8, 11.4, 14.9, 17.9, 20.4
2019	CHRP9	2.3, 3, 5, 8, 10, 11.4, 13, 14.9, 16, 17, 18.4, 19, 20.4	2.3, 8, 11.4, 14.9, 18.4, 20.4

Table S3

	2017		2018		2019	
	Dates	ΔT	Dates	ΔT	Dates	ΔT
SITE1	8-31 to 9-03	-1.21	9-09 to 9-12	-2.19	8-22 to 8-25	-1.03
SITE2	9-01 to 9-04	-1.53	9-08 to 9-11	-3.16	8-25 to 8-28	-1.97
SITE3	8-31 to 9-03	-1.12	9-07 to 9-10	-3.44	8-22 to 8-25	-1.27
SITE4	9-01 to 9-04	-1.95	9-08 to 9-11	-3.23	8-25 to 8-28	-1.01
SITE5	8-31 to 9-03	-0.99	-	-	8-24 to 8-27	-1.43
SITE7	8-17 to 8-20	-2.38	9-08 to 9-11	-3.6	8-22 to 8-25	-1.3
SITE8	8-31 to 9-03	-1.2	9-08 to 9-11	-7.46	8-26 to 8-29	-1.09
SITE9	9-01 to 9-04	-1.07	9-08 to 9-11	-4.03	8-22 to 8-25	-1.45

Largest 3-day temperature drop from August-September using average daily temperatures from the two topmost sensors at each site.

Figure S1



The mooring design was a “U” shape to allow attachment of multiple sensors below a surface spar buoy (Rolyan B961R). The sensors were secured via PVC clamps to the ¼” stainless steel 7 x 16 wound aircraft cable, which was attached to 15ft. of ½” long link chain anchored to a 68 kg concrete weight. There was a ~100 m groundline (1/2” MFP Floatline, Samson Ropes) taped at meter intervals to a ¼” stainless steel cable as a tensioner to another 68 kg concrete weight. The rest of the sensors were floated above this weight using a sub-surface float with 18 kg buoyancy. This design facilitated multiple ways of mooring recovery, while dampening wave action due to the chain and isolating the bottom-most sensors to prevent wave action damage.

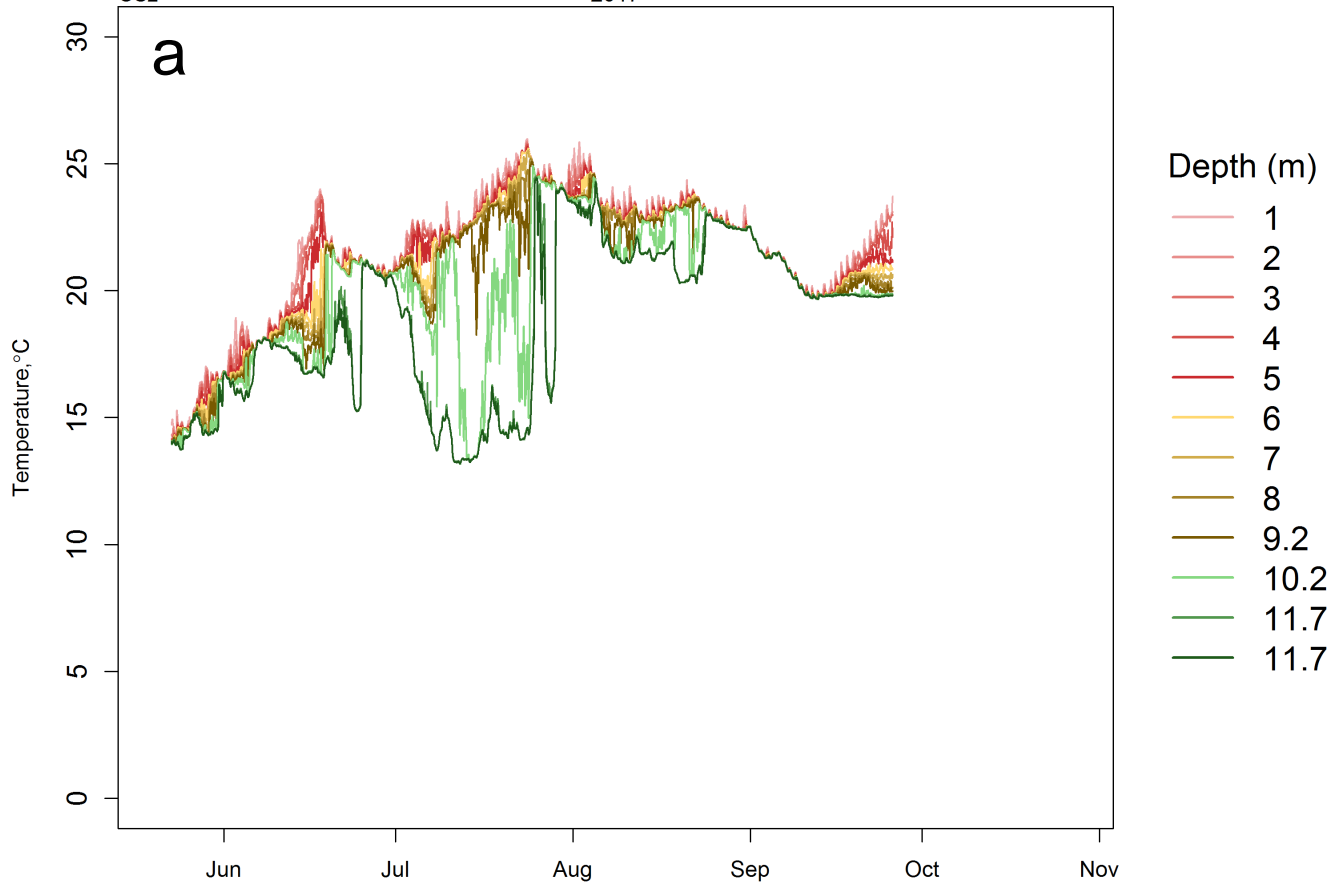
Figure S2

Time-series nearshore mooring site observations for temperature and DO. Plots are labeled to correspond to Figure 2 in the main document.

