NCCOS Algal Bloom Beta/Experimental Products

The National Oceanic and Atmospheric Administration

Level-3/Mapped Ocean Data (NRT)

CoastWatch NOAA Submit

Need Help? Contact the Help Desk:

Email | (301) 683-3335

NCCOS Algal Bloom Beta/Experimental Products

Search Criteria

Region:

Select a Region

Product:

Sensor:

From: (MM/DD/YYYY)

08/09/2020

To: (MM/DD/YYYY)

08/14/2020

Search

The Harmful Algal Bloom - Forecasting Branch (HAB-FB) is a research group within the National Oceanic and Atmospheric Administration (NOAA), National Centers for Coastal Ocean Science (NCCOS) tasked with forecasting and monitoring HABs. One of the more effective ways to do so is through satellite based monitoring, which provides a synoptic view at high temporal resolution. The HAB-FB has established a routine and automated processing capability for satellite-derived products pertaining to the color of water. Water color can be used as proxy for various geophysical parameters, such as chlorophyll-a, turbidity, and water depth. All of our products are generated from mapped reflectance products, which we refer to as "level 3" products:

- True Color : a Red, Green, Blue (RGB) composite image
- Chlorophyll-a (Gilerson) : chlorophyll a concentration determined by a near-Infrared to red ratio as described by Gilerson et al. (2010).
- Cyanobacteria Index : the relative abundance of cyanobacteria biomass as determined by the cyanobacteria index algorithm developed by Wynne et al. (2008).
- Low fluorescing Algae : the relative abundance of phytoplankton which are low or non-fluorescing and do not contain phycocyanin (non-cyanobacteria).
- Relative Fluorescence : the relative chlorophyll fluorescence representative of chlorophyll concentration for high biomass blooms, determined by the Red-Band Difference developed by Amin et al. (2009).

For more information on these products, refer to the NCCOS products website.

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NCCOS Algal Bloom Beta/Experimental Products

Search Criteria

Region:
Chesapeake Bay

Product:
True Color
Chlorophyll-a (Gilerson)
Relative Fluorescence
Cyanobacteria Index

Sensor:
OLCI_nccos

From: (MM/DD/YYYY)
08/09/2020

To: (MM/DD/YYYY)
08/14/2020

Search

Region: CB3 Sensor: OLCI_nccos Product: Datasets displayed per page: 6
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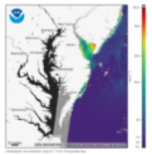
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PNG TIFF

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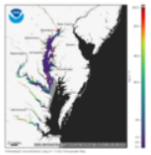
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PNG TIFF

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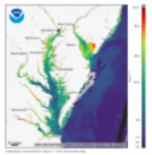
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PNG TIFF

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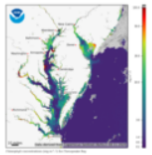
Sentinel-3B/OLCI_nccos Chesapeake Bay Chlorophyll-a (Gilerson)
PNG TIFF

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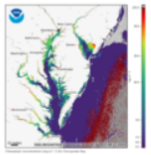
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PNG TIFF

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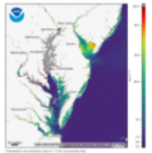
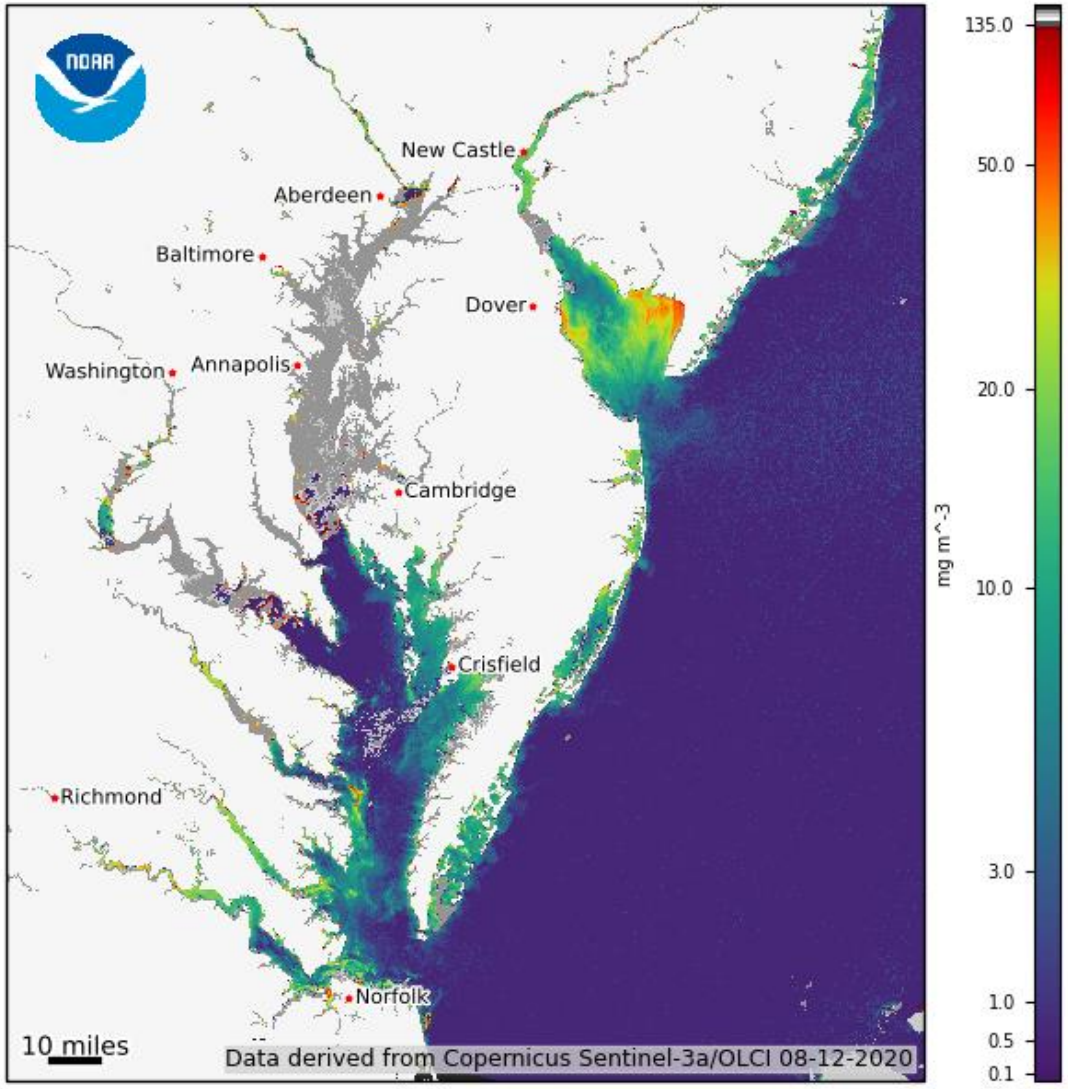
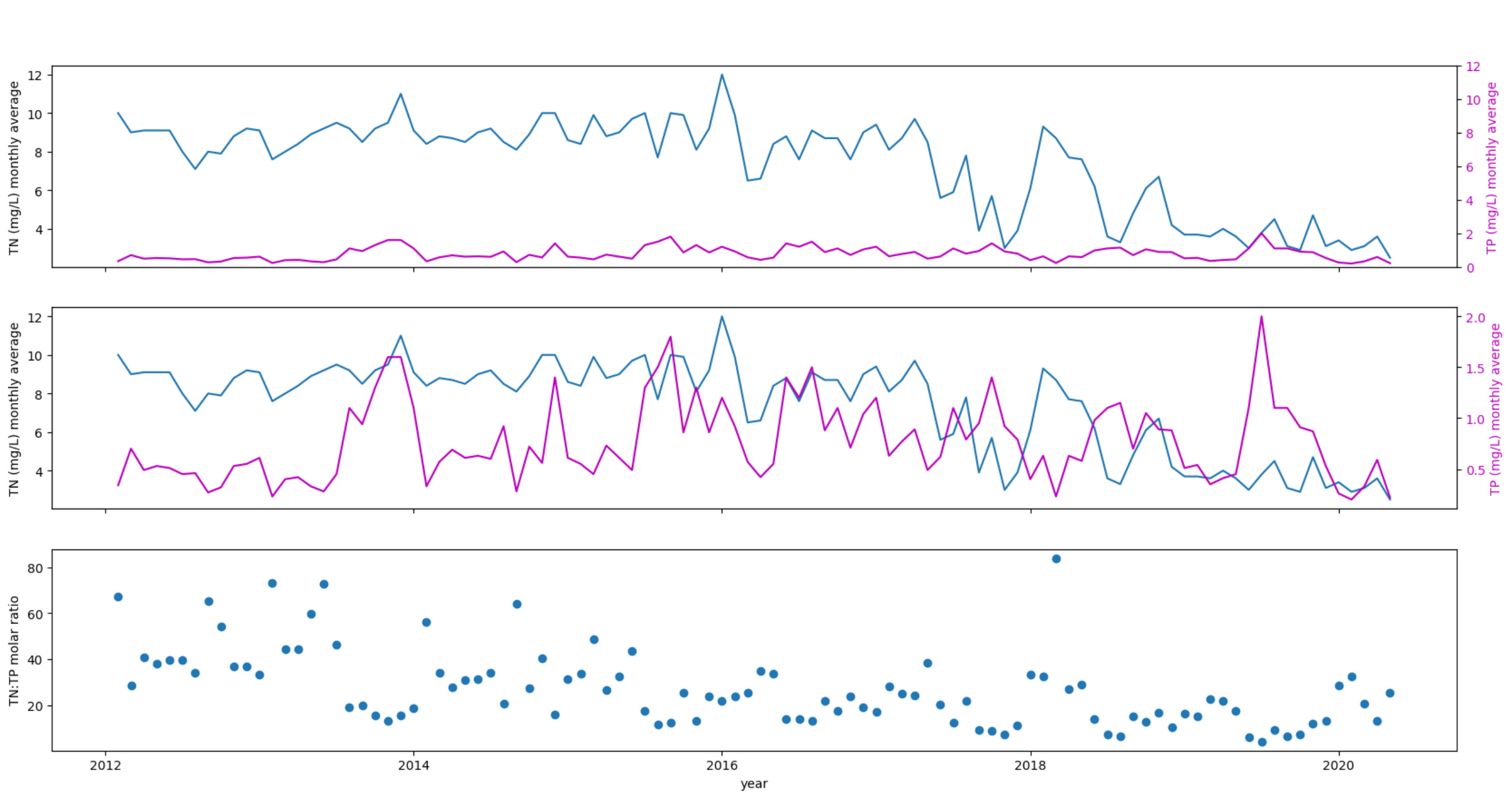

Sentinel-3A/OLCI_nccos Chesapeake Bay Chlorophyll-a (Gilerson)

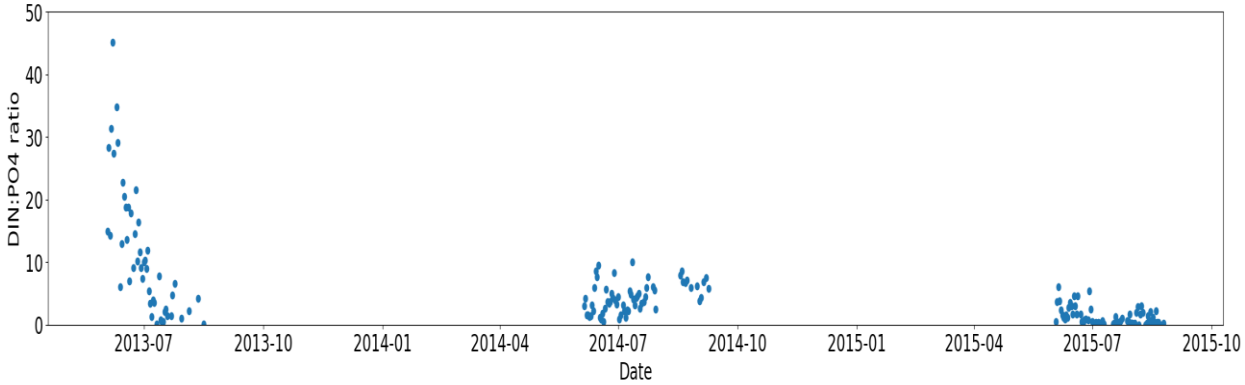


Chlorophyll concentrations (mg m^-3) for Chesapeake Bay.

Data from the NFK waste-water treatment plant with outflow near the mouth of the Lafayette River


TN (mg/L) monthly average
TP (mg/L) monthly average
TN (mg/L) monthly average
TP (mg/L) monthly average
TN:TP molar ratio
year
2012
2014
2016
2018
2020

Nutrient data from daily sampling campaign (2012 - 2015)

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data_NYCC_NUTS.columns
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       'PO4_uM', 'PO4_std', 'DIN_PO4_ratio', 'TDN_uM', 'TDN_uM.1'],
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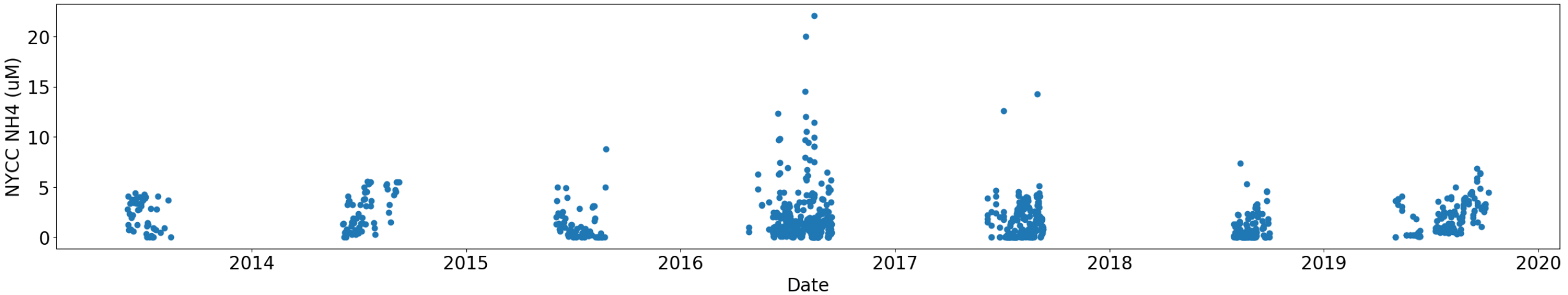
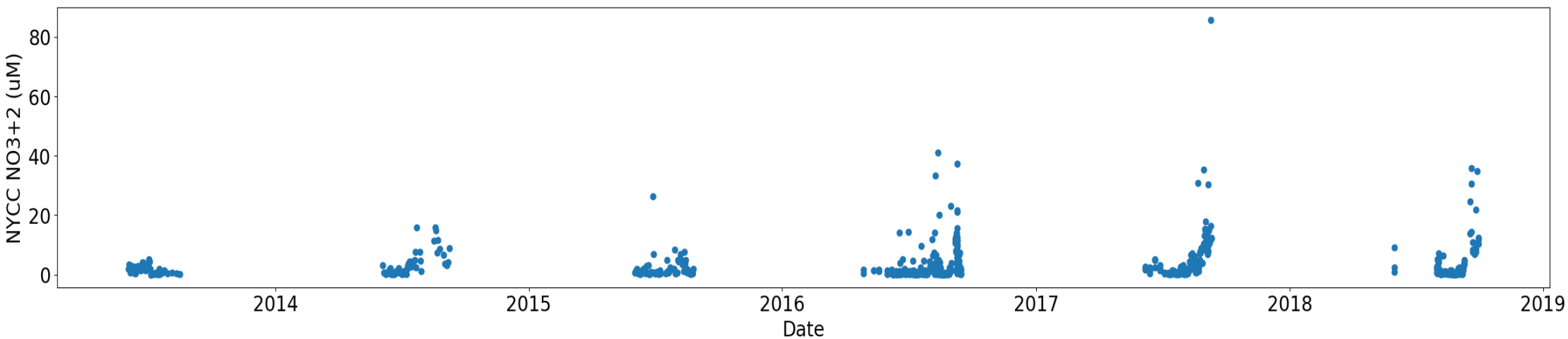
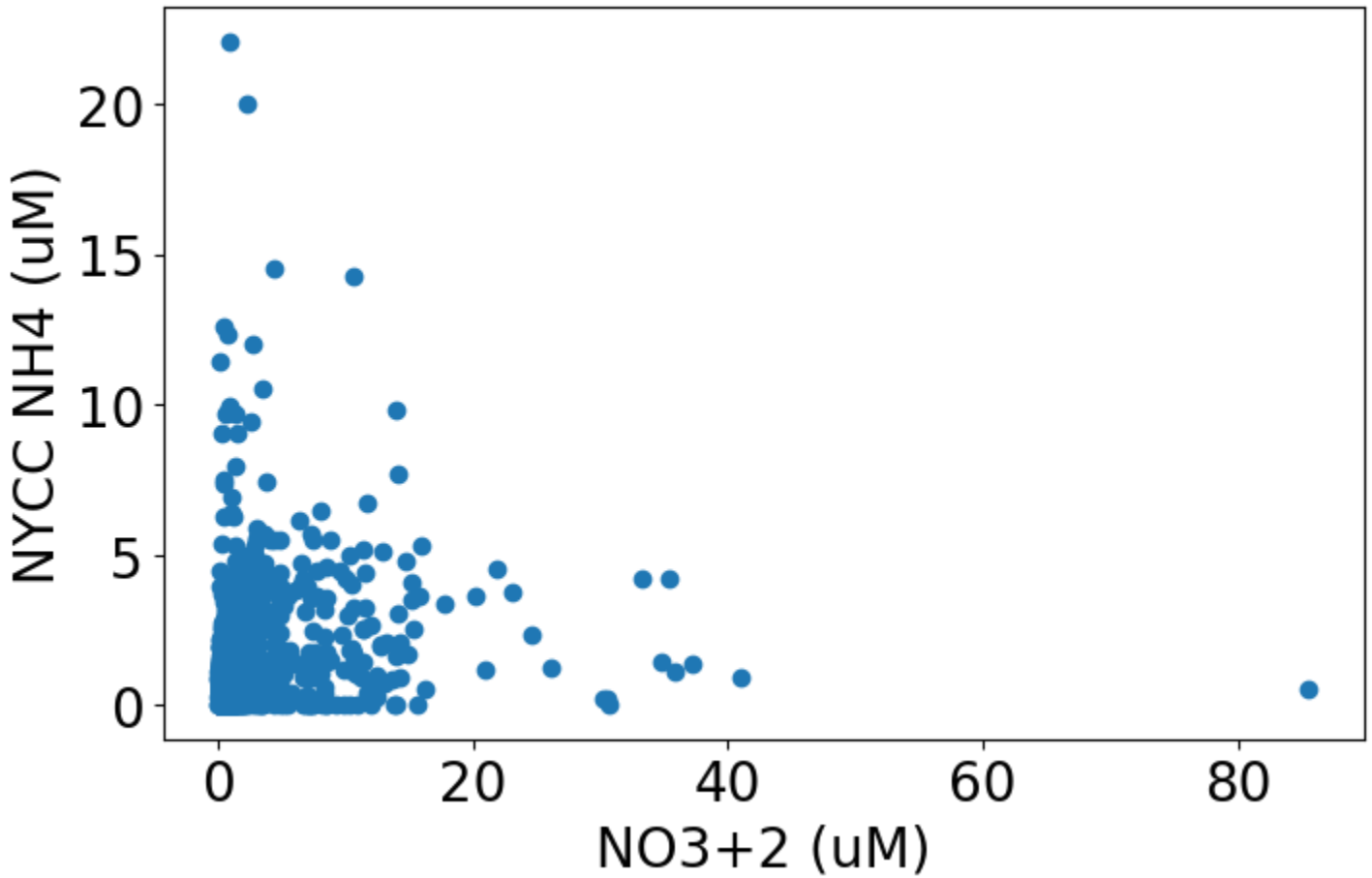
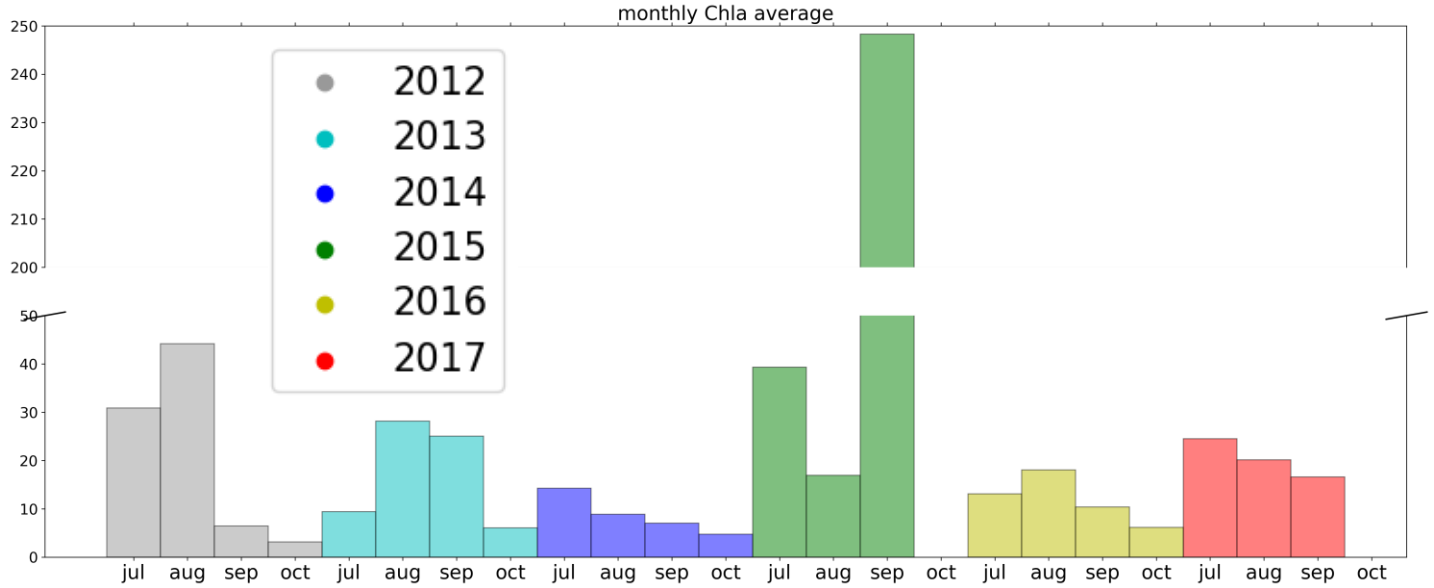




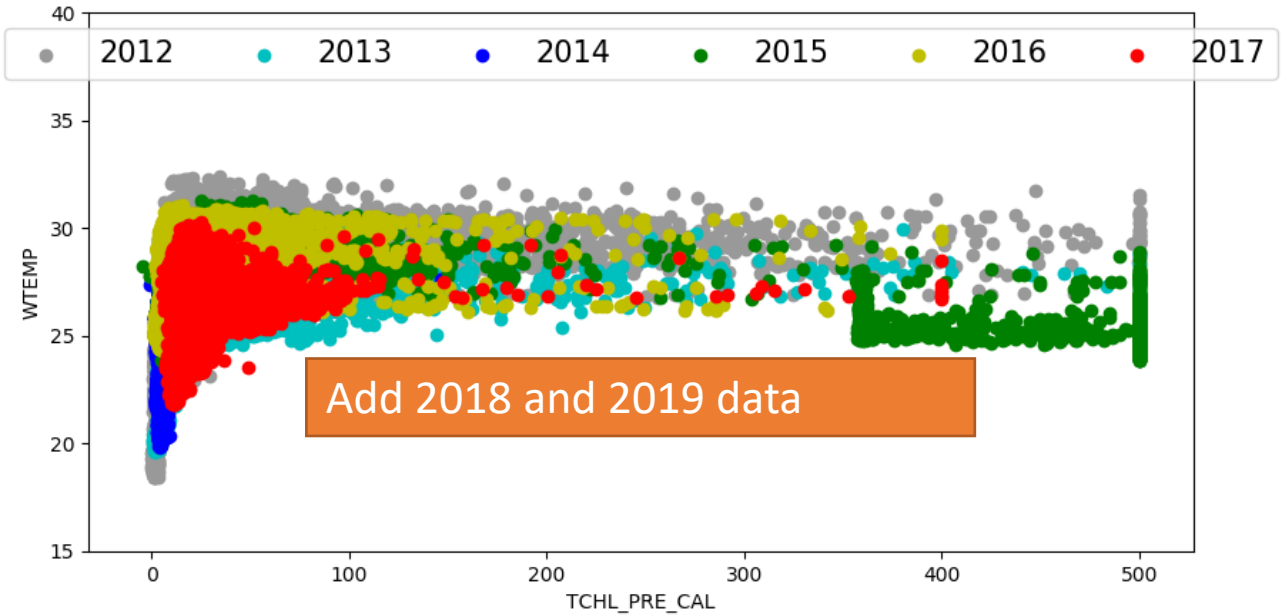

NYCC NH4 (uM)
0
5
10
15
20
0
20
40
60
80
NO3+2 (uM)

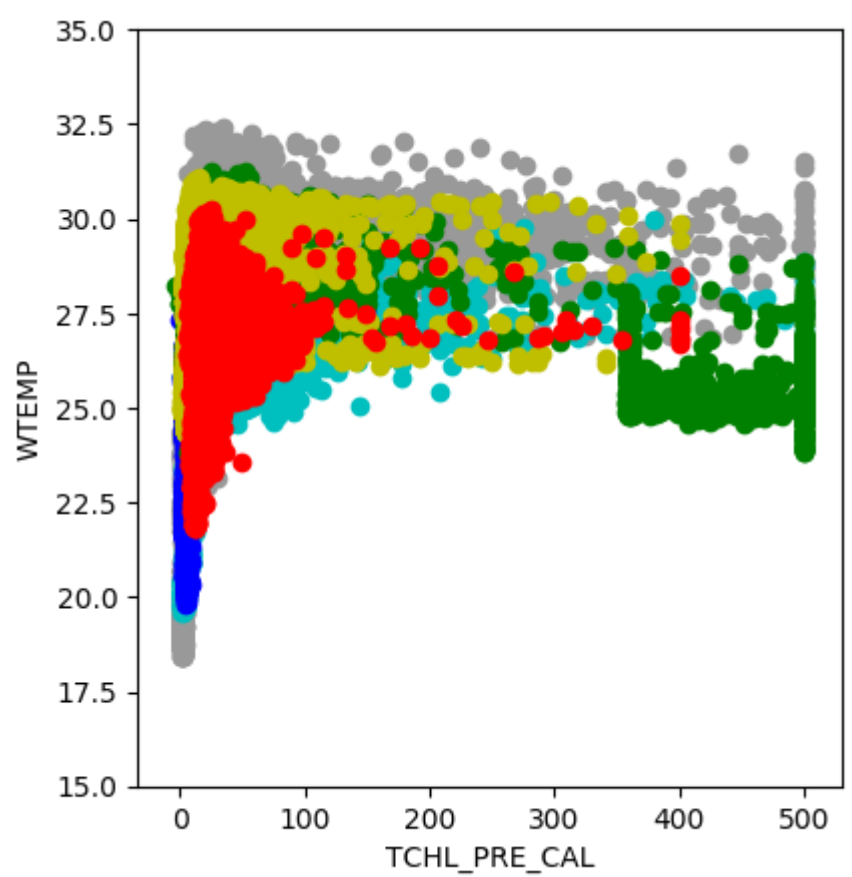
YSI data collected at the NYCC by M. Mulholland group.

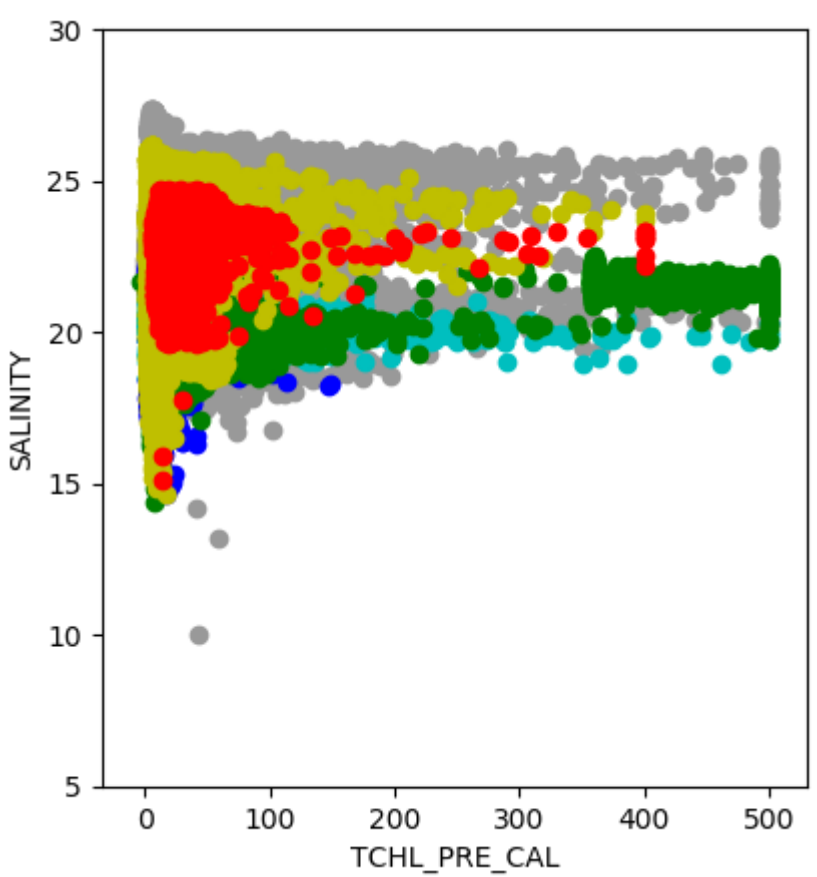
Monthly average from YSI data collected from 2012 to 2019 (colors). Months are indicated in the y axis; x axis is Chl concentration as reported by the variable “TCHL_PRE_CAL”. There is a brake in the y axis because September average on 2015 is an order of magnitude higher than the remaining dates.

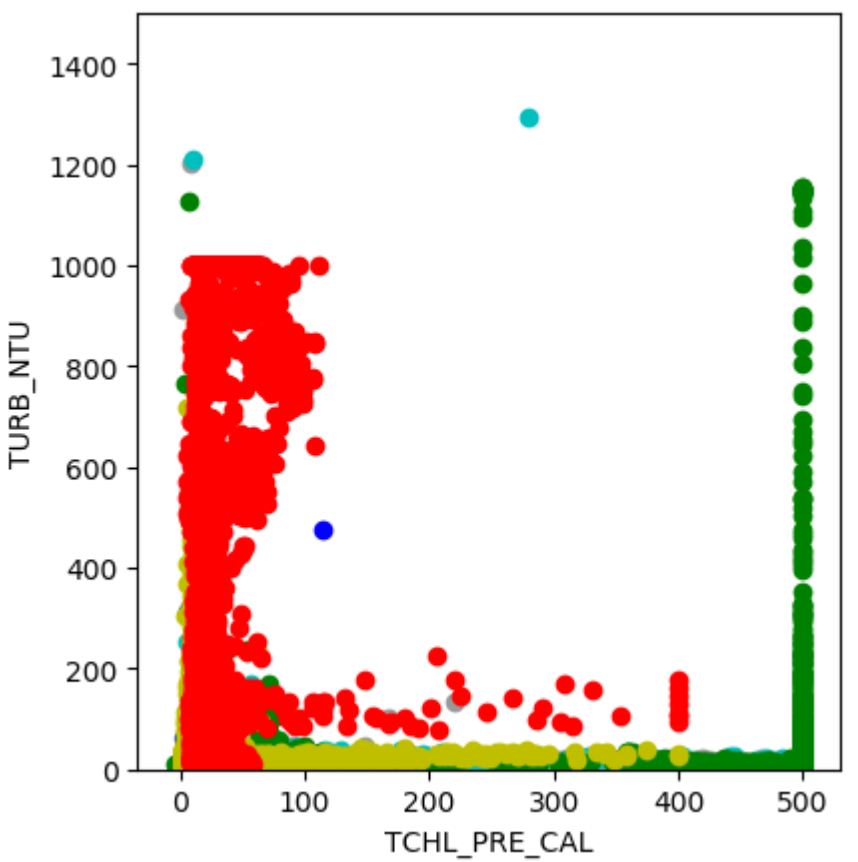


Cell count spread sheet

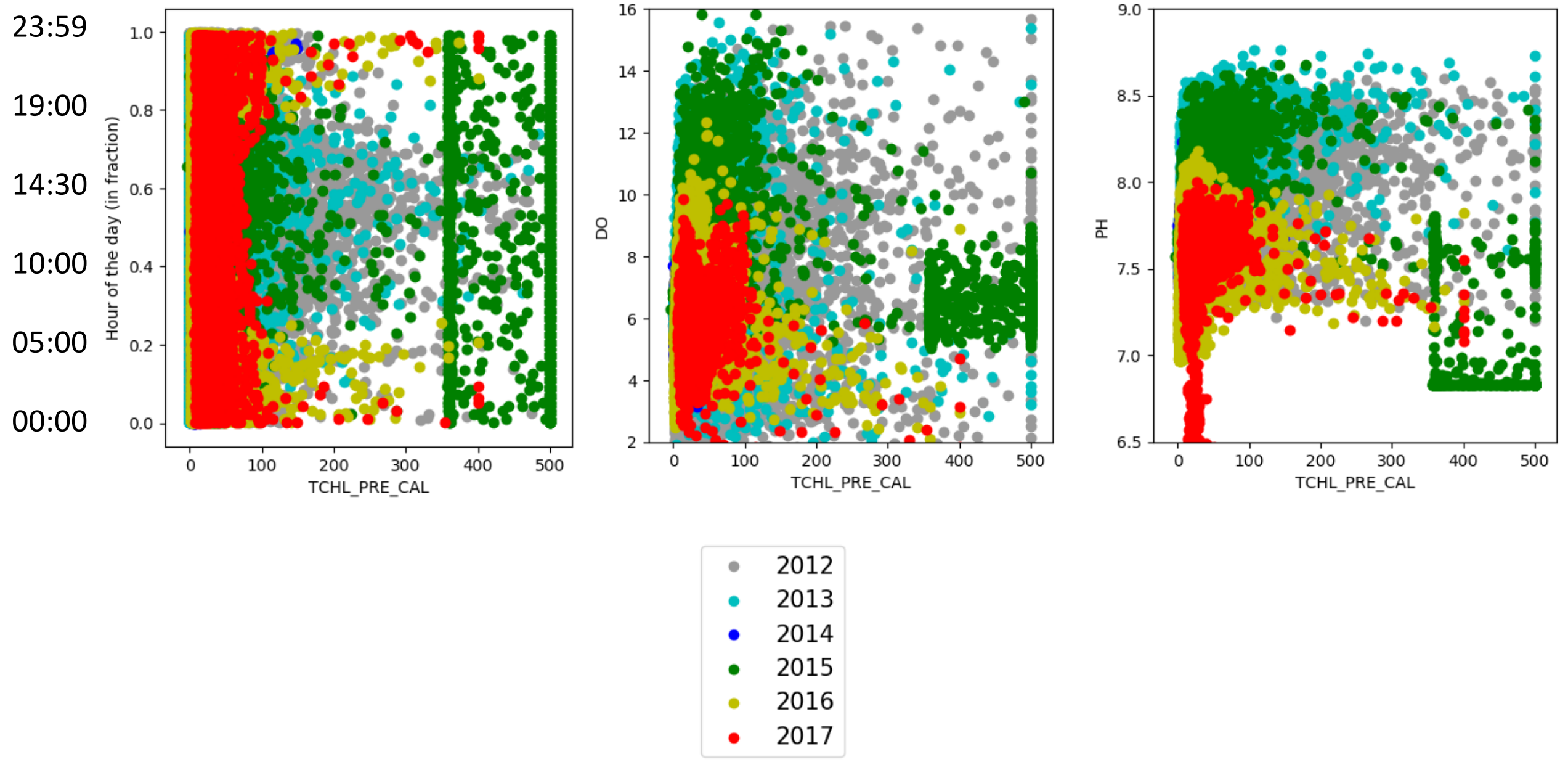



WTEMP
TCHL_PRE_CAL

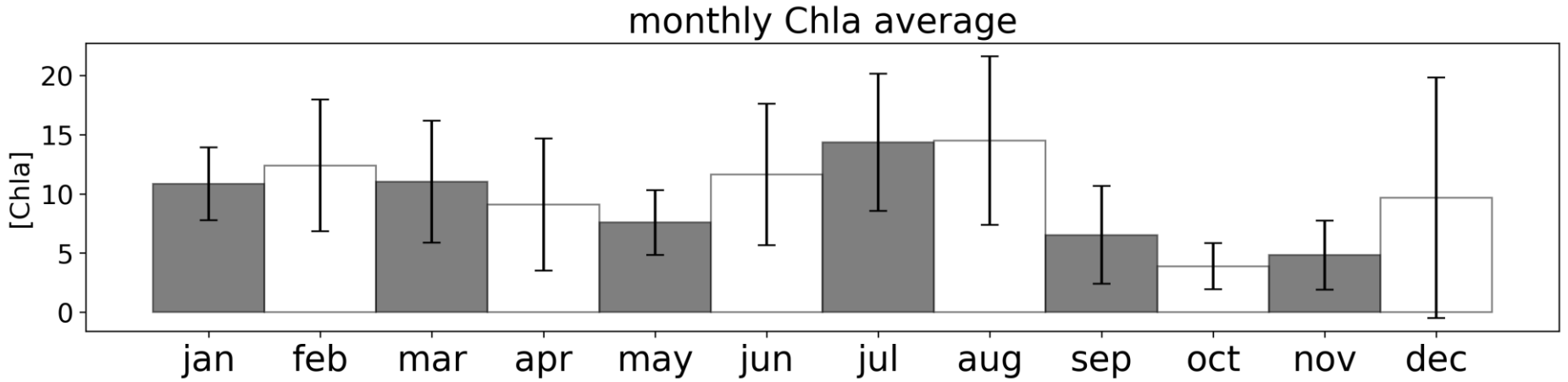

SALINITY
TCHL_PRE_CAL


TURB_NTU
TCHL_PRE_CAL

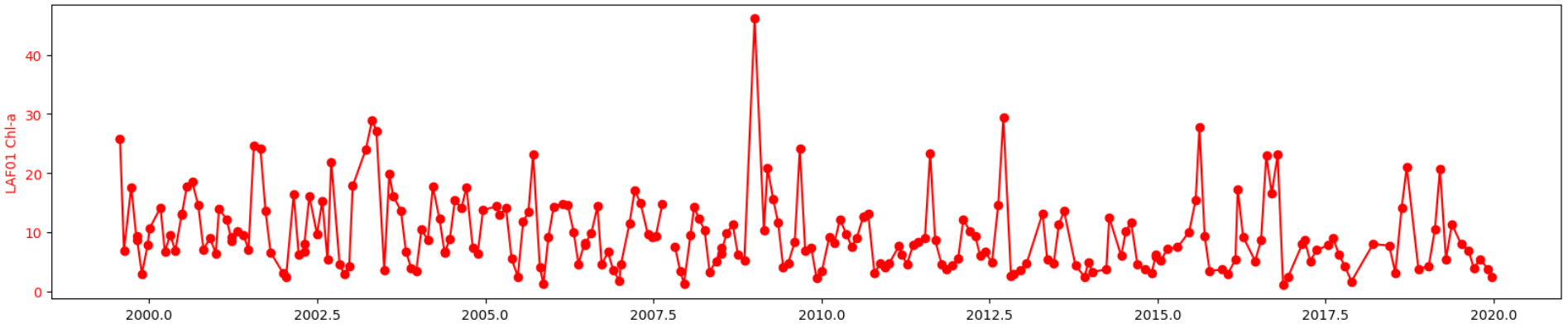

2012
2013
2014
2015
2016
2017


23:59
19:00
14:30
10:00
05:00
00:00
Hour of the day (in fraction)
TCHL_PRE_CAL
DO
TCHL_PRE_CAL
PH
TCHL_PRE_CAL
2012
2013
2014
2015
2016
2017