Plotted Sensors:
PME
SBE
OS2

CHRP1

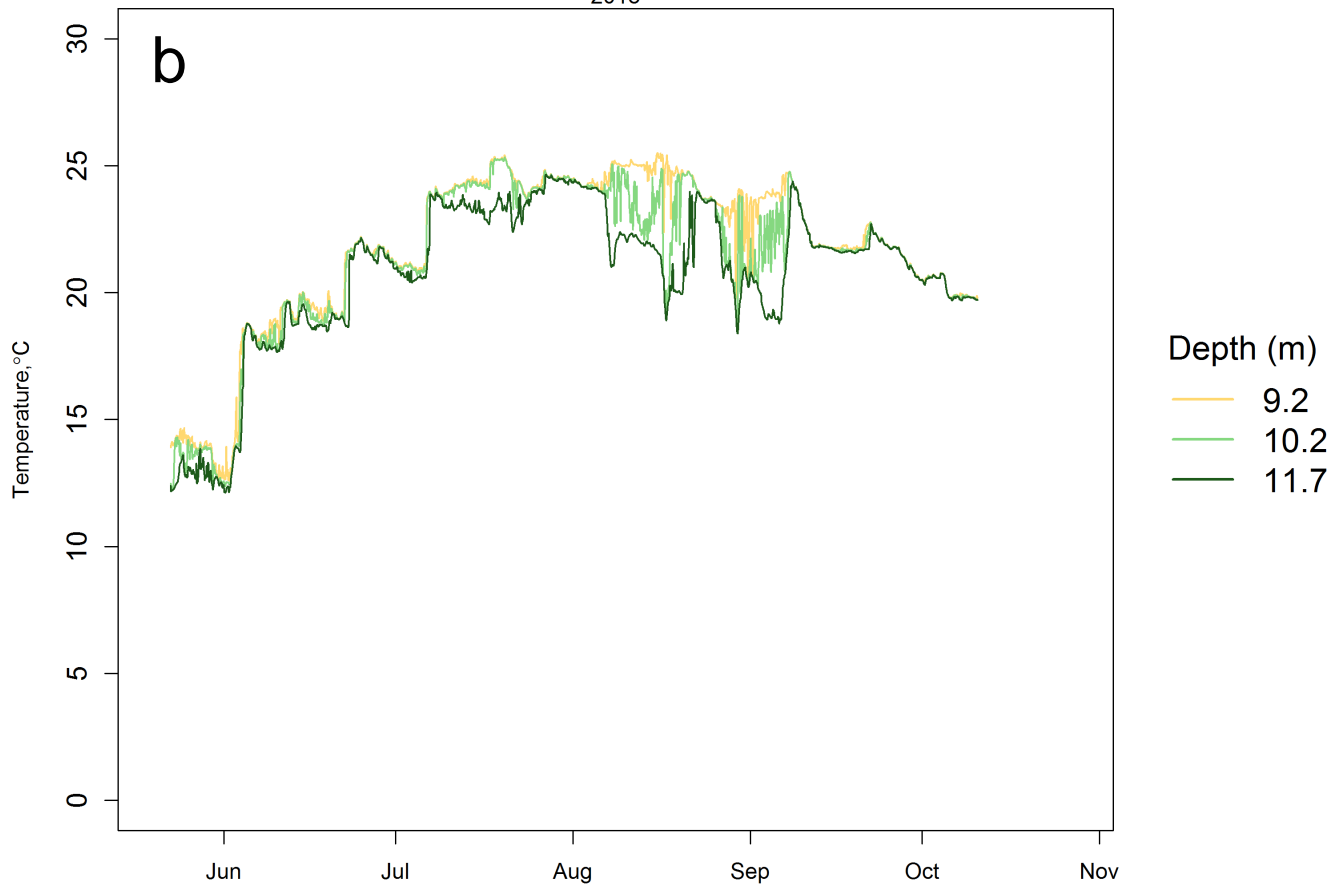
2017



Plotted Sensors:
PME

CHRP1

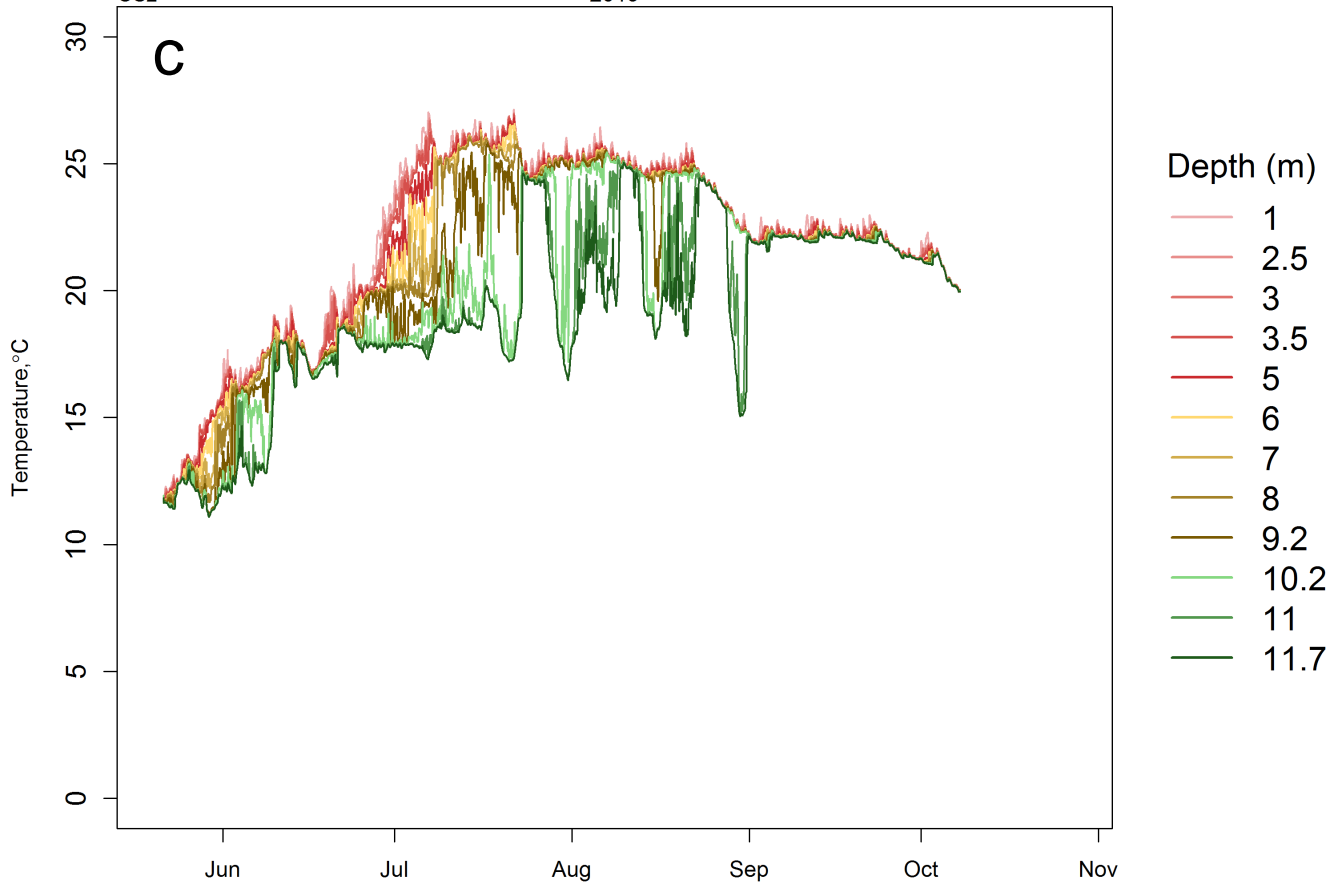
2018



Plotted Sensors:
PME
SBE
OS2

CHRP1

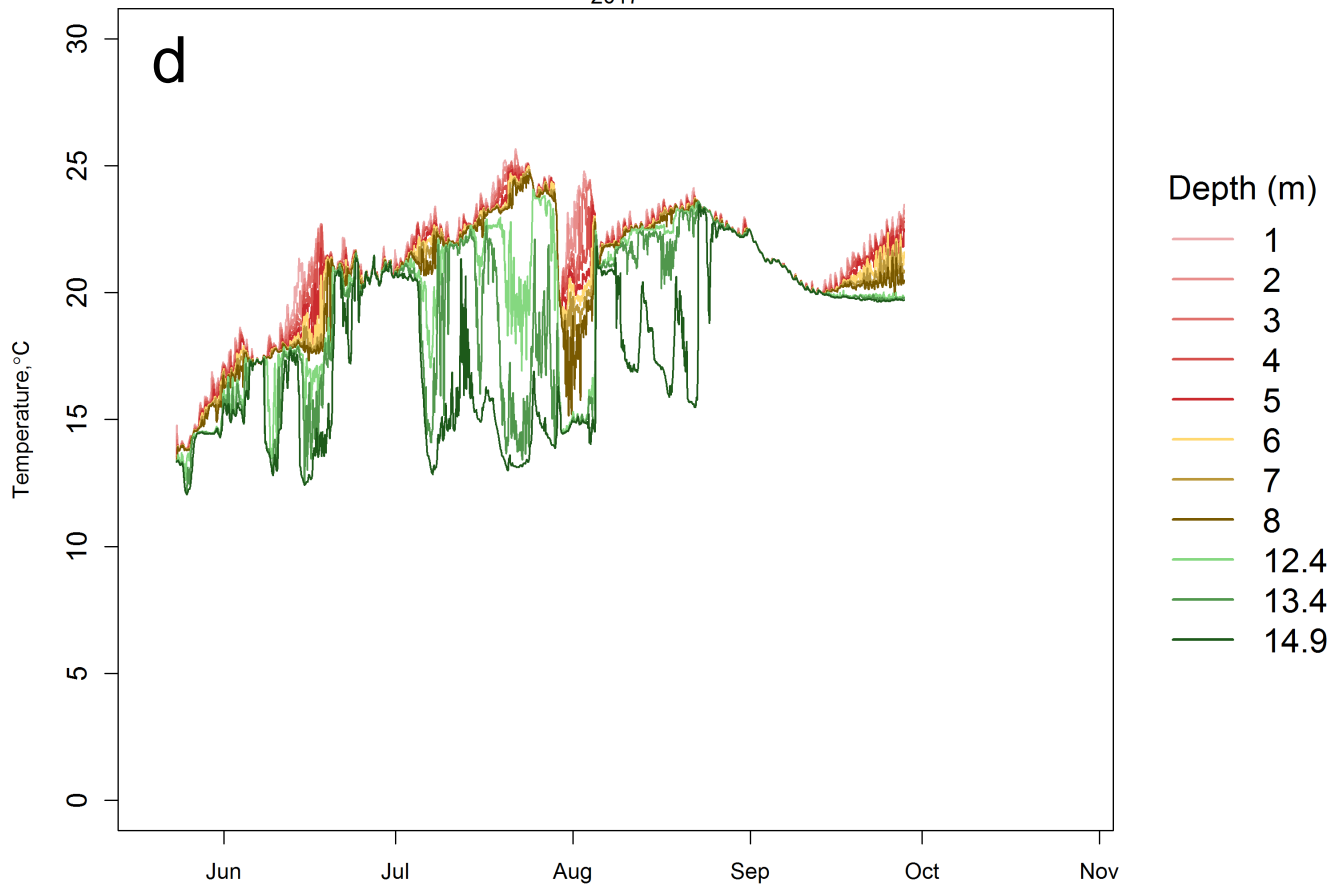
2019



Plotted Sensors:
PME
SBE

CHRP3

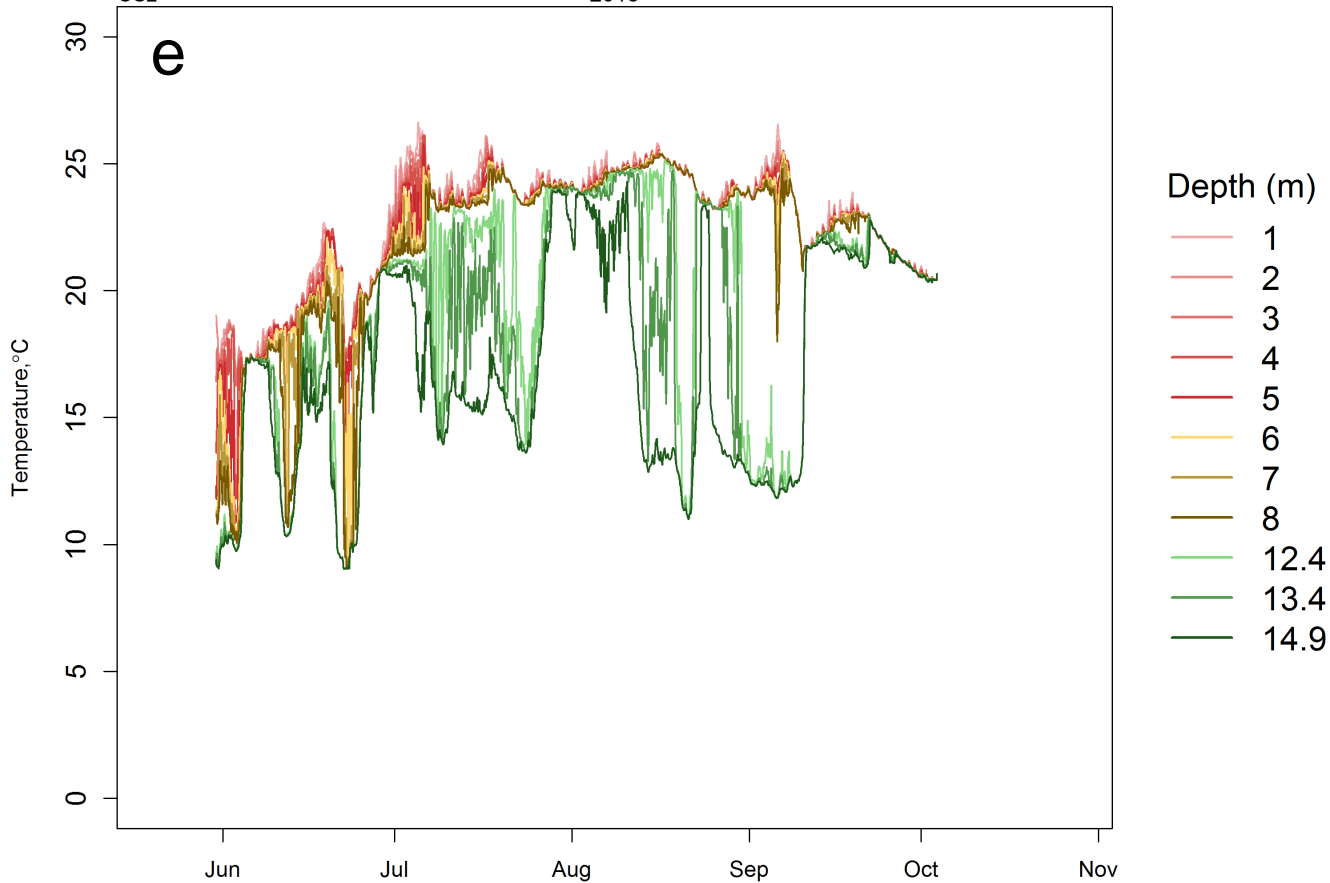
2017



Plotted Sensors:
PME
SBE
OS2

CHRP3

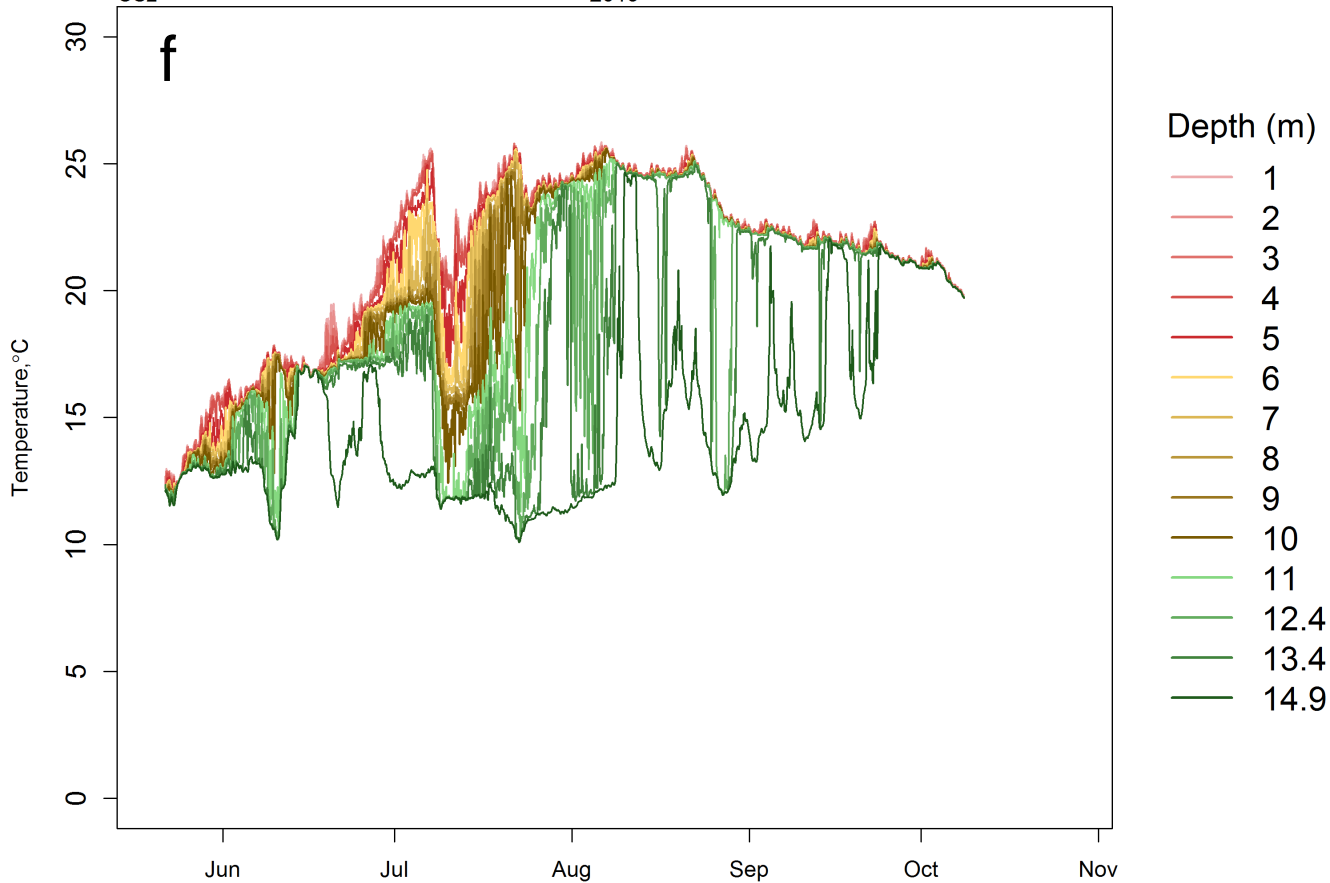
2018



Plotted Sensors:
PME
SBE
OS2

CHRP3

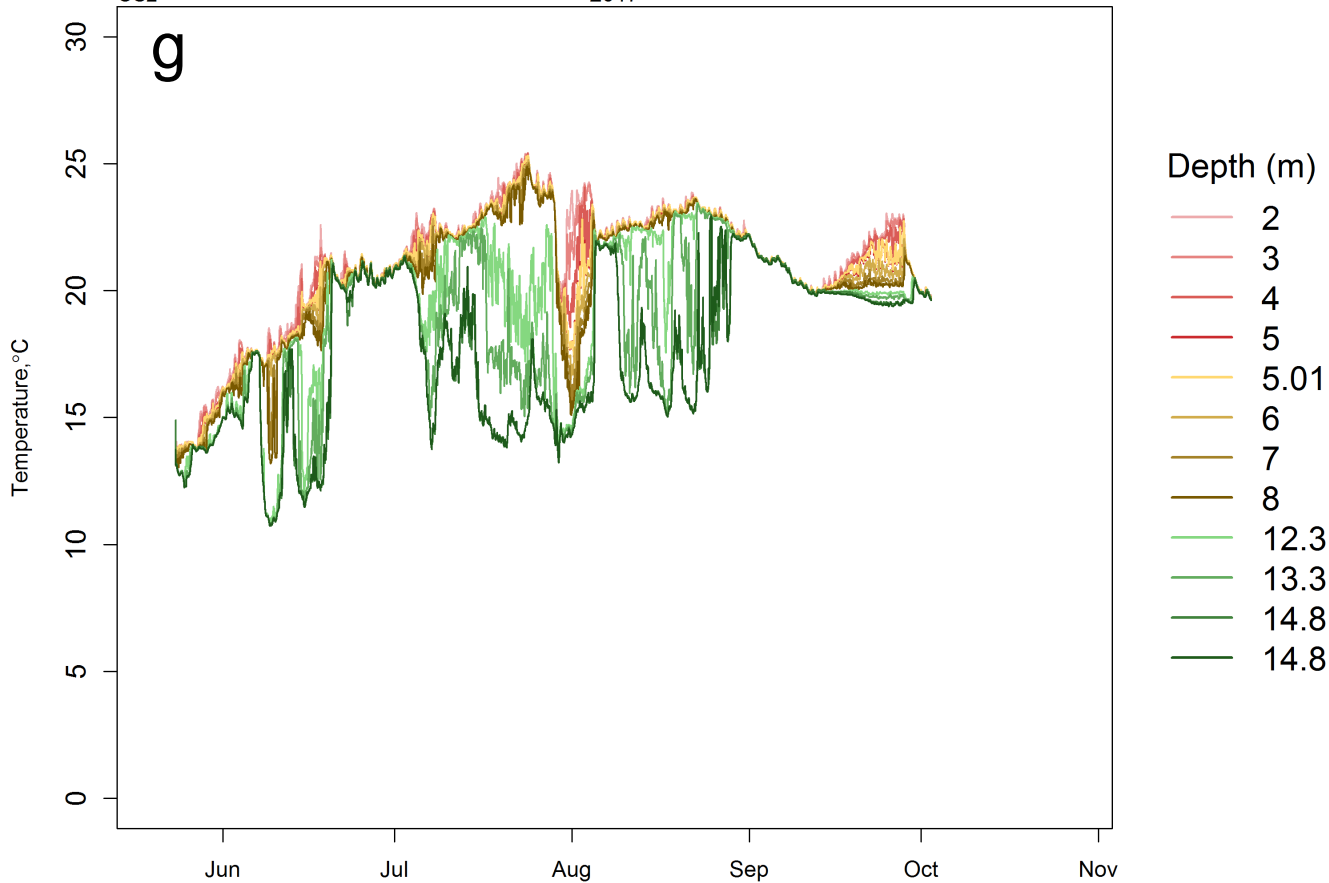
2019



Plotted Sensors:
PME
SBE
OS2

CHRP5

2017



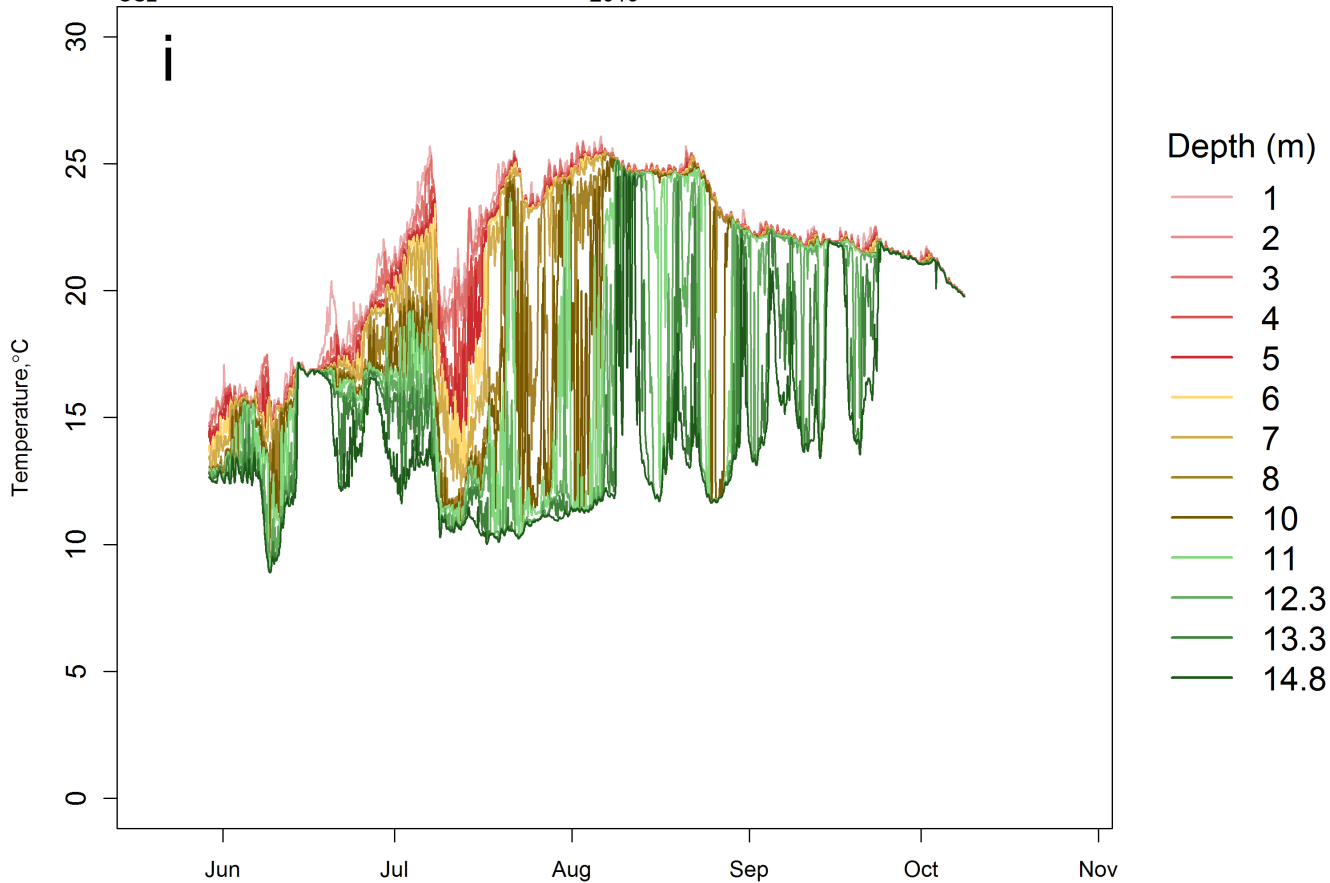
h

CHRP5 was lost, no 2018 data available

Plotted Sensors:
PME
SBE
OS2

CHRP5

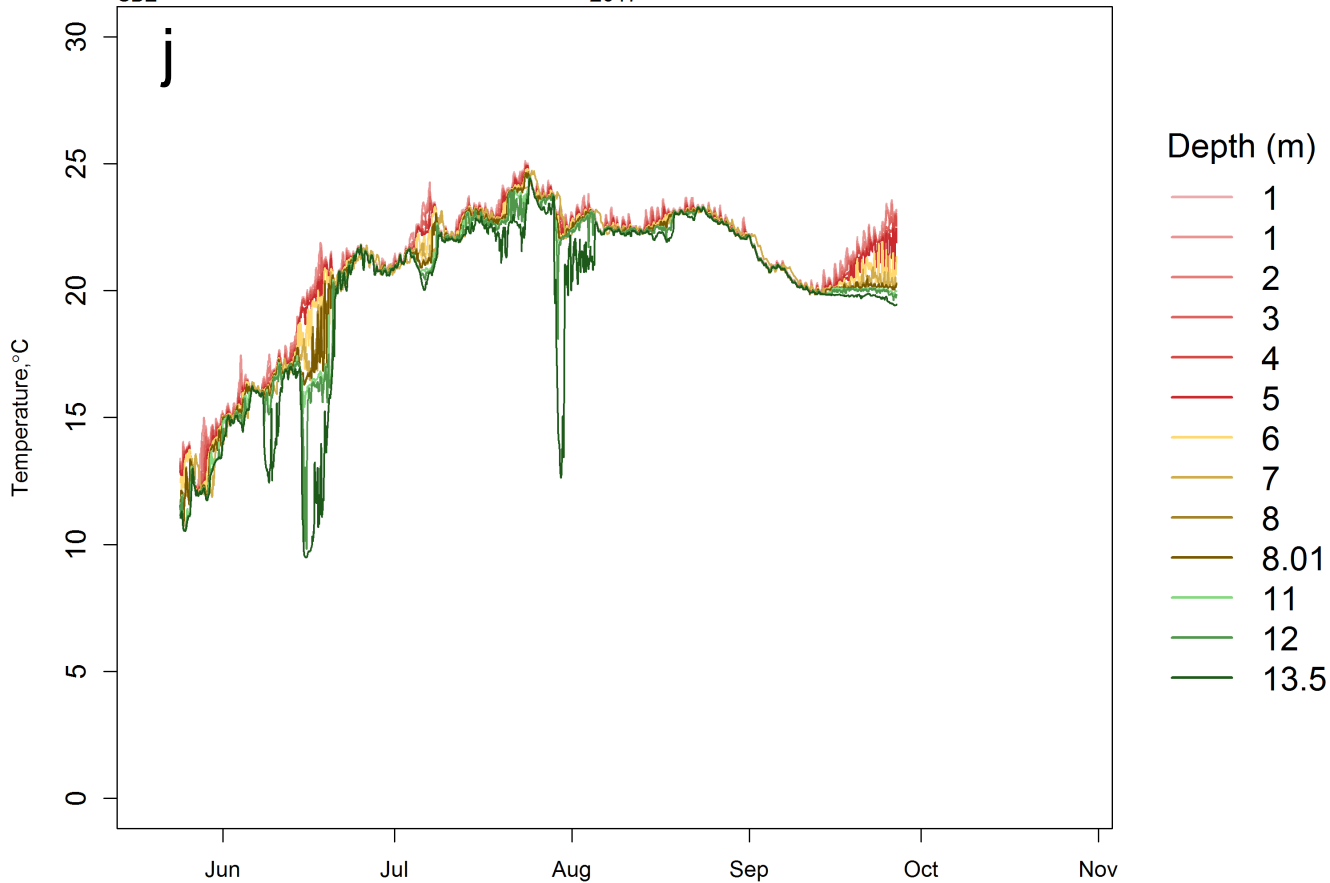
2019



Plotted Sensors:
PME
OS2
SBE

CHRP8

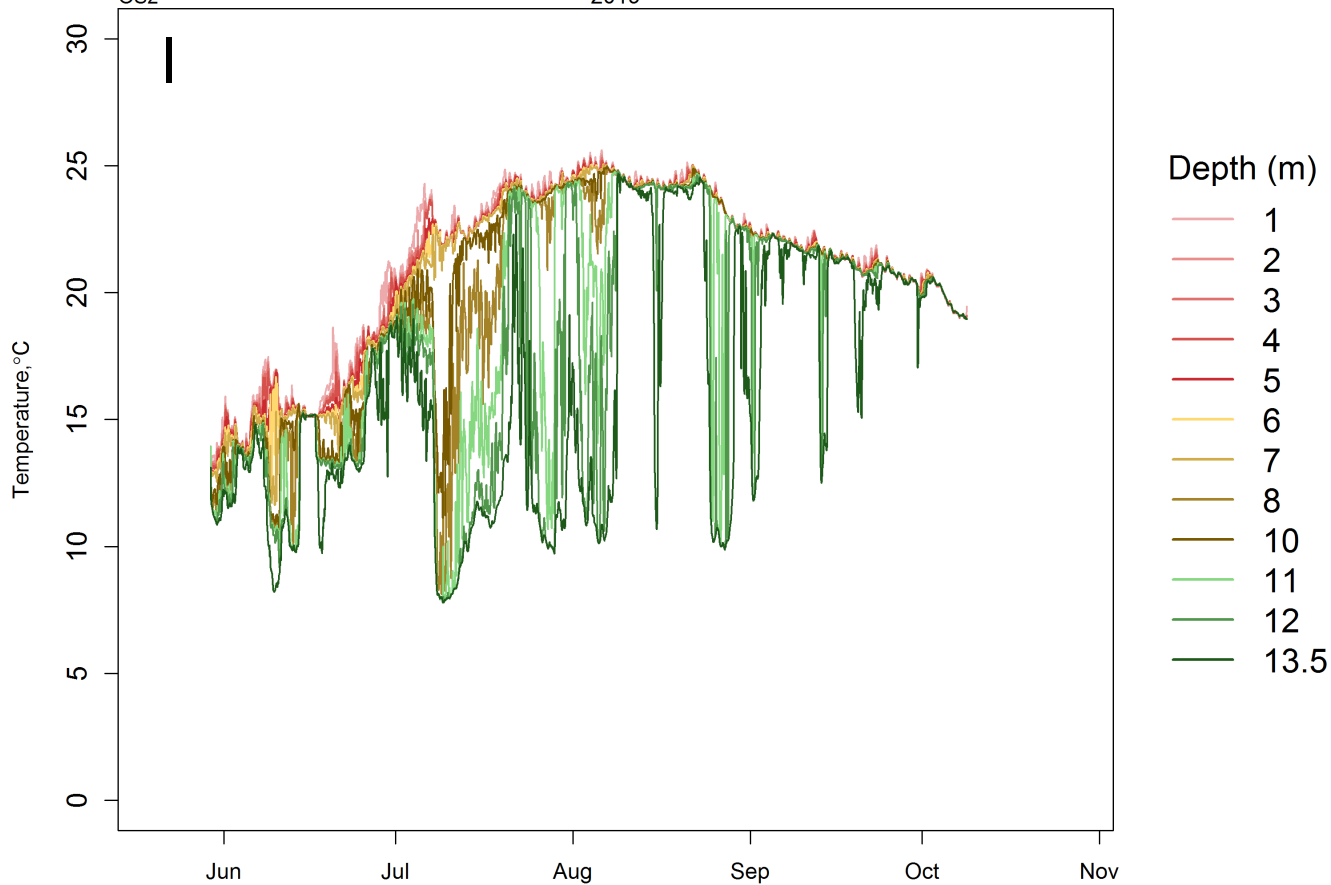
2017



Plotted Sensors:
PME
SBE
OS2

CHRP8

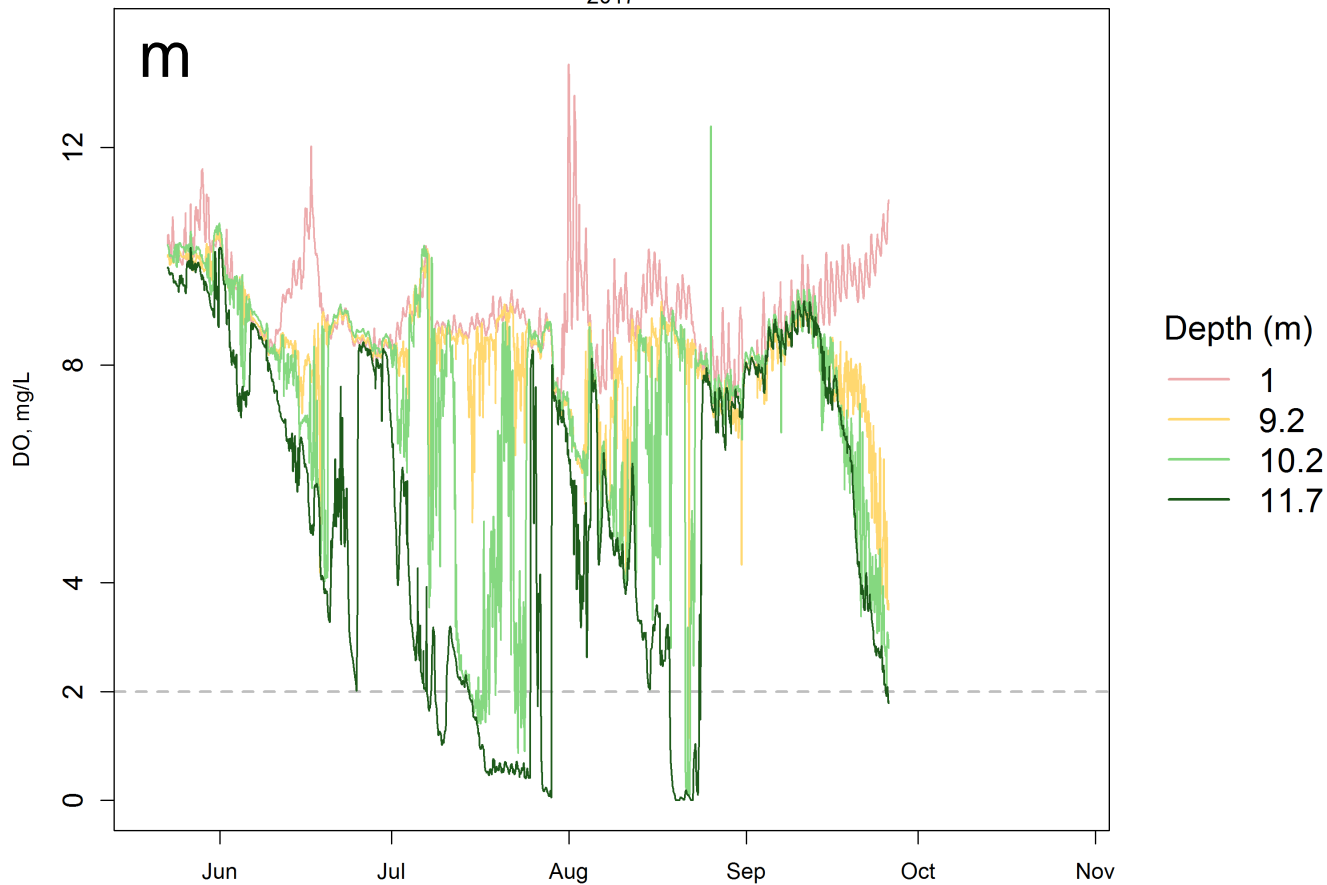
2019



Plotted Sensors:
PME

CHRP1

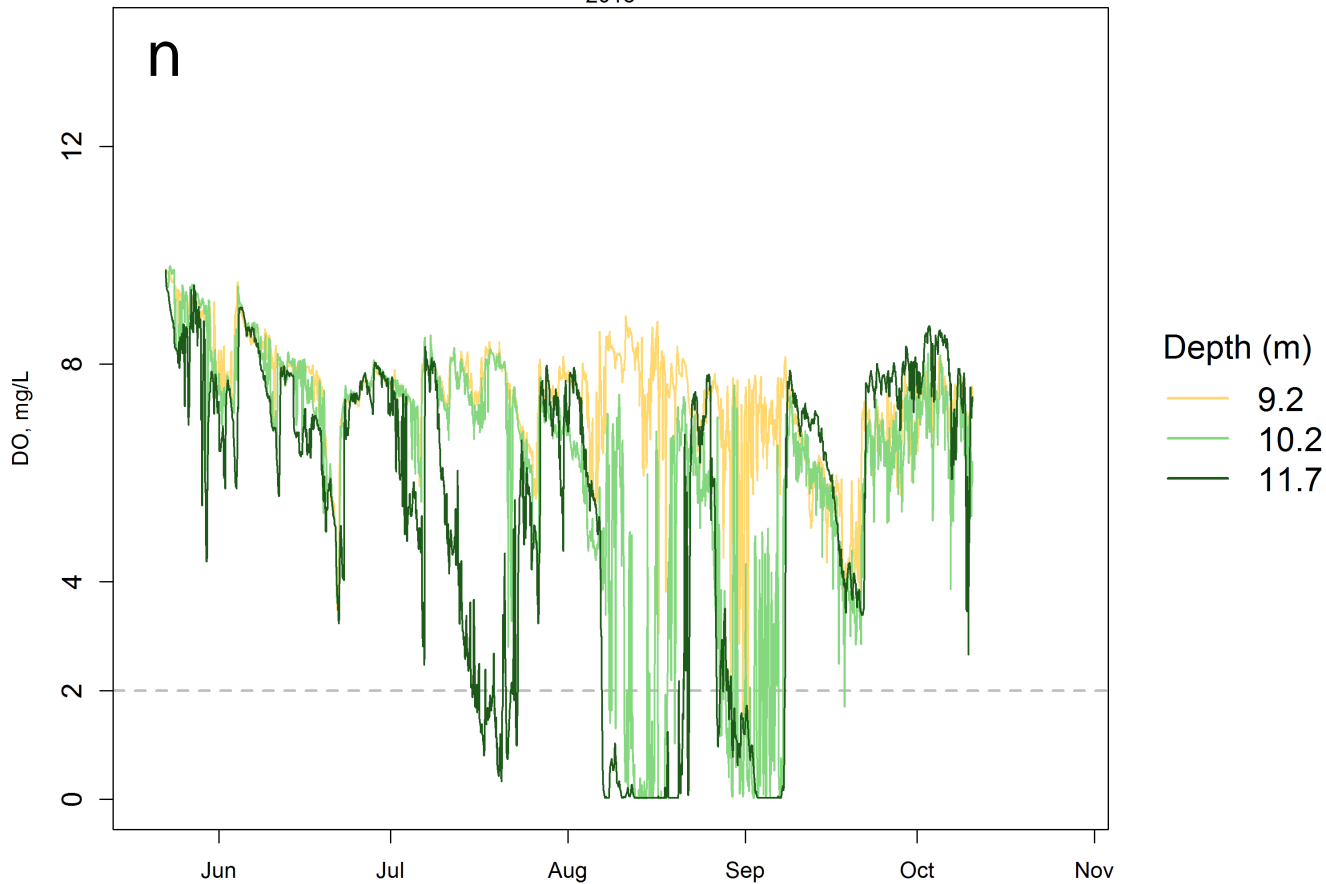
2017



Plotted Sensors:
PME

CHRP1

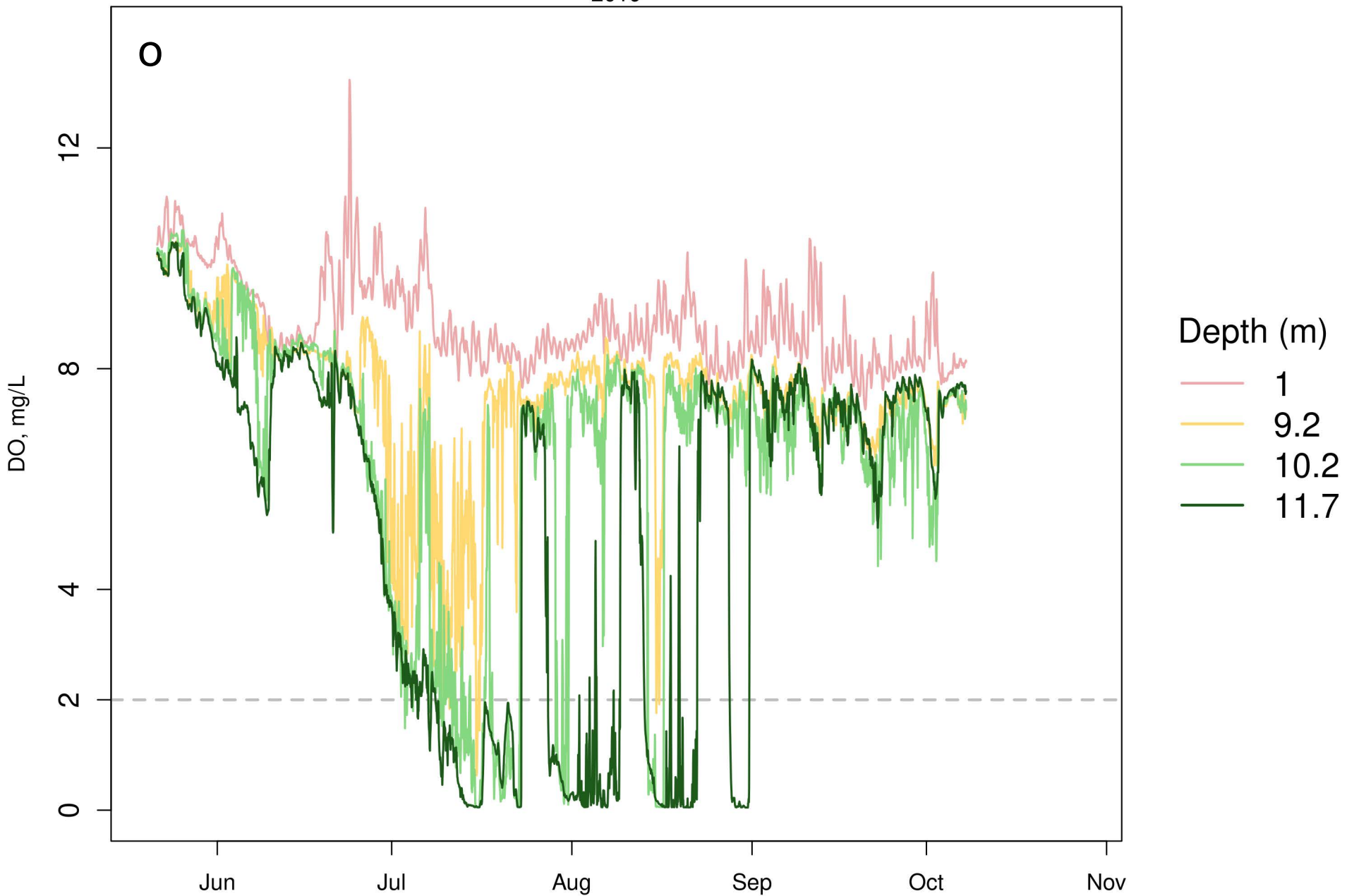
2018



Plotted Sensors:
PME

CHRP1

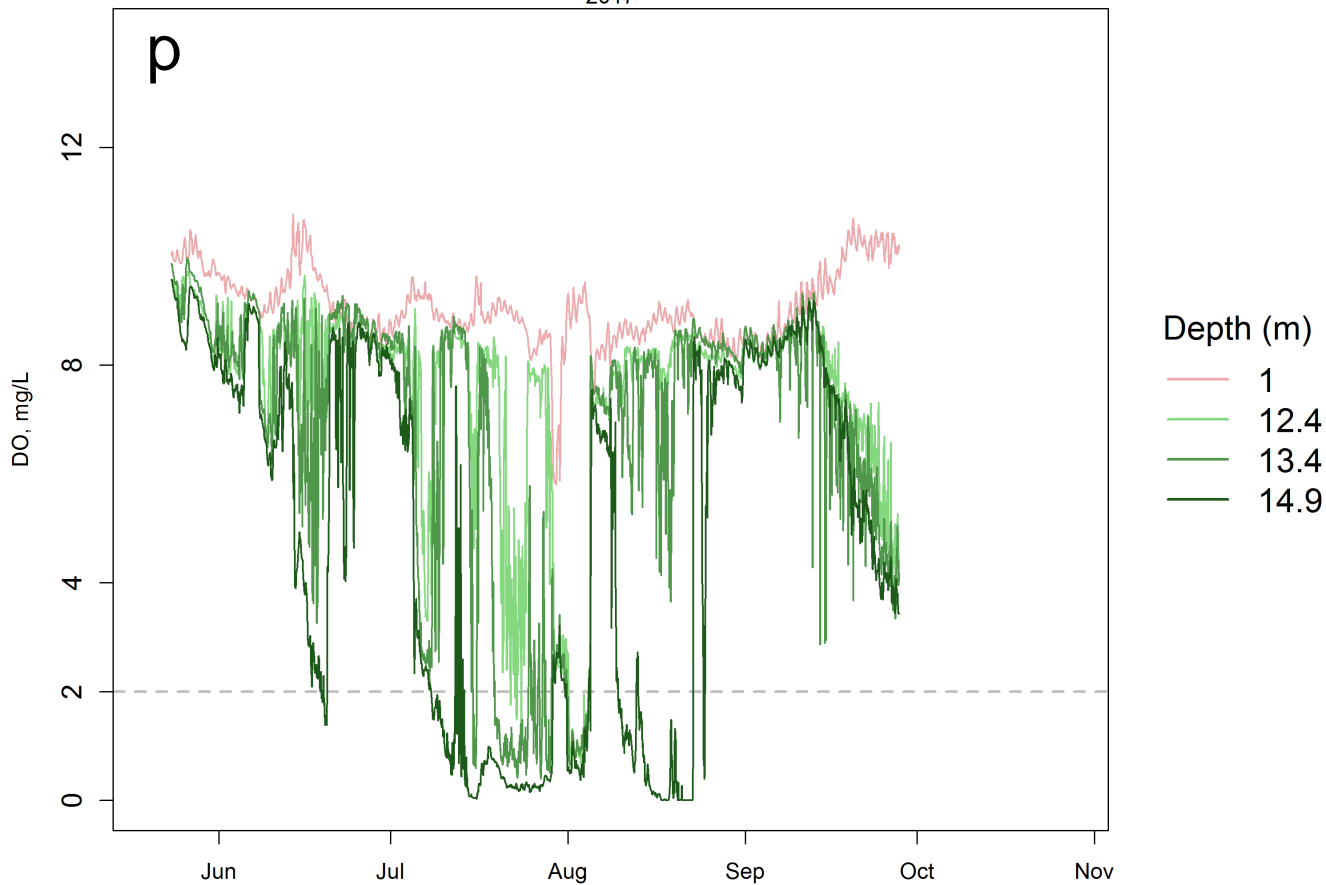
2019



Plotted Sensors:
PME

CHRP3

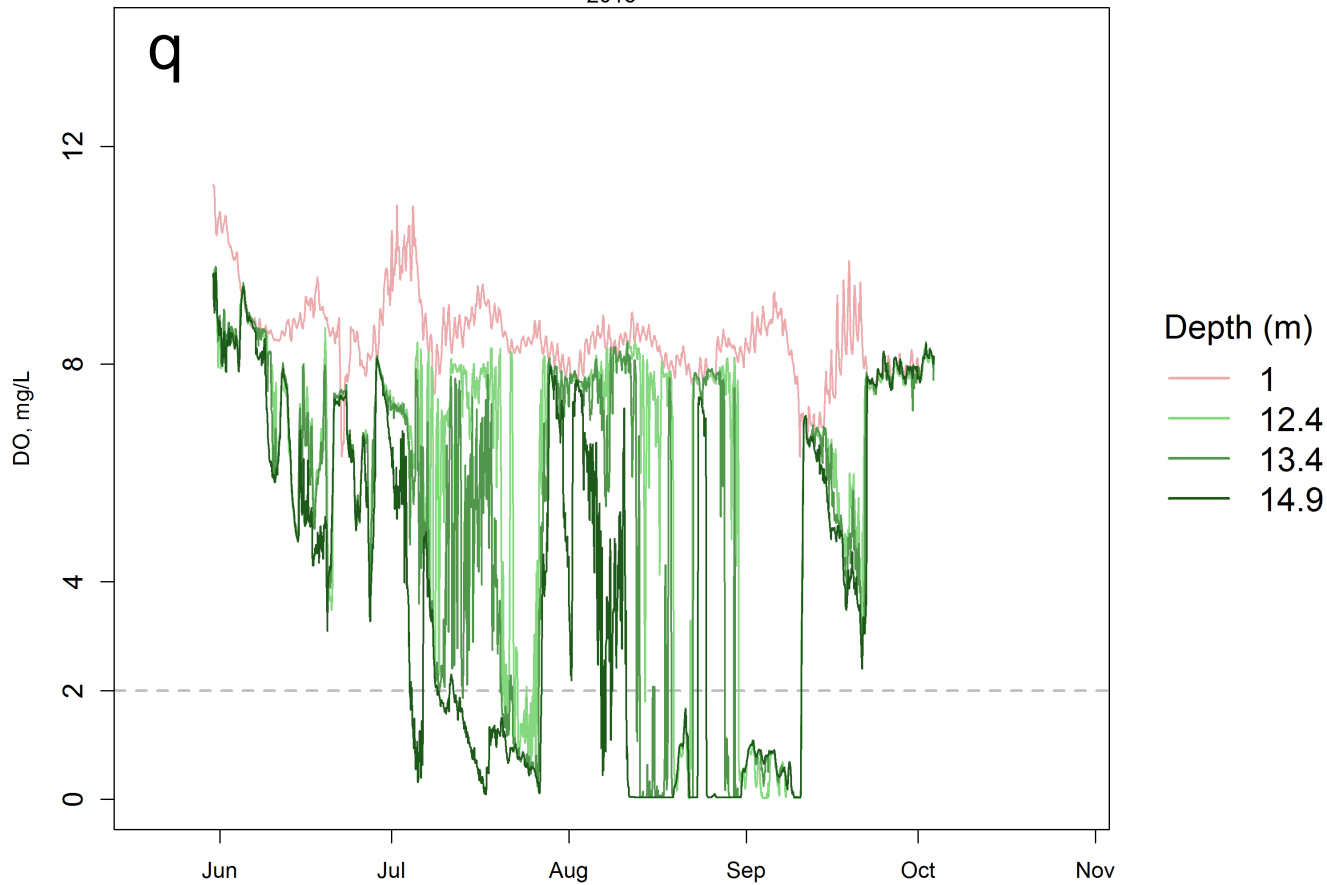
2017



Plotted Sensors:
PME

CHRP3

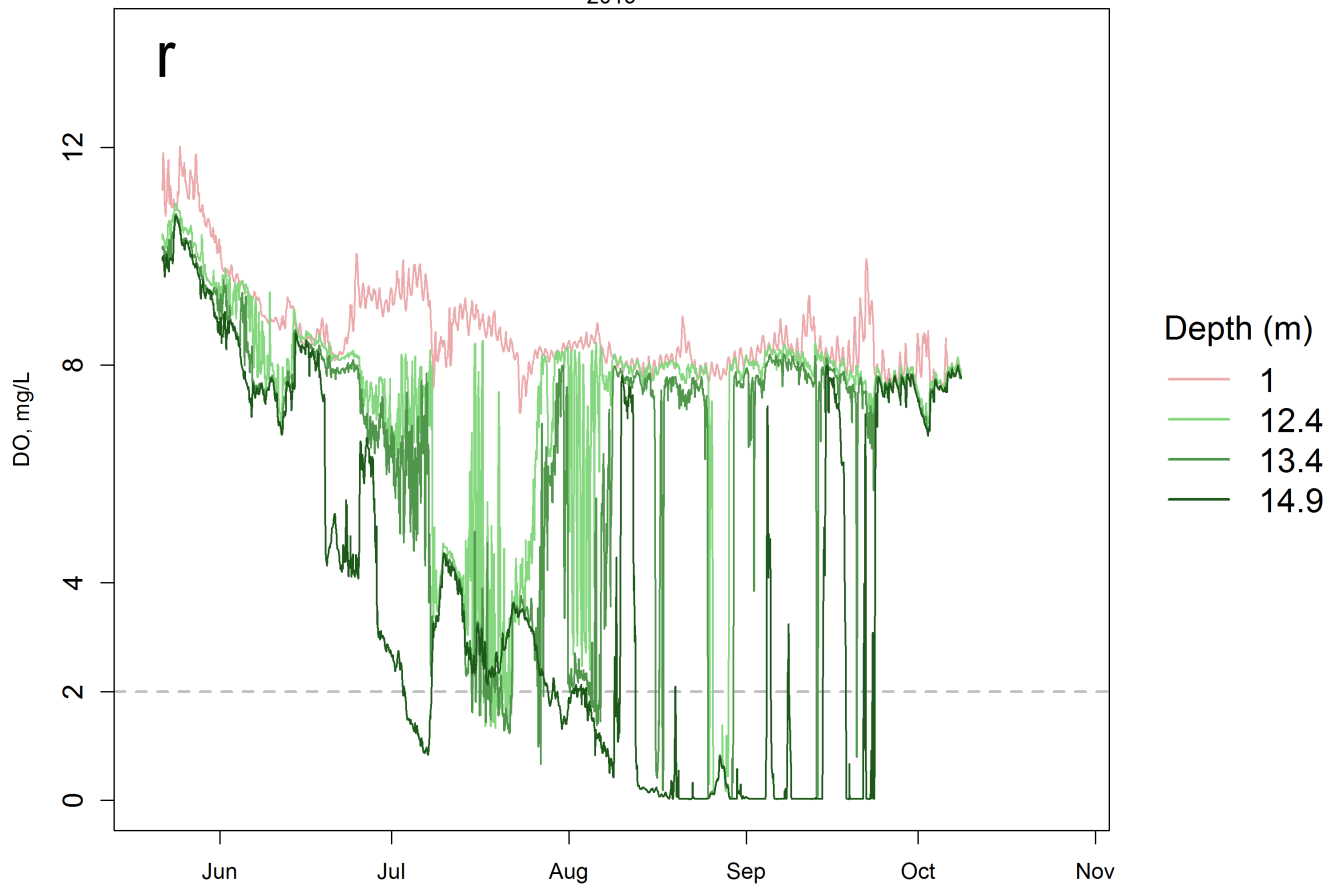
2018



Plotted Sensors:
PME

CHRP3

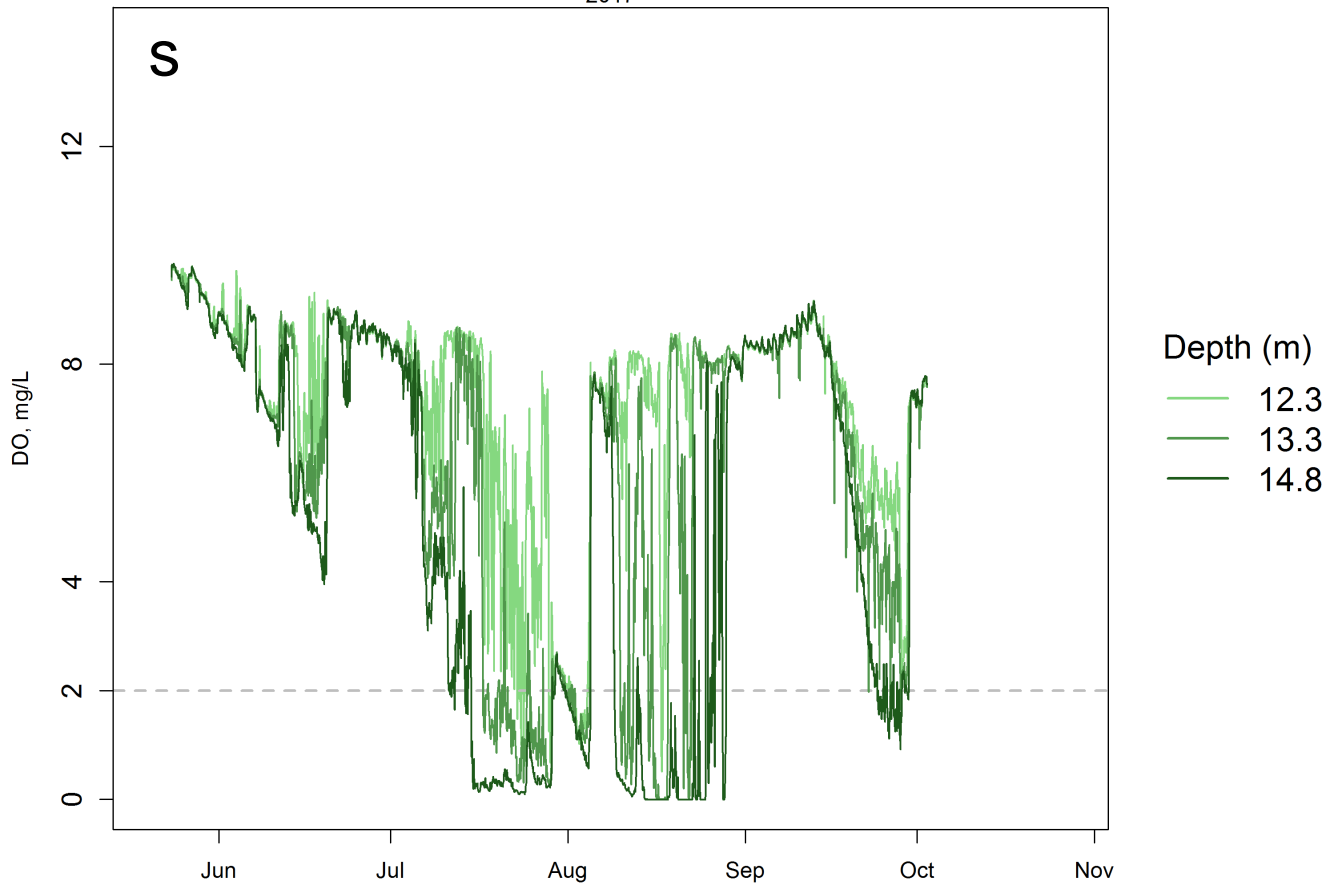
2019



Plotted Sensors:
PME

CHRP5

2017



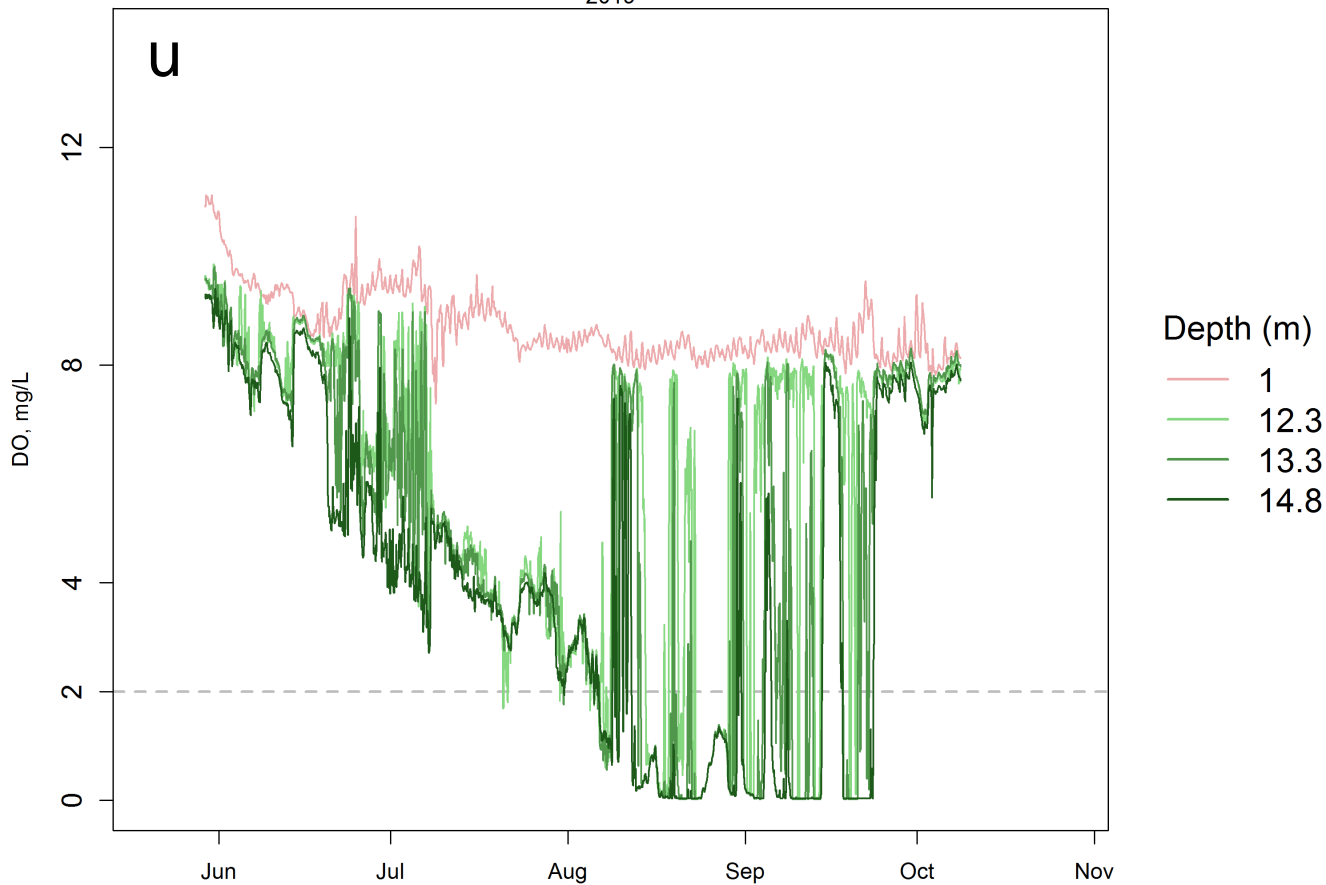
t

CHRP5 was lost, no 2018 data available

Plotted Sensors:
PME

CHRP5

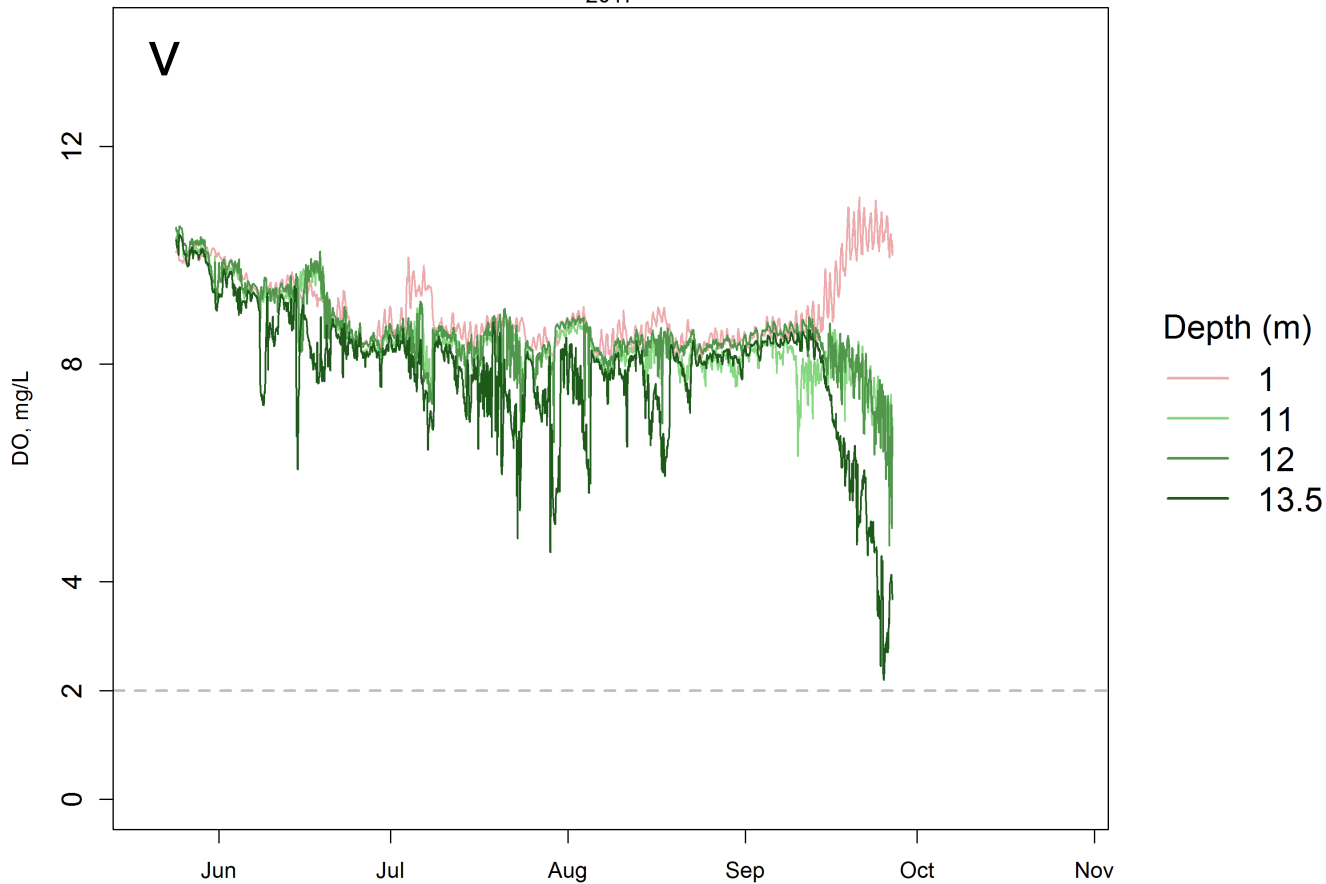
2019



Plotted Sensors:
PME

CHRP8

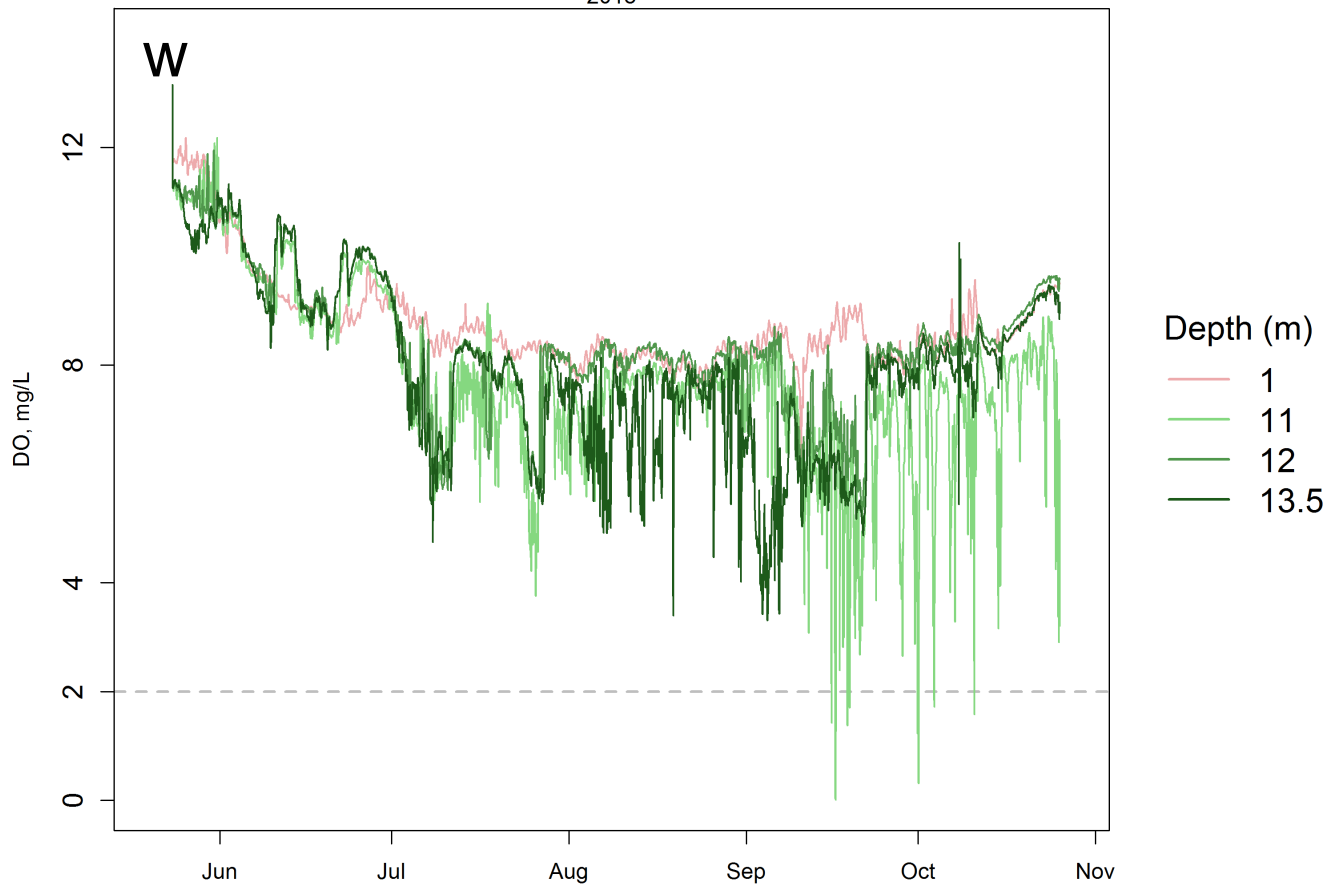
2017



Plotted Sensors:
PME

CHRP8

2018



Plotted Sensors:
PME

CHRP8

2019

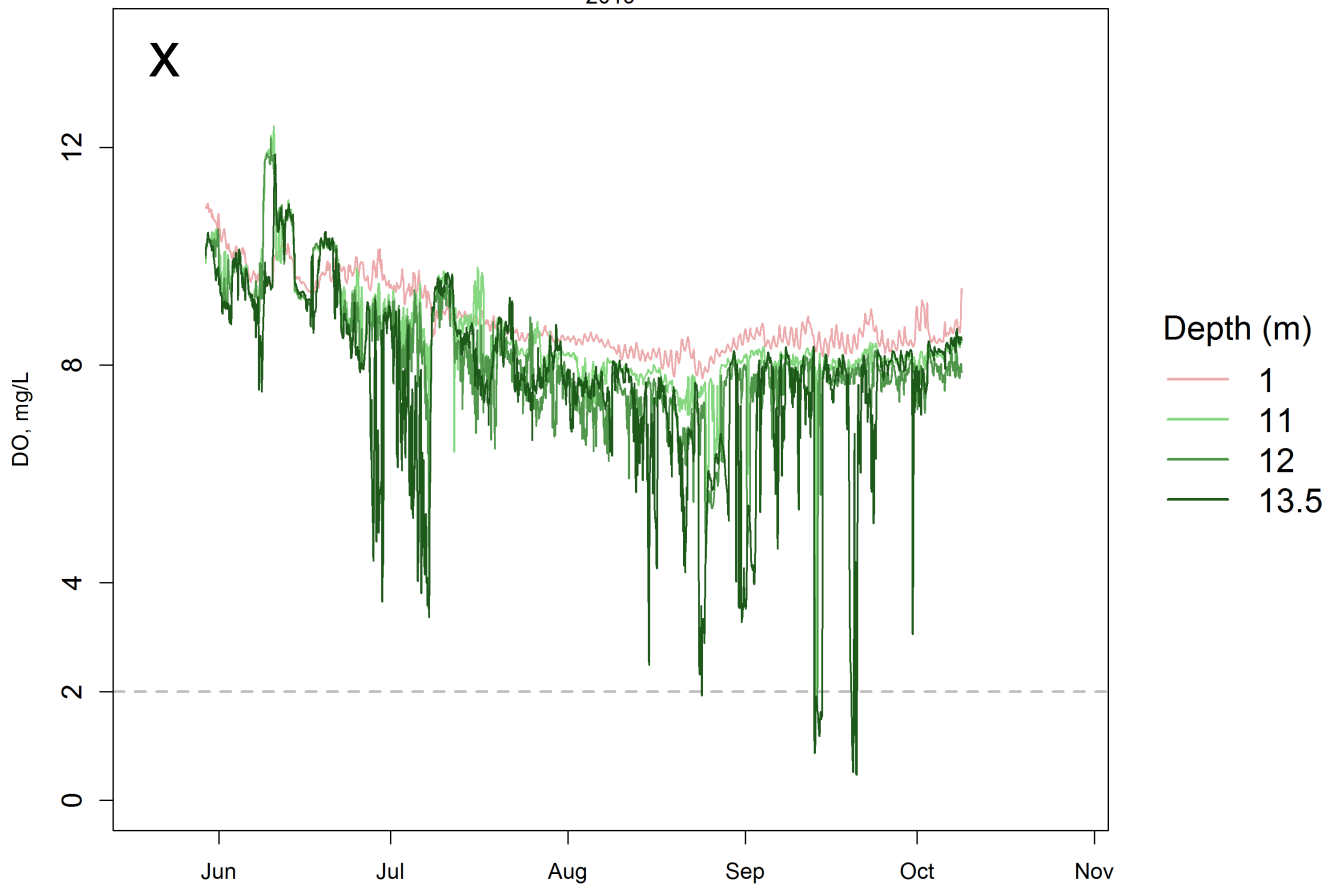


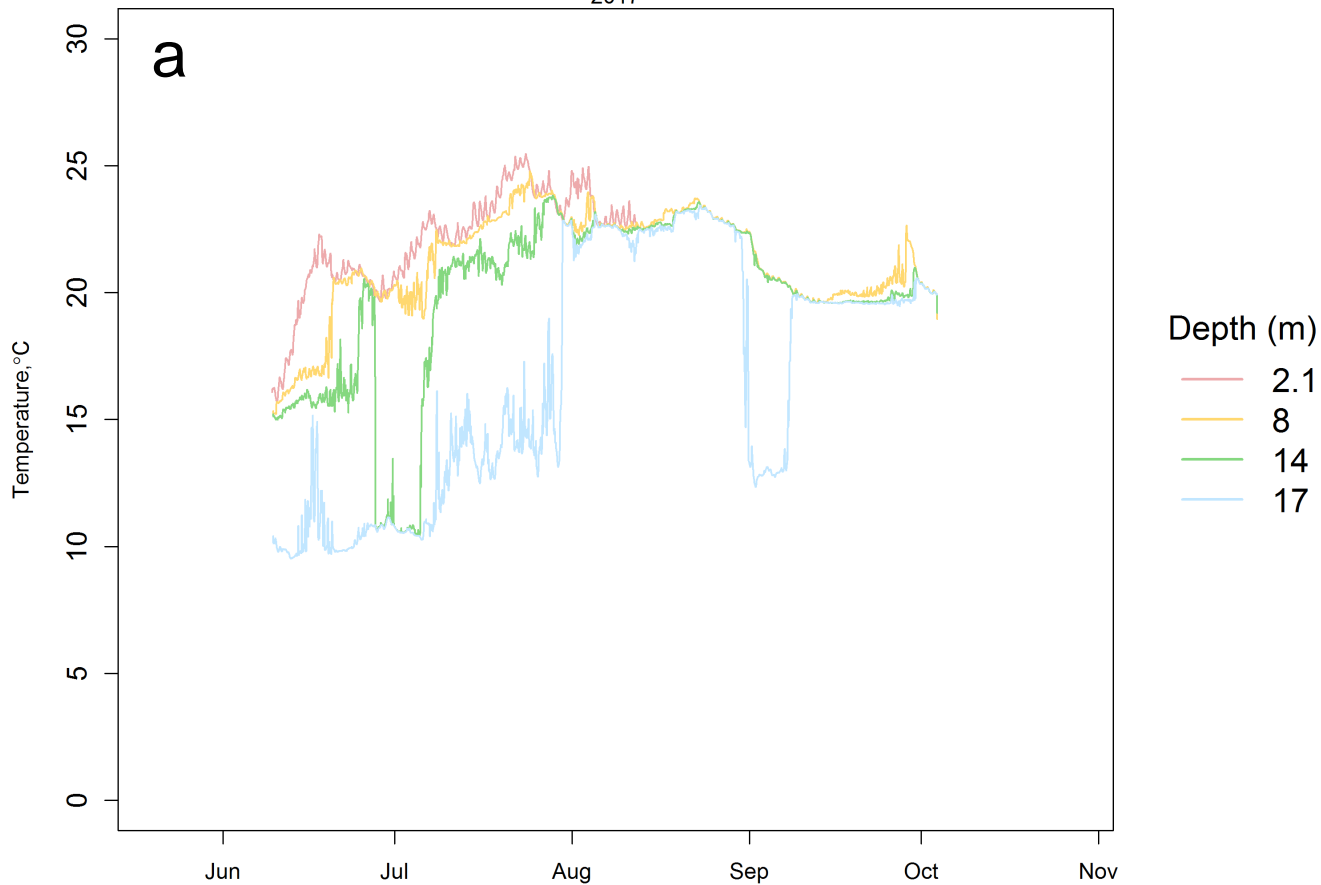
Figure S3

Time-series offshore mooring site observations for temperature and DO. Plots are labeled to correspond to Figure 3 in the main document.