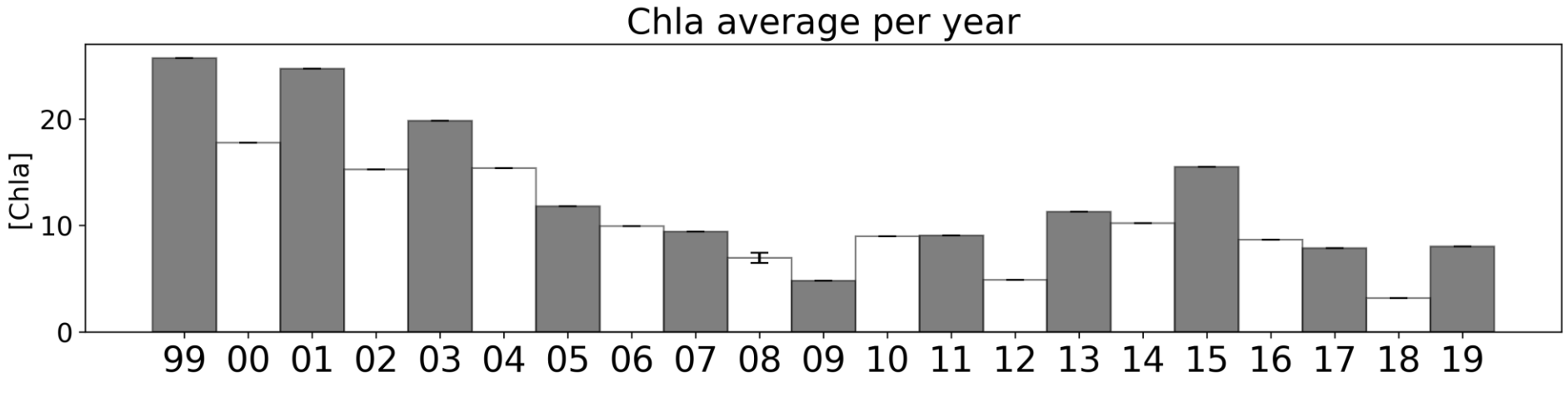
Chesapeake Bay Long Term monitoring Program – LAF01 station



Monthly average from 1999 to 2019 for measurements done at “laf01” station

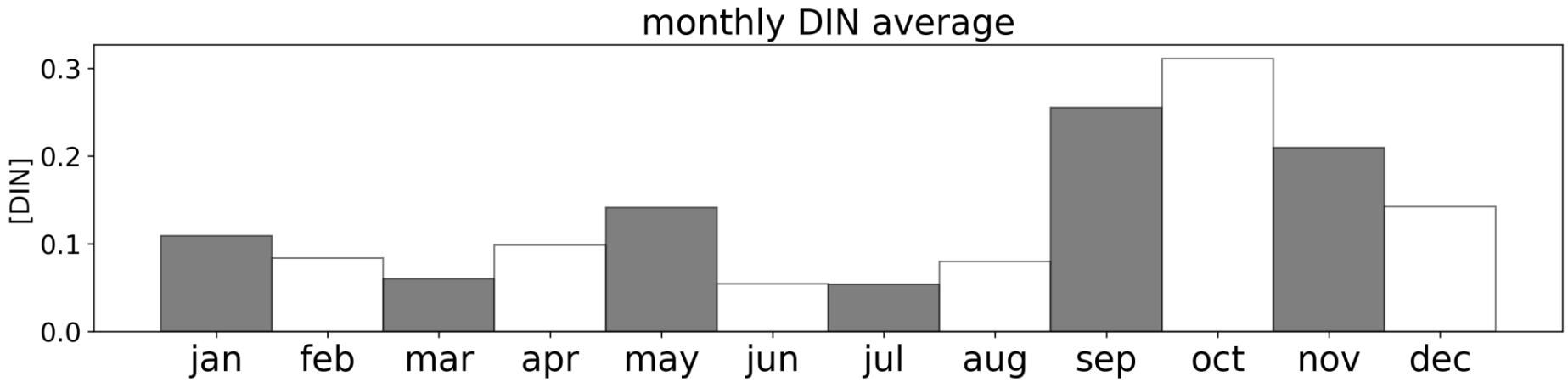


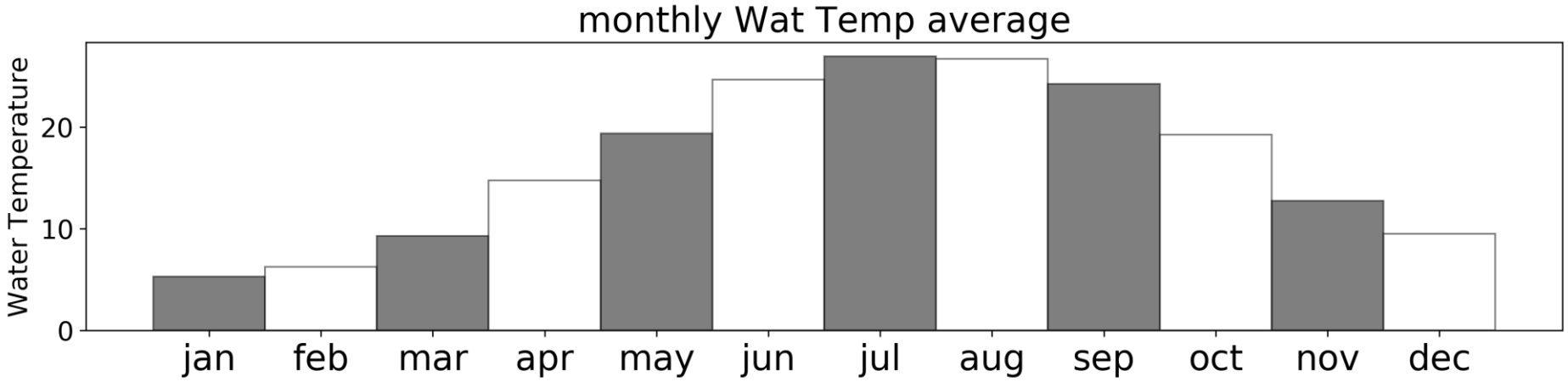
Chl data collected at “laf01” station from 1999 to 2019. Plot shows data density and “trends” on data

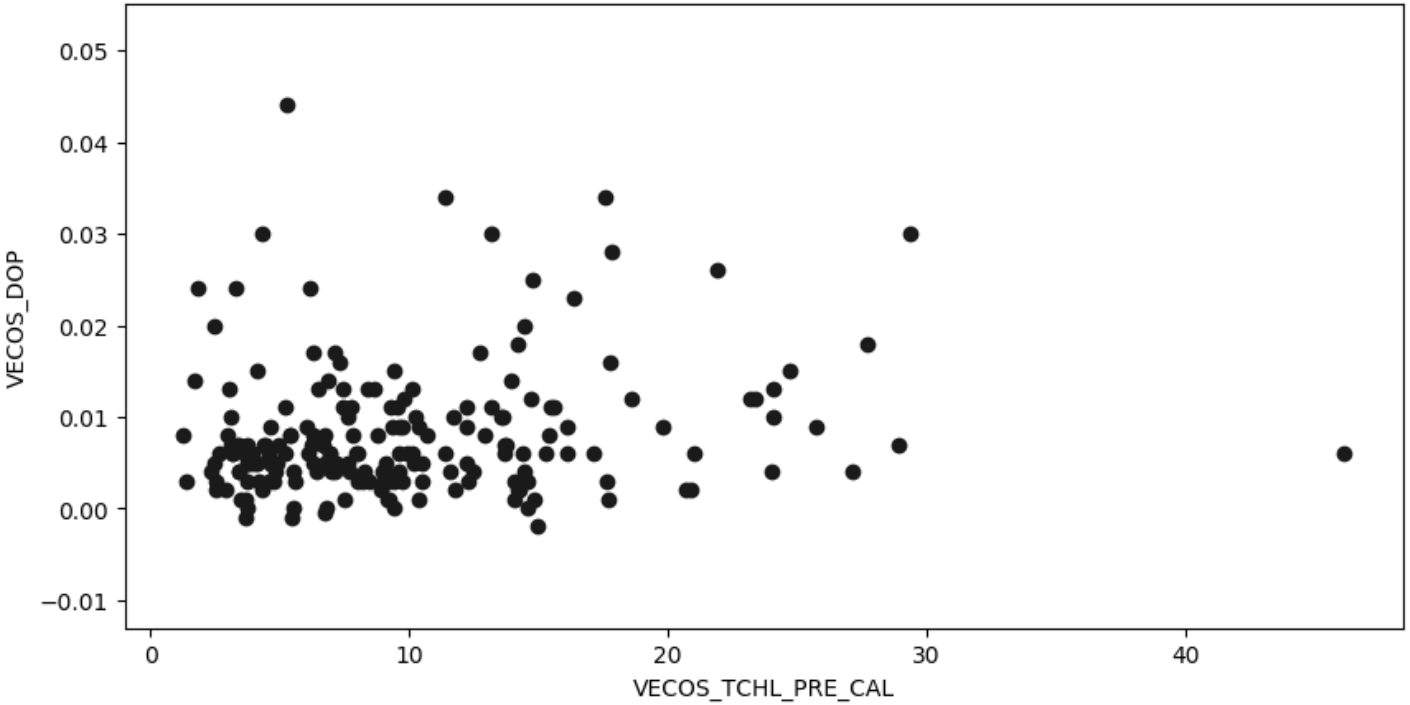


Average per year from 1999 to 2019. SD is shown, but it is too small (only visible in 2008)

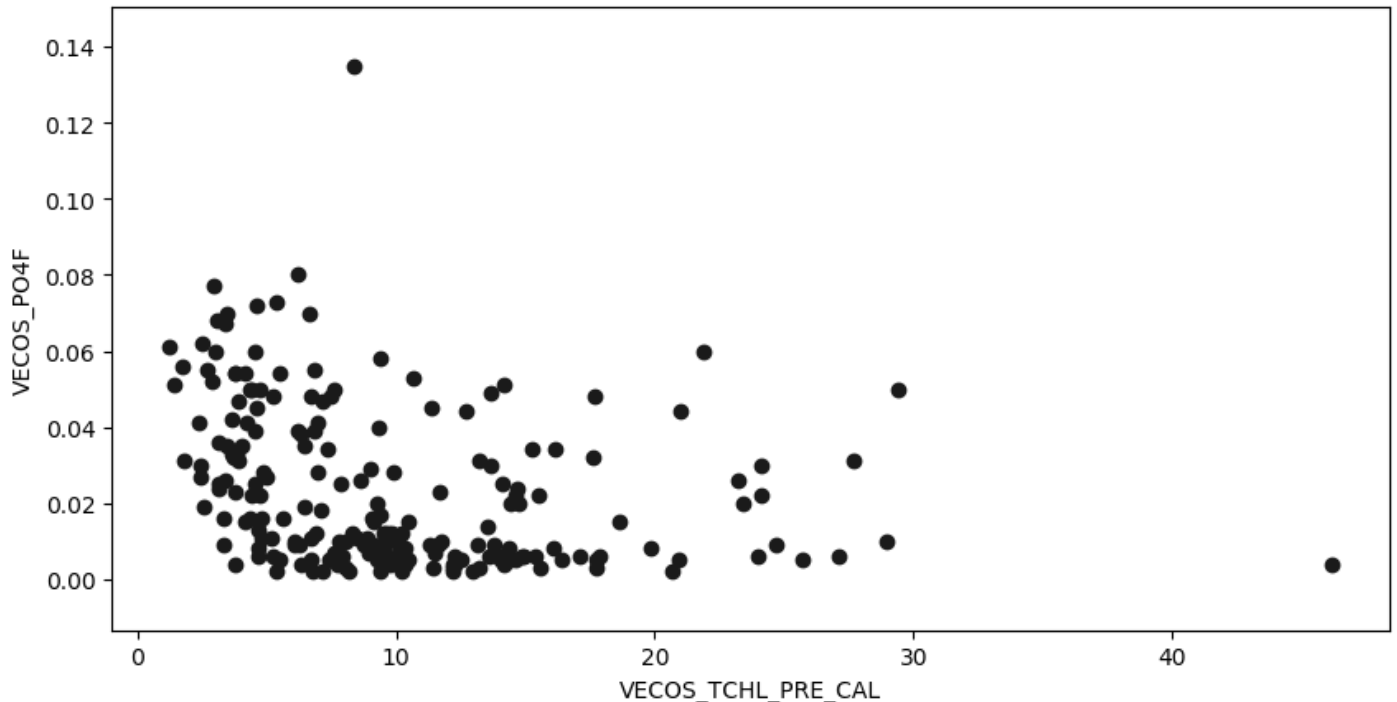
Monthly averages from 1999 to 2019 for measurements done at “laf01” station

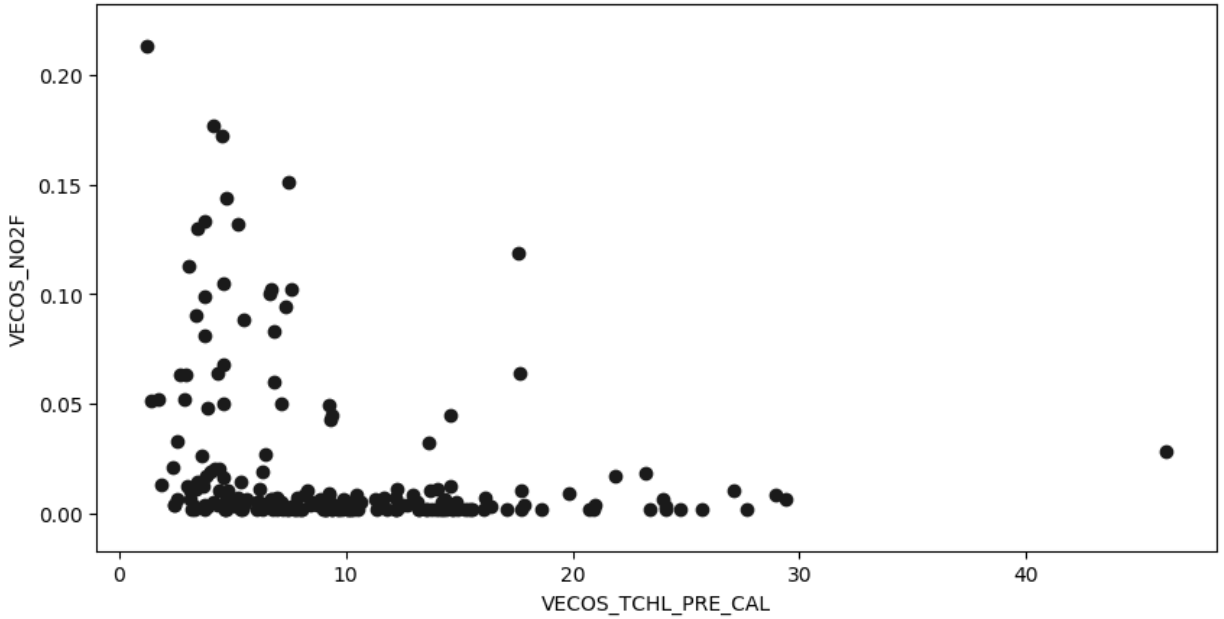


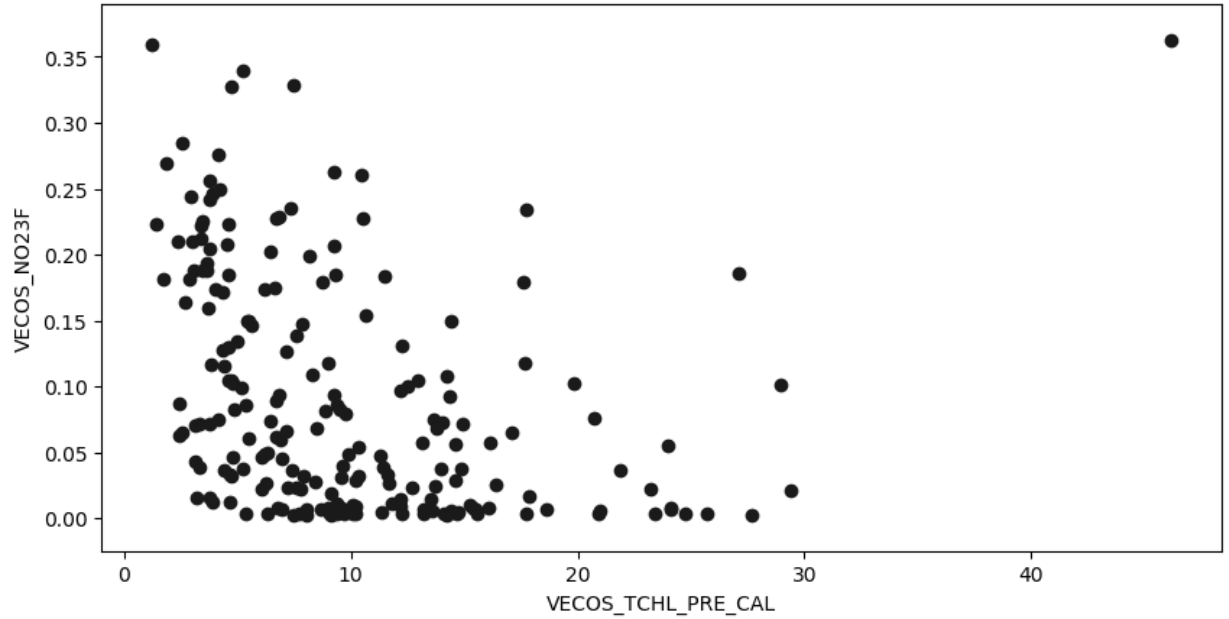


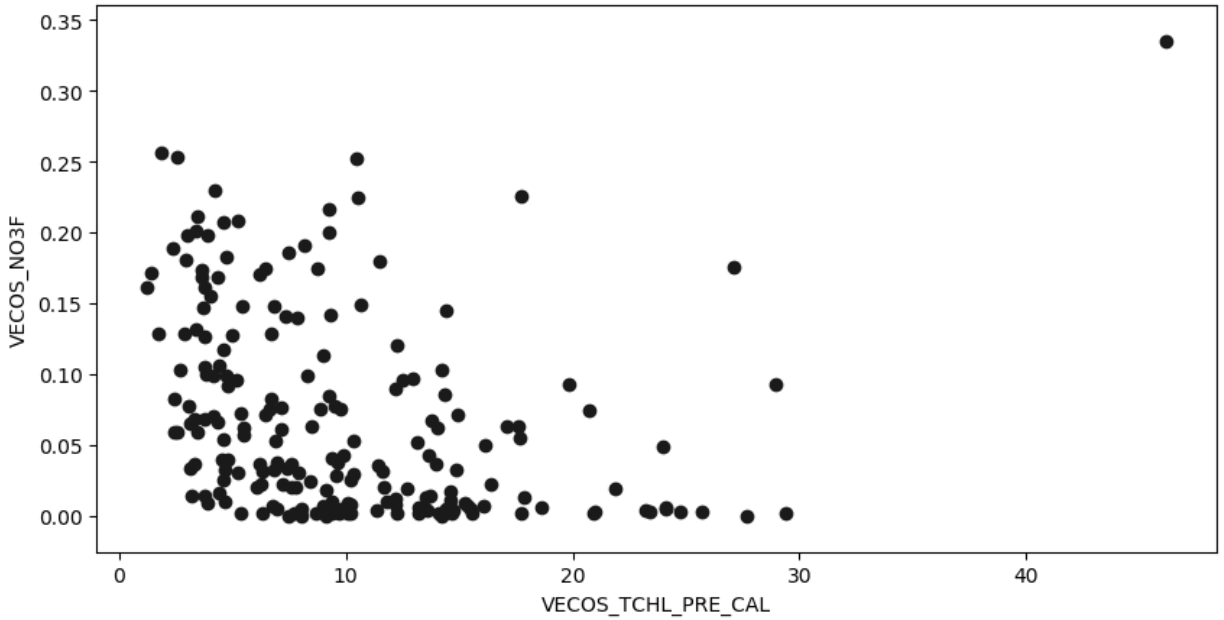


"correlation" plots of different water variables vs Chl. All values were measured in the long-term monitoring program at the Lafayette station.




VECOS_NO2F
VECOS_TCHL_PRE_CAL
0.00
0.05
0.10
0.15
0.20
0
10
20
30
40


VECOS_NO23F
VECOS_TCHL_PRE_CAL
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0
10
20
30
40


VECOS_NO3F
VECOS_TCHL_PRE_CAL
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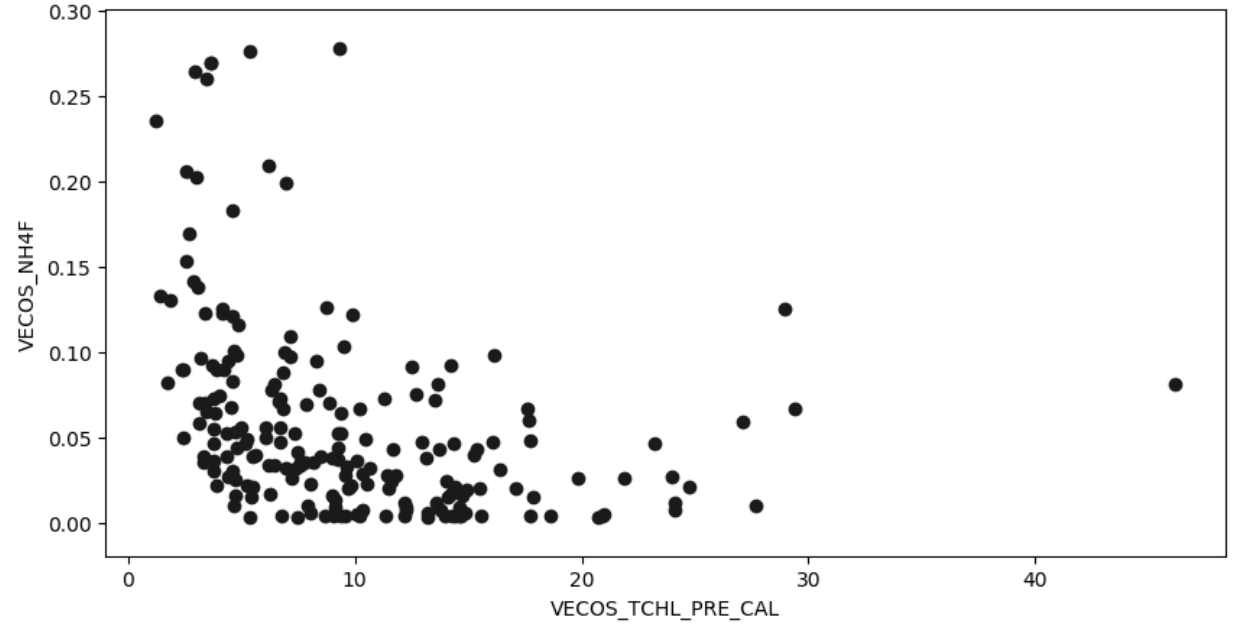
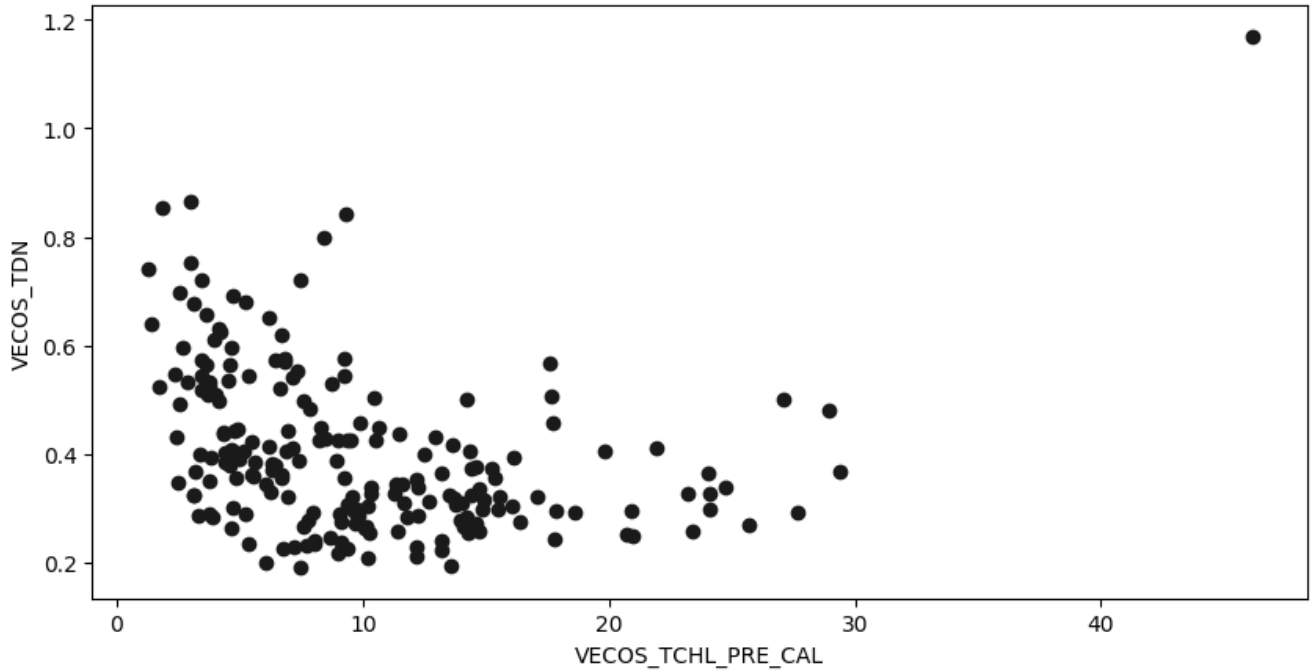
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0
10
20
30
40


VECOS_NH4F
VECOS_TCHL_PRE_CAL
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0
10
20
30
40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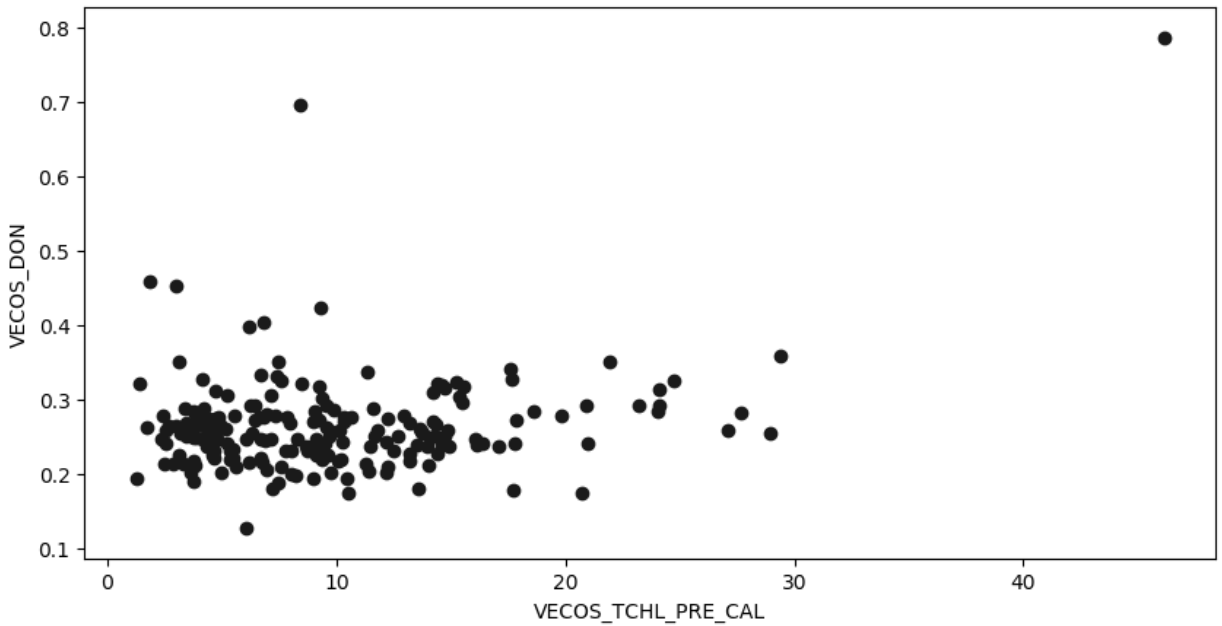
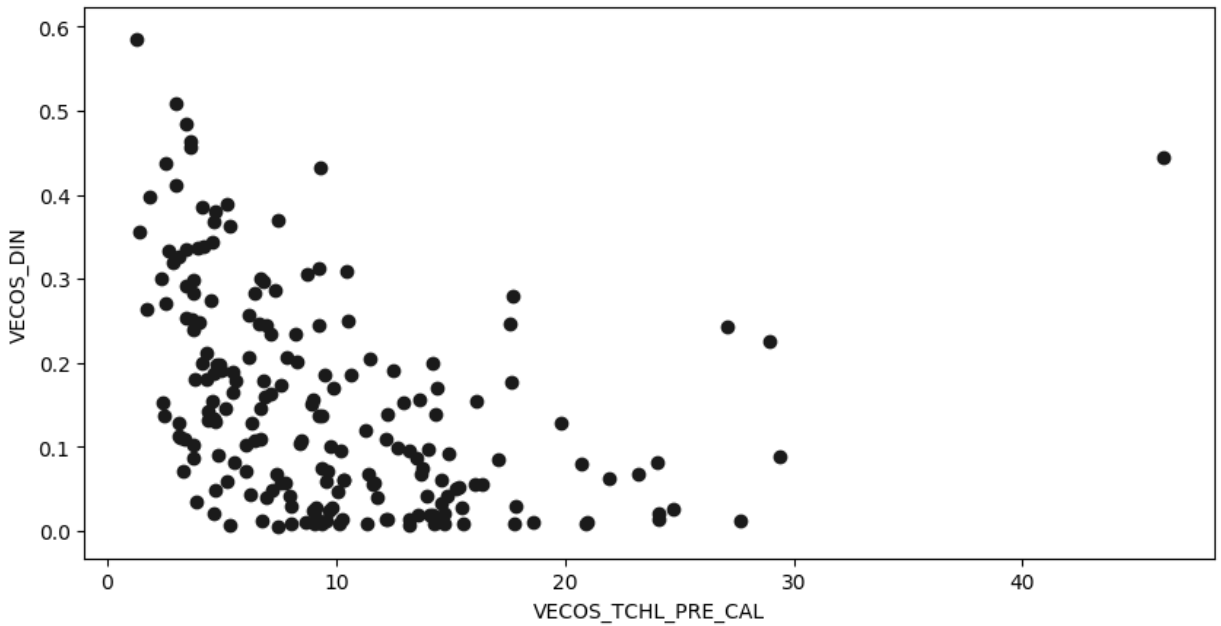
VECOS_TCHL_PRE_CAL


VECOS_DON
VECOS_TCHL_PRE_CAL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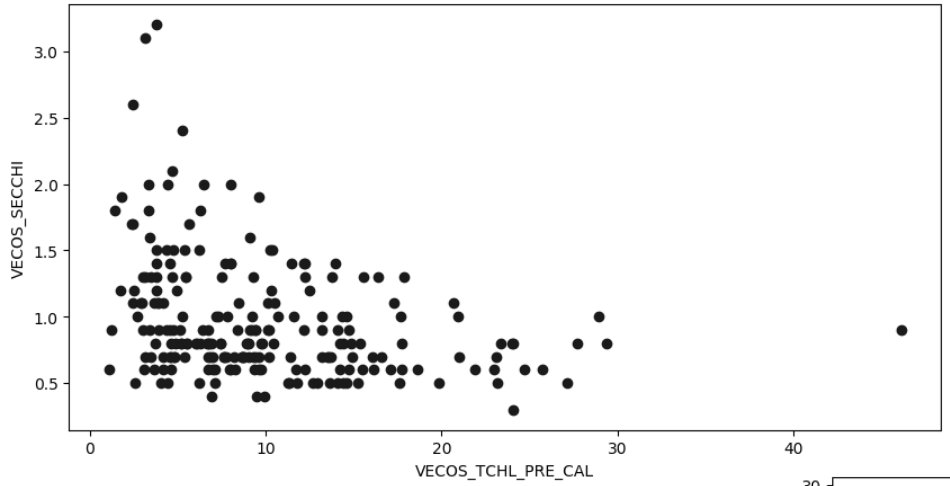
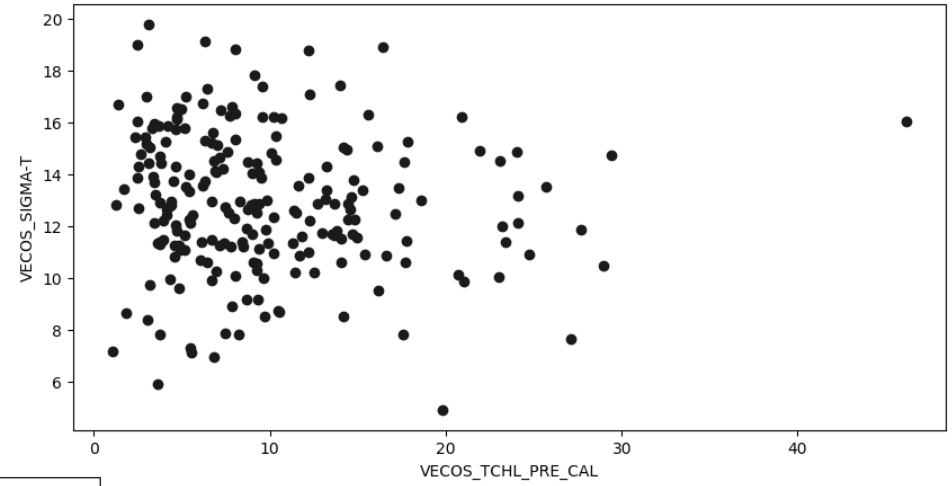
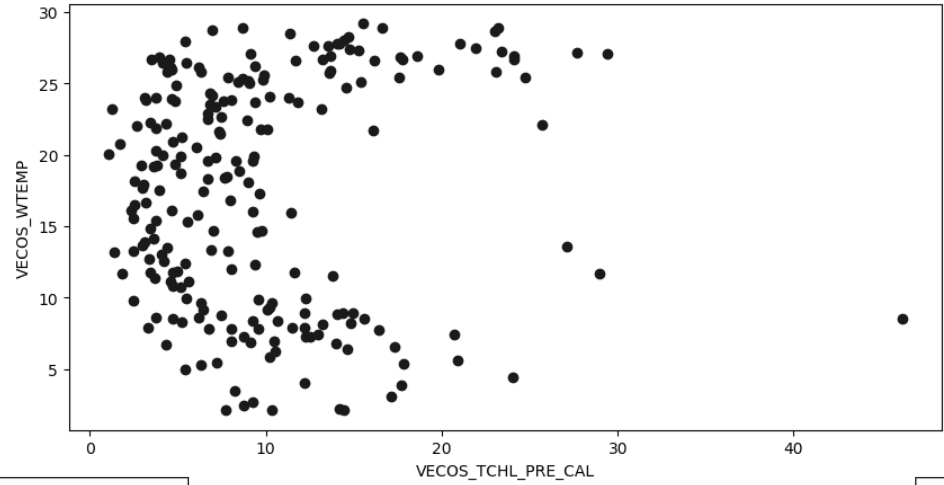