Plotted Sensors:
PME
EXO

CHRP2

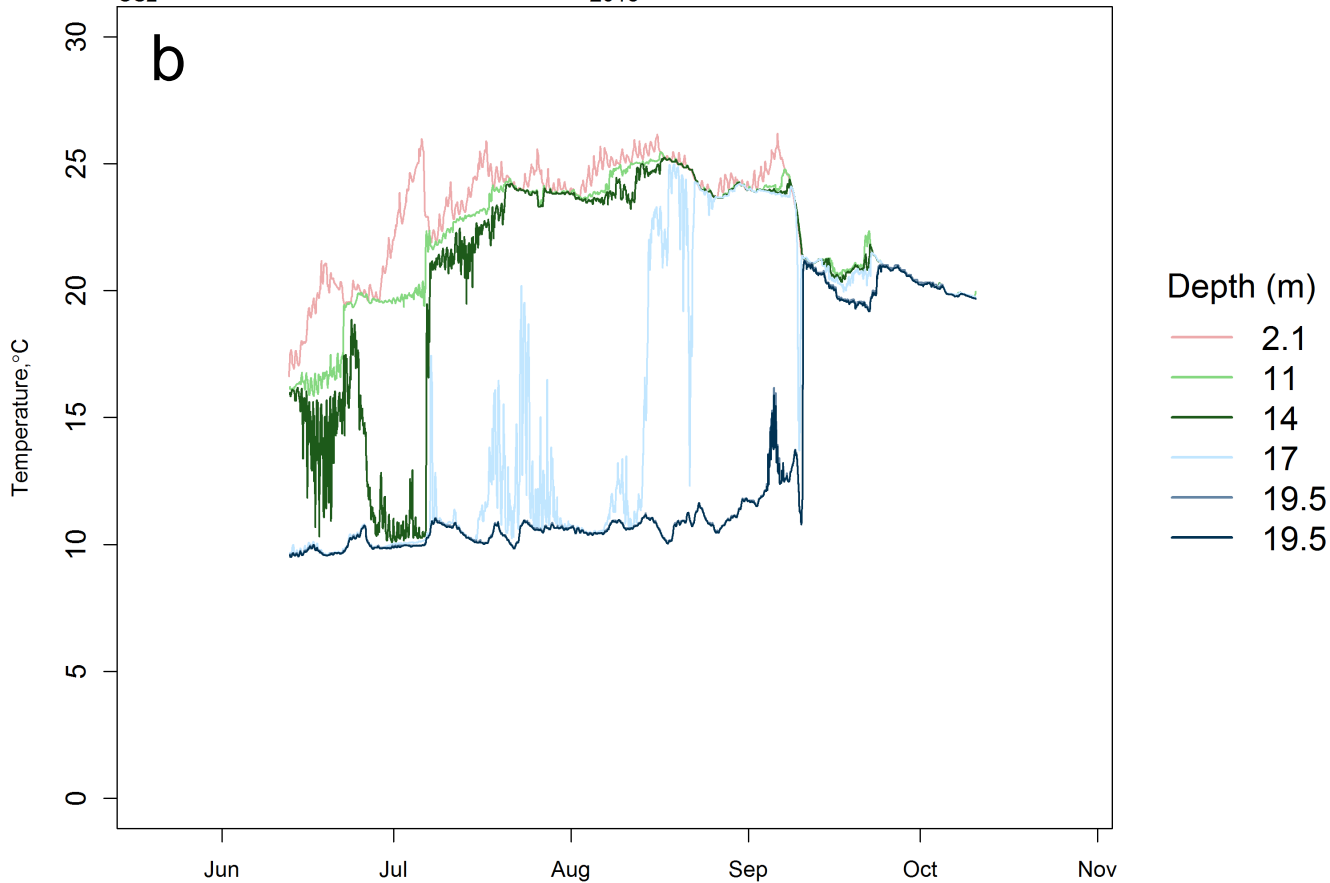
2017



Plotted Sensors:
PME
EXO
OS2

CHRP2

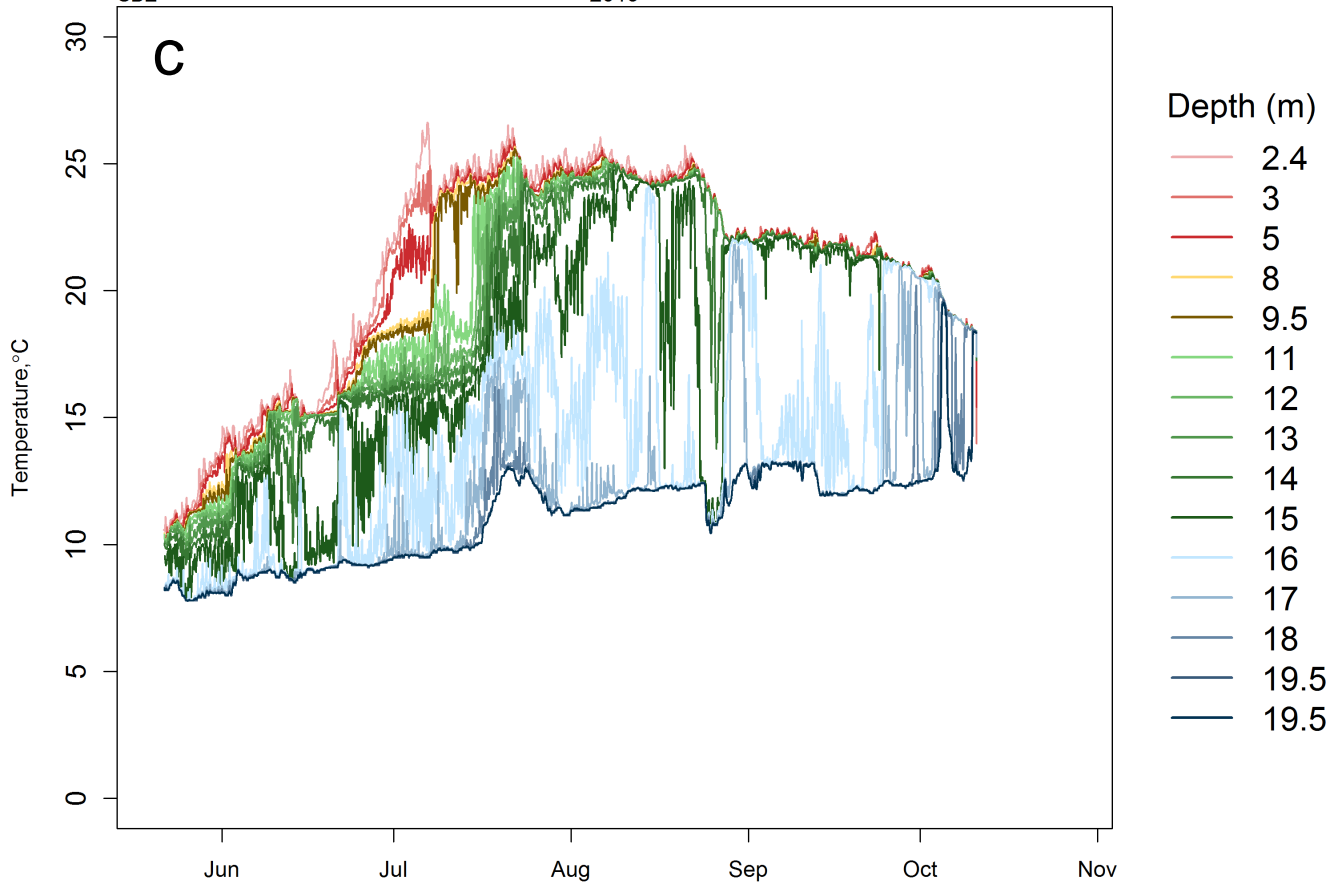
2018



Plotted Sensors:
PME
EXO
SBE

CHRP2

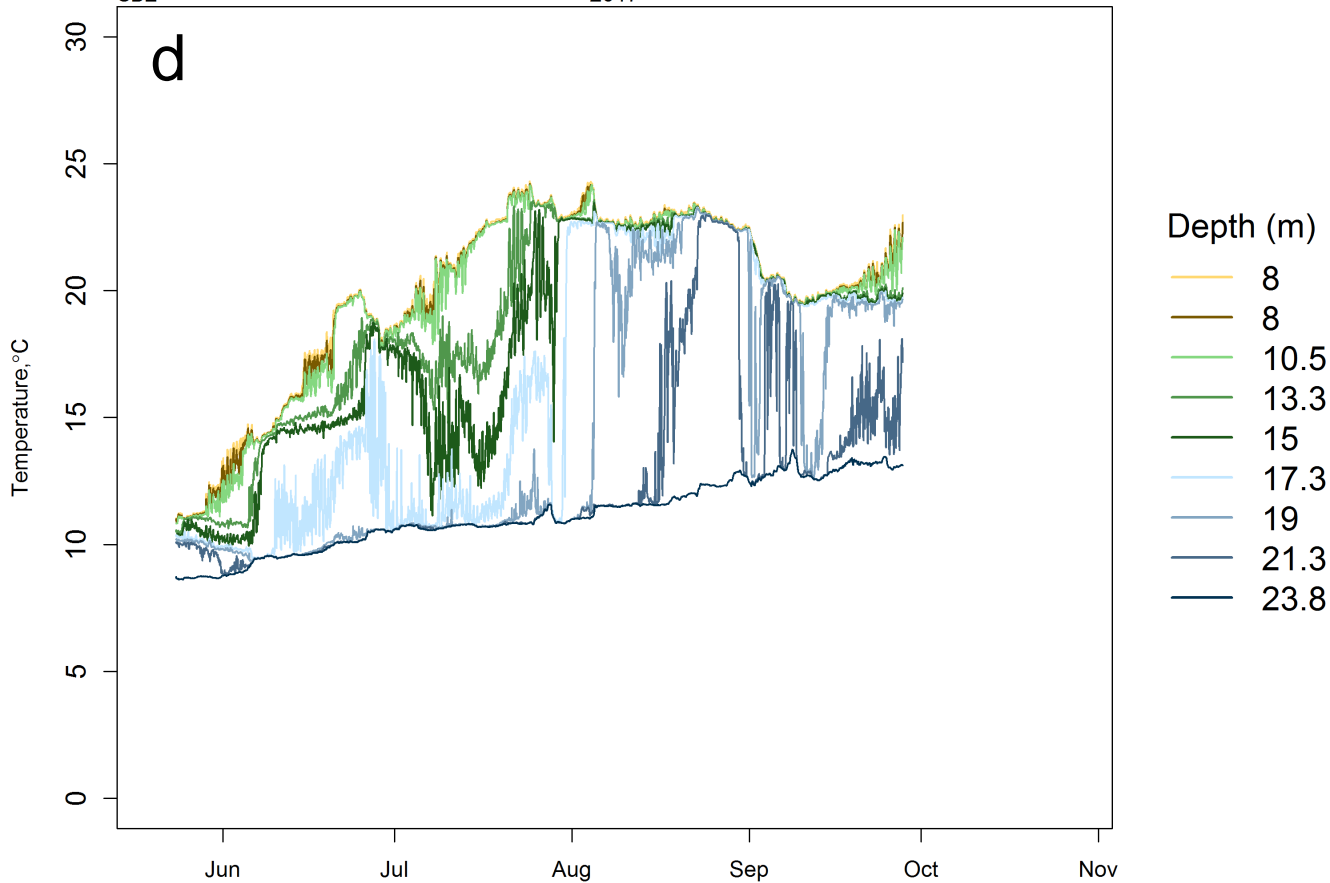
2019



Plotted Sensors:
PME
OS2
SBE

CHRP4

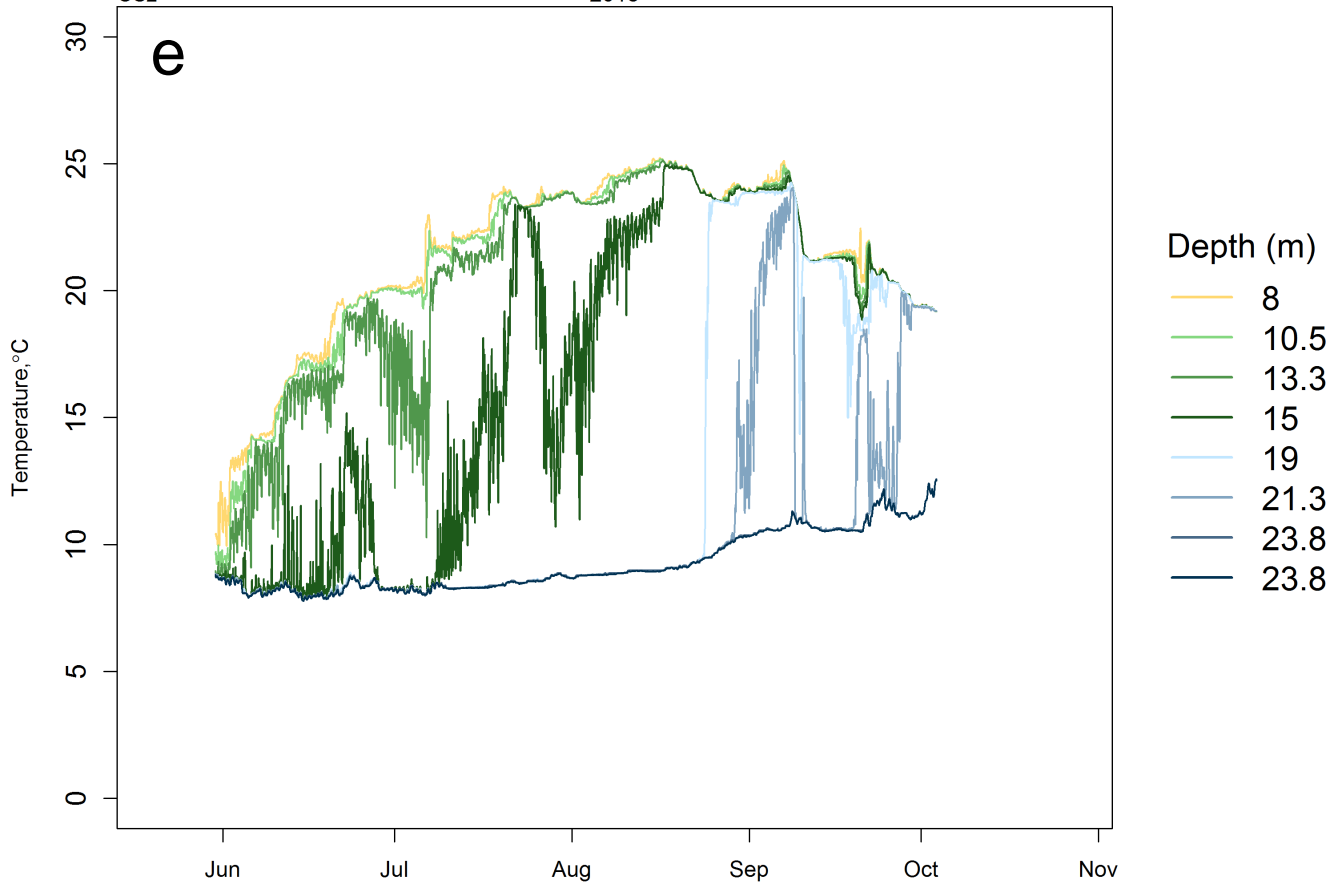
2017



Plotted Sensors:
PME
SBE
OS2

CHRP4

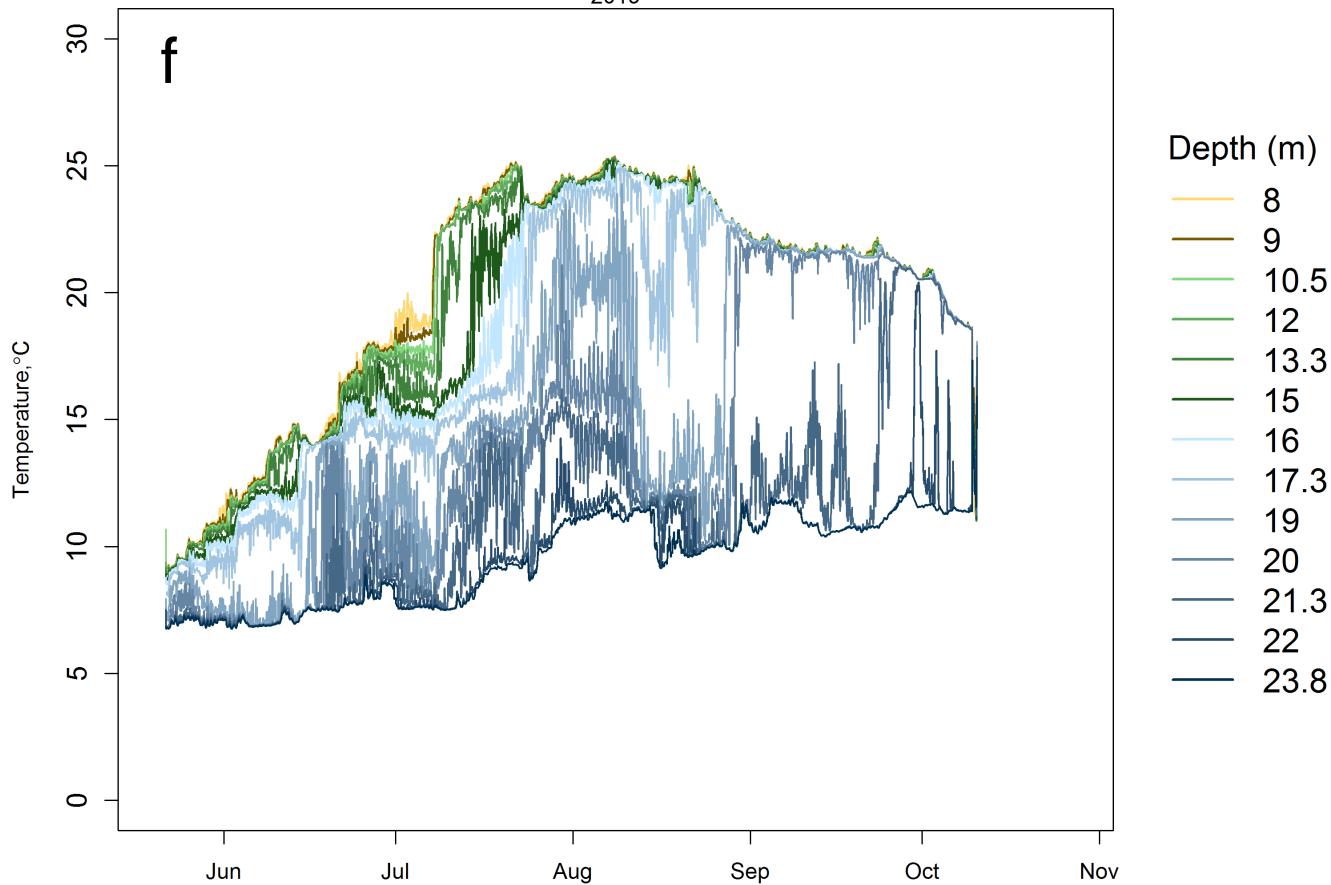
2018



Plotted Sensors:
PME
SBE

CHRP4

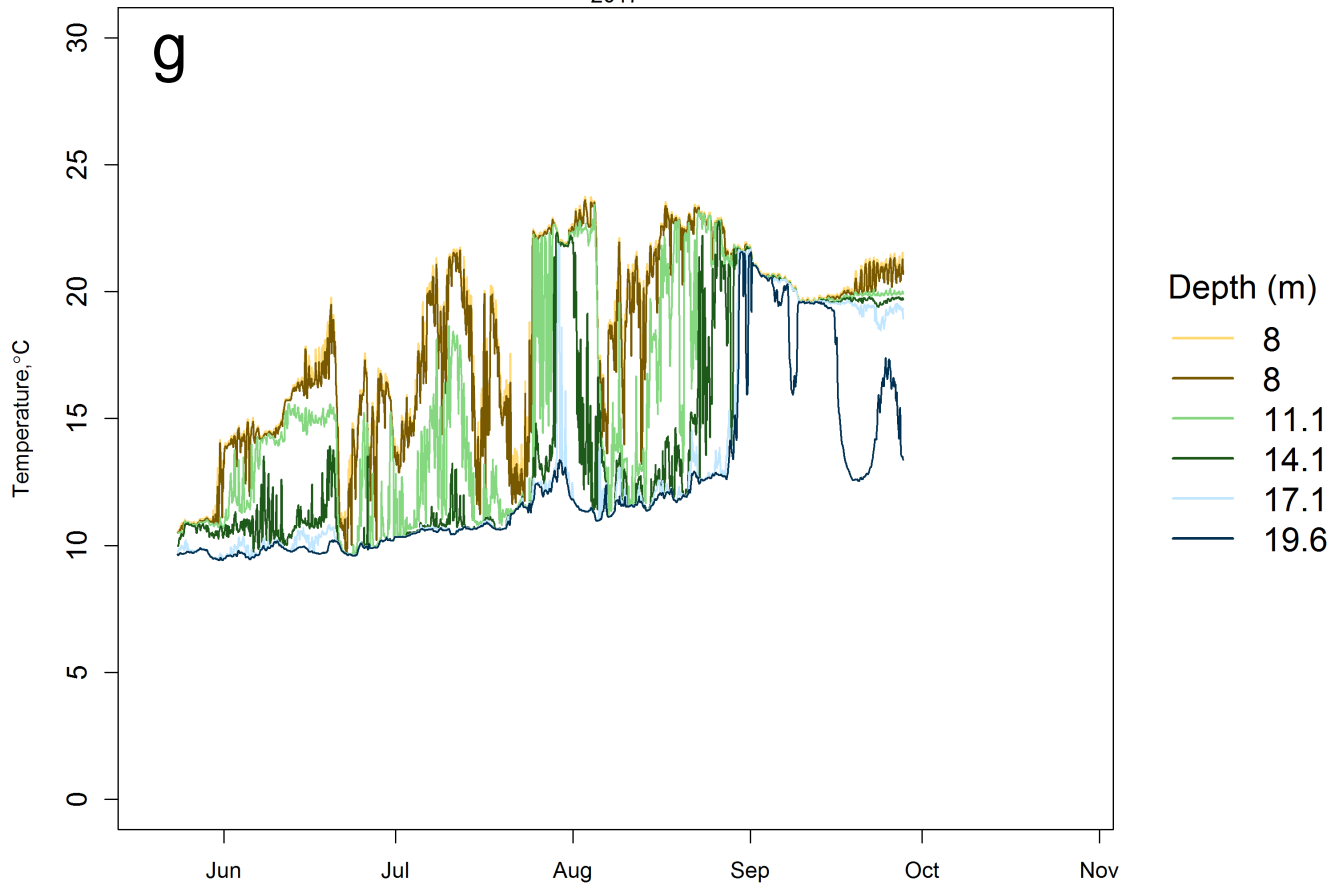
2019



Plotted Sensors:
PME
OS2

CHRP7

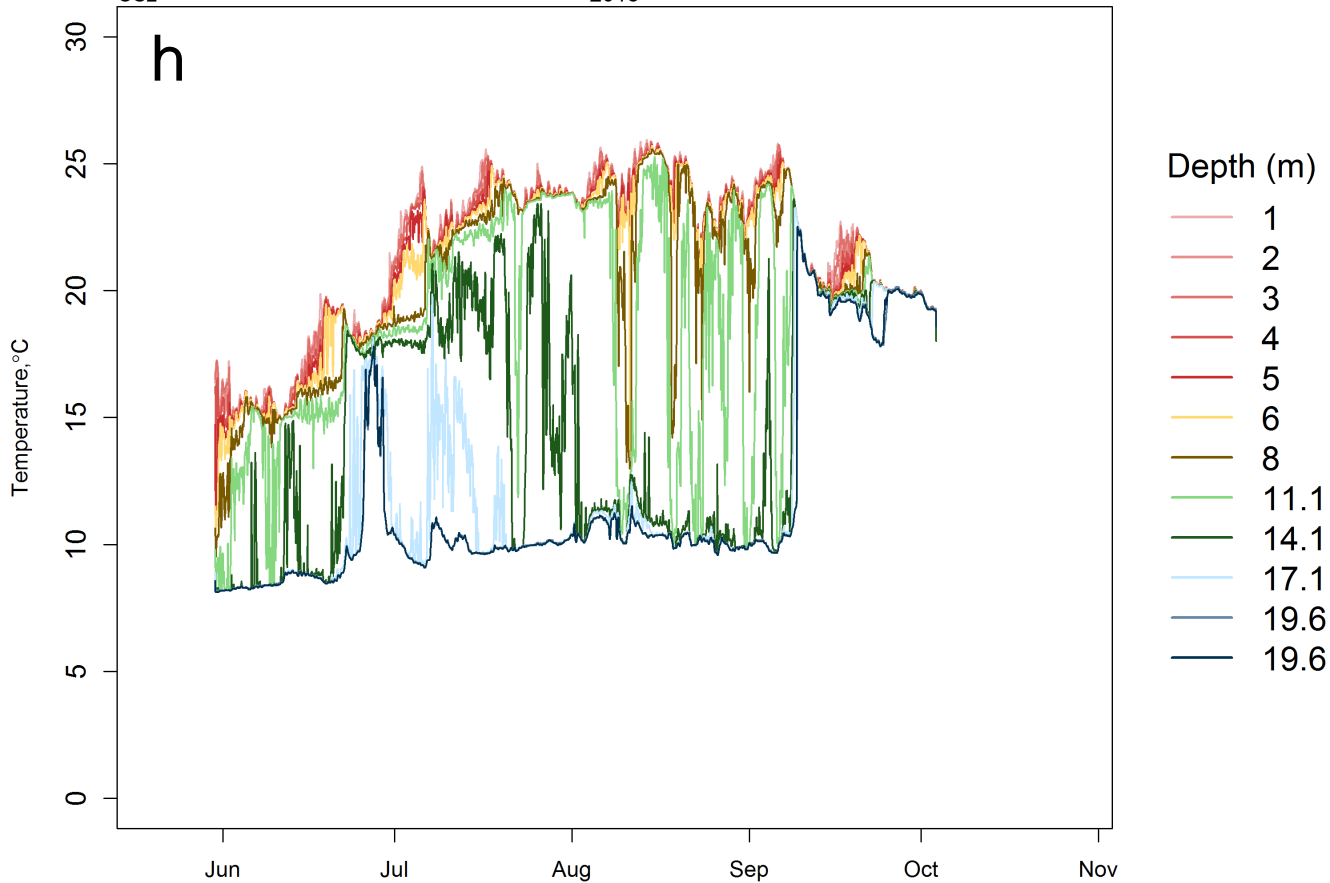
2017



Plotted Sensors:
PME
SBE
OS2

CHRP7