VECOS_SECCHI
VECOS_TCHL_PRE_CAL


VECOS_SIGMA-T
VECOS_TCHL_PRE_CAL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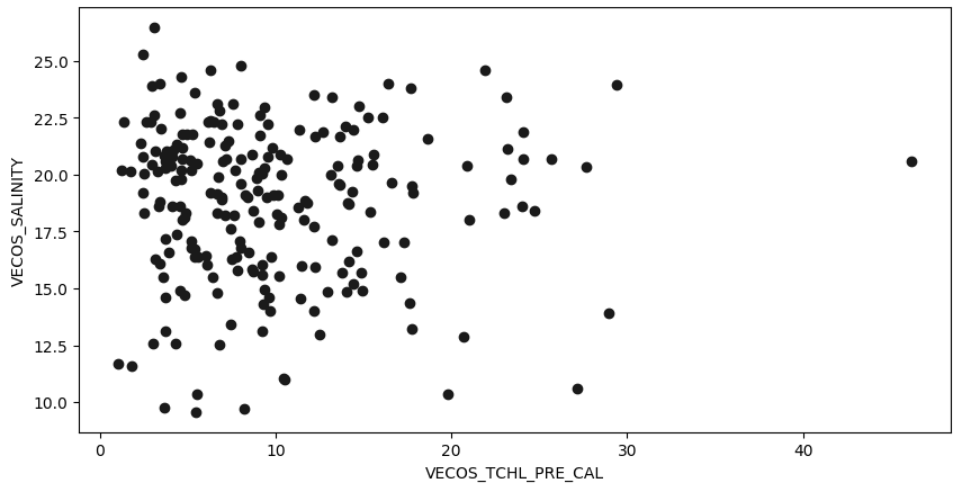
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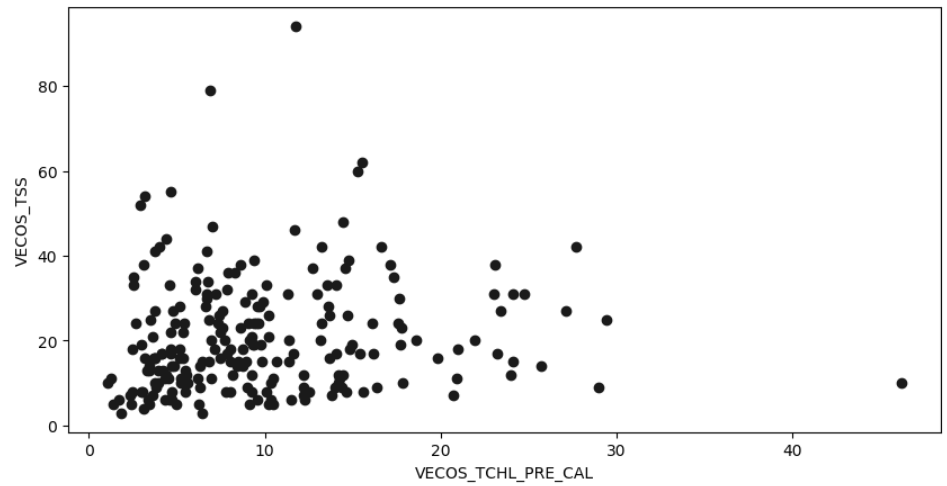
VECOS_TSS
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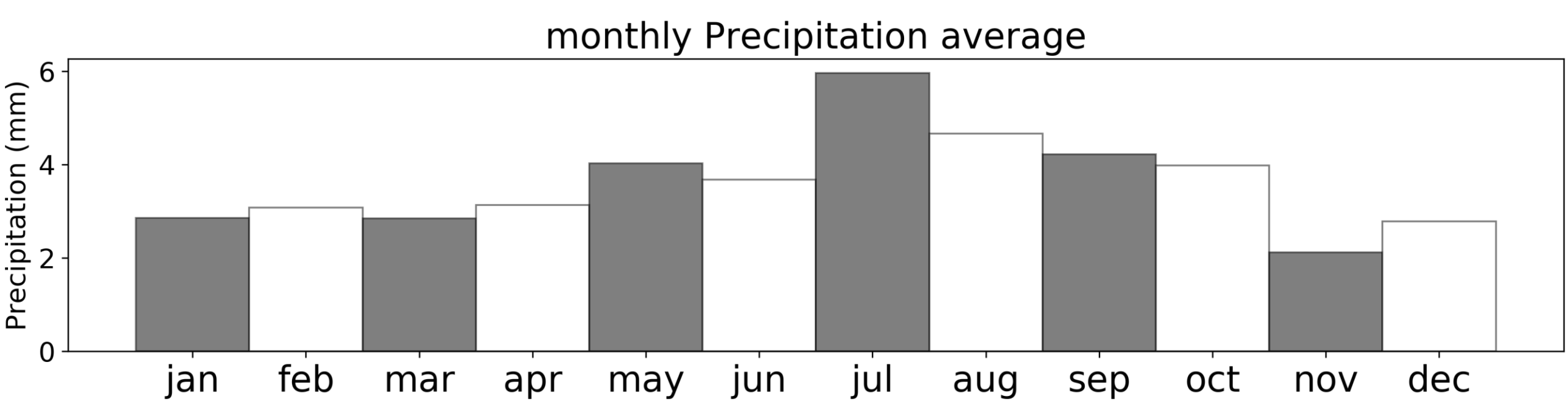
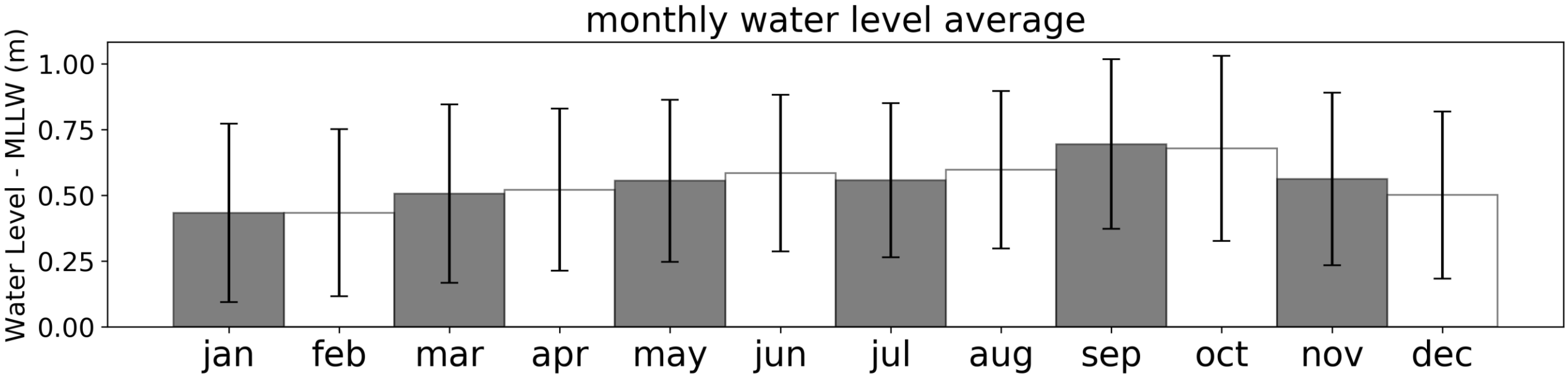
Weather data (i.e. rain) from different sources near the NYCC/laf01 sampling station



NFK international airport data (wind/precipitation)

Data is publicly available at https://www.ncdc.noaa.gov/cdo-web/cart
Station name: NORFOLK INTERNATIONAL AIRPORT, VA US Station ID: GHCND:USW00013737
Data contains daily average of wind speed and wind direction, and daily values of accumulated precipitation.



Water level from the NOAA station at Sewells Point

Data is publicly available at
https://tidesandcurrents.noaa.gov/physocean.html?bdate=20190101&edate=20191231&units=metric&timezone=GMT&id=8638610&interval=h&action=data
Station name: Sewell’s Point, VA Station ID: 8638610
Data contains hourly measurements of water level. The page only allows you to download 365 days of data. Therefore, you need to download manually each year if more than one is required.

Daily Sampling – Cell counts


```
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       'long', 'Depth', 'Time', 'Extracted_Chl', 'New_YSI', 'YSI_Chla',
       'Annual_Corrected_Chla', 'Annual_Chla_Bins', 'Species_code', 'Taxa2',
       'Phyla', 'PhyNum', 'Density_cells_ml', 'biomas_pgC_cell',
       'biomas_pgC_ml', 'biomas_ugC_L', 'Total_abundance_cells_ml',
       'Total_biomas_ugC_L', 'PERCNT_biomass', 'Chlorophytes_biomass_ugC_L',
       'Cryptomonads_biomass_ugC_L', 'Cyanobacteria_biomass_ugC_L',
       'Diatoms_biomass_ugC_L', 'Dinoflagellates_biomass_ugC_L',
       'Eugelenoids_biomass_ugC_L', 'Prasinophytes_biomass_ugC_L',
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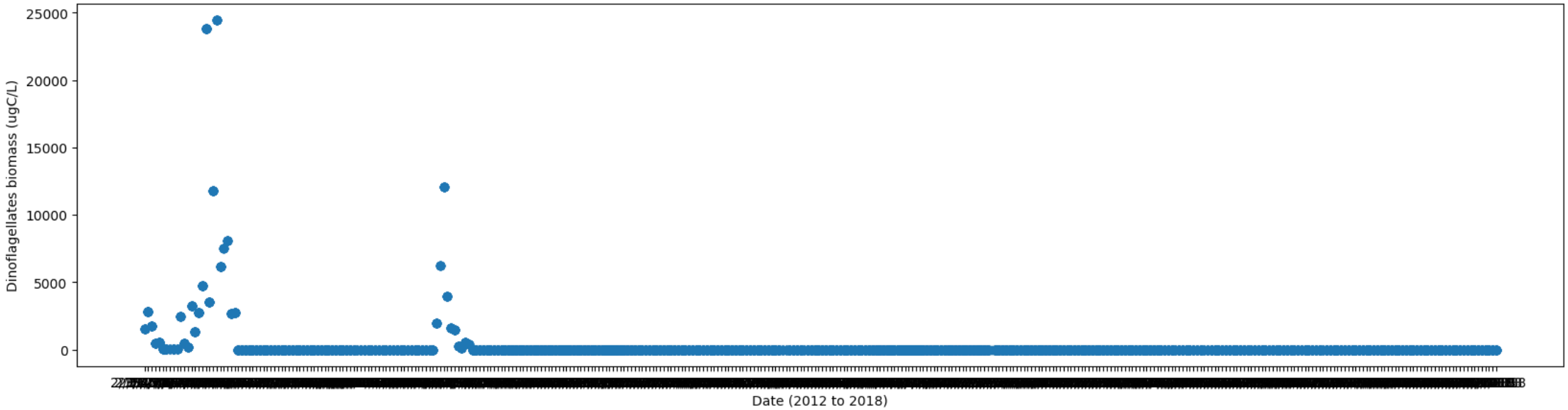
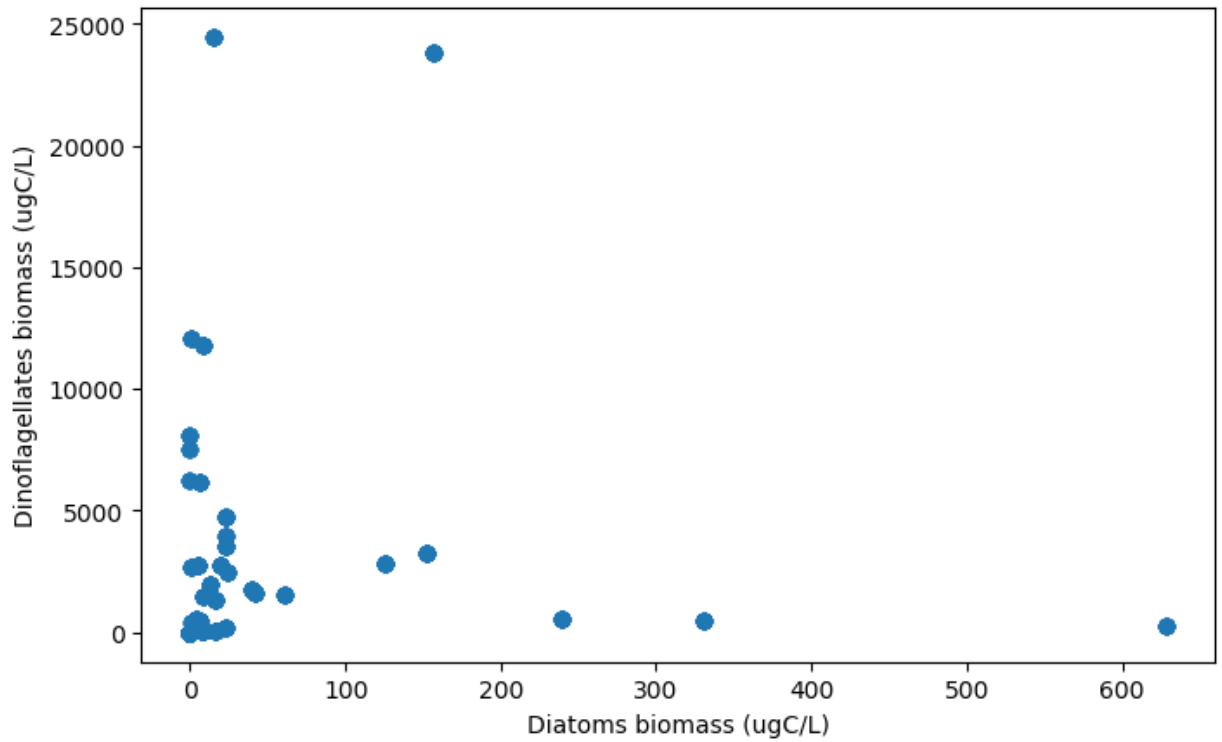
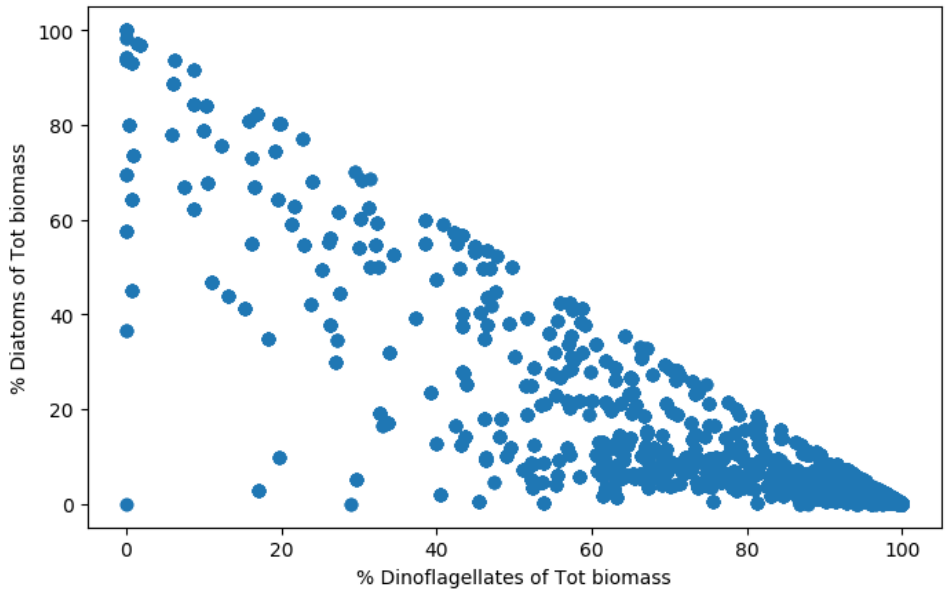
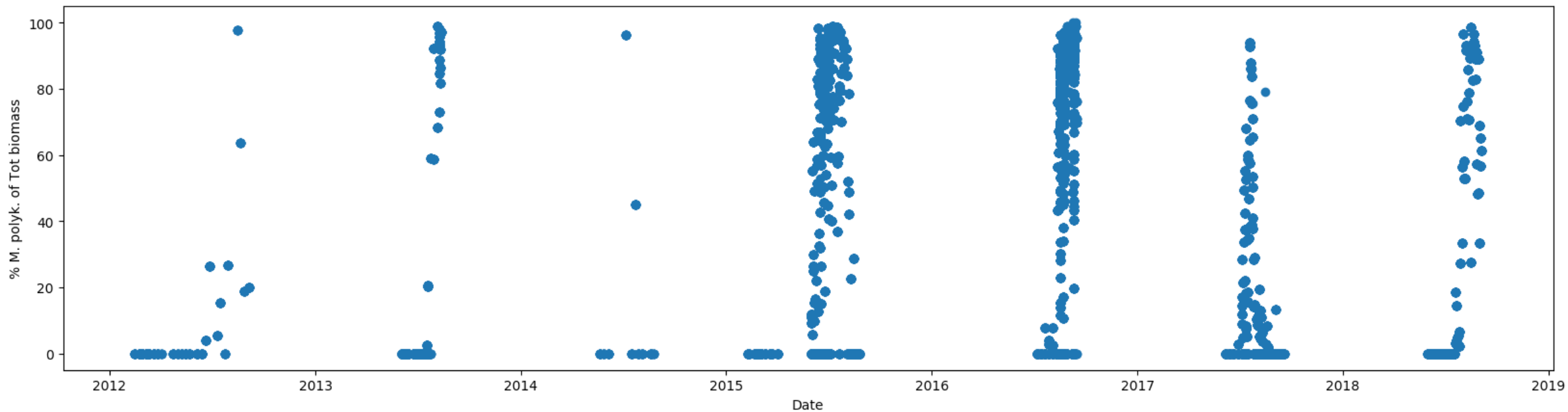

25000
20000
15000
10000
5000
0
Dinoflagellates biomass (ugC/L)
Date (2012 to 2018)


25000
20000
15000
10000
5000
0
Dinoflagellates biomass (ugC/L)
0
100
200
300
400
500
600
Diatoms biomass (ugC/L)

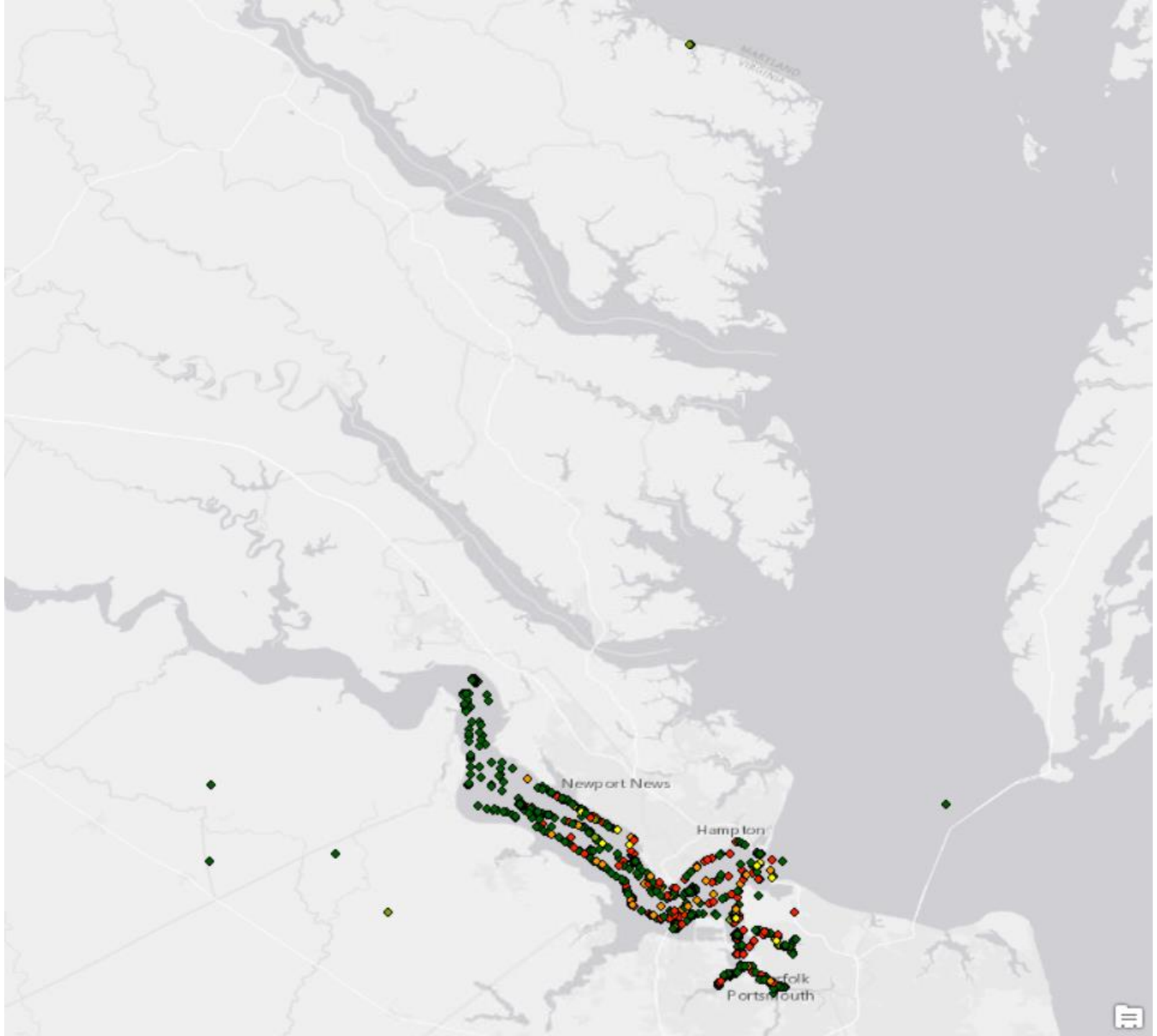
```
fig, (ax3)=plt.subplots(1,1,figsize=(8,5),dpi=100,sharex='all')
ax3.scatter(data_cellcount_dataflow2.PERCNT_Dinoflagellates_biomass,data_cellcount_dataflow2.PERCNT_Diatoms_biomass)
ax3.set_ylabel('% Diatoms of Tot biomass')
ax3.set_xlabel('% Dinoflagellates of Tot biomass')
```

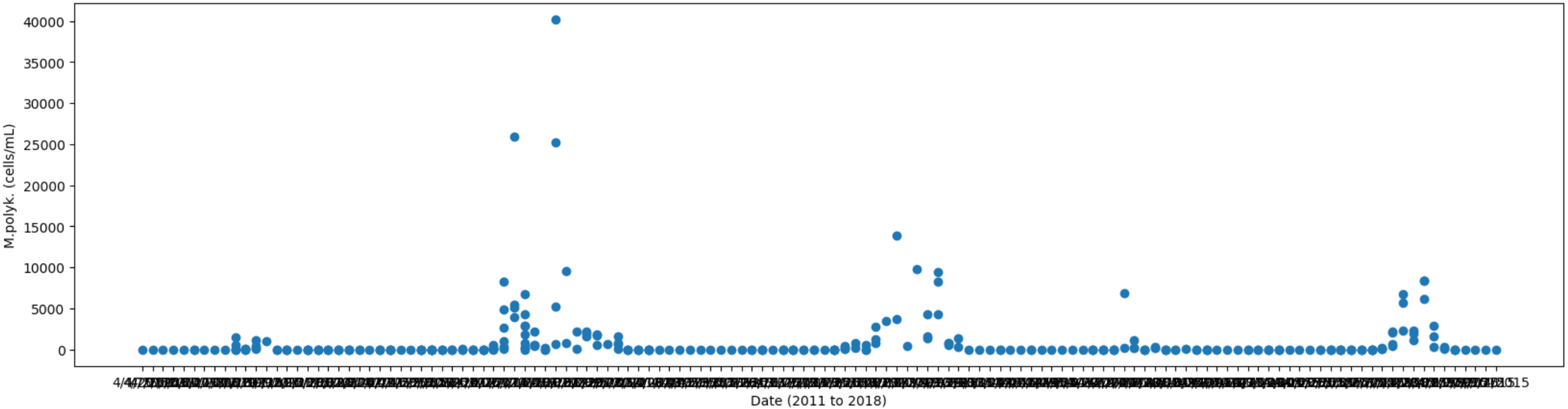
```
Text(0.5, 0, '% Dinoflagellates of Tot biomass')
```

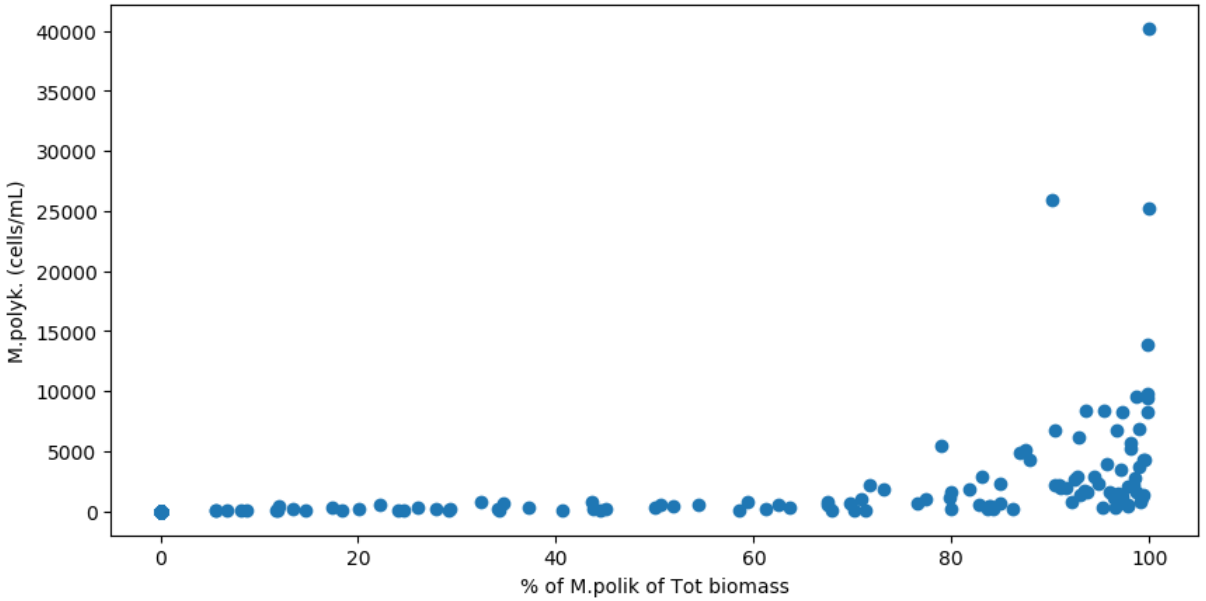


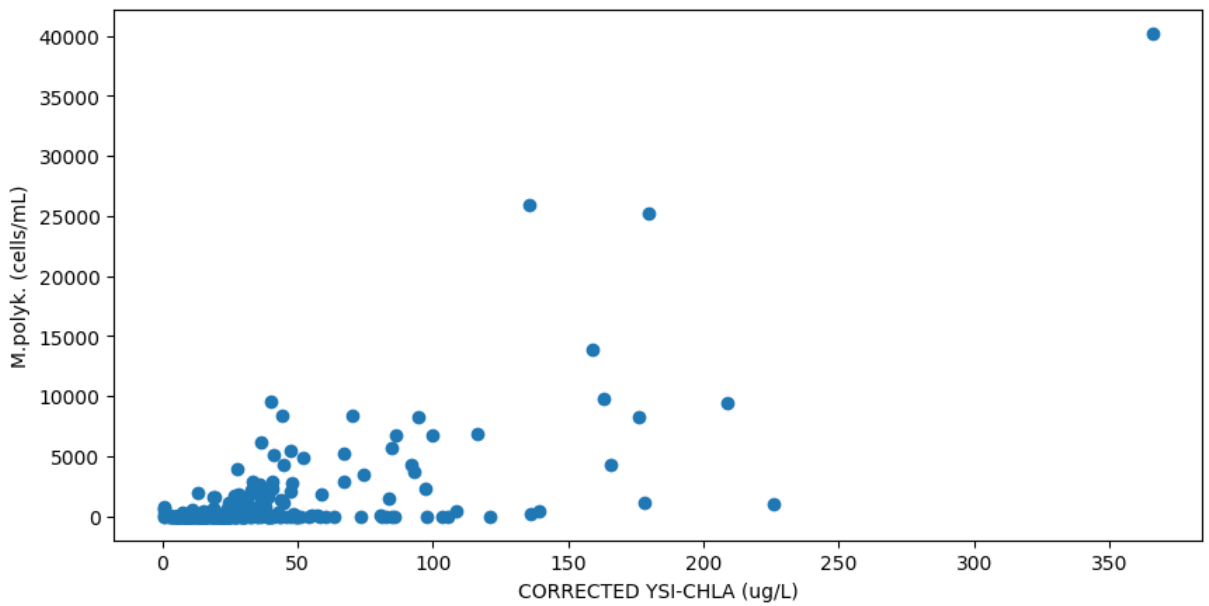


Cell counts from dataFLOW transects

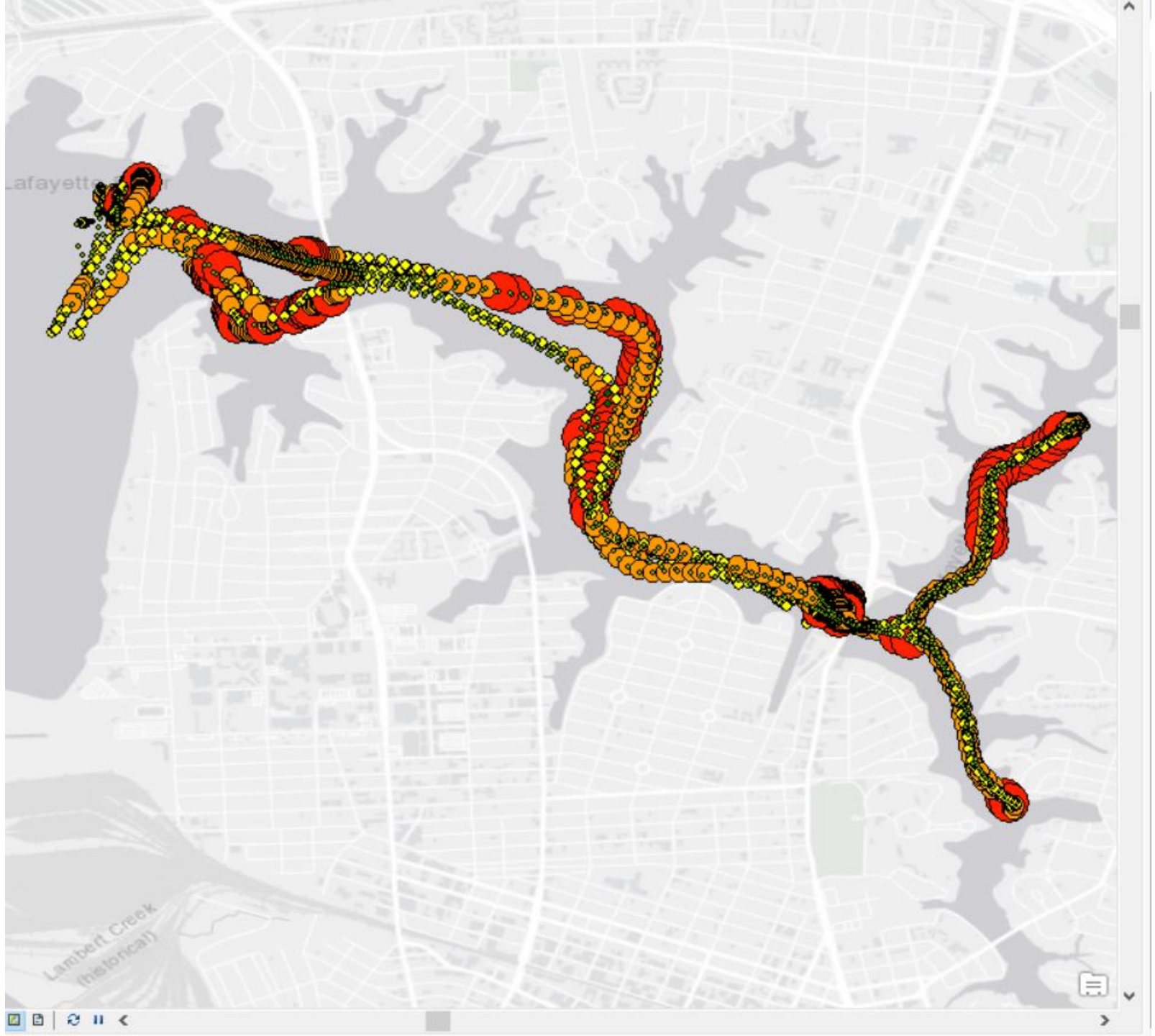

Newport News
Hampton
Portsmouth


40000
35000
30000
25000
20000
15000
10000
5000
0
M.polyk. (cells/mL)
Date (2011 to 2018)


M.polyk. (cells/mL)
% of M.polik of Tot biomass
0
5000
10000
15000
20000
25000
30000
35000
40000
0
20
40
60
80
100


M.polyk. (cells/mL)
CORRECTED YSI-CHLA (ug/L)
0
5000
10000
15000
20000
25000
30000
35000
40000
0
50
100
150
200
250
300
350

Data-FLOW transects through the Lafayette river (2008 – 2015)


Lafayette
Lambert Creek
(historical)

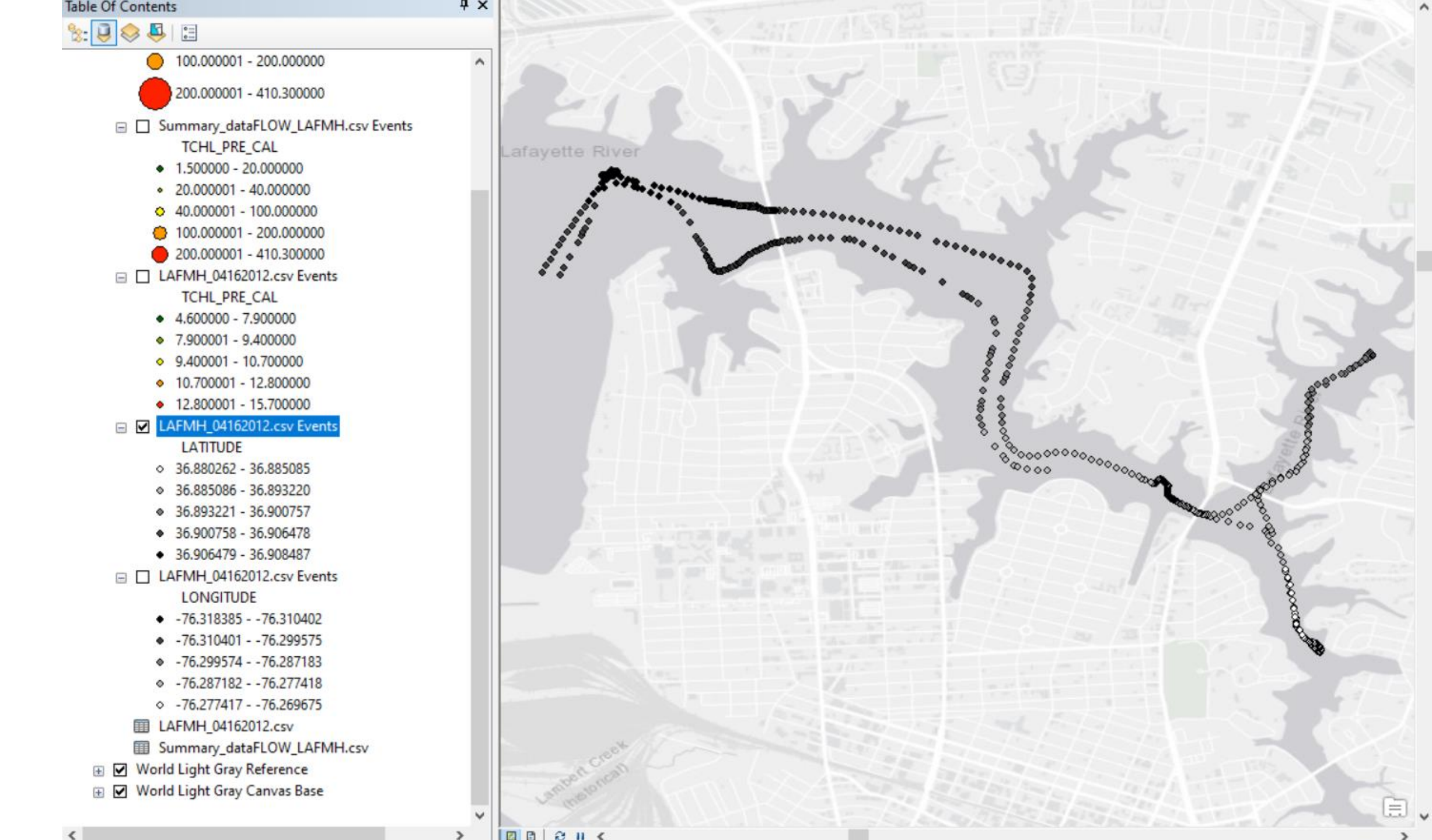
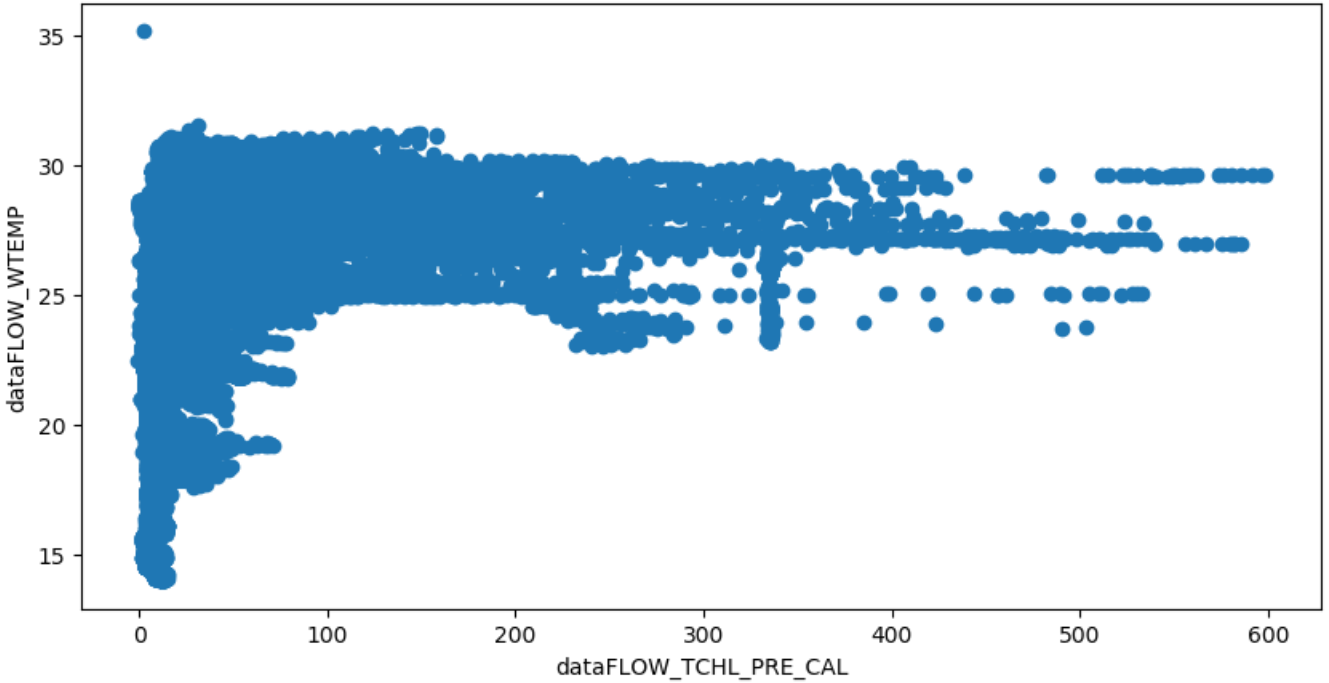
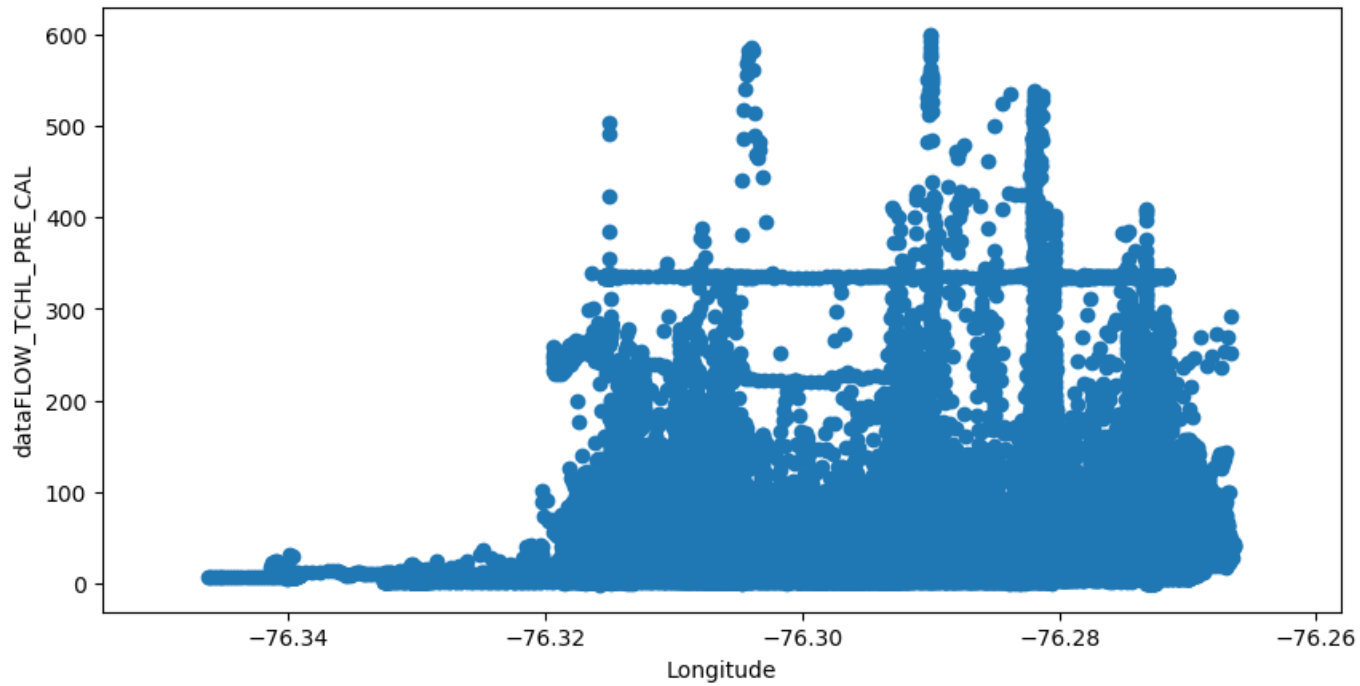
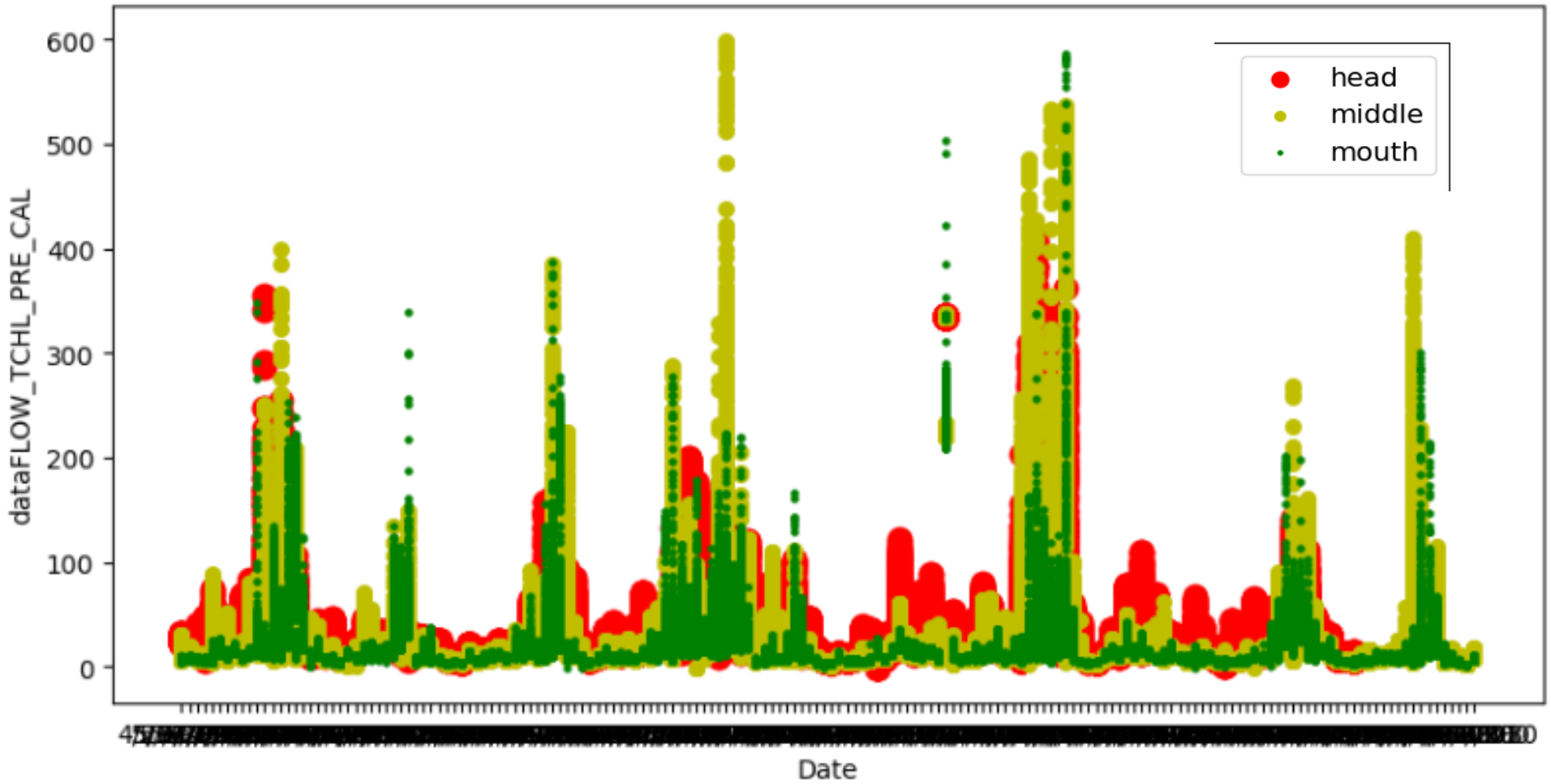


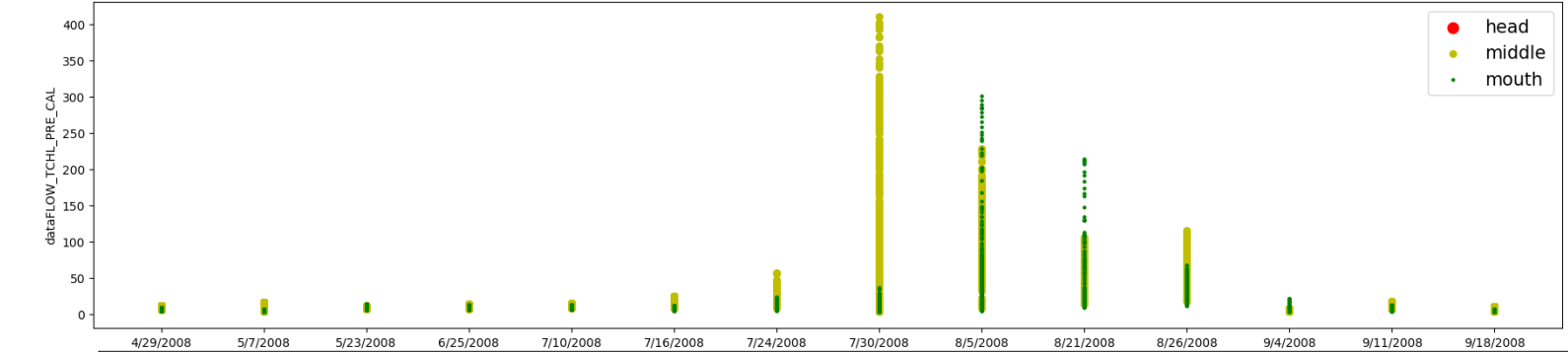
Table Of Contents
100.000001 - 200.000000
200.000001 - 410.300000
Summary_dataFLOW_LAFMH.csv Events
TCHL_PRE_CAL
1.500000 - 20.000000
20.000001 - 40.000000
40.000001 - 100.000000
100.000001 - 200.000000
200.000001 - 410.300000
LAFMH_04162012.csv Events
TCHL_PRE_CAL
4.600000 - 7.900000
7.900001 - 9.400000
9.400001 - 10.700000
10.700001 - 12.800000
12.800001 - 15.700000
LAFMH_04162012.csv Events
LATITUDE
36.880262 - 36.885085
36.885086 - 36.893220
36.893221 - 36.900757
36.900758 - 36.906478
36.906479 - 36.908487
LAFMH_04162012.csv Events
LONGITUDE
-76.318385 - -76.310402