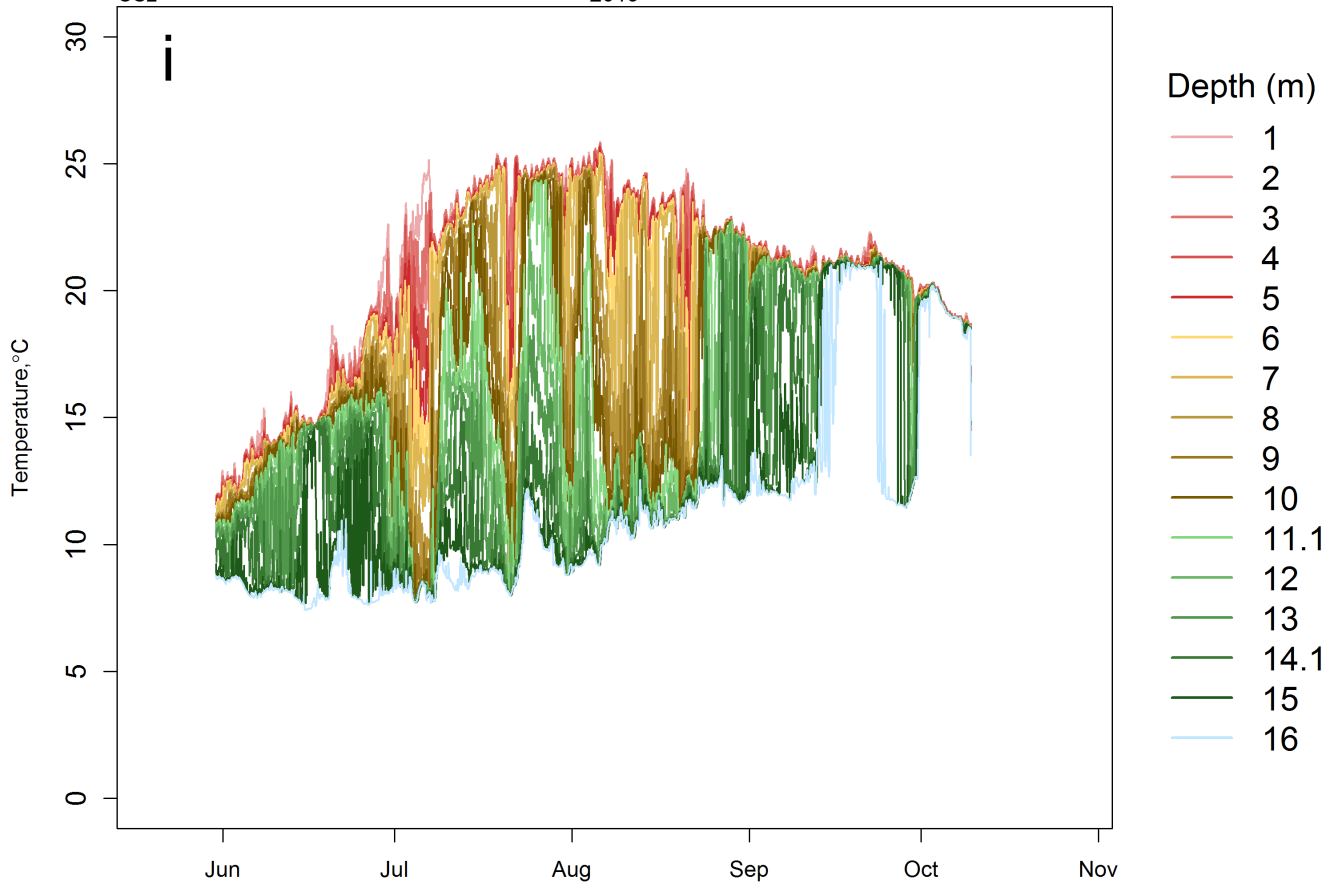
2018



Plotted Sensors:
PME
RBR
OS2

CHRP7

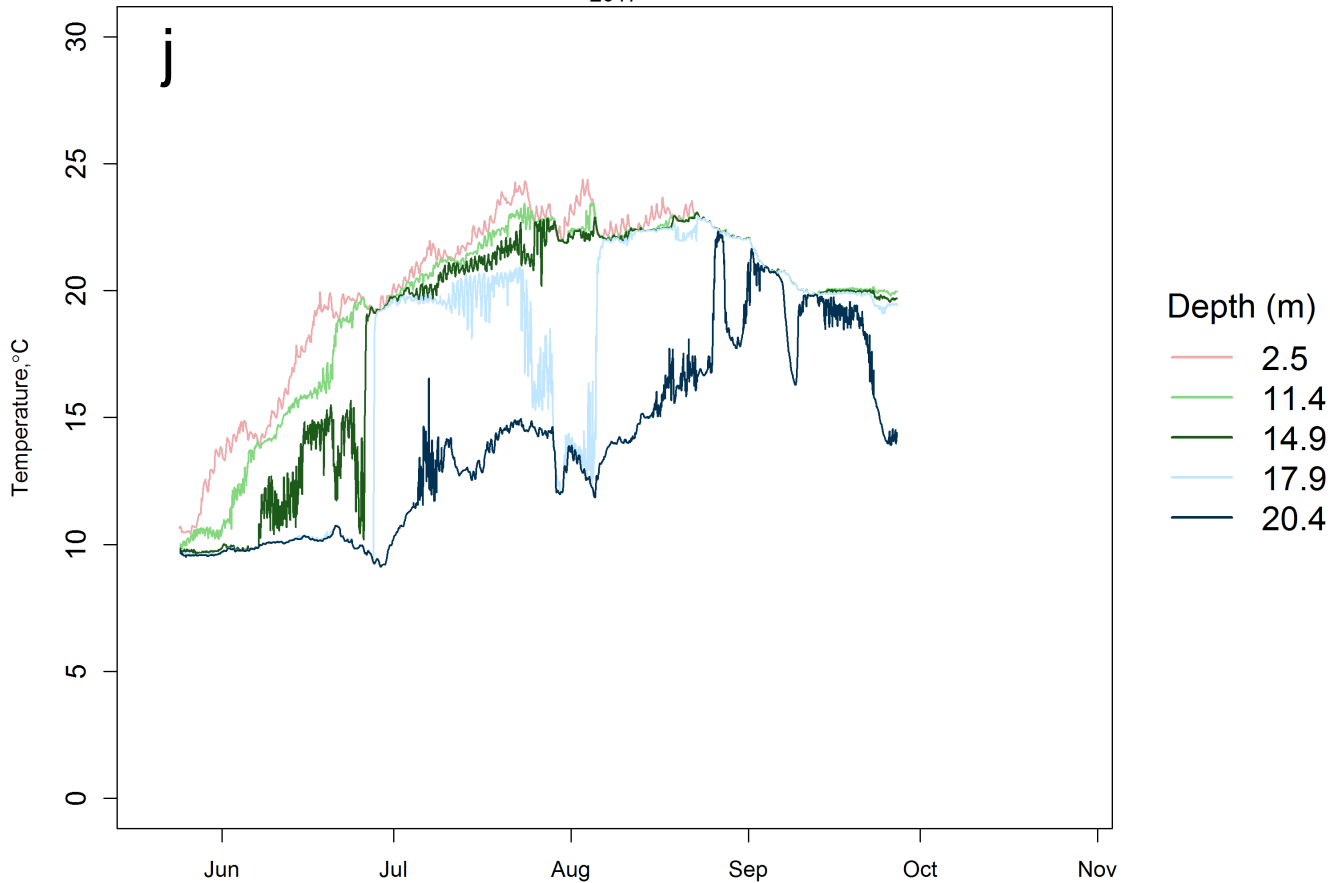
2019



Plotted Sensors:
PME
EXO

CHRP9

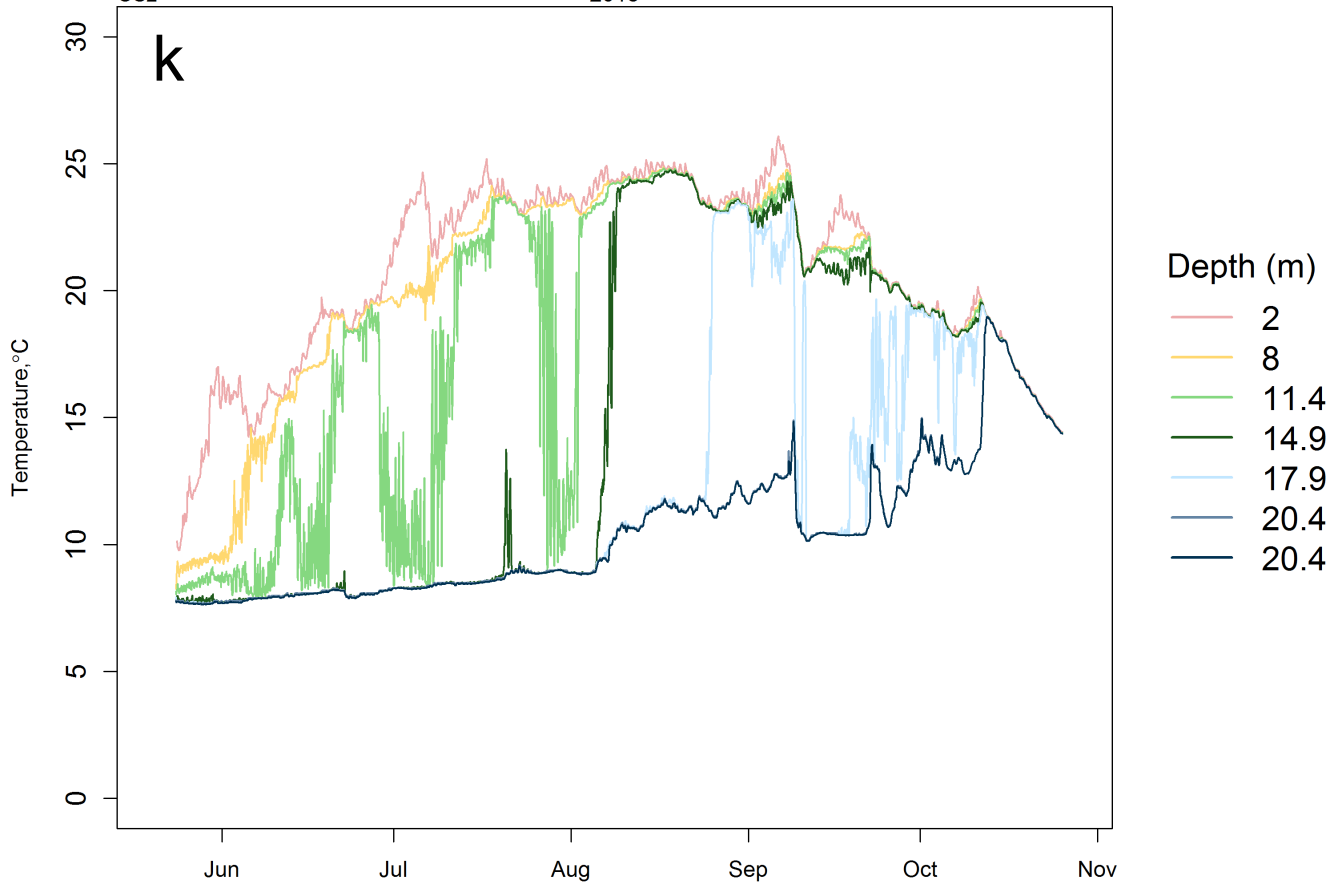
2017



Plotted Sensors:
PME
EXO
OS2

CHRP9

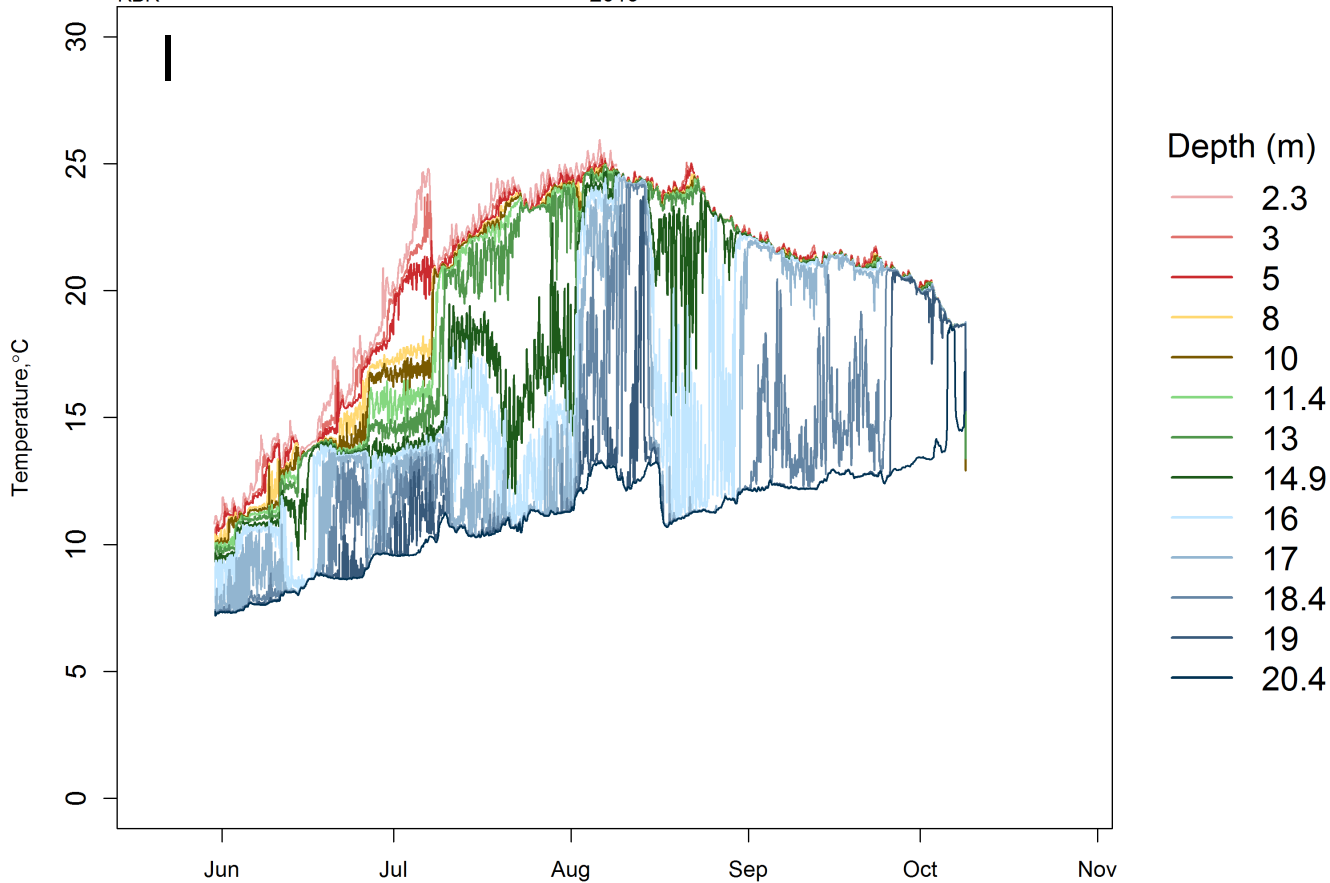
2018



Plotted Sensors:
PME
EXO
RBR

CHRP9

2019



Plotted Sensors:
EXO
PME

CHRP2

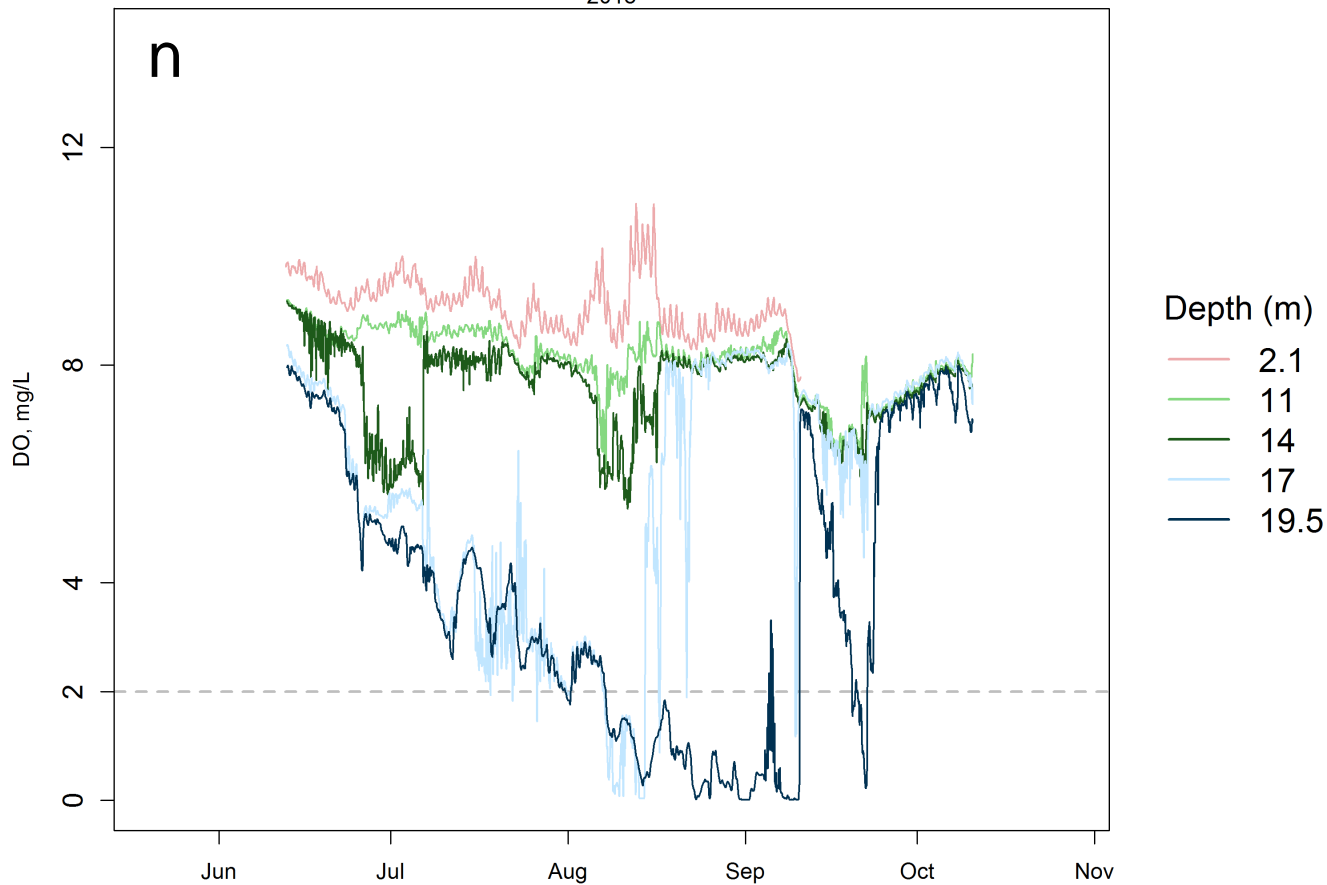
2017



Plotted Sensors:
EXO
PME

CHRP2

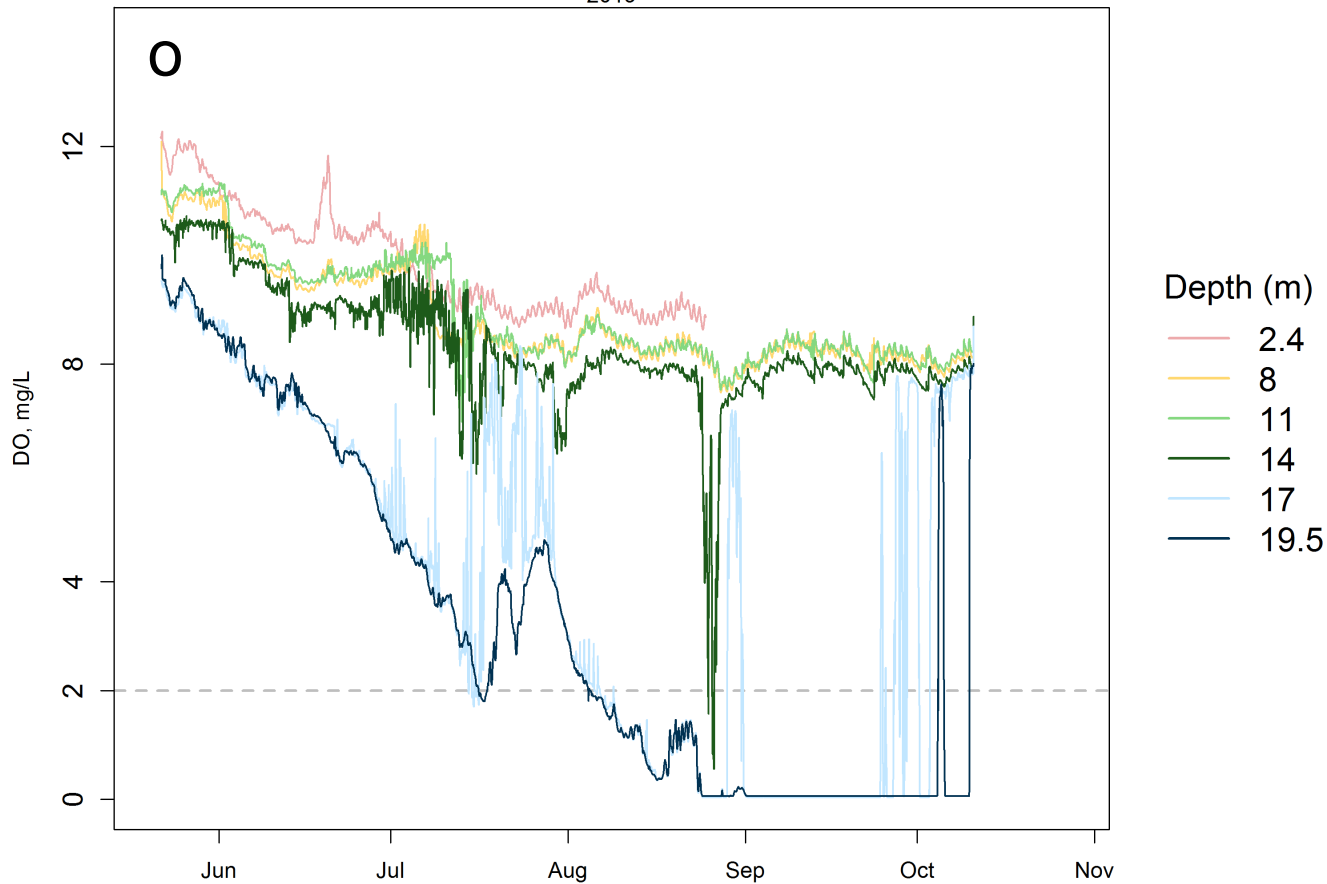
2018



Plotted Sensors:
EXO
PME

CHRP2

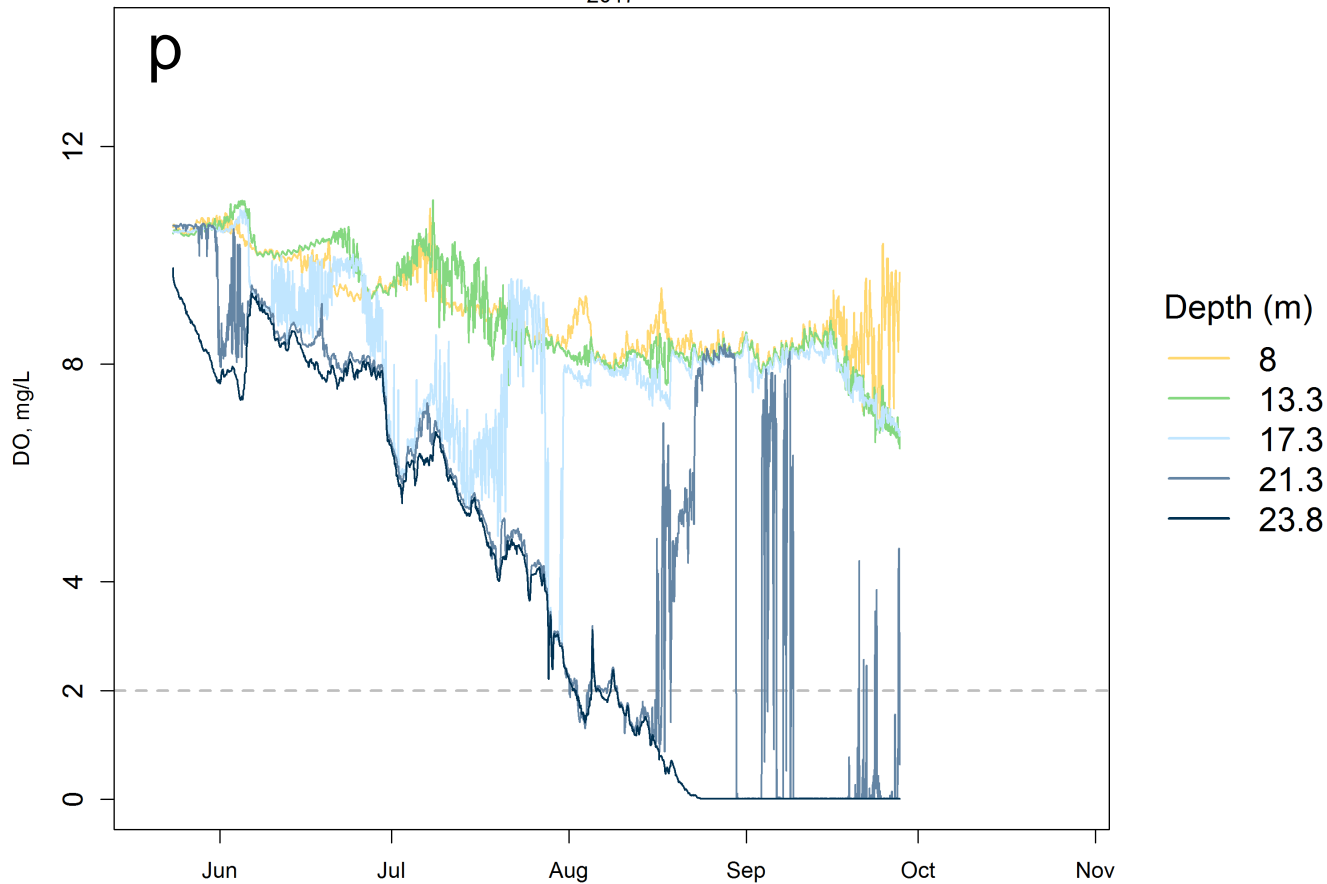
2019



Plotted Sensors:
PME

CHRP4

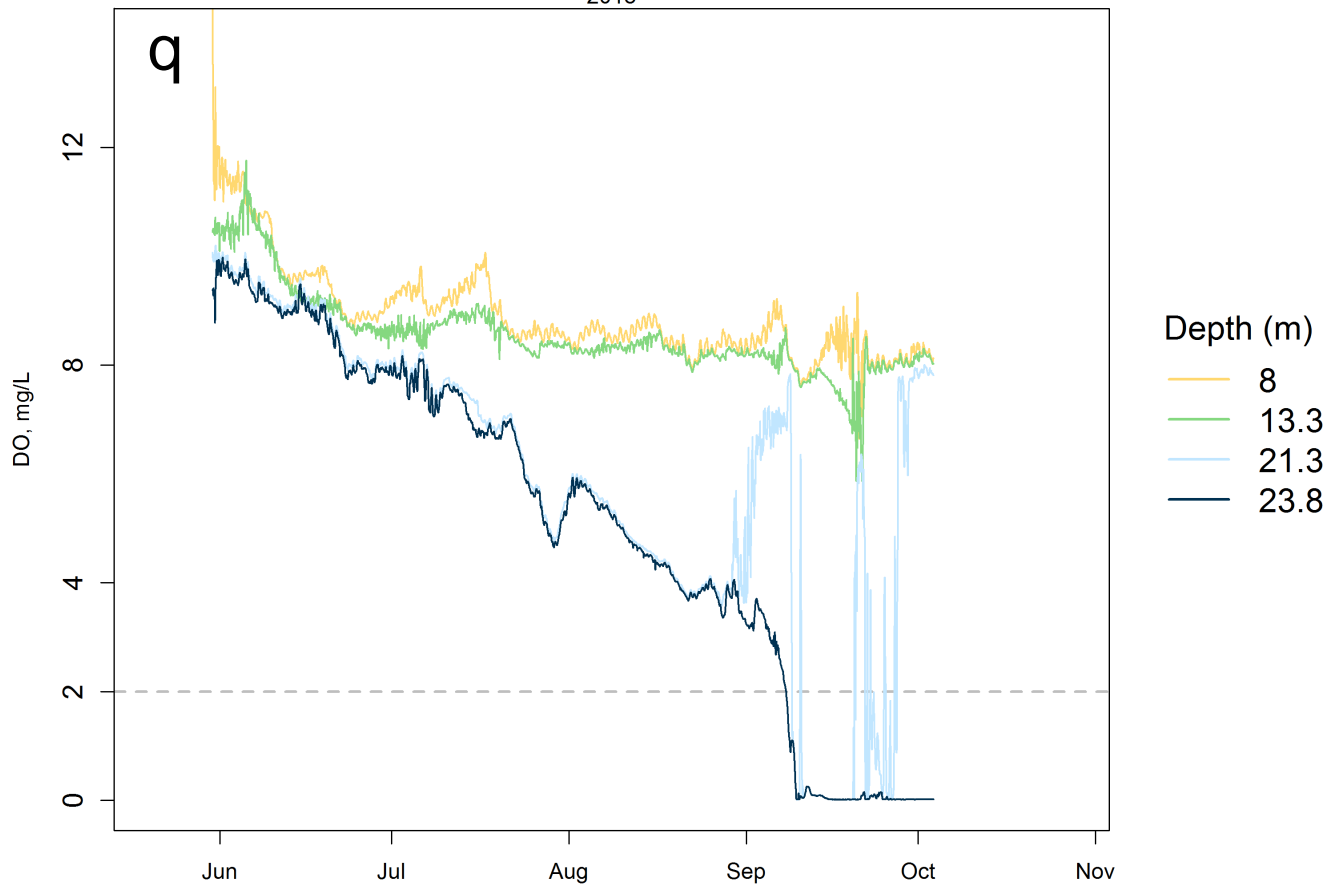