-76.310401 - -76.299575
-76.299574 - -76.287183
-76.287182 - -76.277418
-76.277417 - -76.269675
LAFMH_04162012.csv
Summary_dataFLOW_LAFMH.csv
World Light Gray Reference
World Light Gray Canvas Base
Lafayette River
Lambert Creek (historical)

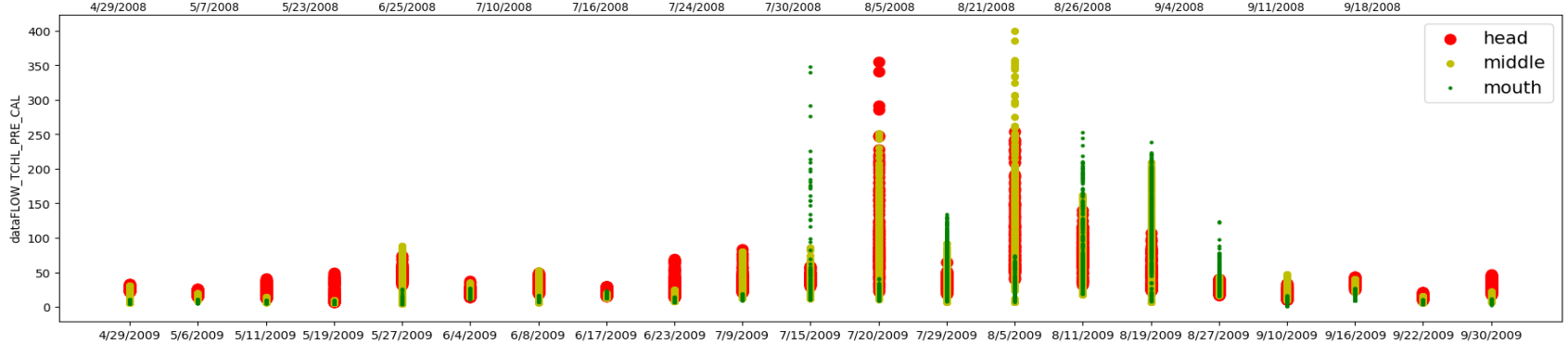

35
30
25
20
15
dataFLOW_WTEMP
0
100
200
300
400
500
600
dataFLOW_TCHL_PRE_CAL

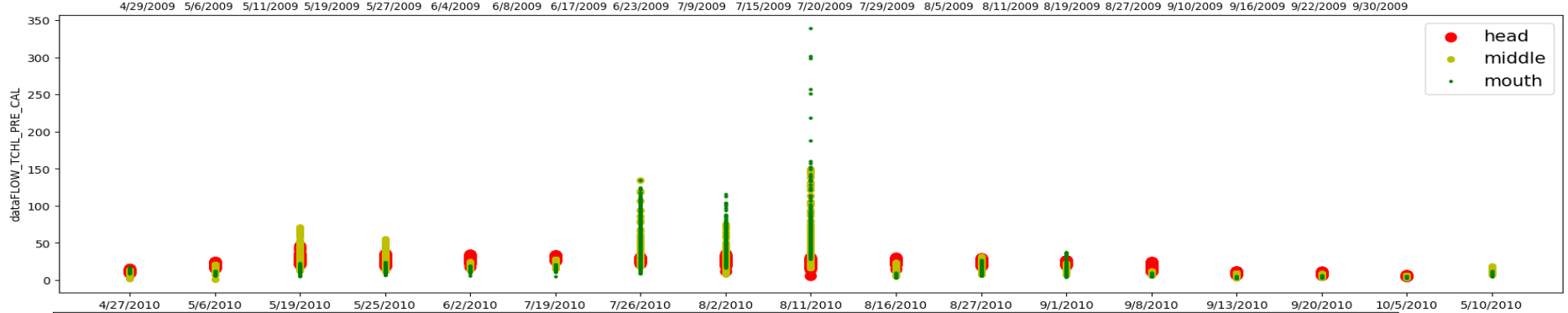

600
500
400
300
200
100
0
dataFLOW_TCHL_PRE_CAL
−76.34
−76.32
−76.30
−76.28
−76.26
Longitude

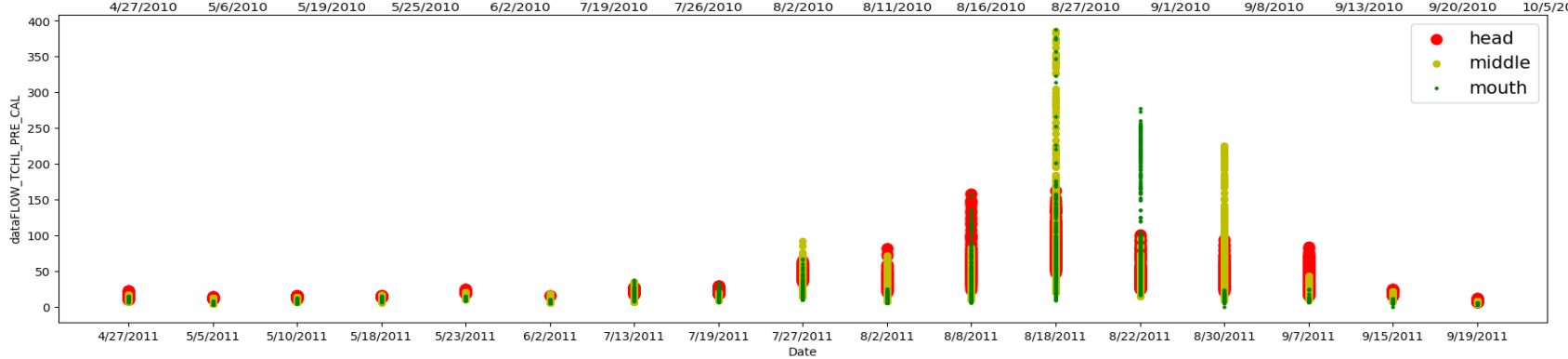
Chl measurements from 2008 to 2015 from dataFlow transects done along the James River. Data only includes the end of April to the beginning of October for a given year (longer datasets available online). Data is separated by longitude to attribute ‘head’, ‘middle’, and ‘mouth’ values. The coordinates used for this separations are arbitrary (observation in a map).

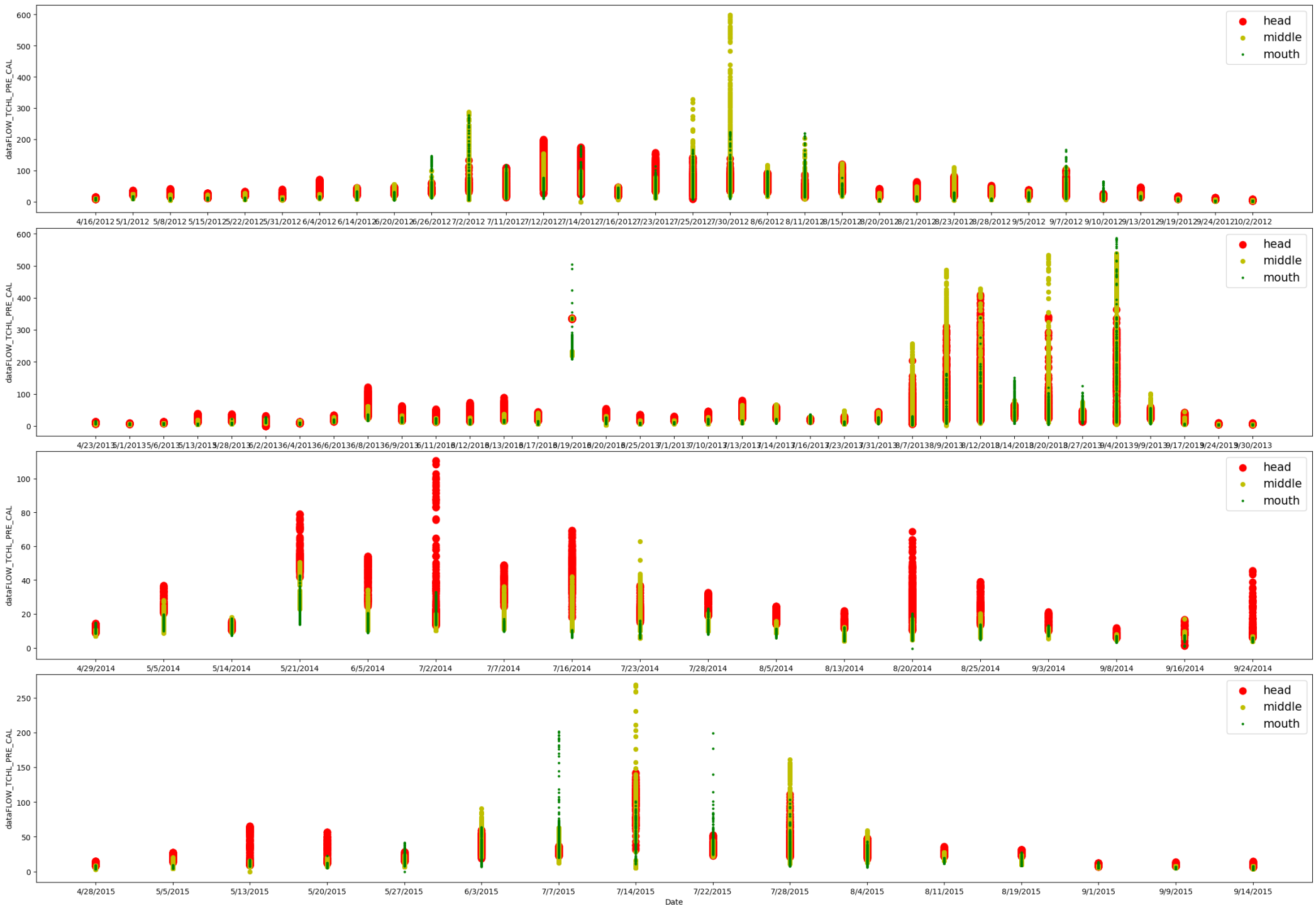


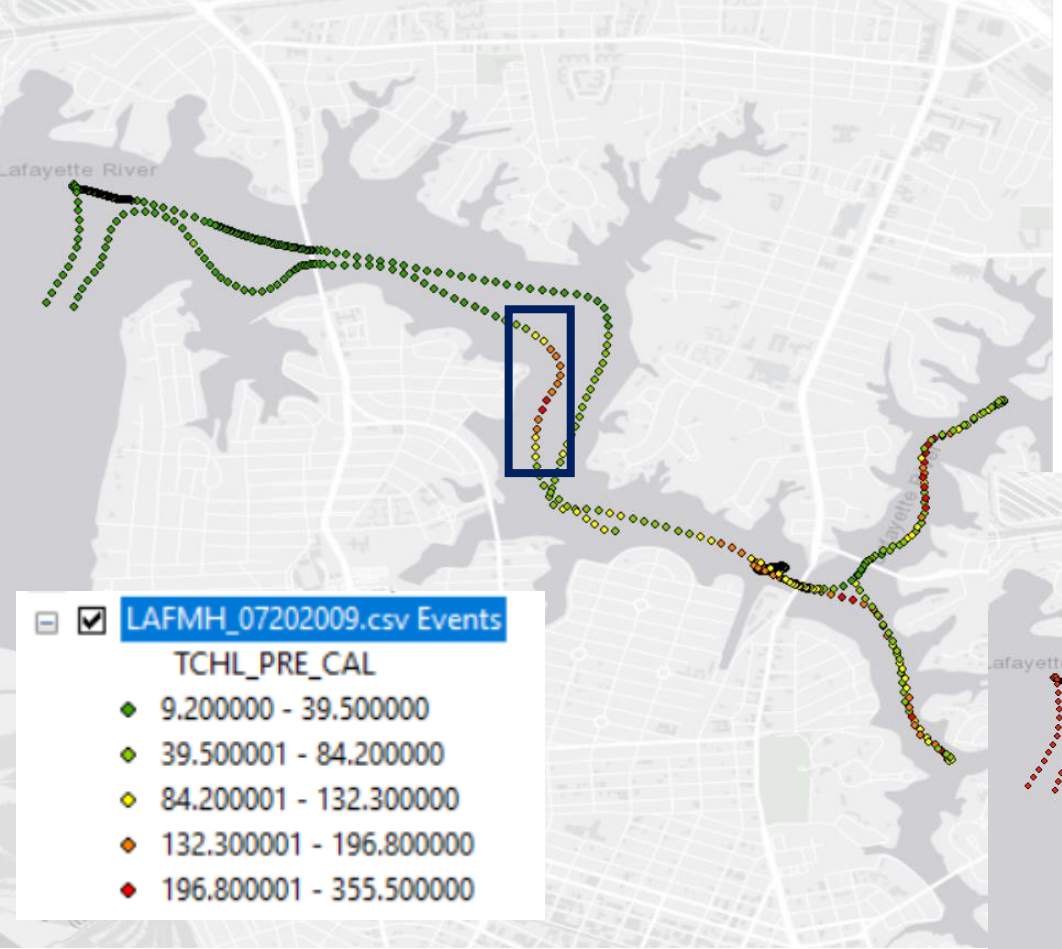

head
middle
mouth
dataFLOW_TCHL_PRE_CAL
0
50
100
150
200
250
300
350
400
4/29/2008
5/7/2008
5/23/2008
6/25/2008
7/10/2008
7/16/2008
7/24/2008
7/30/2008
8/5/2008
8/21/2008
8/26/2008
9/4/2008
9/11/2008
9/18/2008

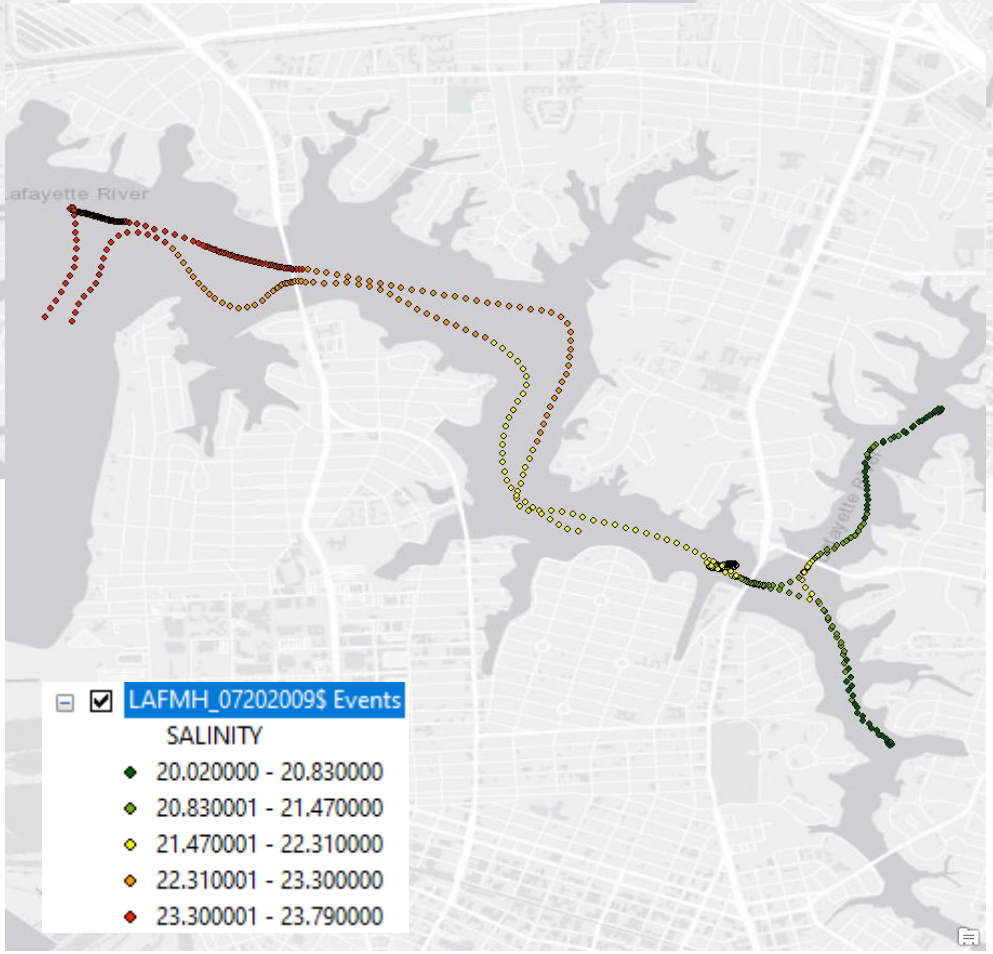

head
middle
mouth
dataFLOW_TCHL_PRE_CAL
0
50
100
150
200
250
300
350
400
4/29/2009
5/6/2009
5/11/2009
5/19/2009
5/27/2009
6/4/2009
6/8/2009
6/17/2009
6/23/2009
7/9/2009
7/15/2009
7/20/2009
7/29/2009
8/5/2009
8/11/2009
8/19/2009
8/27/2009
9/10/2009
9/16/2009
9/22/2009
9/30/2009

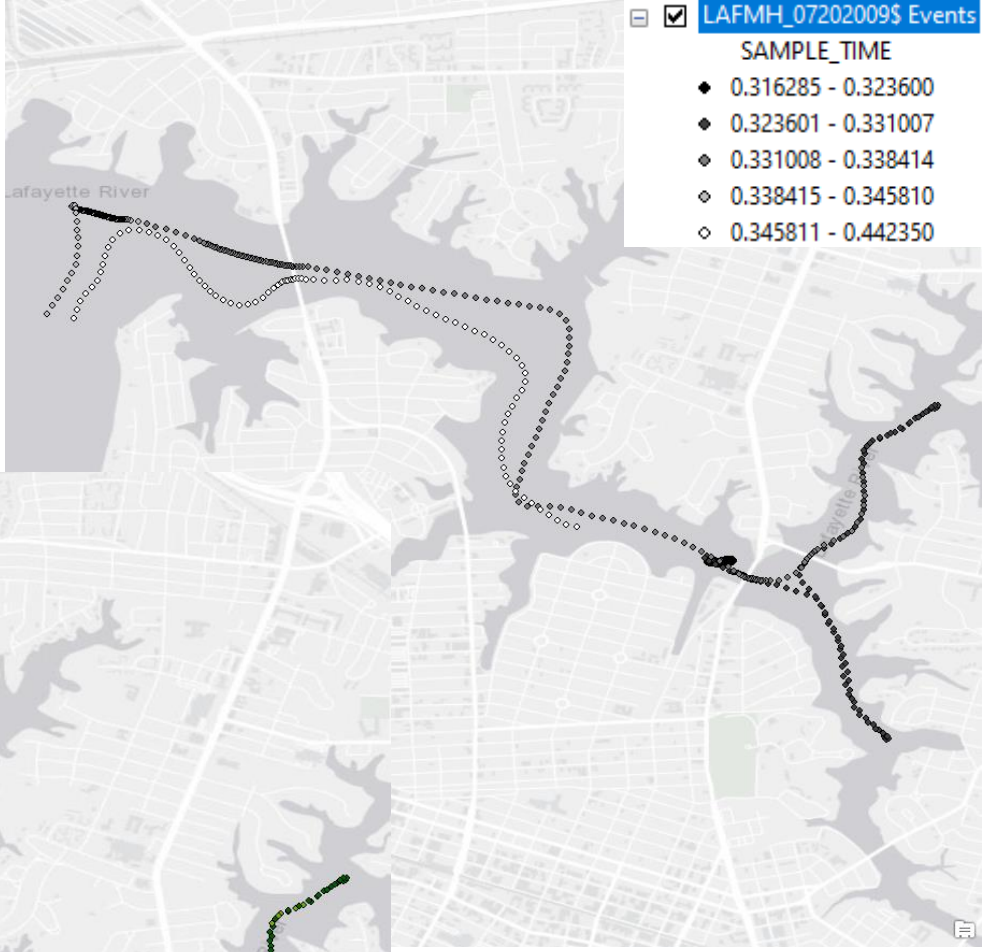

head
middle
mouth
dataFLOW_TCHL_PRE_CAL
0
50
100
150
200
250
300
350
4/27/2010
5/6/2010
5/19/2010
5/25/2010
6/2/2010
7/19/2010
7/26/2010
8/2/2010
8/11/2010
8/16/2010
8/27/2010
9/1/2010
9/8/2010
9/13/2010
9/20/2010
10/5/2010
5/10/2010


head
middle
mouth
dataFLOW_TCHL_PRE_CAL
0
50
100
150
200
250
300
350
400
4/27/2011
5/5/2011
5/10/2011
5/18/2011
5/23/2011
6/2/2011
7/13/2011
7/19/2011
7/27/2011
8/2/2011
8/8/2011
8/18/2011
8/22/2011
8/30/2011
9/7/2011
9/15/2011
9/19/2011
Date

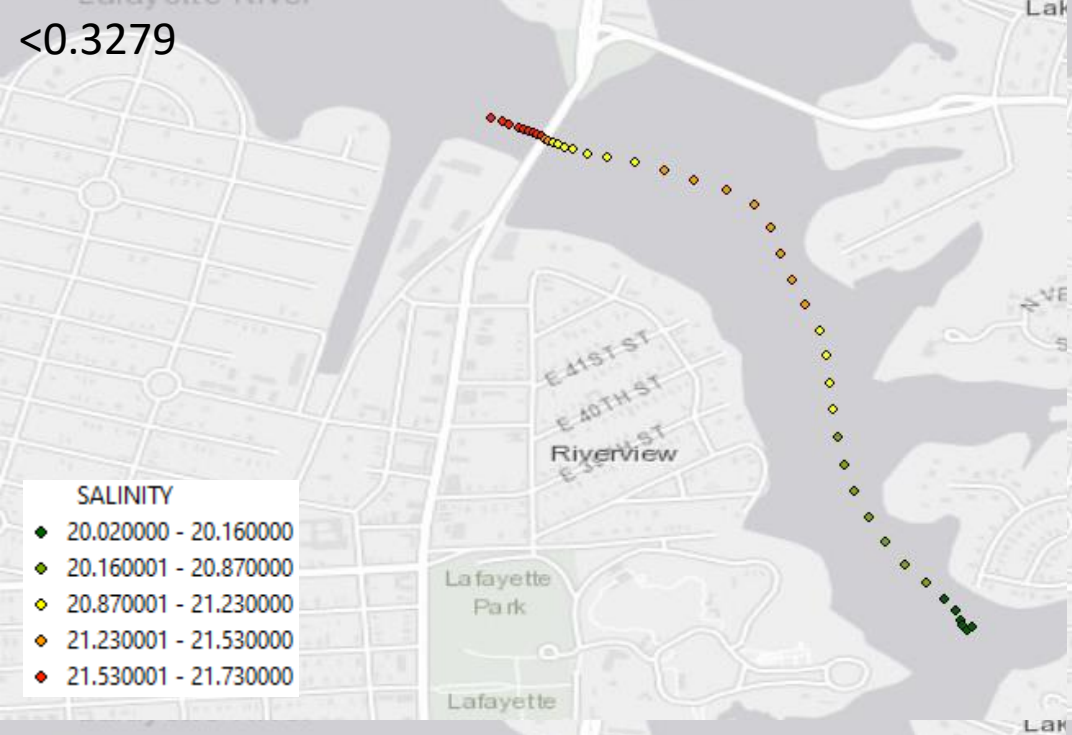

head
middle
mouth
dataFLOW_TCHL_PRE_CAL
Date

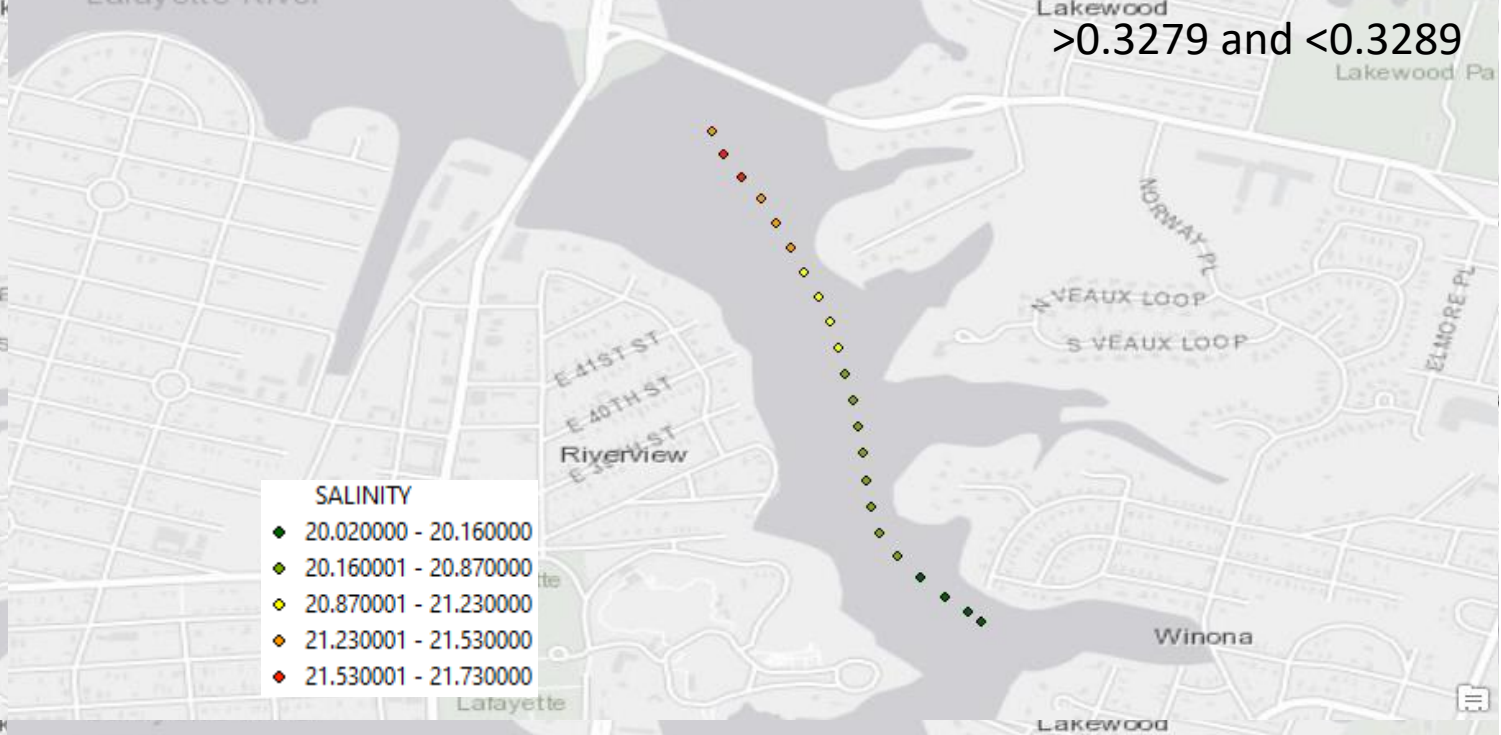


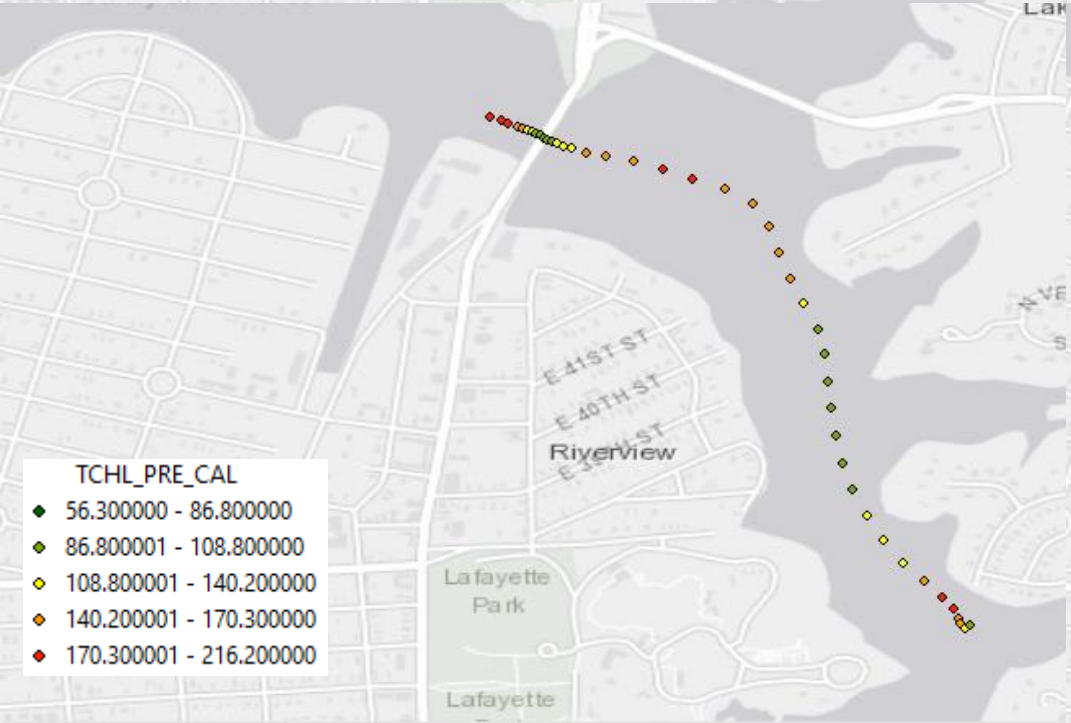


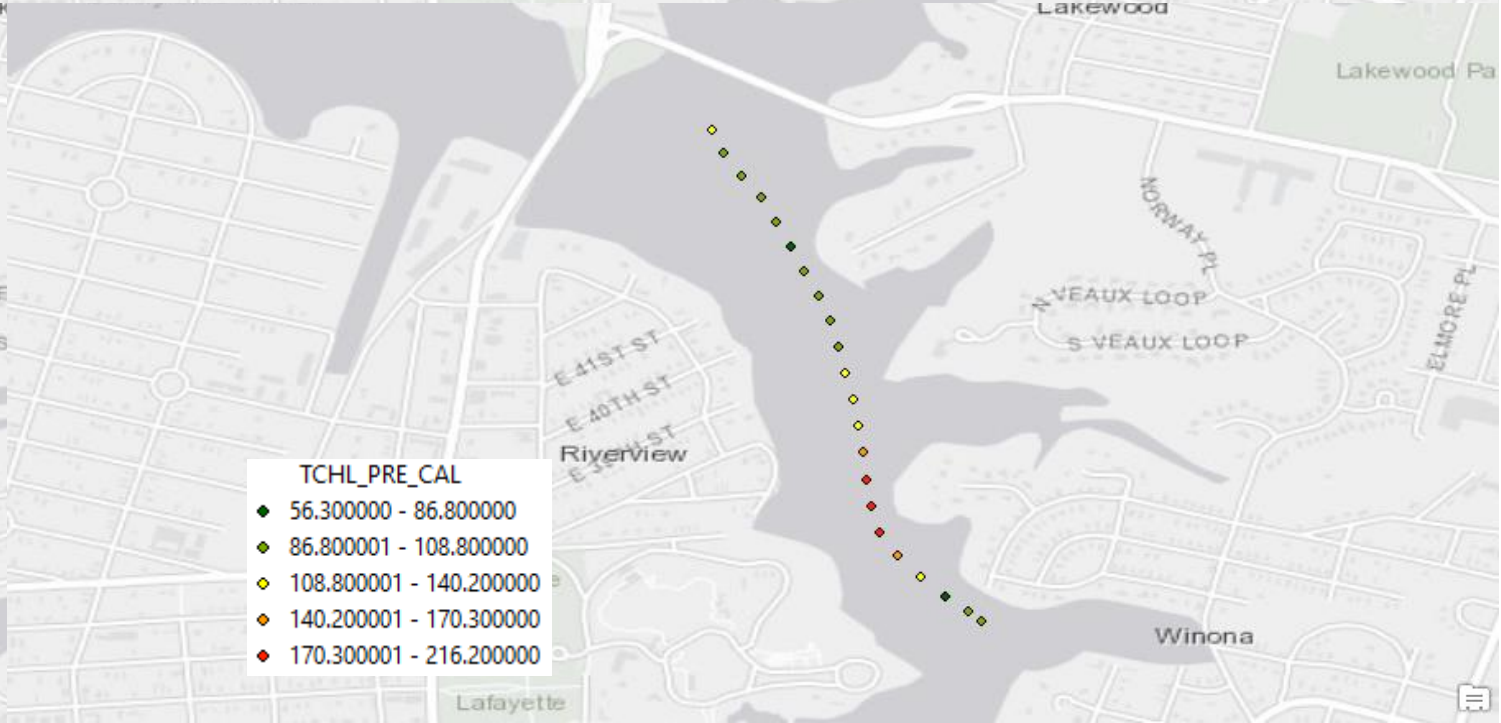


dataFLOW transects. Individual circles represent points at which samples were collected. (right) Chl, (middle) Salinity, and (left) sampling time.
It can be seen that high Chl concentrations move through the mouth along with salinity during the latest transect done

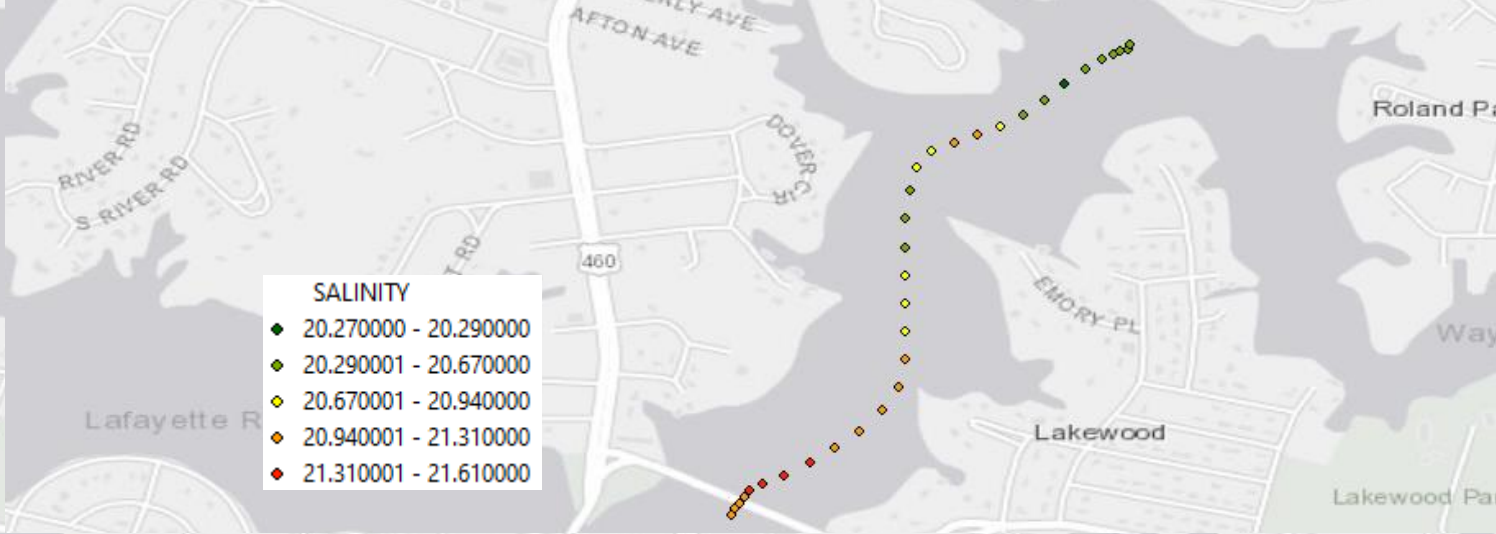

<0.3279
SALINITY
20.020000 - 20.160000
20.160001 - 20.870000
20.870001 - 21.230000
21.230001 - 21.530000
21.530001 - 21.730000
E 41ST ST
E 40TH ST
Riverview
Lafayette Park
Lafayette


>0.3279 and <0.3289
SALINITY
20.020000 - 20.160000
20.160001 - 20.870000
20.870001 - 21.230000
21.230001 - 21.530000
21.530001 - 21.730000
Lakewood
Lakewood Pa
NORWAY PL
N VEAUX LOOP
S VEAUX LOOP
ELMORE PL
E 41ST ST
E 40TH ST
Riverview
Winona
Lafayette

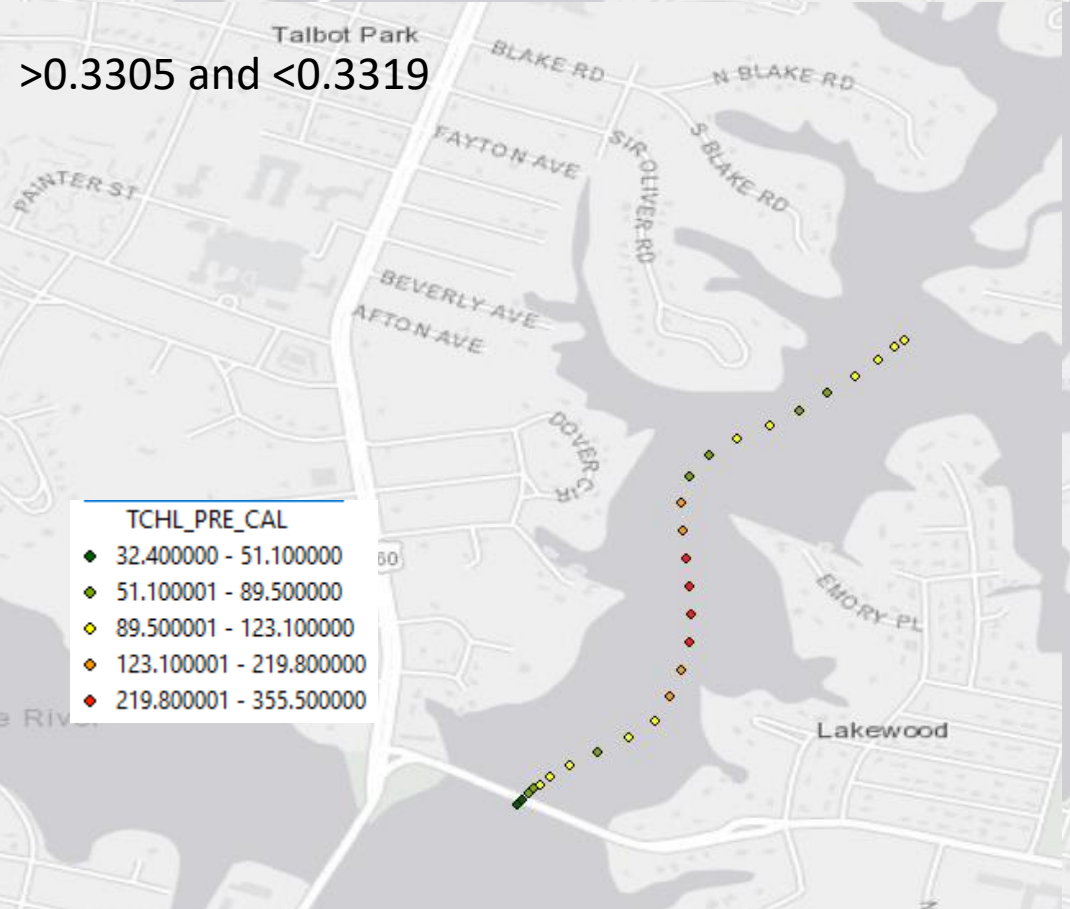

TCHL_PRE_CAL
56.300000 - 86.800000
86.800001 - 108.800000
108.800001 - 140.200000
140.200001 - 170.300000
170.300001 - 216.200000
E 41ST ST
E 40TH ST
Riverview
Lafayette Park
Lafayette

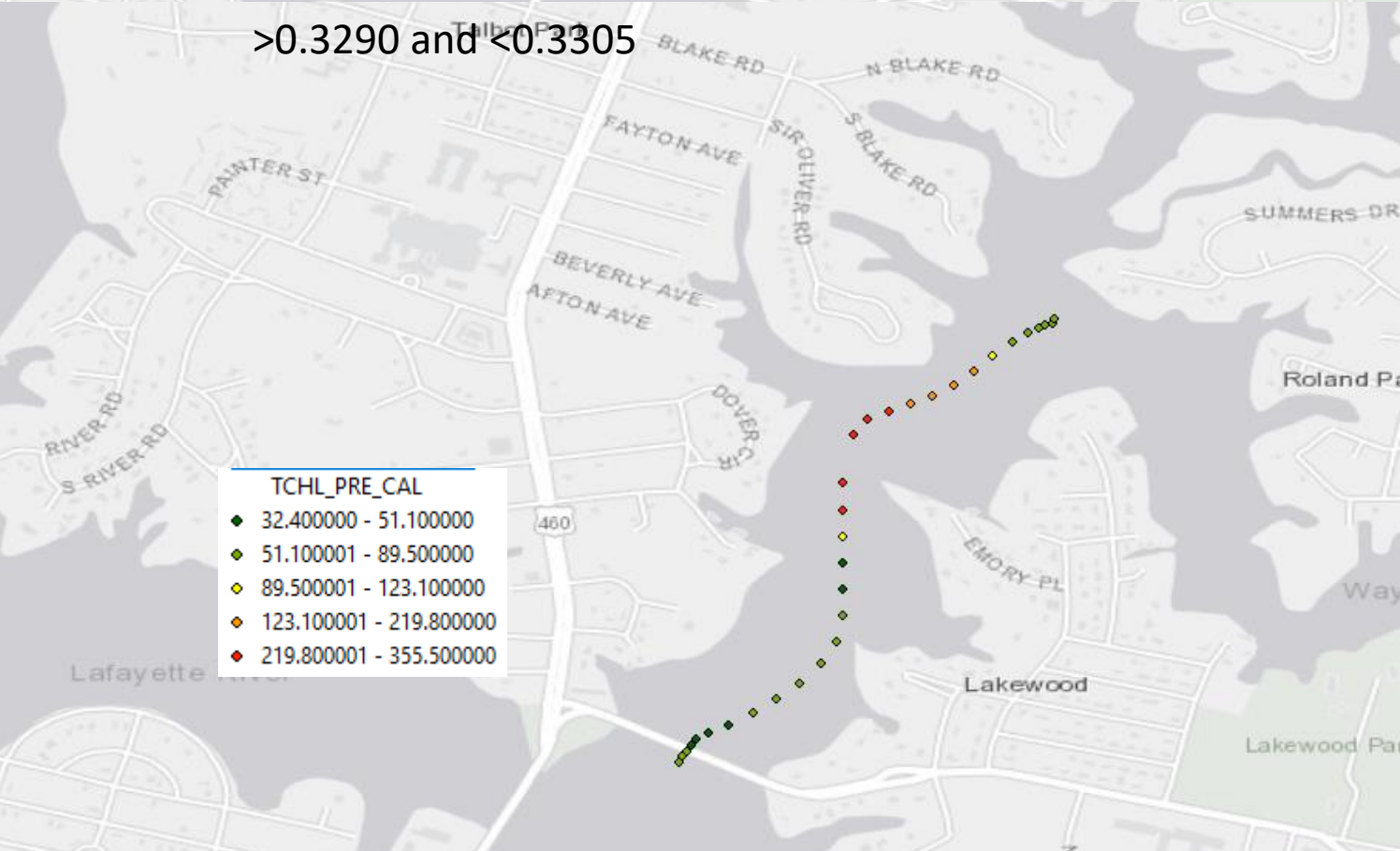

TCHL_PRE_CAL
56.300000 - 86.800000
86.800001 - 108.800000
108.800001 - 140.200000
140.200001 - 170.300000
170.300001 - 216.200000
Lakewood
Lakewood Pa
NORWAY PL
N VEAUX LOOP
S VEAUX LOOP
ELMORE PL
E 41ST ST
E 40TH ST
Riverview
Winona
Lafayette

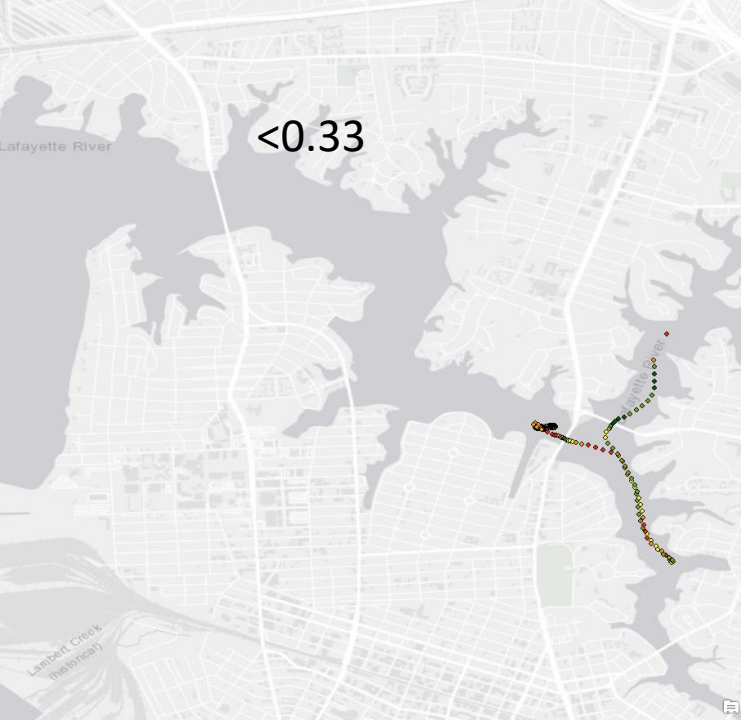
>0.3305 and <0.3319

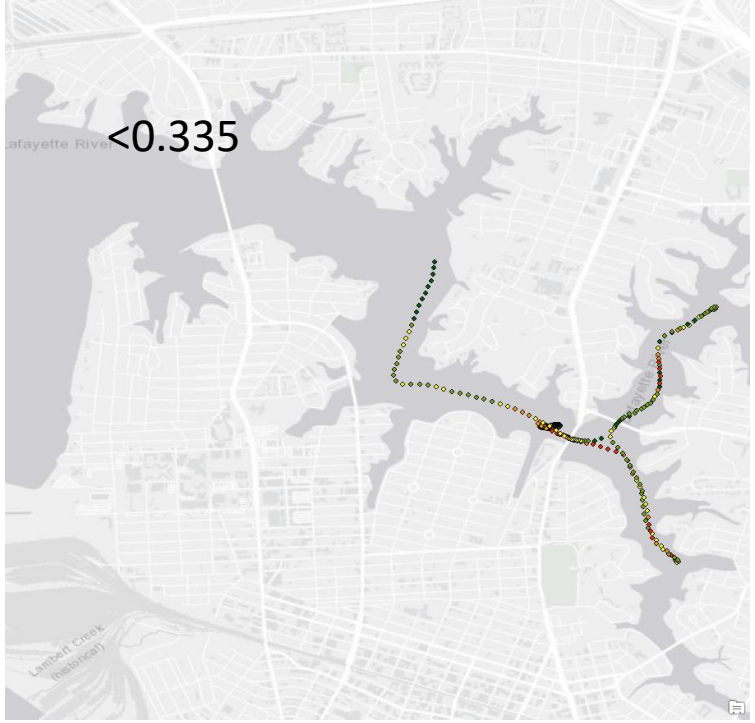


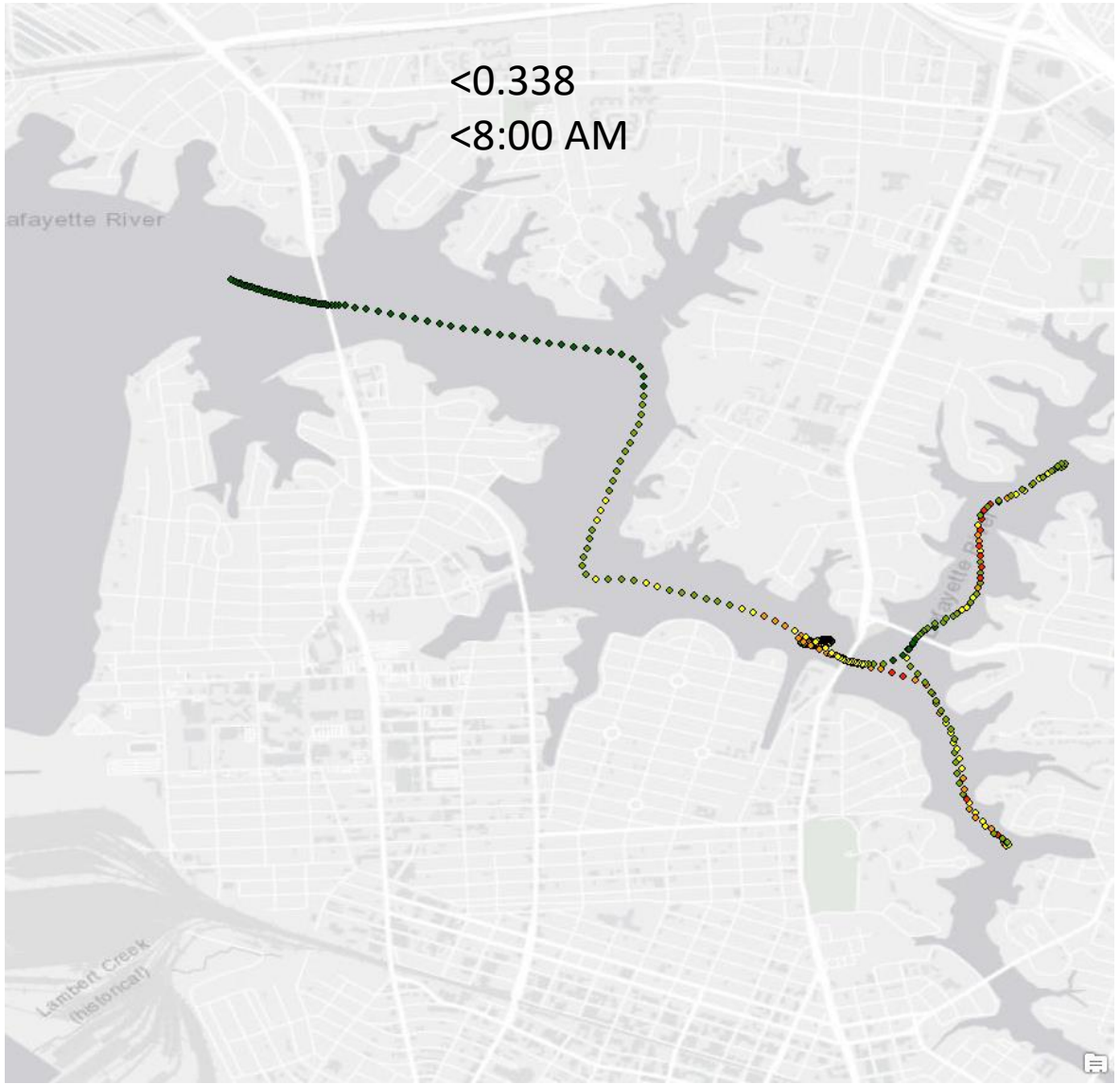
>0.3290 and <0.3305

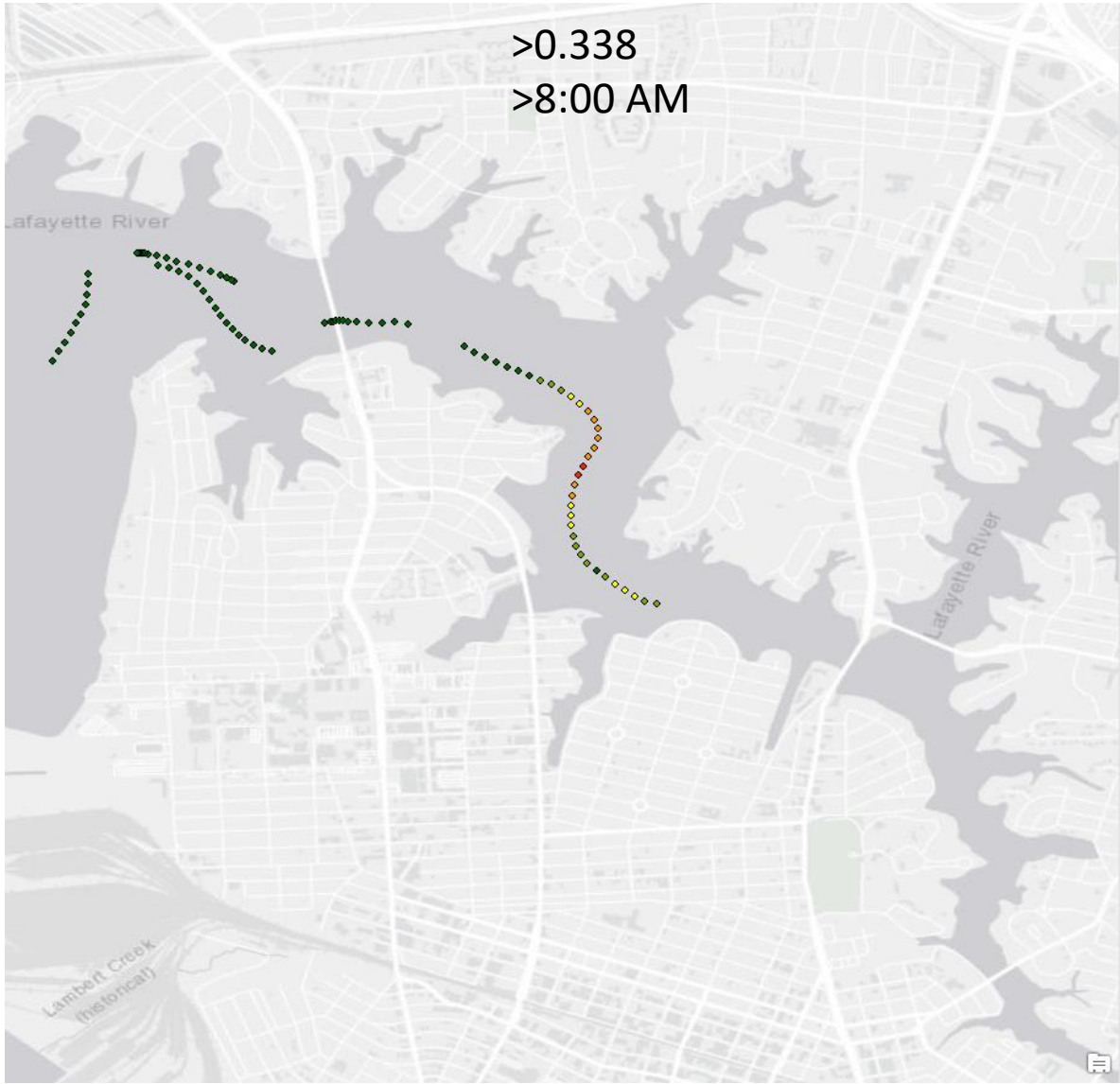


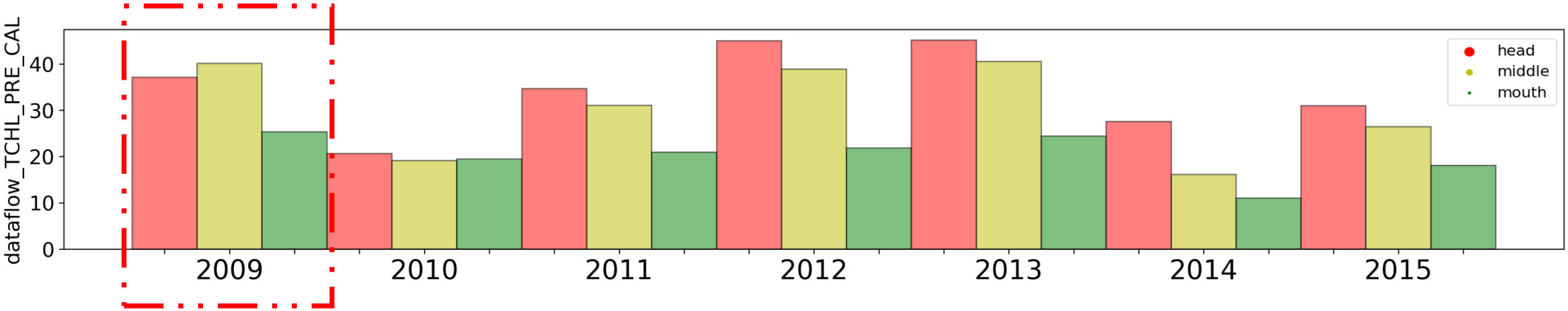



<0.33
Lafayette River
Lambert Creek (historical)


<0.335
Lafayette River
Lambert Creek (historical)

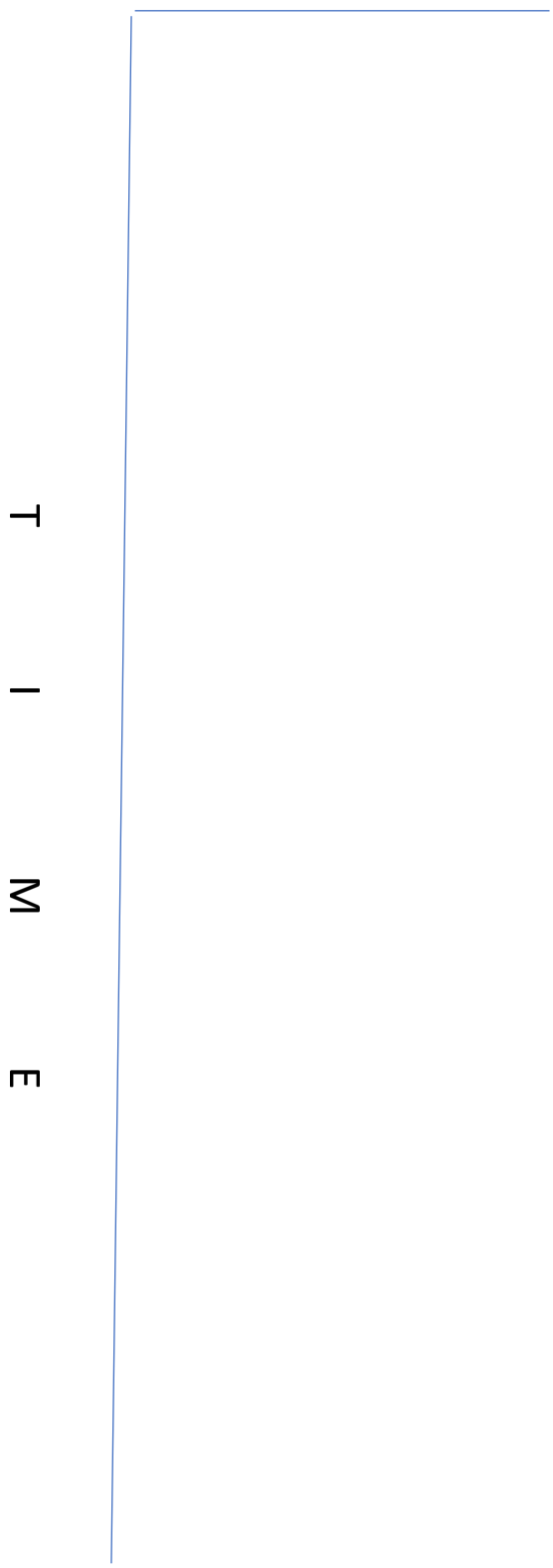

<0.338
<8:00 AM
afayette River
Lambert Creek
(historical)


>0.338
>8:00 AM
Lafayette River
Lafayette River
Lambert Creek
(historical)

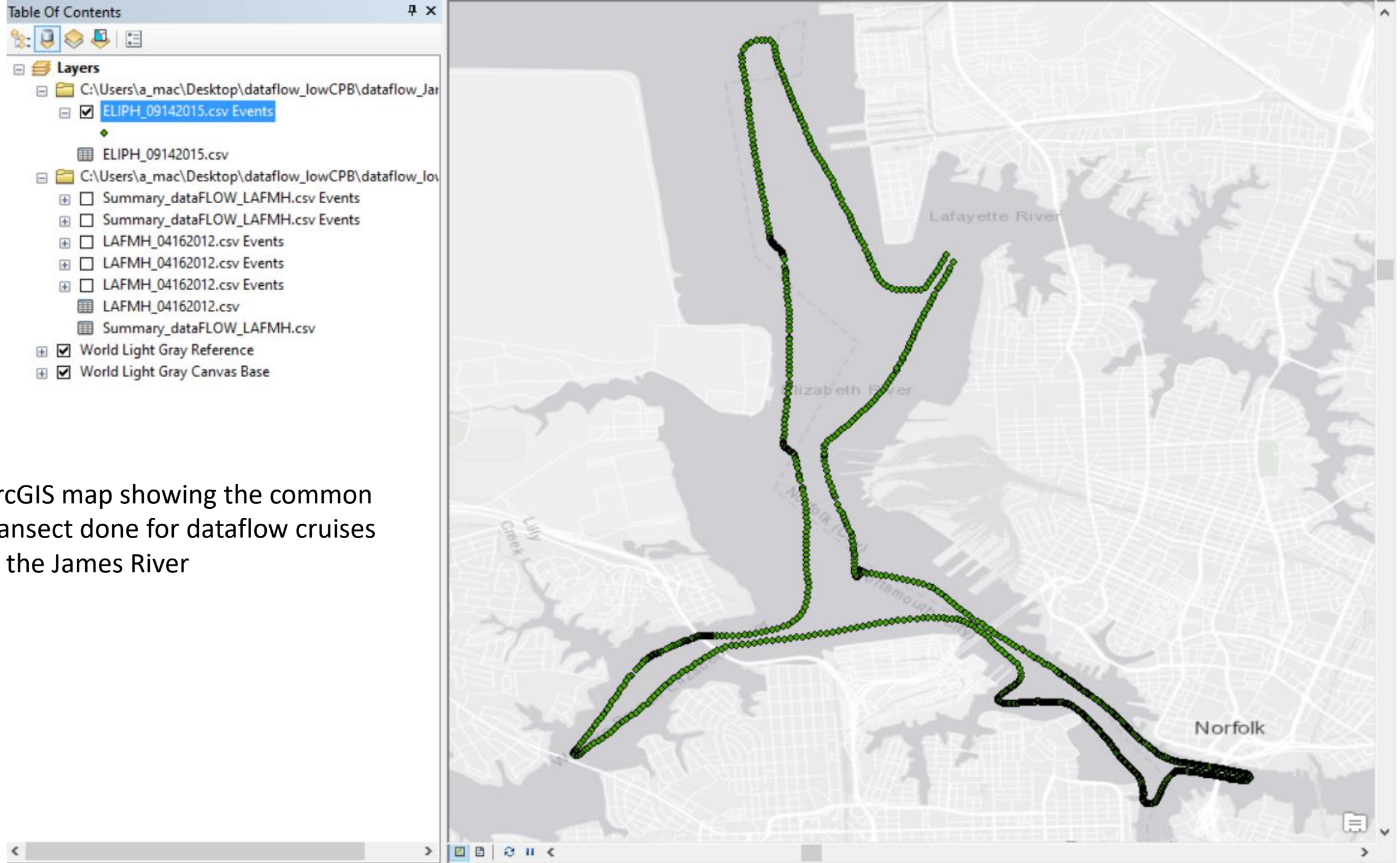


In only one case mid is higher than head (2009). In the rest of the years, head has the highest concentrations and mouth the lowest (confirmation of initiation at head?)

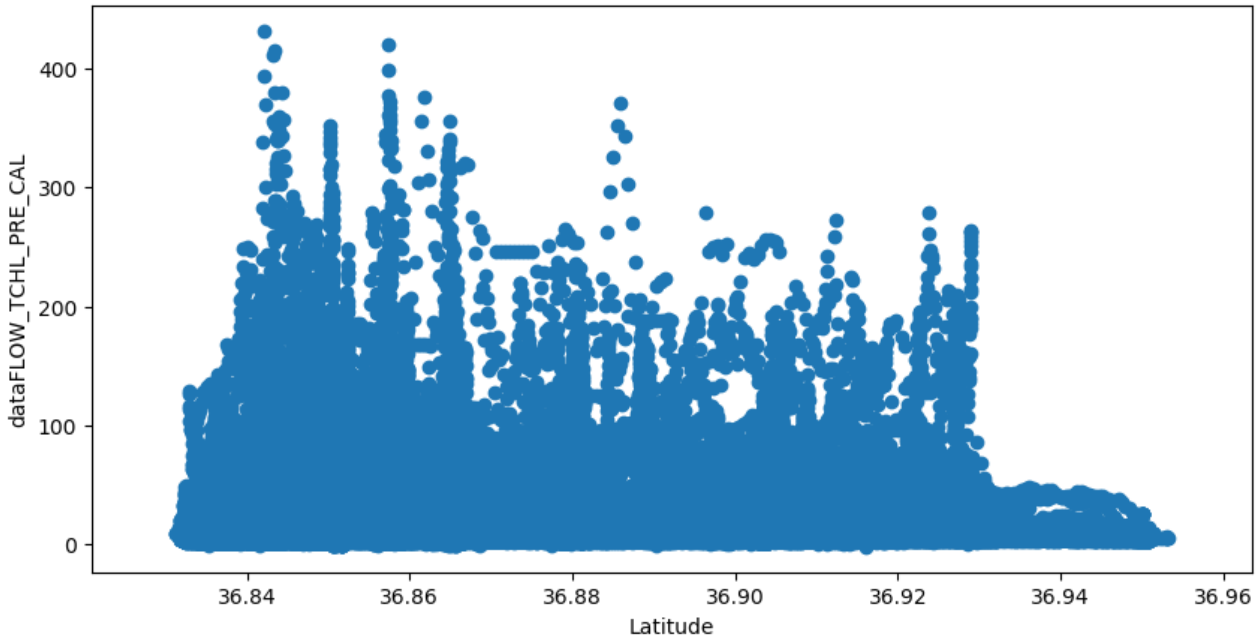
Days in which Chl was higher in a region (i.e. head) in a given time

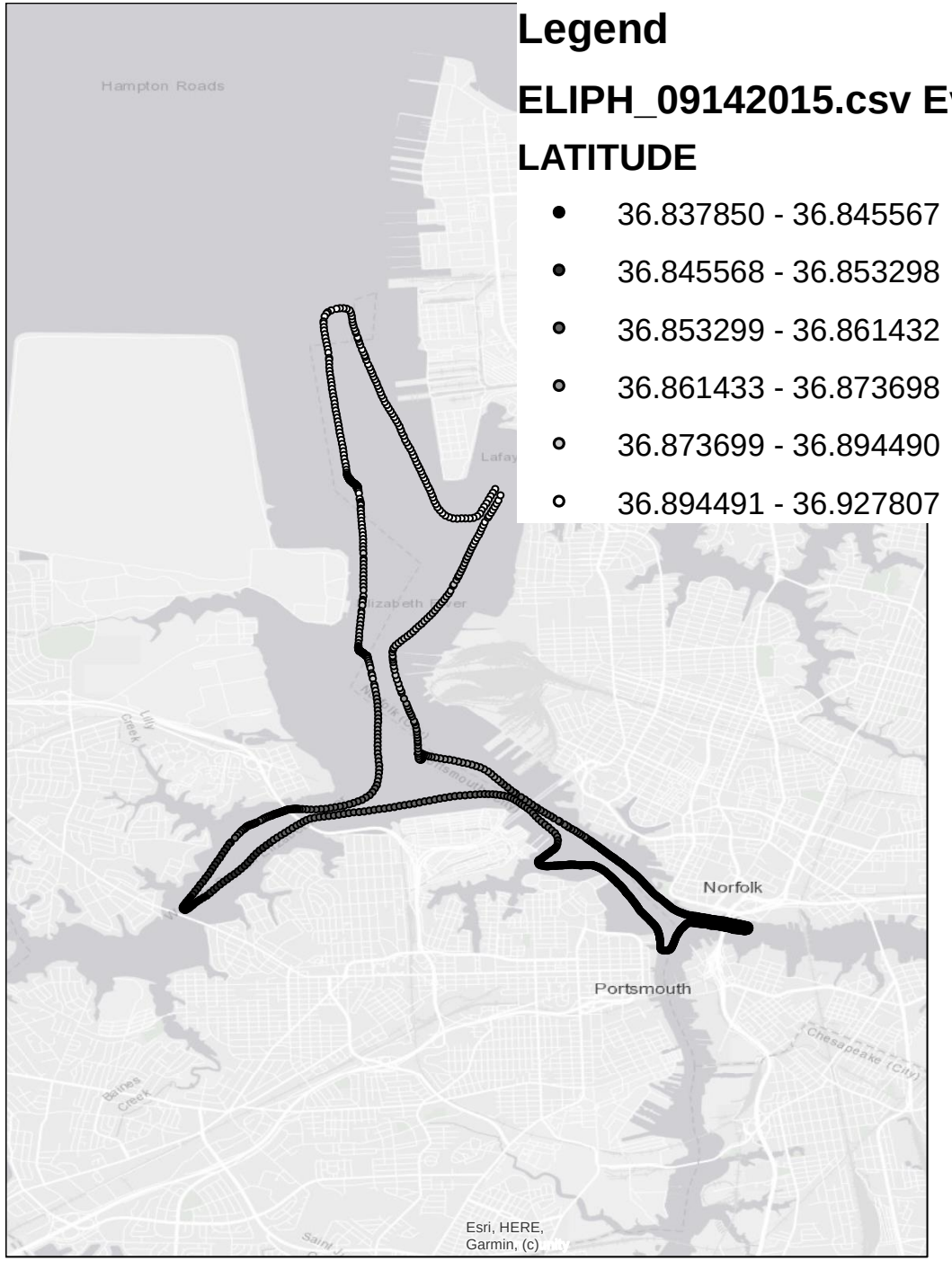


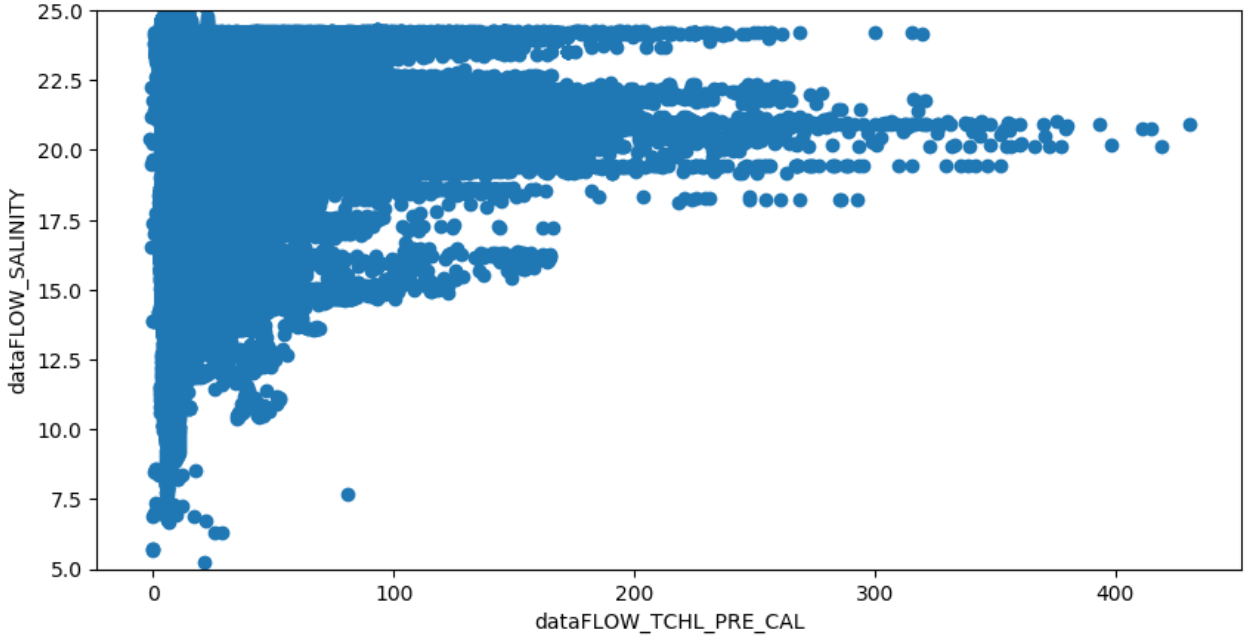
Data-FLOW transects through the James river (2008 – 2015)

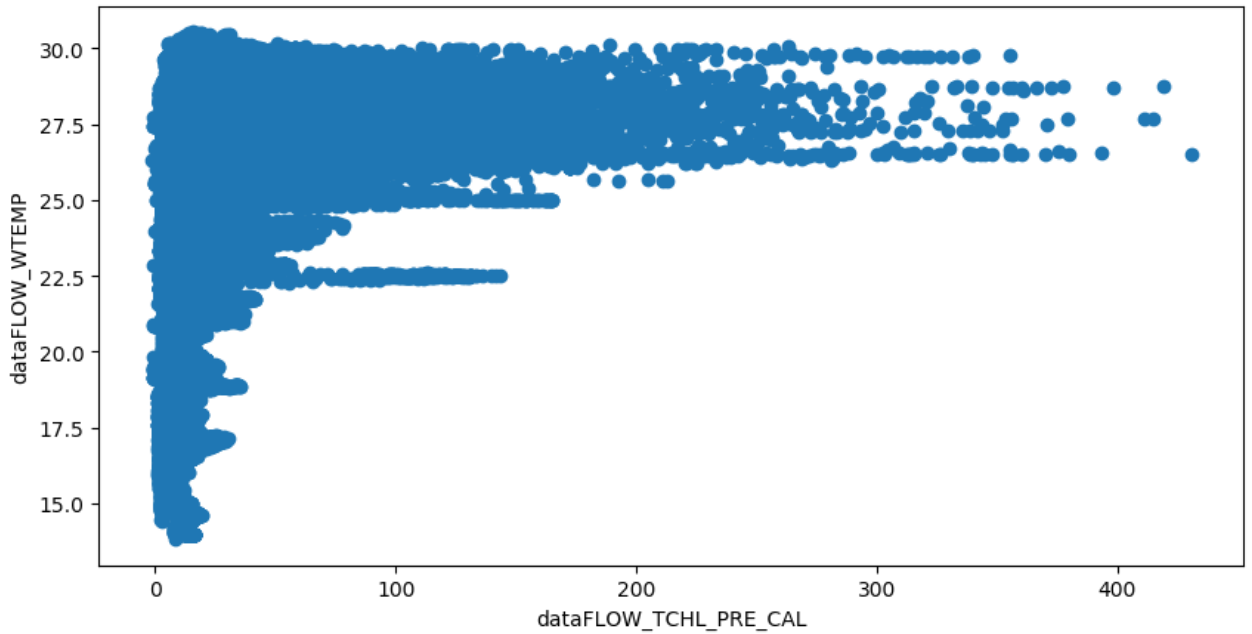


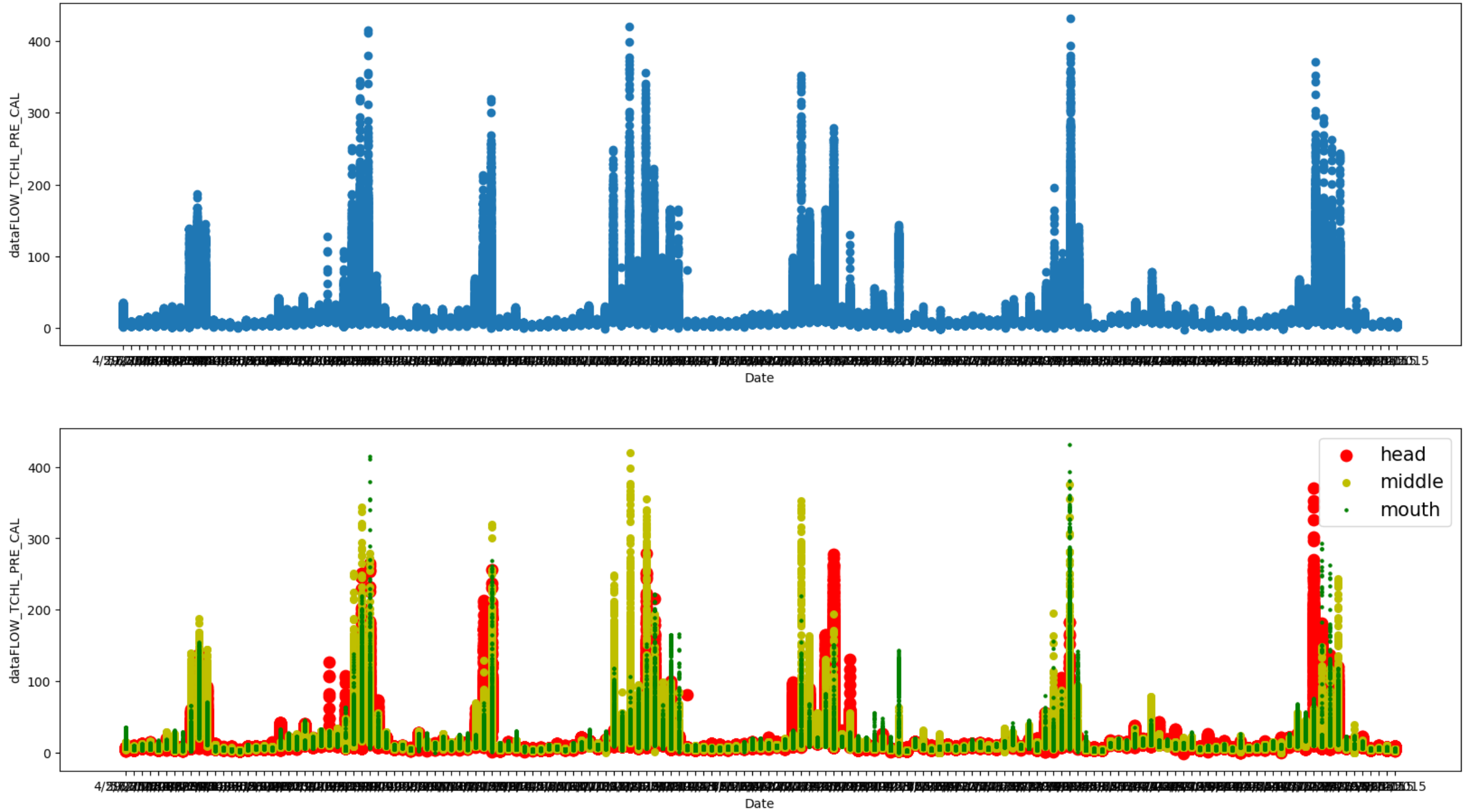
ArcGIS map showing the common transect done for dataflow cruises in the James River


dataFLOW_TCHL_PRE_CAL
400
300
200
100
0
36.84
36.86
36.88
36.90
36.92
36.94
36.96
Latitude

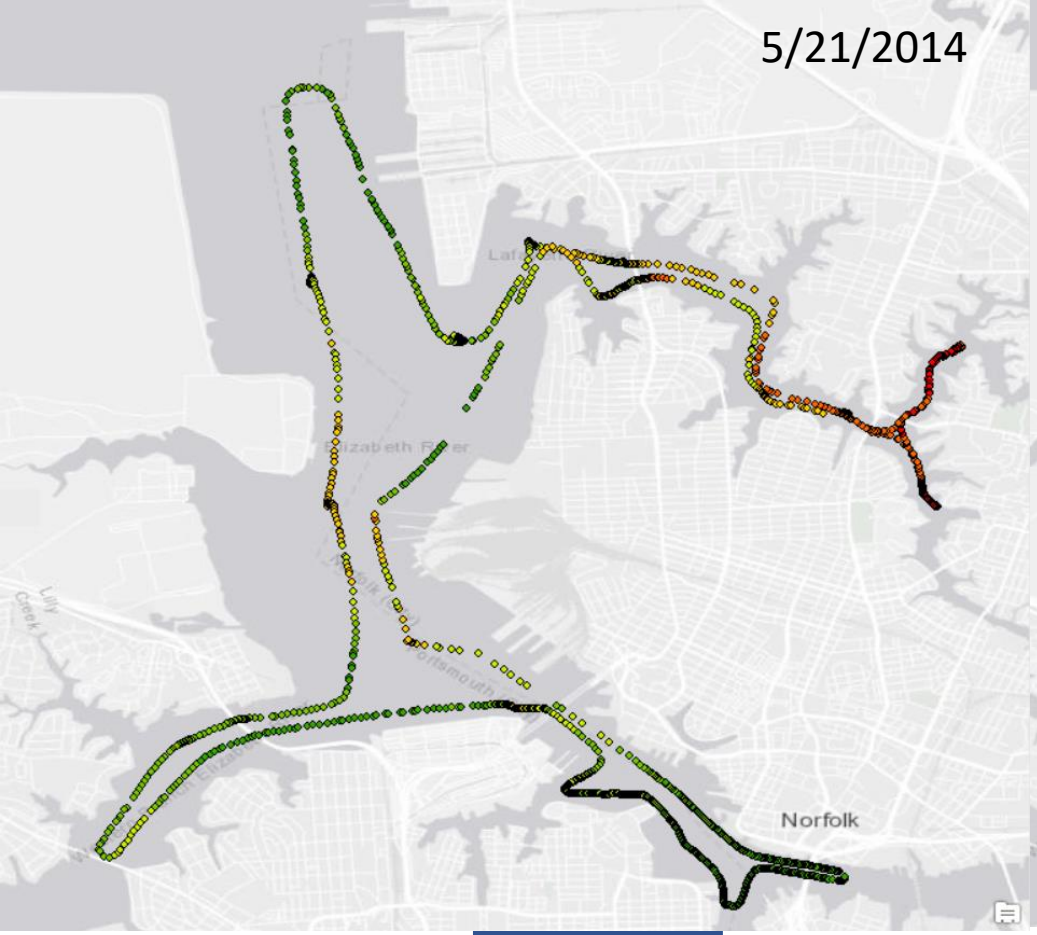

Legend
ELIPH_09142015.csv Events
LATITUDE
36.837850 - 36.845567
36.845568 - 36.853298
36.853299 - 36.861432
36.861433 - 36.873698
36.873699 - 36.894490
36.894491 - 36.927807
Hampton Roads
Norfolk
Portsmouth
Esri, HERE,
Garmin, (c)

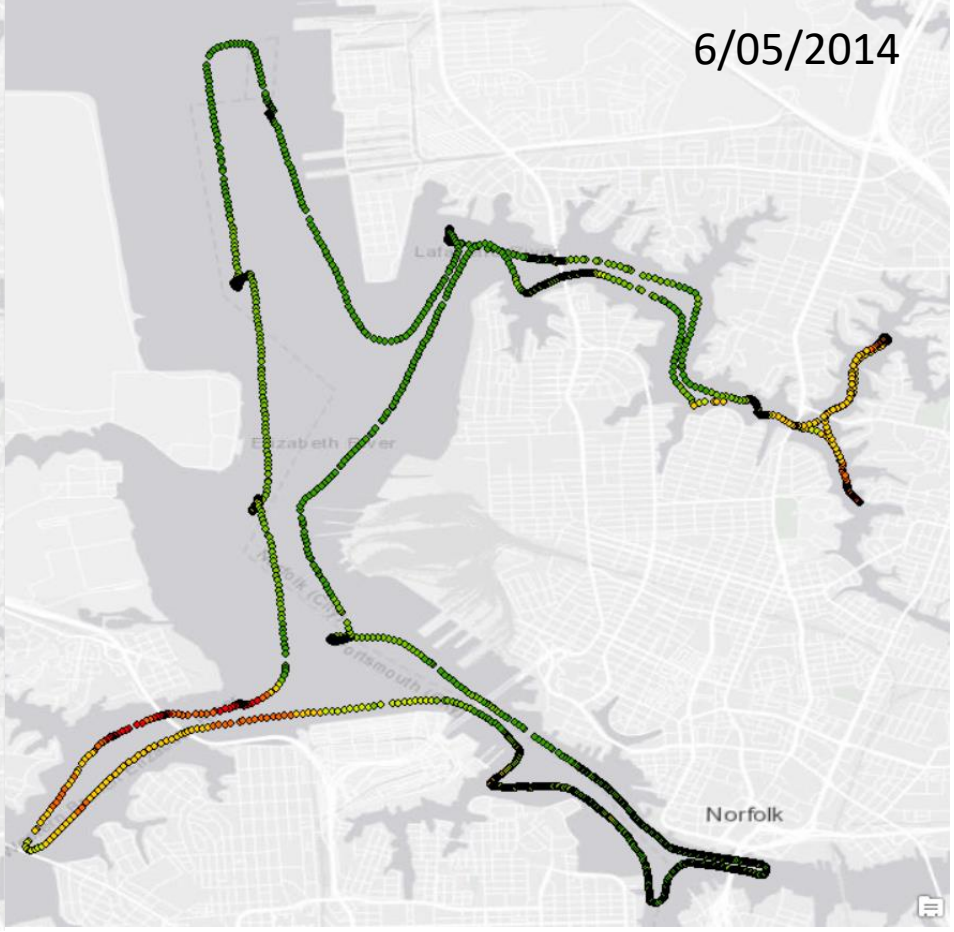

dataFLOW_SALINITY
dataFLOW_TCHL_PRE_CAL
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
0
100
200
300
400


dataFLOW_WTEMP
dataFLOW_TCHL_PRE_CAL
30.0
27.5
25.0
22.5
20.0
17.5
15.0
0
100
200
300
400


dataFLOW_TCHL_PRE_CAL
0
100
200
300
400
Date
head
middle
mouth

Comparison of multiple datasets



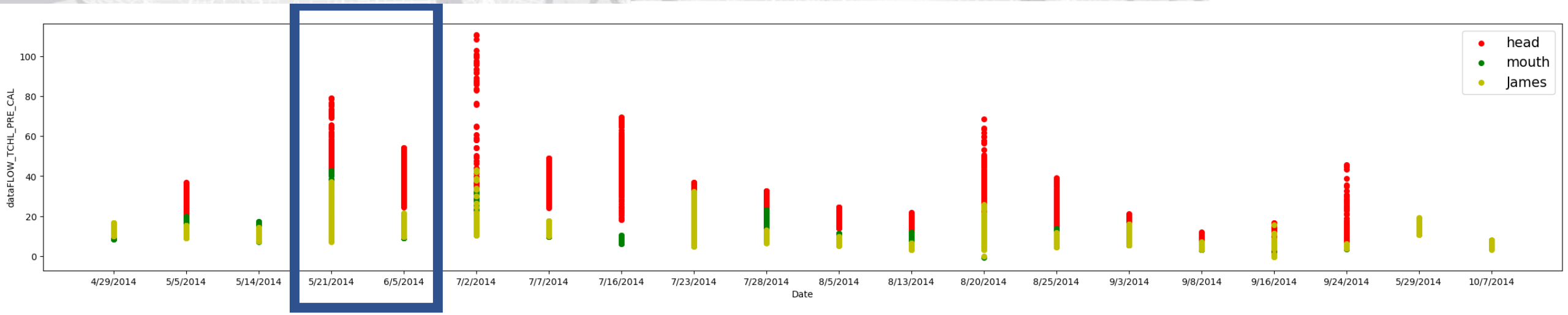


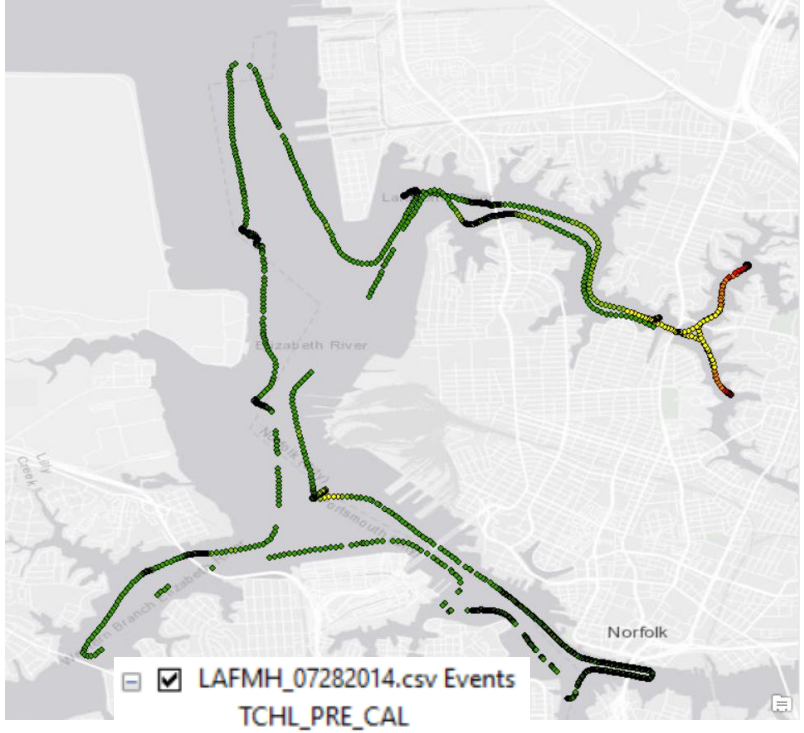
Legend

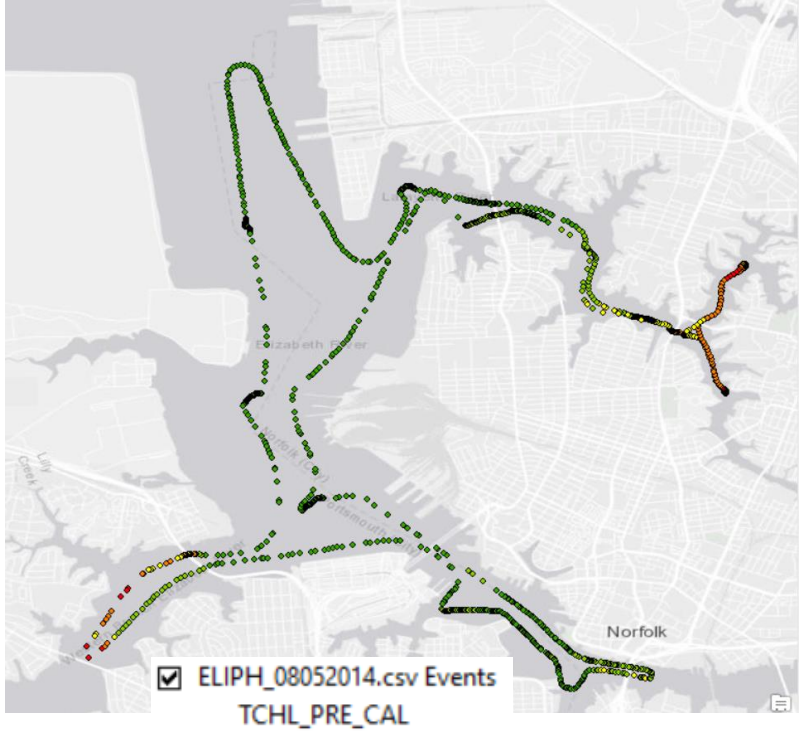
ELIPH_06052014.csv Events

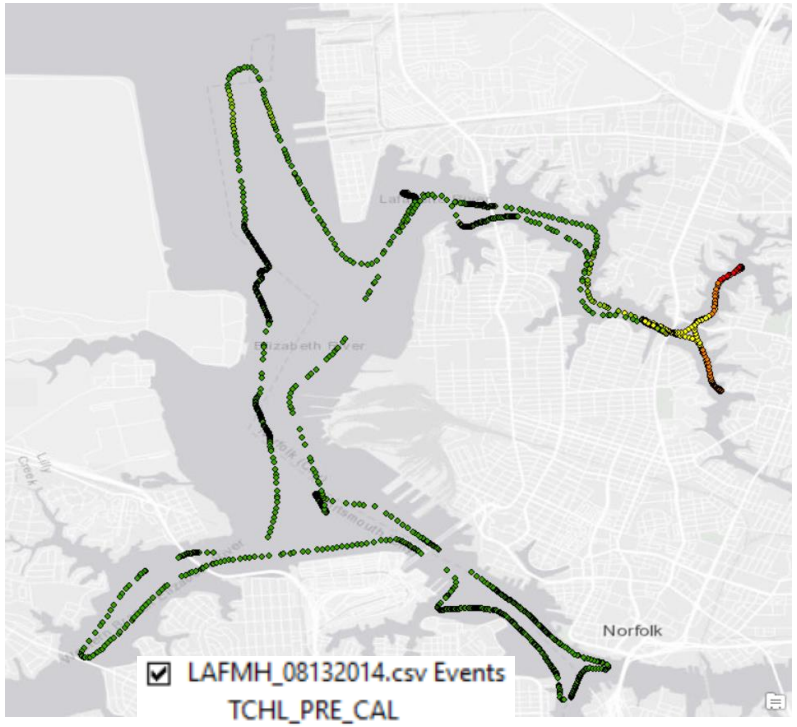
TCHL_PRE_CAL

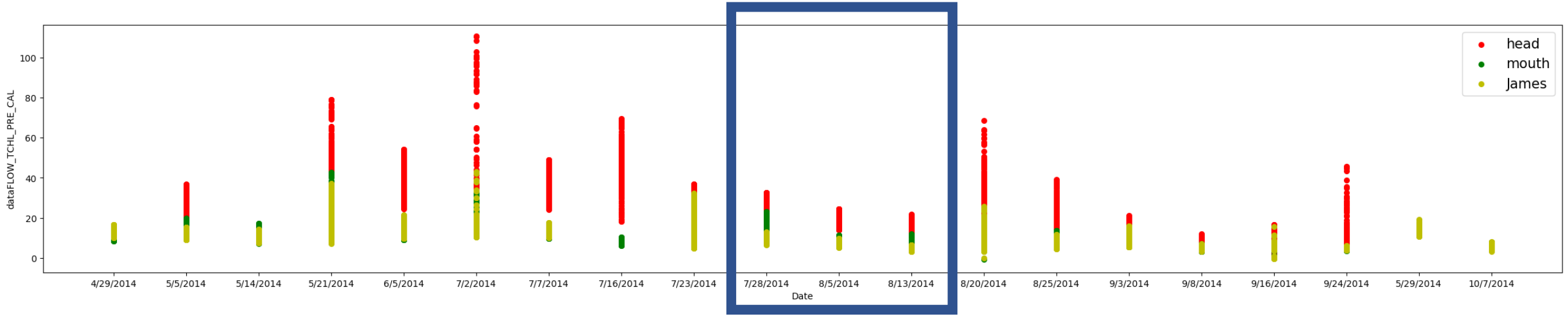
- 8.1 - 14.2
- 14.2 - 18.5
- 18.5 - 25.8
- 25.8 - 37.0
- 37.0 - 49.8
- 49.8 - 78.7



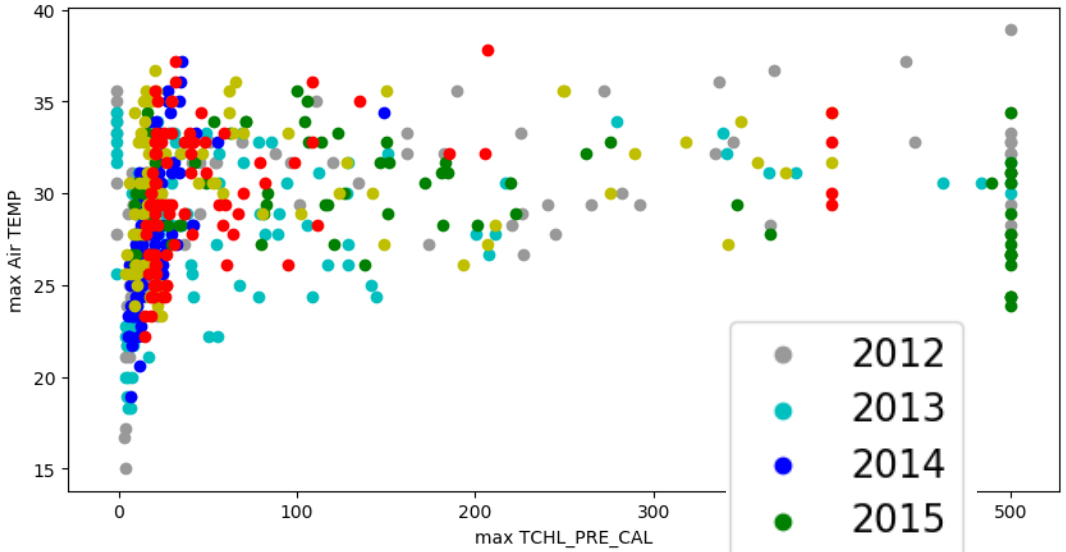