2017



Plotted Sensors:
PME

CHRP4

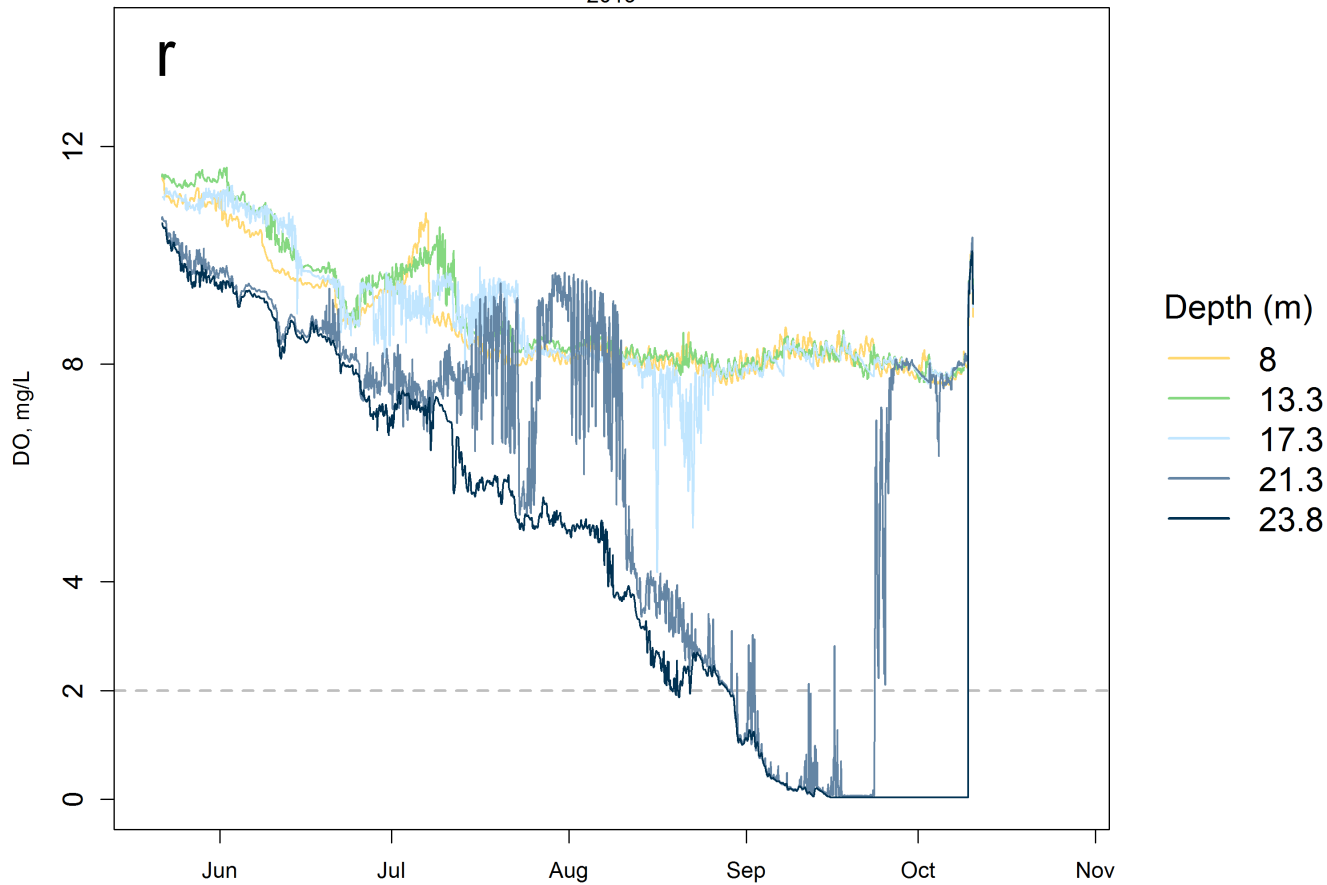
2018



Plotted Sensors:
PME

CHRP4

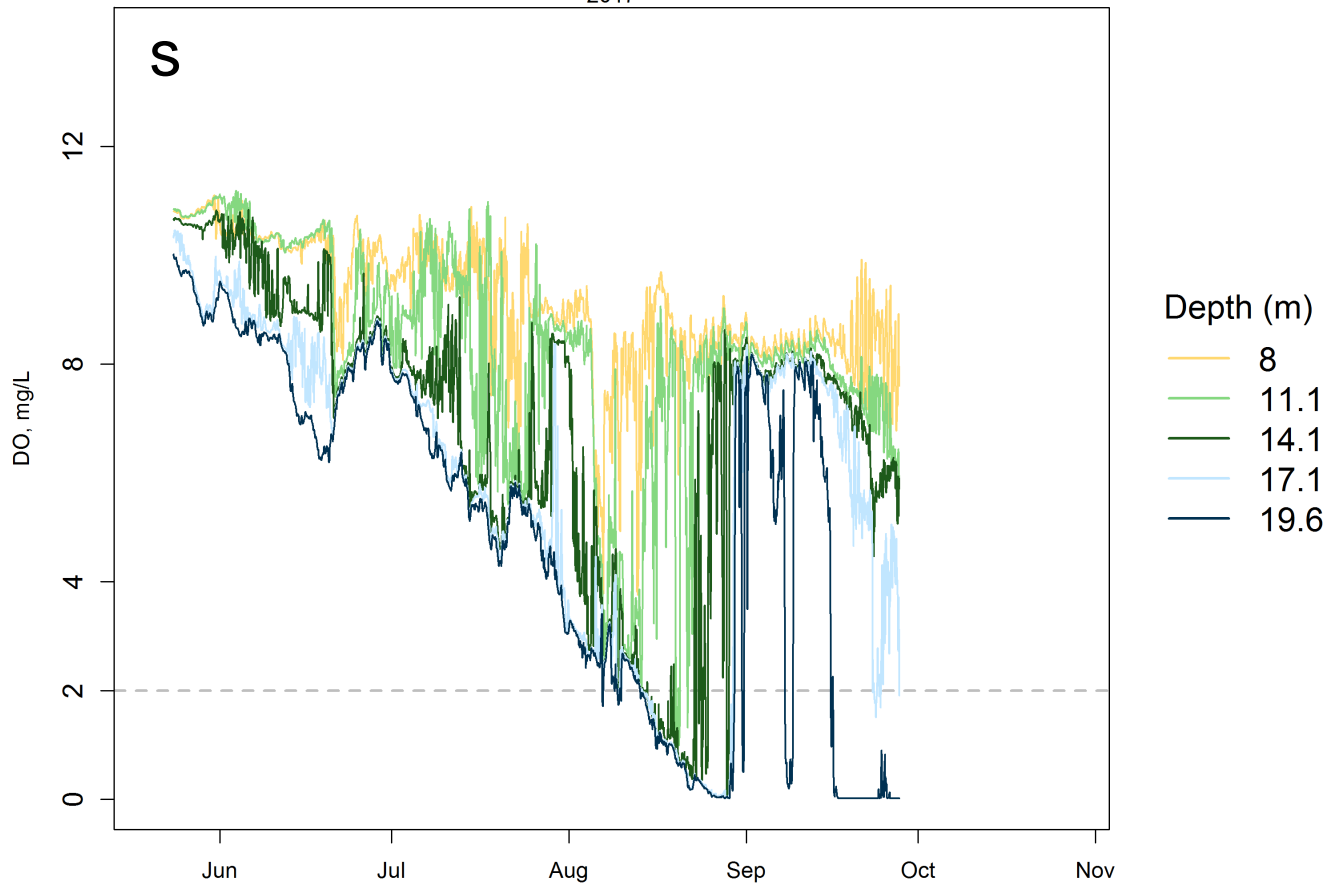
2019



Plotted Sensors:
PME

CHRP7

2017

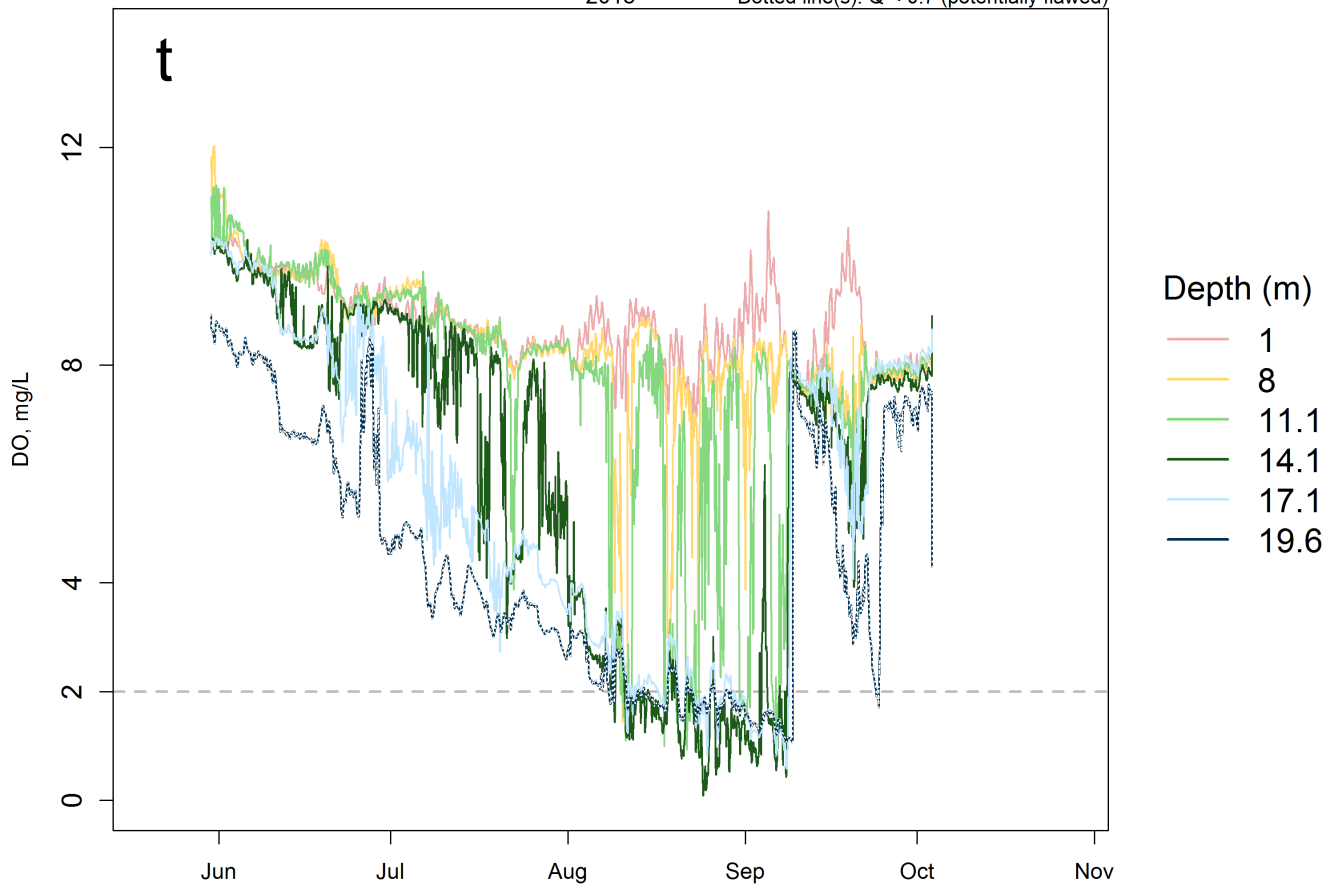


Plotted Sensors:
PME

CHRP7

2018

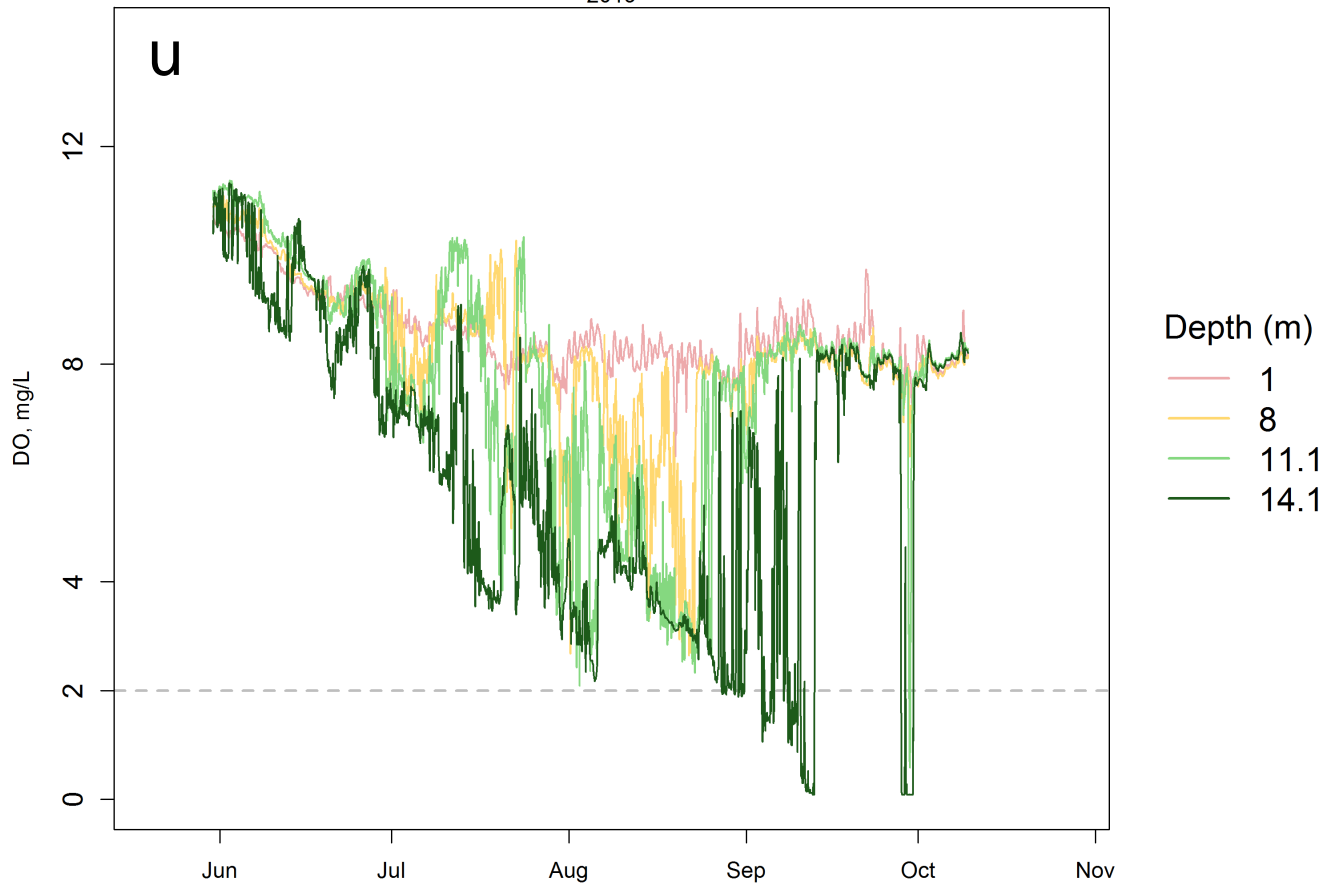
Dotted line(s): Q < 0.7 (potentially flawed)



Plotted Sensors:
PME

CHRP7

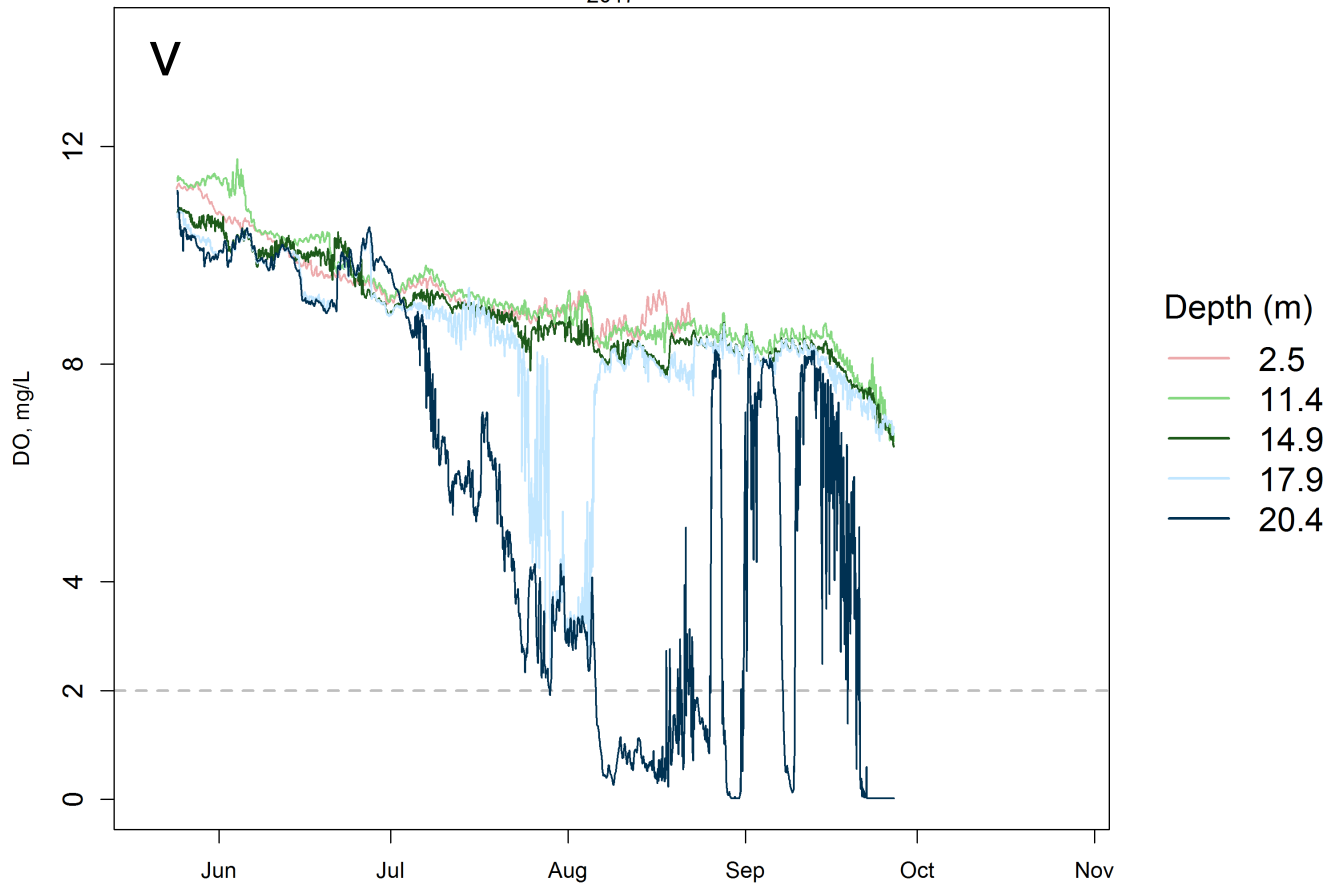
2019



Plotted Sensors:
EXO
PME

CHRP9

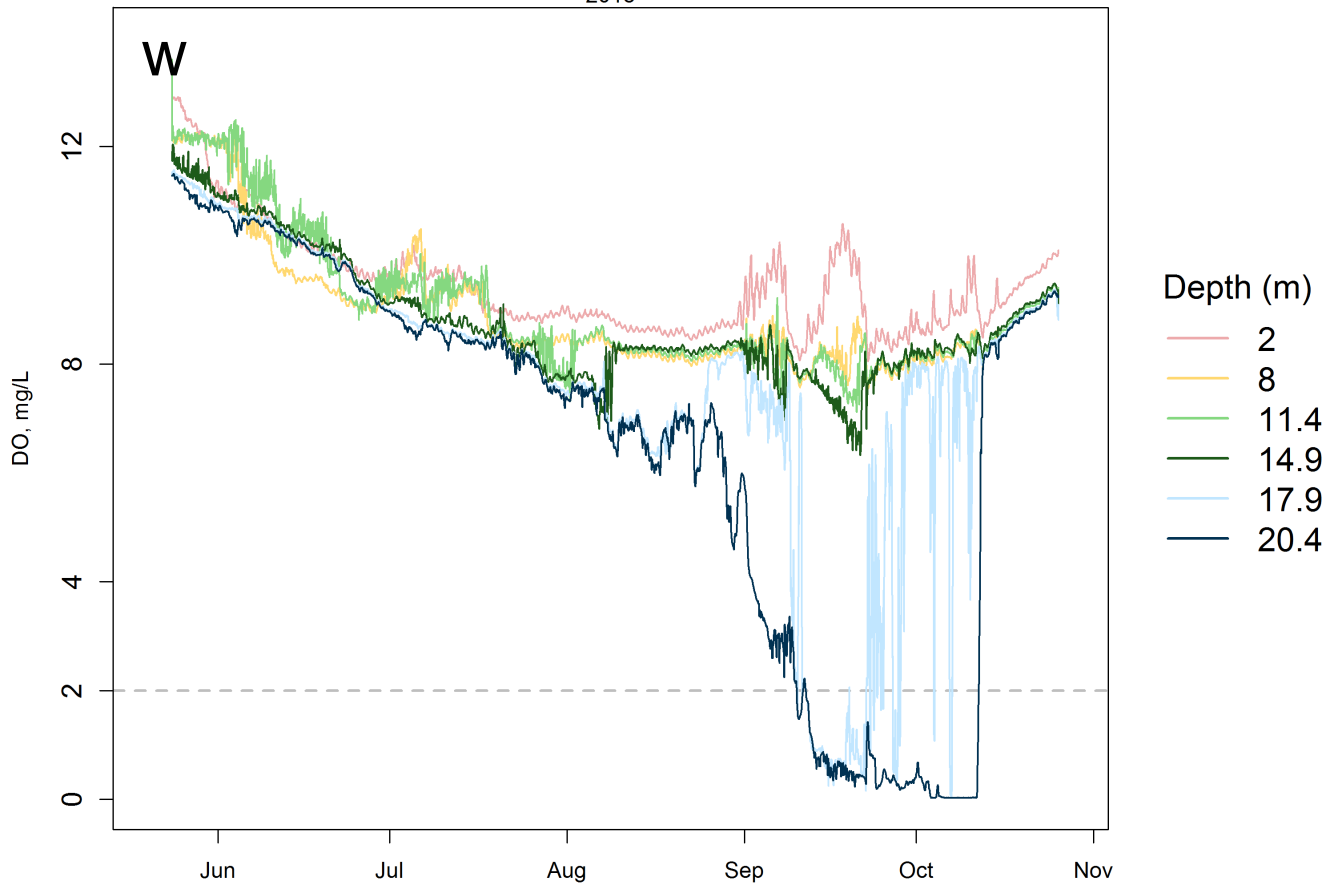
2017



Plotted Sensors:
EXO
PME

CHRP9

2018



Plotted Sensors:
EXO
PME

CHRP9

2019