Norfolk
LAFMH_07282014.csv Events
TCHL_PRE_CAL
8.100000 - 12.600000
12.600001 - 17.000000
17.000001 - 22.500000
22.500001 - 27.700000
27.700001 - 32.800000

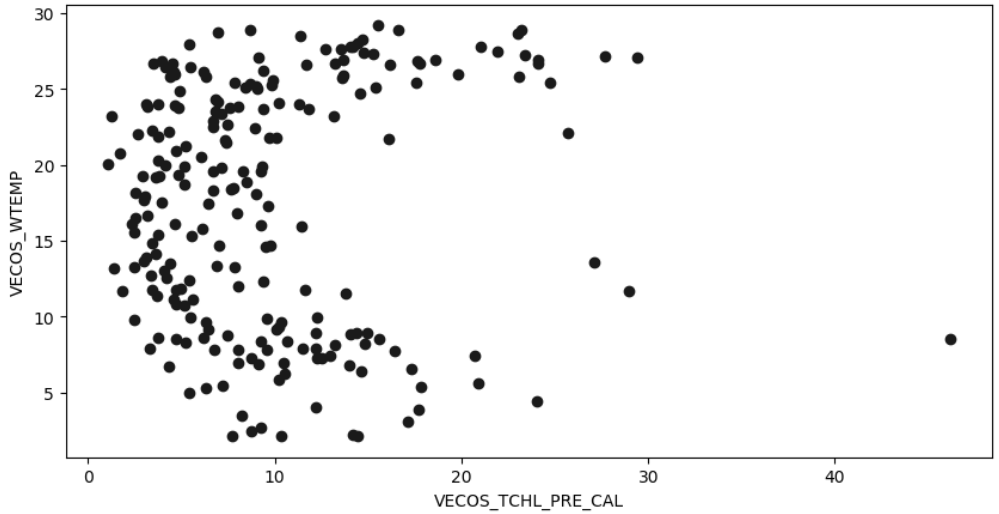

Norfolk
ELIPH_08052014.csv Events
TCHL_PRE_CAL
5.700000 - 9.900000
9.900001 - 13.100000
13.100001 - 16.400000
16.400001 - 20.400000
20.400001 - 24.500000

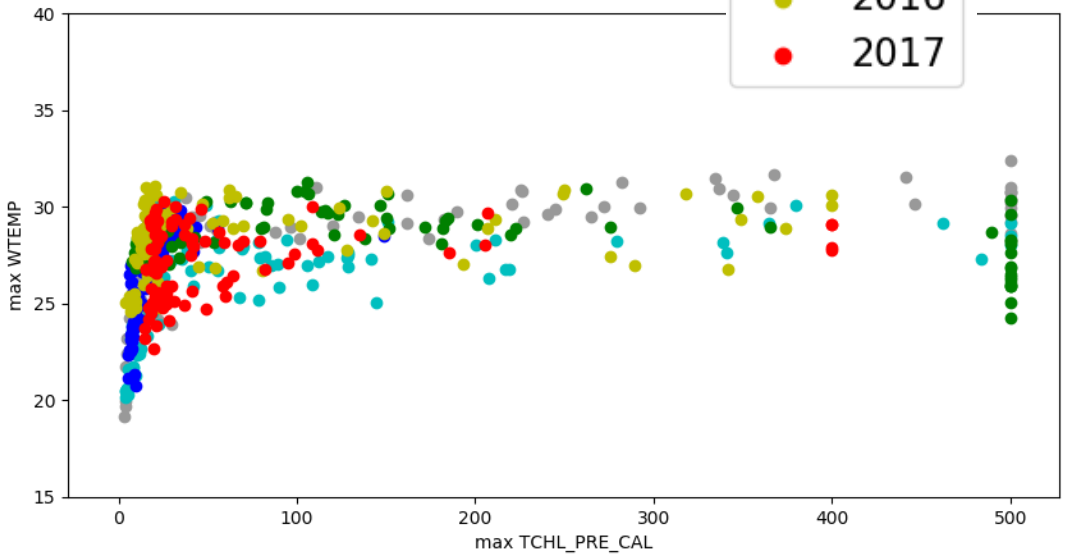

Norfolk
LAFMH_08132014.csv Events
TCHL_PRE_CAL
4.000000 - 7.100000
7.100001 - 10.400000
10.400001 - 13.700000
13.700001 - 17.500000
17.500001 - 22.000000

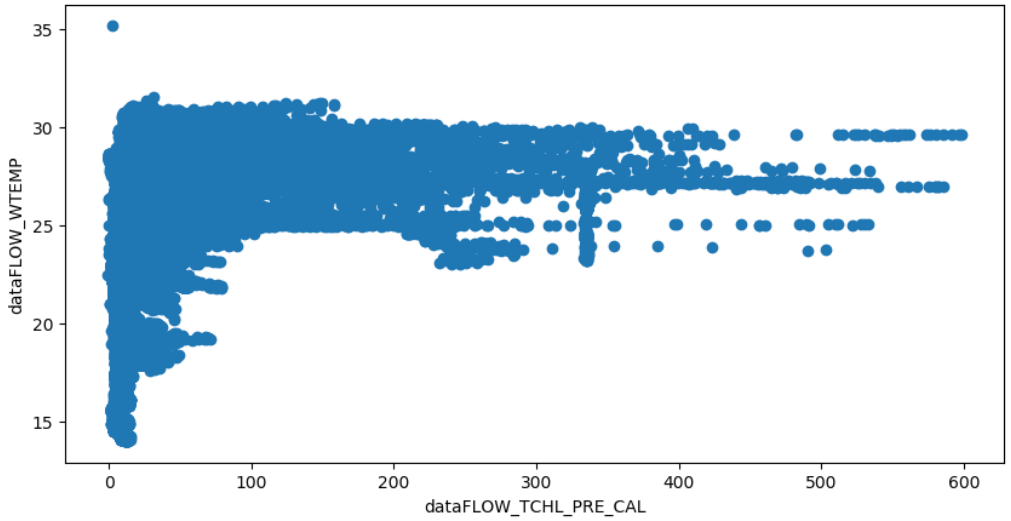

dataFLOW_TCHL_PRE_CAL
100
80
60
40
20
0
4/29/2014
5/5/2014
5/14/2014
5/21/2014
6/5/2014
7/2/2014
7/7/2014
7/16/2014
7/23/2014
7/28/2014
8/5/2014
8/13/2014
8/20/2014
8/25/2014
9/3/2014
9/8/2014
9/16/2014
9/24/2014
5/29/2014
10/7/2014
Date
head
mouth
James

Maximum values per day.
Left plots: (top) Air temperature is from the NFK airport station; (bottom) max water temperature and chl are from YSI data collected at the head of the Lafayette River (NYCC)
Right plots: (top) Water temperature and Chl values are from long term (1999 to 2019) monitoring station at the Lafayette; and (bottom) similar comparison with data from dataflow transects done at the Lafayette river (2008 to 2015)

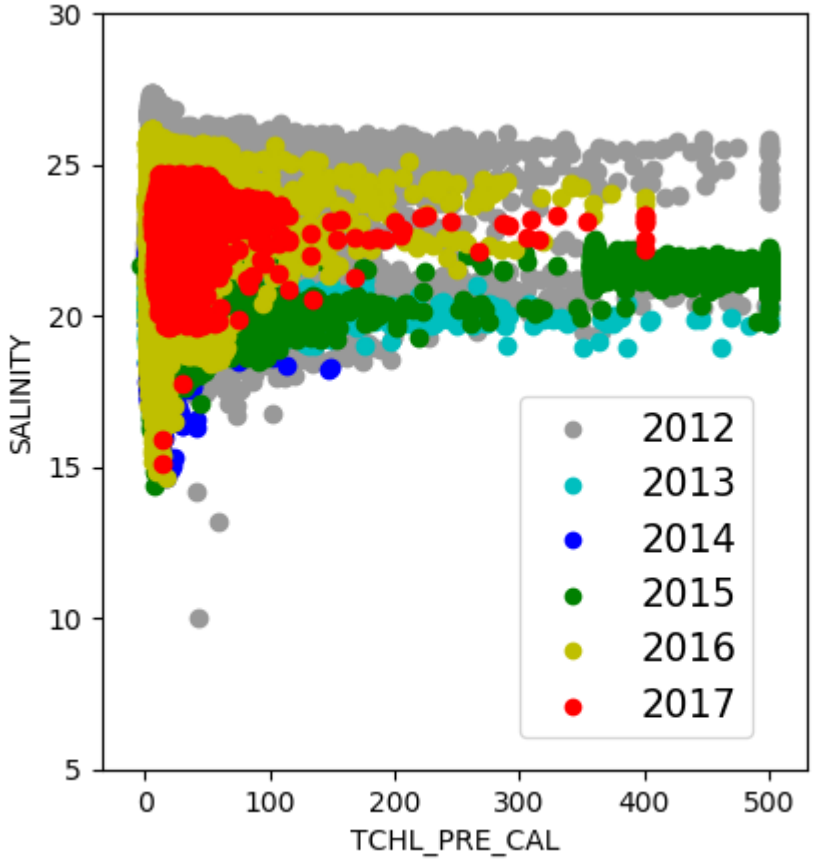


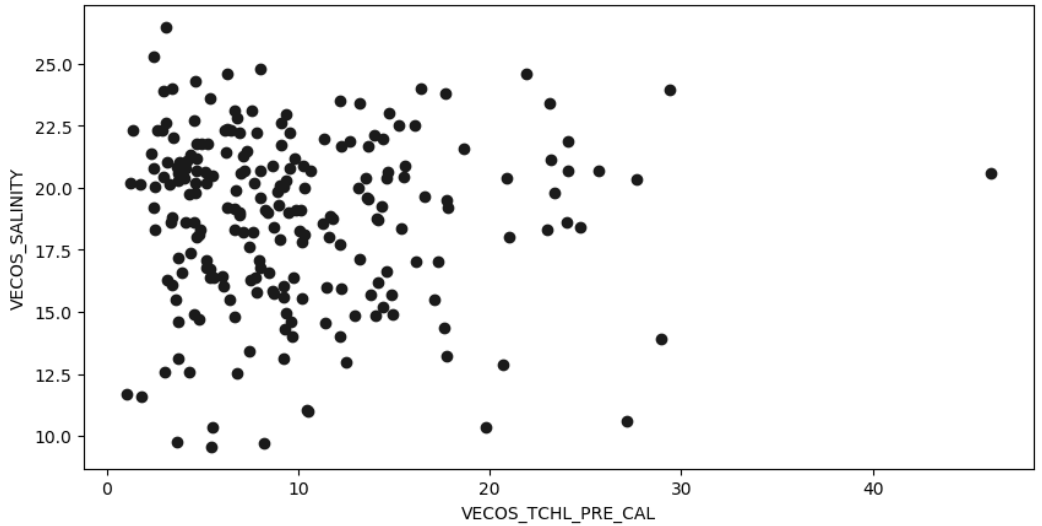


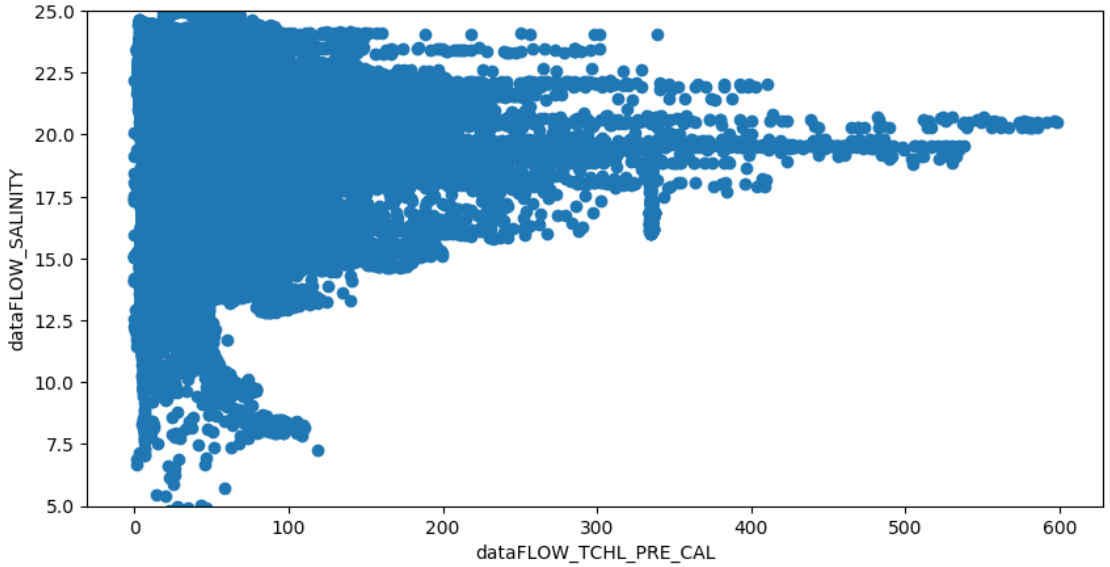


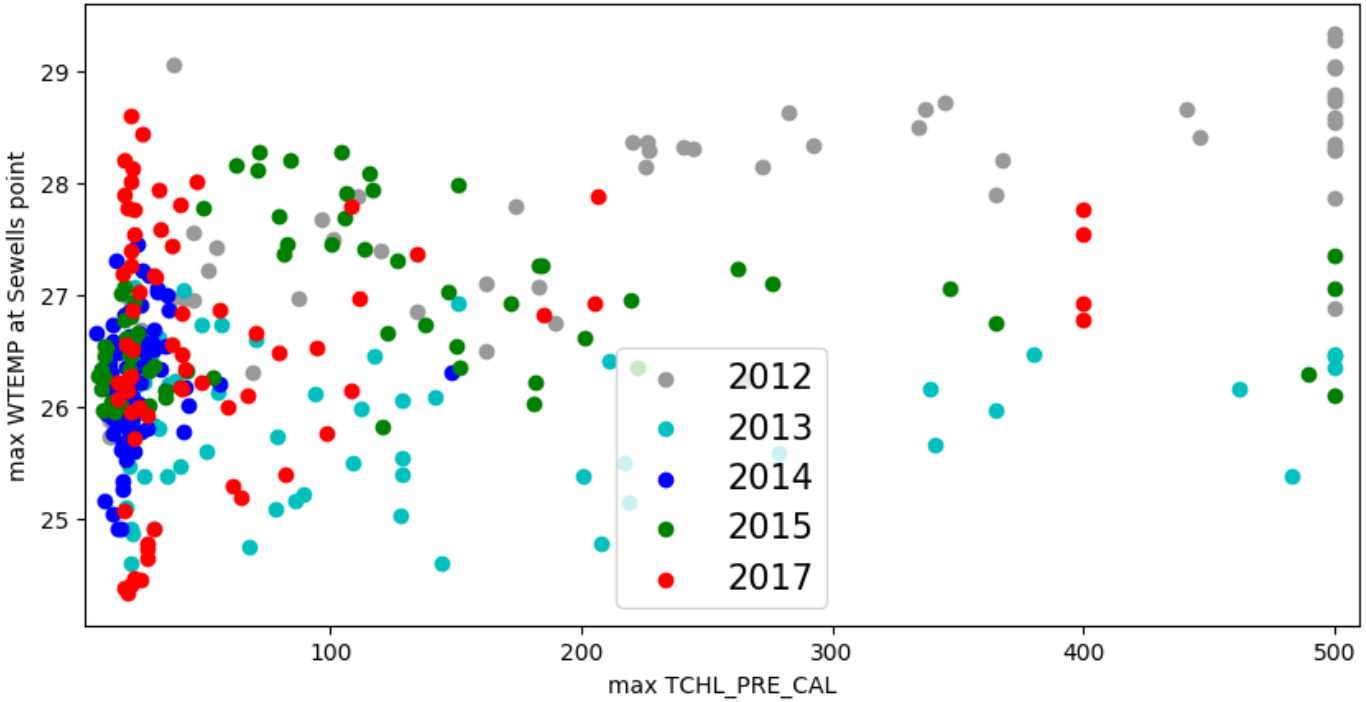


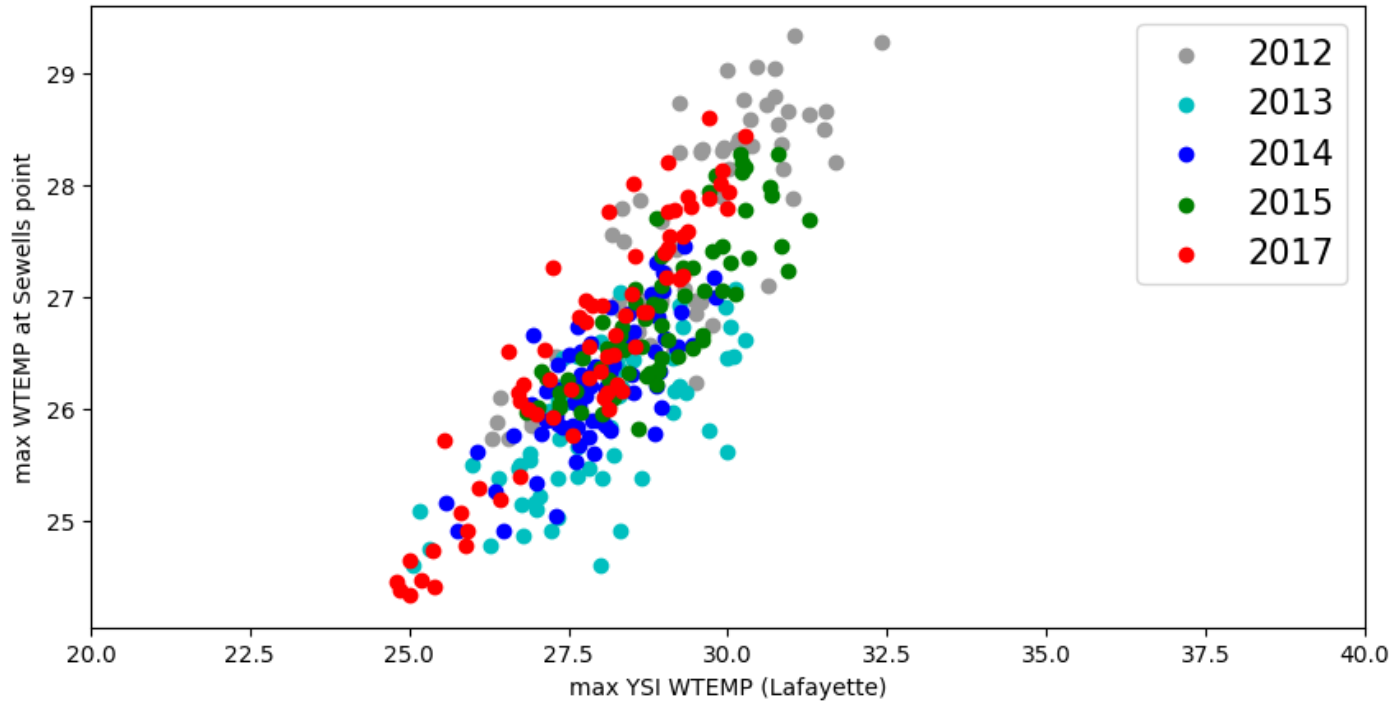
Maximum values per day.
Left plot: Salinity and Chl from YSI data collected at the head of the Lafayette River (NYCC)
Right plots: (top) Salinity and Chl values are from long term (1999 to 2019) monitoring station at the Lafayette; and (bottom) similar comparison with data from dataflow transects done at the Lafayette river (2008 to 2015)

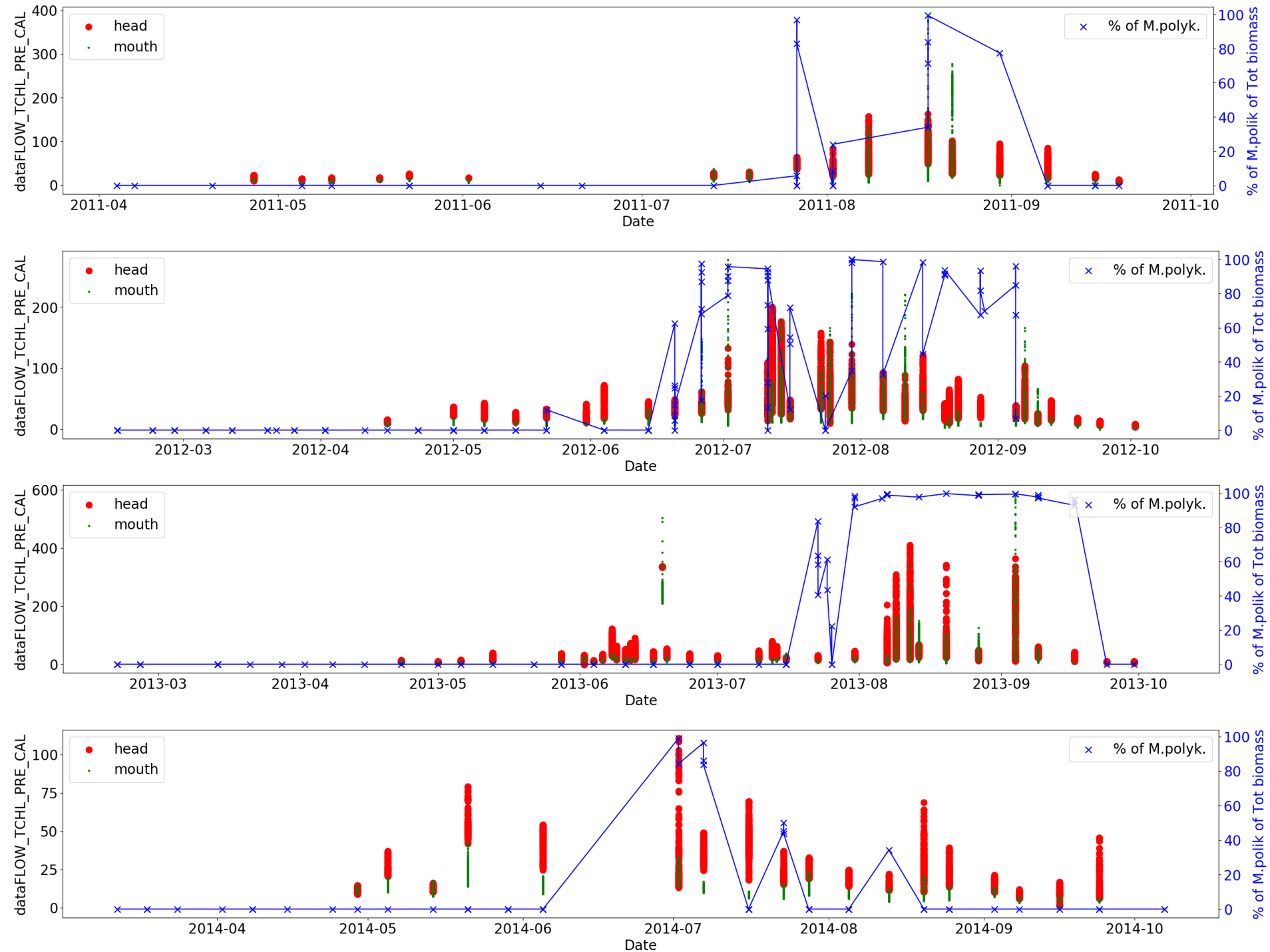







max WTEMP at Sewells point
max TCHL_PRE_CAL
2012
2013
2014
2015
2017

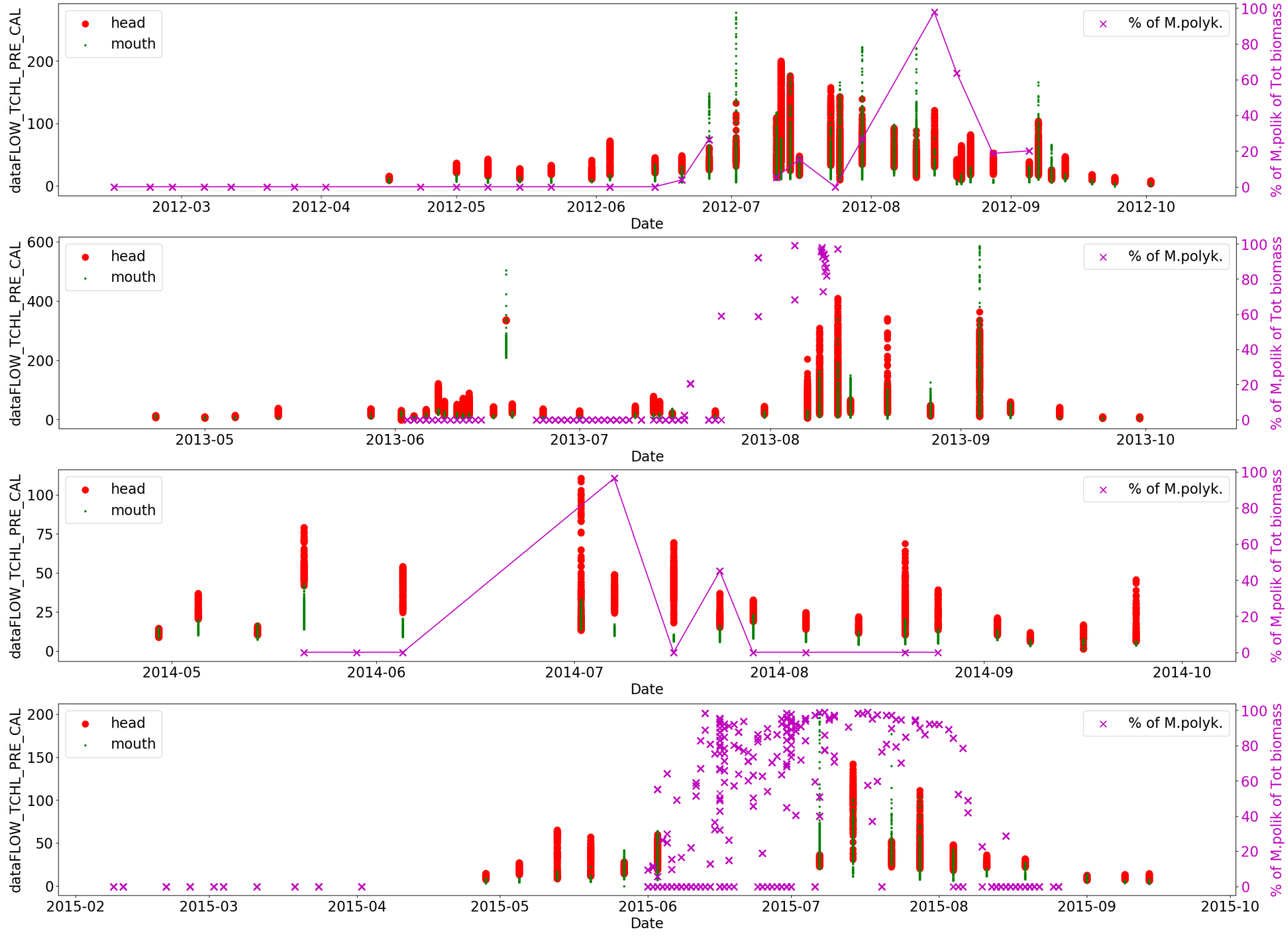

max WTEMP at Sewells point
max YSI WTEMP (Lafayette)
2012
2013
2014
2015
2017



Cell counts from **dataflow transects**

These are plots showing blooms capture during dataflow transects from 2011 to 2014. Chl data goes from 2008 to 2015, but cell counts from dataflow transects done at the Lafayette go only from 2011 to 2014.

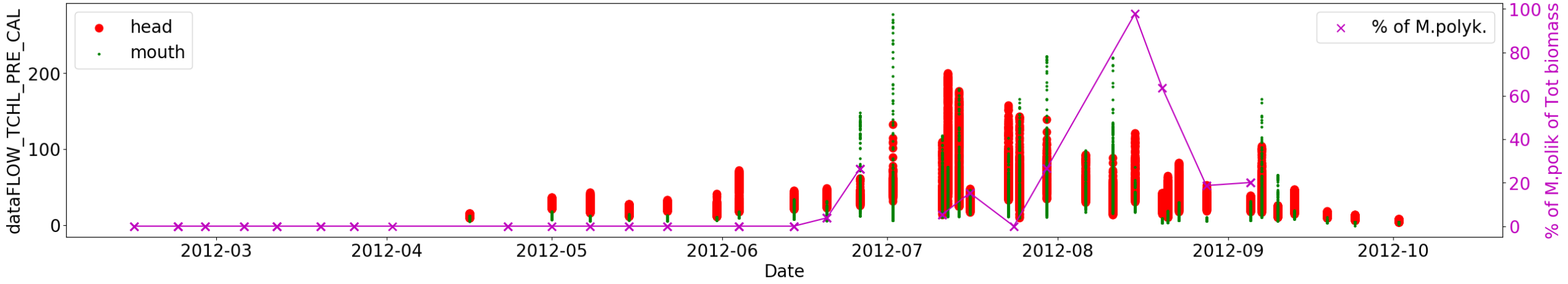
Left axis shows TCHL measured along the dataflow transects. Right axis shows the percentage of M. polykrikoides out of total biomass during the same dataflow transects

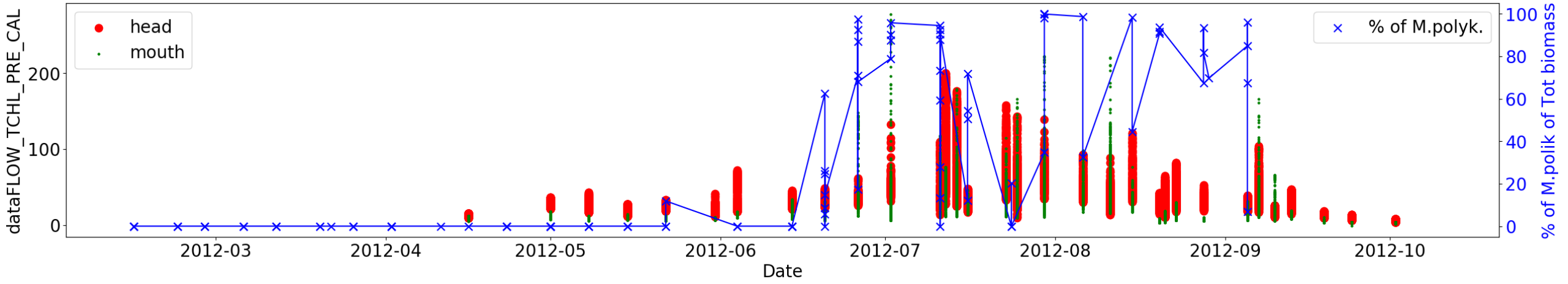


Cell counts from **daily sampling**

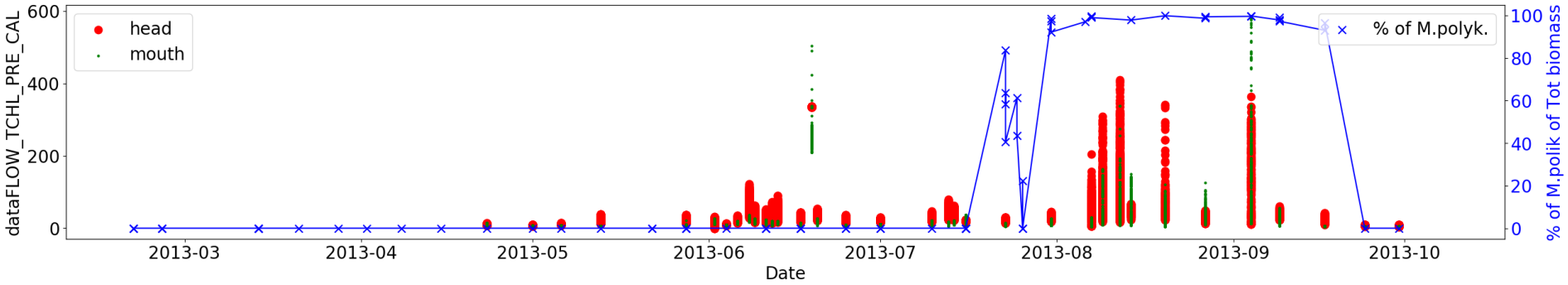
These are plots showing blooms capture during dataflow transects from 2012 to 2015. Chl data goes from 2008 to 2015, but cell counts from daily sampling done at the Lafayette go only from 2012 to 2015.