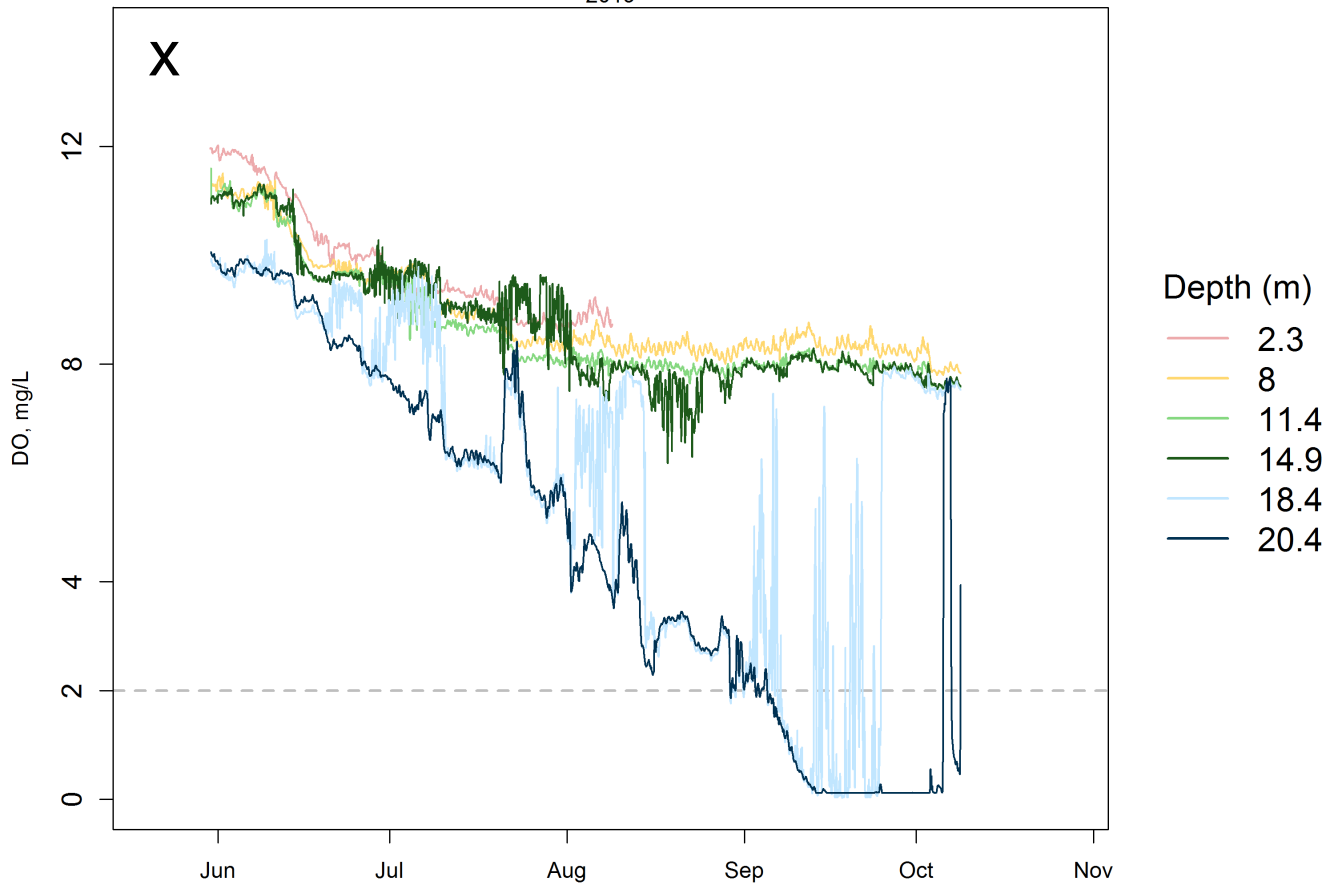
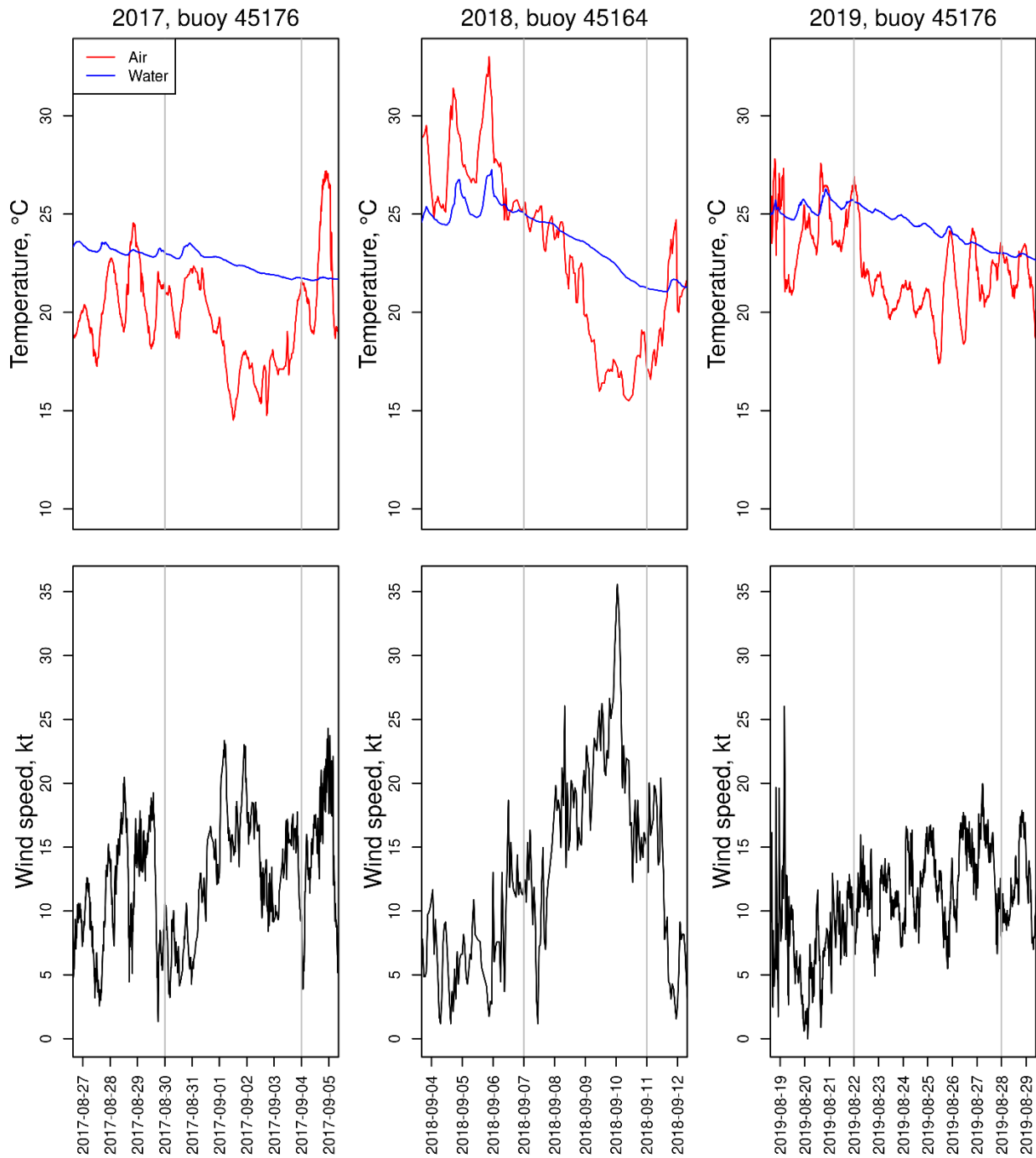


Figure S4



Air temperature, water temperature, and wind speed during cooling events in 2017, 2018, and 2019 (SI Table 3). The time period of the cooling event is indicated between vertical gray lines.

Data were obtained from buoy 45164 (25 km north of Cleveland) and buoy 45176 (6.7 km northwest of Cleveland) in the central basin of Lake Erie (Great Lakes Observing System, <http://data.glos.us/erddap>, accessed 1-19-2023). Data were missing from buoy 45176 in 2018, and from buoy 45164 in 2019, so we selected a buoy with available data for each time period.