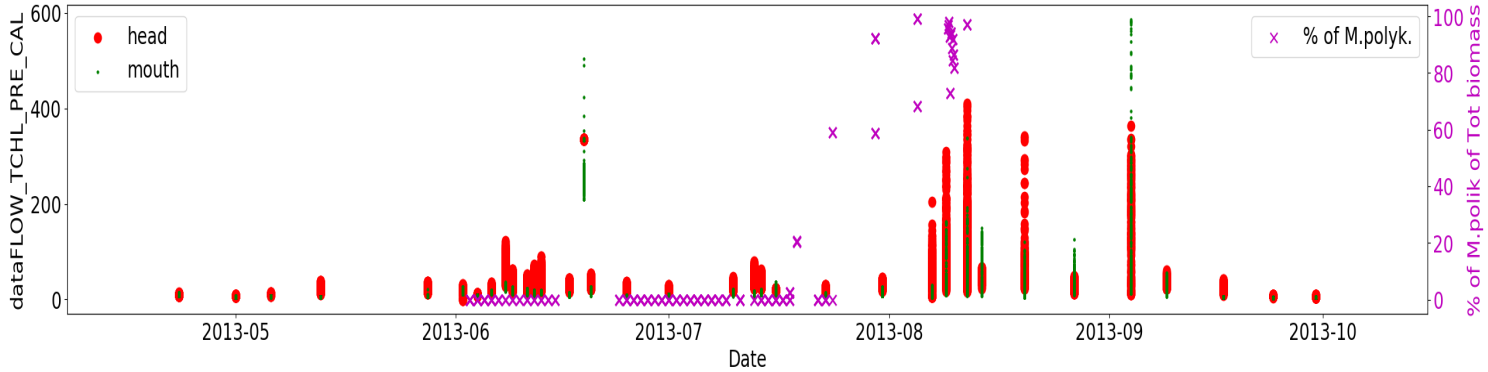
Left axis shows TCHL measured along the dataflow transects. Right axis shows the percentage of M. polykrikoides out of total biomass from samples collected during daily sampling campaigns.



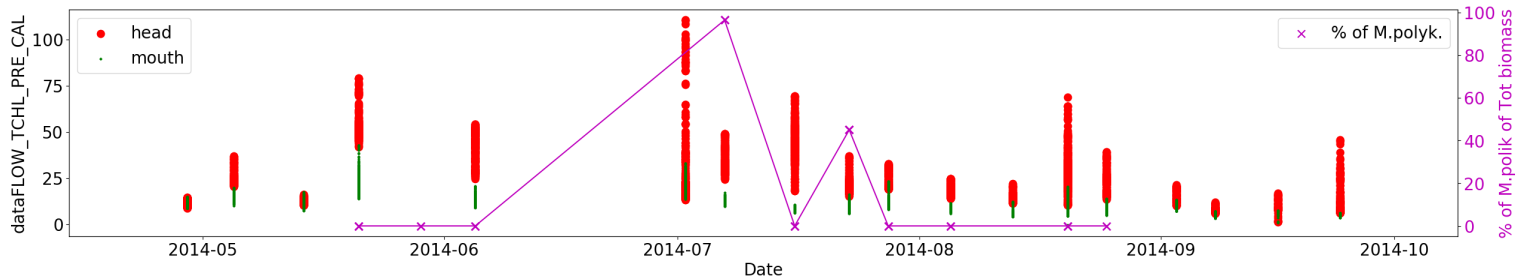


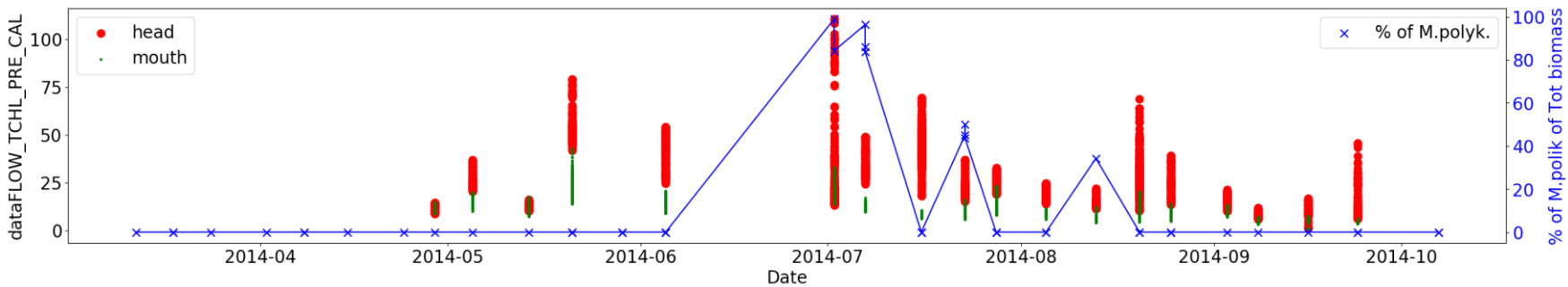
Missmatch(?) between the daily sampling (magenta) and dataflow (blue) cell counts. In the early part of the time series, both results agree in low numbers for % of M.polykrikoides. However, there are significant visual differences during the bloom. Can this help to ask for money to use Pete's boat to do transects? There are examples for other years in the next slide

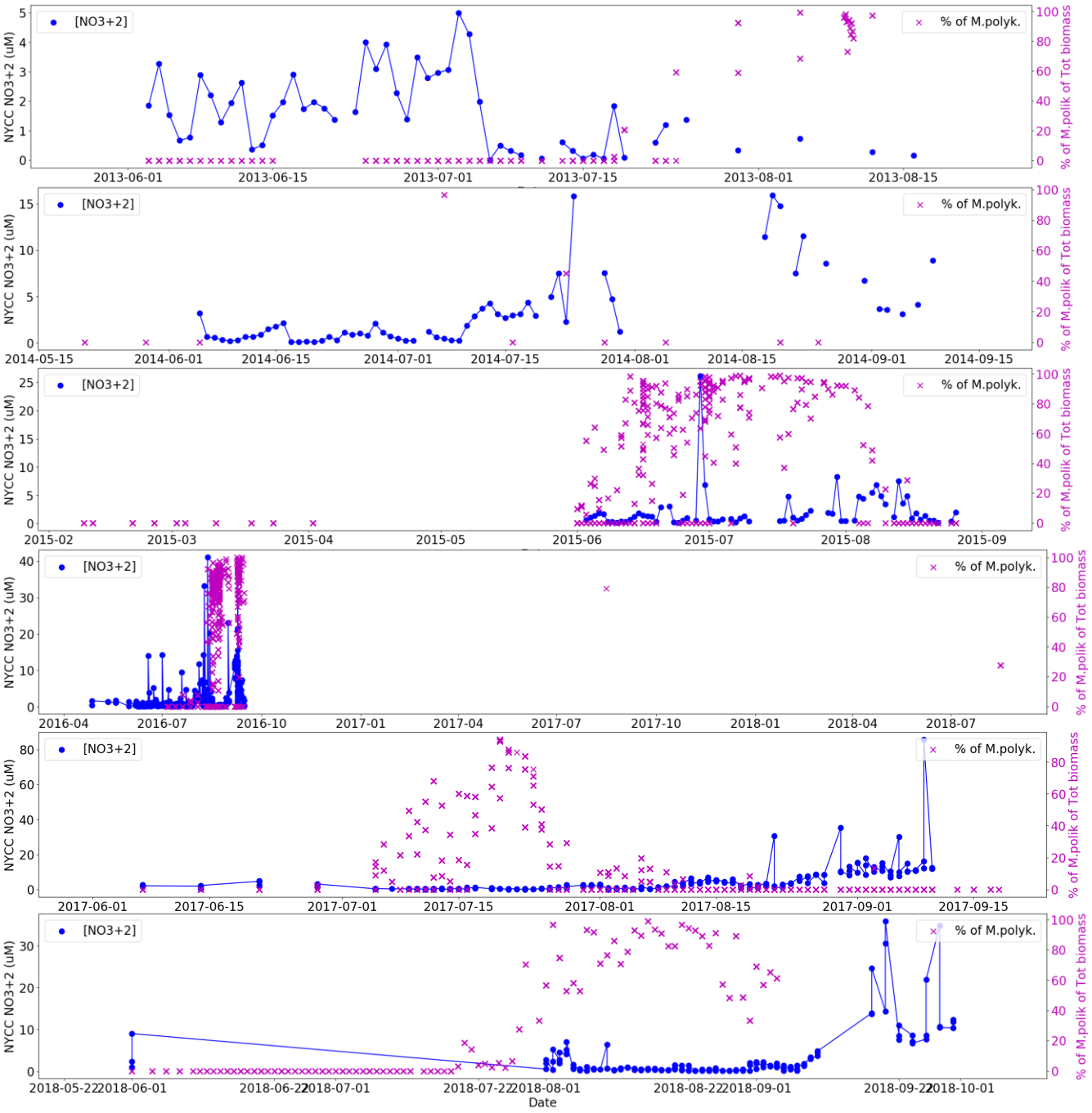




More examples of the mismatch or match between summer sampling and dataflow results.

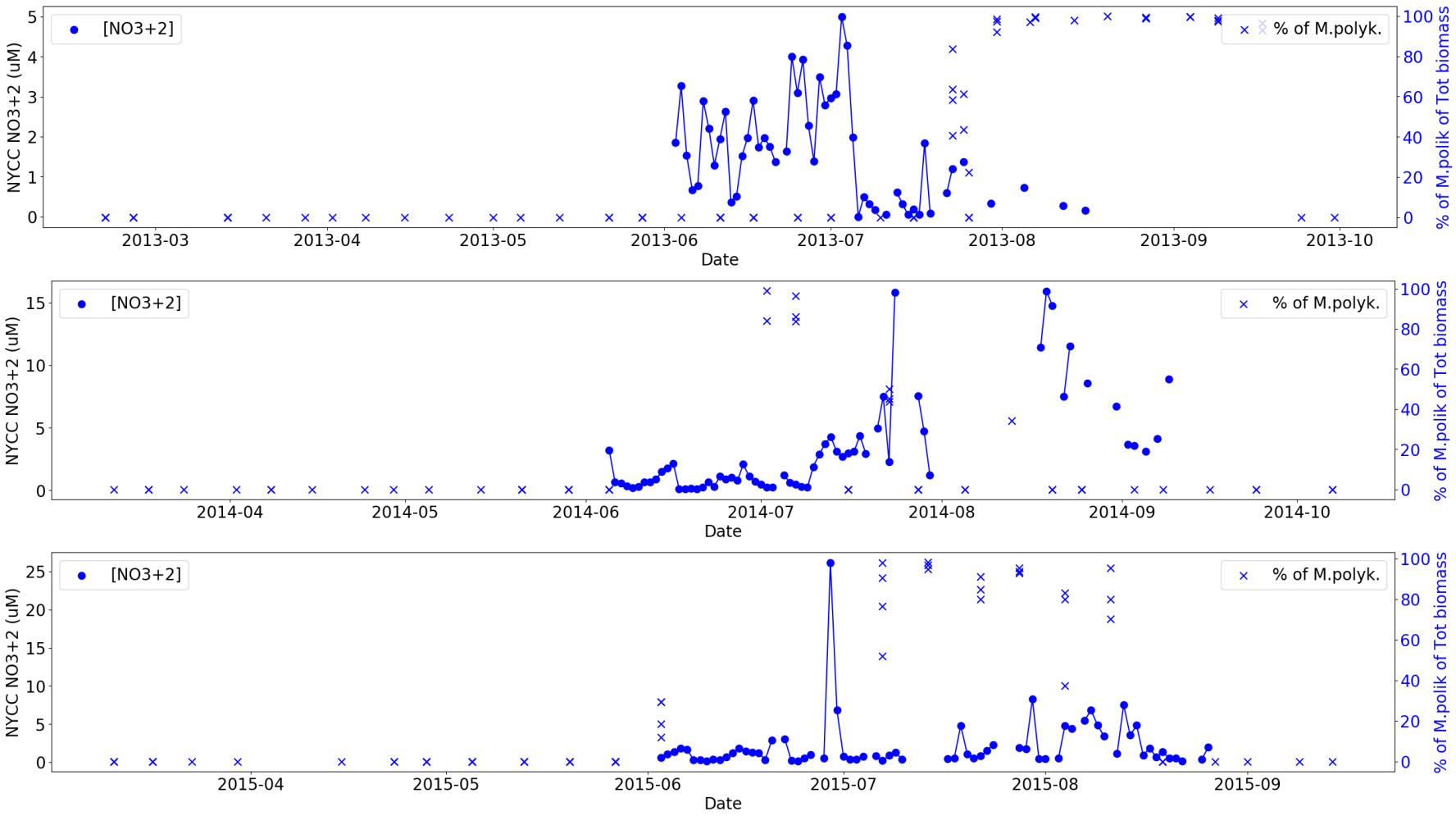






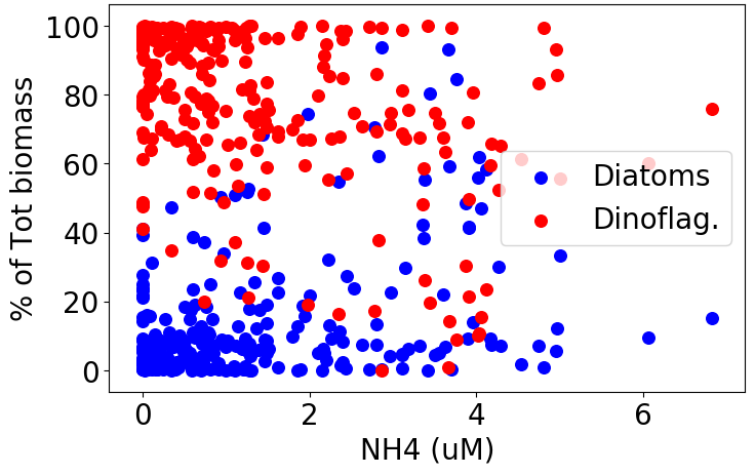
Nutrients (NO_32) and % of M.polyk. (both datasets from summer sampling)

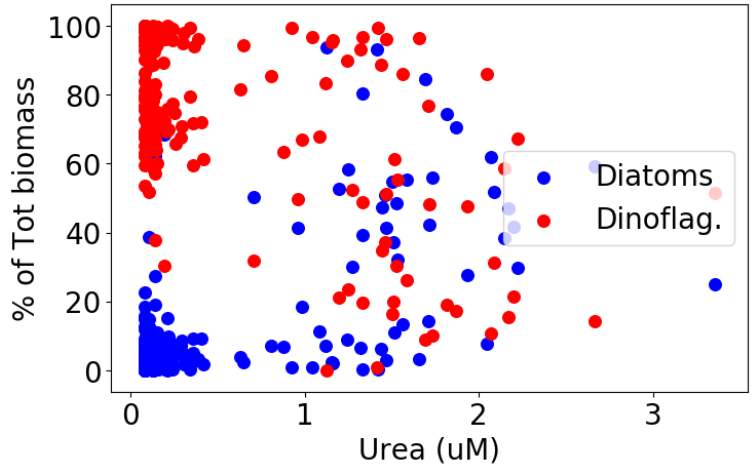
Plots showing nutrient concentration (NO32) from samples collected during summer sampling campaigns from 2013 to 2018; and % of M. polyk. Of total biomass also from samples collected during summer sampling.

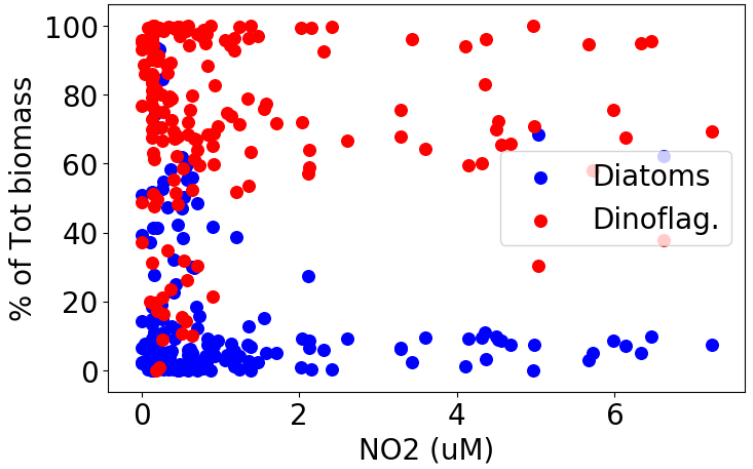


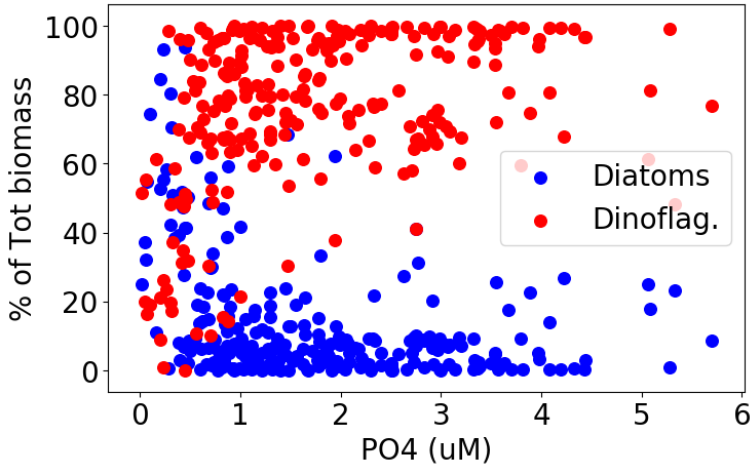
Nutrients (NO_32) and % of M.polyk. (from summer sampling and dataflow, respectively).

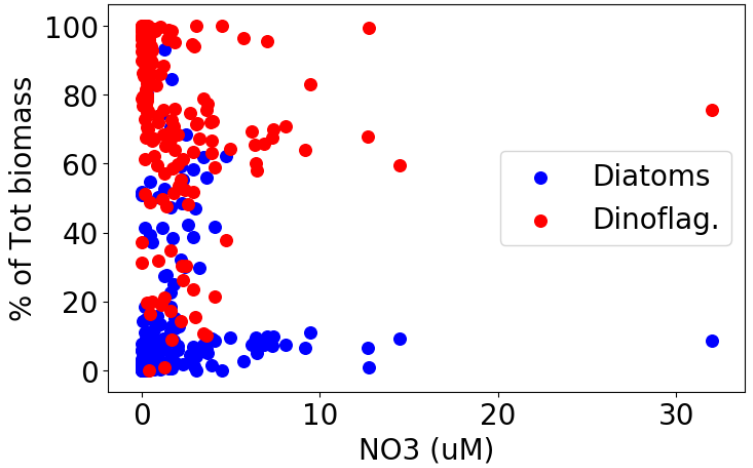
Plots showing nutrient concentration (NO32) from samples collected during summer sampling campaigns from 2013 to 2018; and % of M. polyk. Of total biomass from samples collected during dataFlow transects along the Lafayette R.



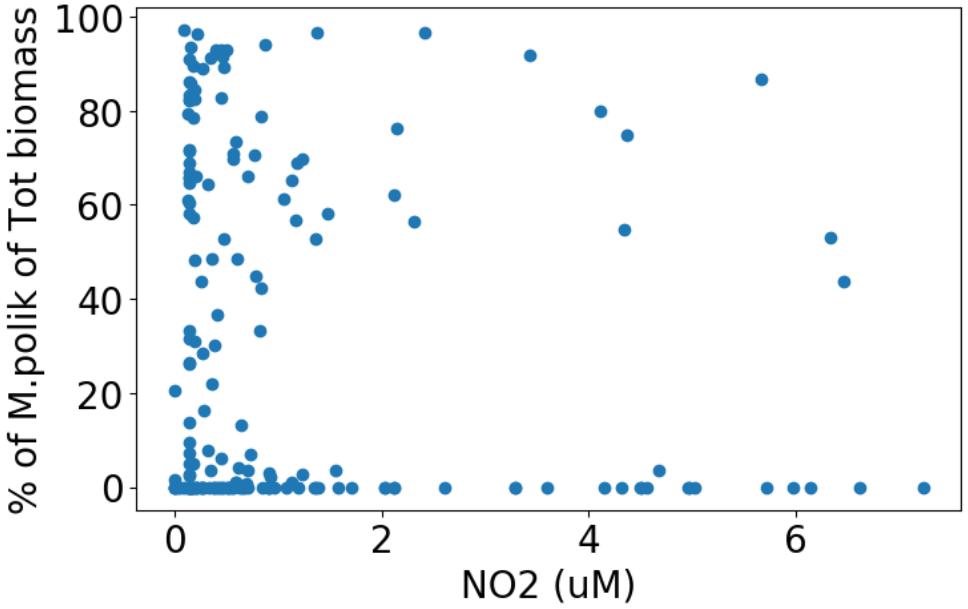


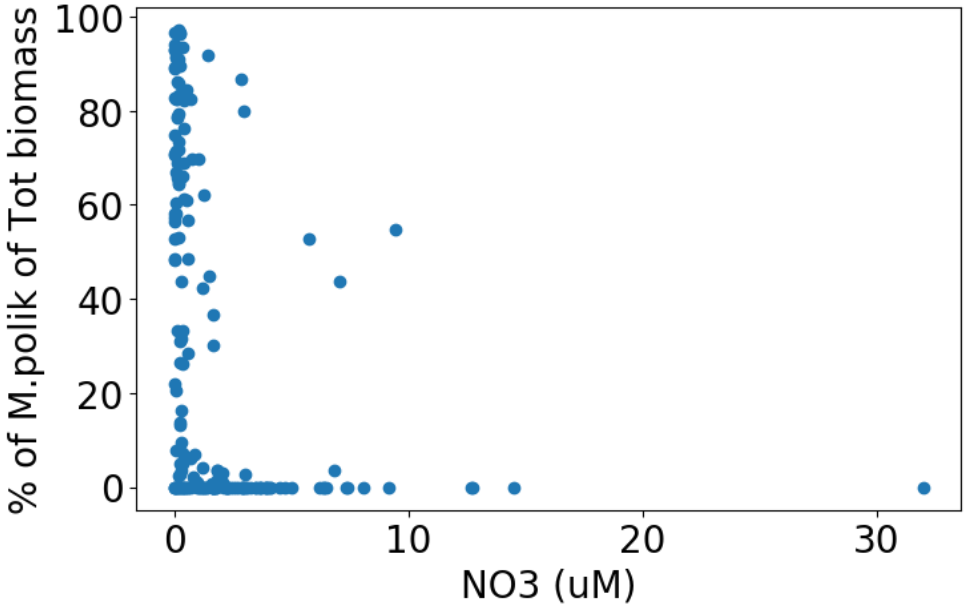


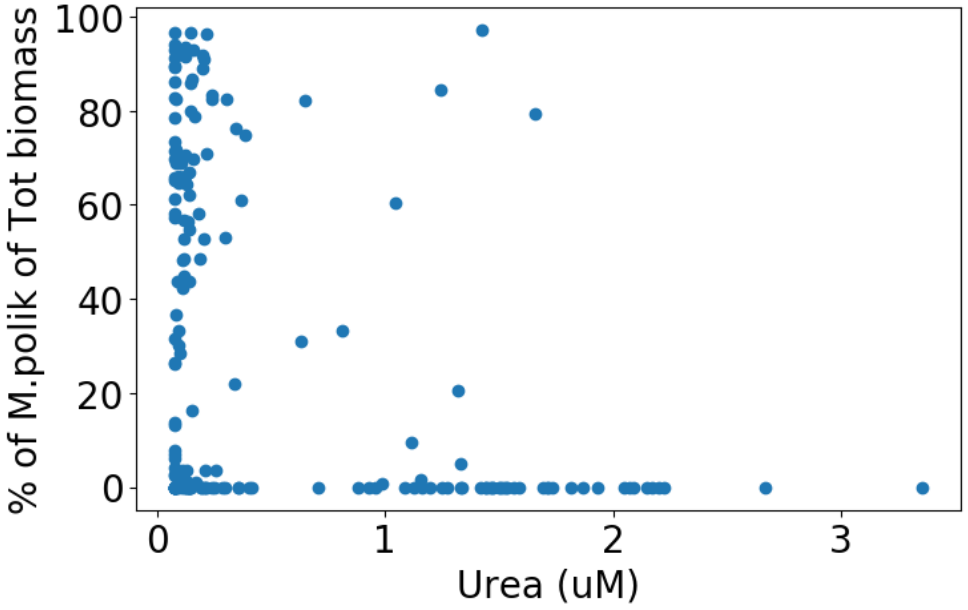


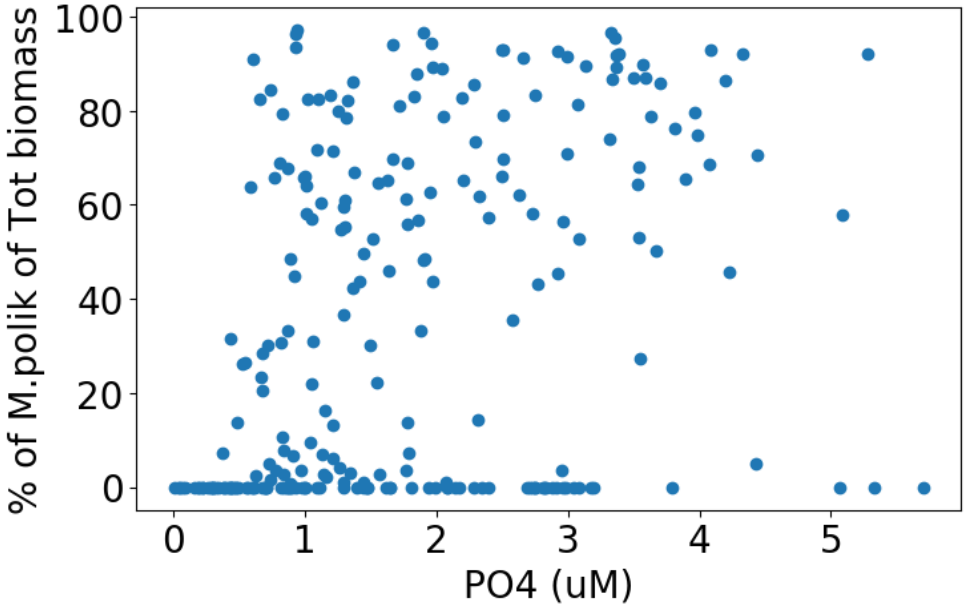


The relationship is clearly not with the dissolved nutrients the day of X abundance.
Is there any relationship if we plot accumulated days instead? i.e. nutrient levels 1,2,3… days before x abundance

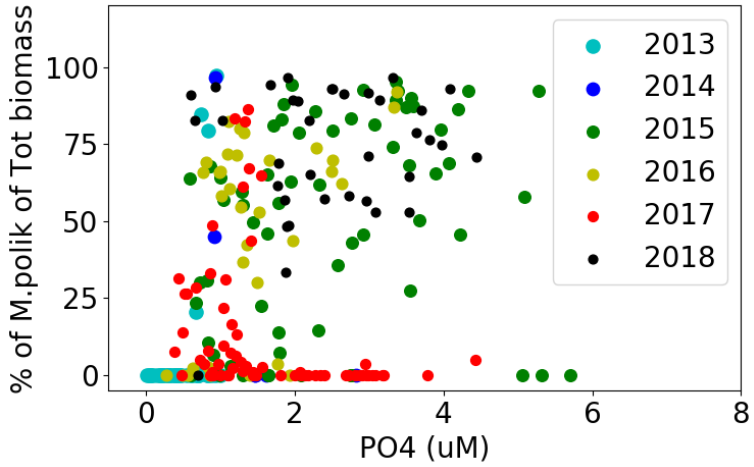


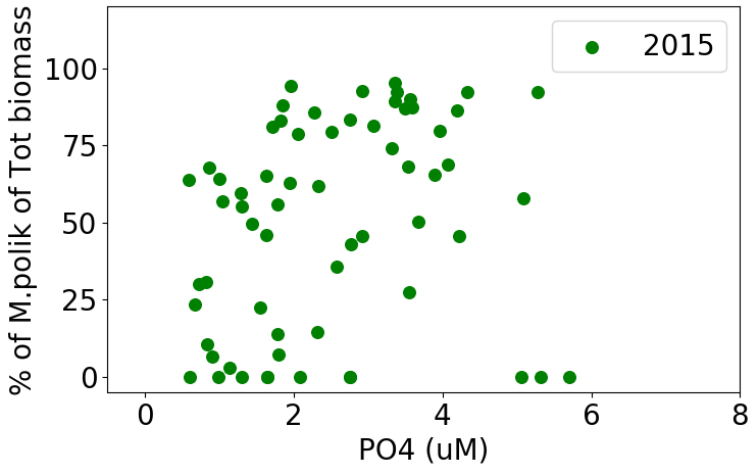


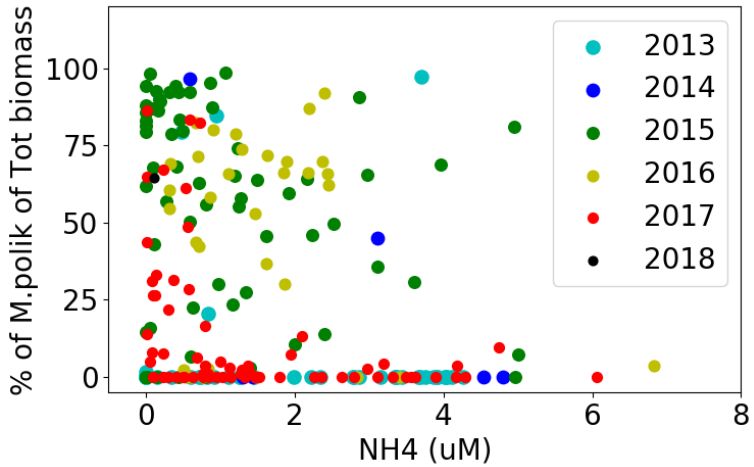


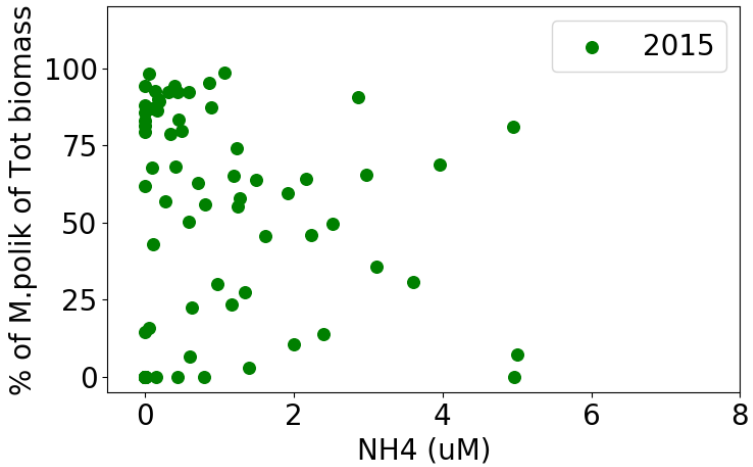


Similar analysis, but using M. polykrikoides abundance specifically

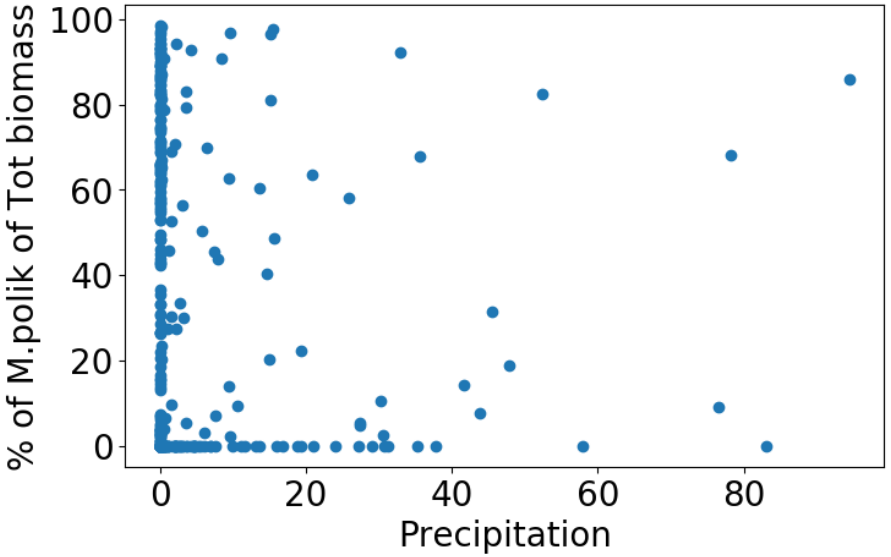


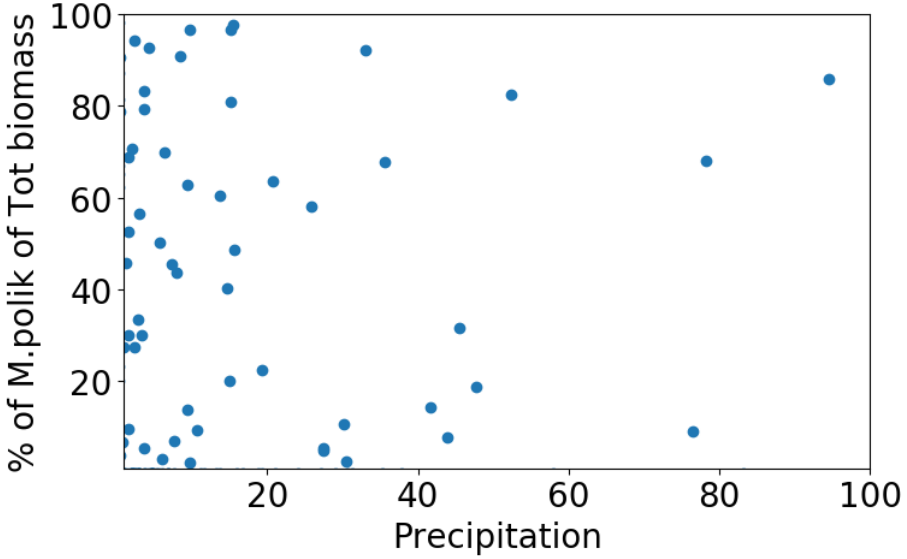






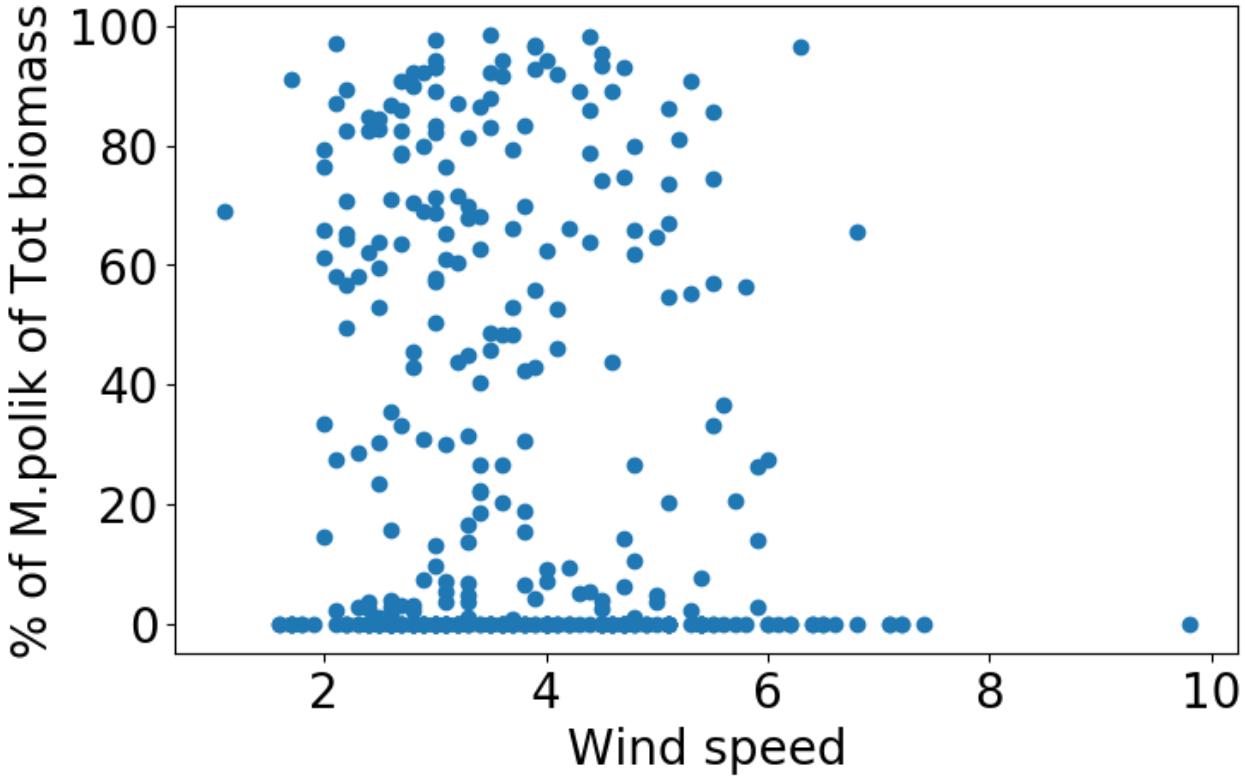
Similar data as the slide before. However, here the data is separated by year. This could allow to clear trends if present only within a specific year but. See example in this slide with PO4 vs %M.polyk. During 2015

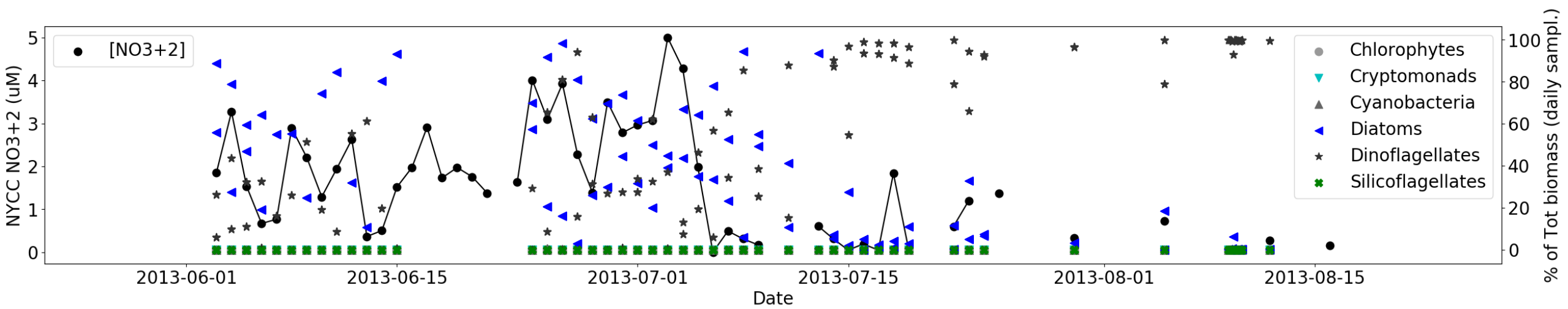


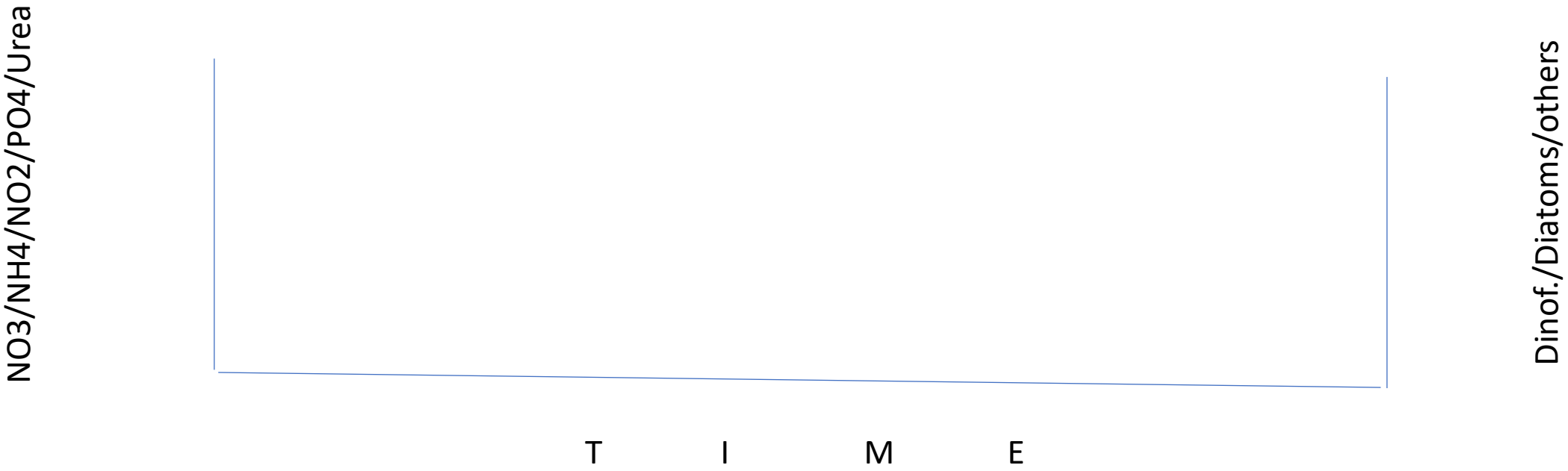


Explore this further. For example, it seems that there is some relationship between precipitation and %of M.polyk. When removing the 'Zeros'.

What about wind speed? (lower-right figure)

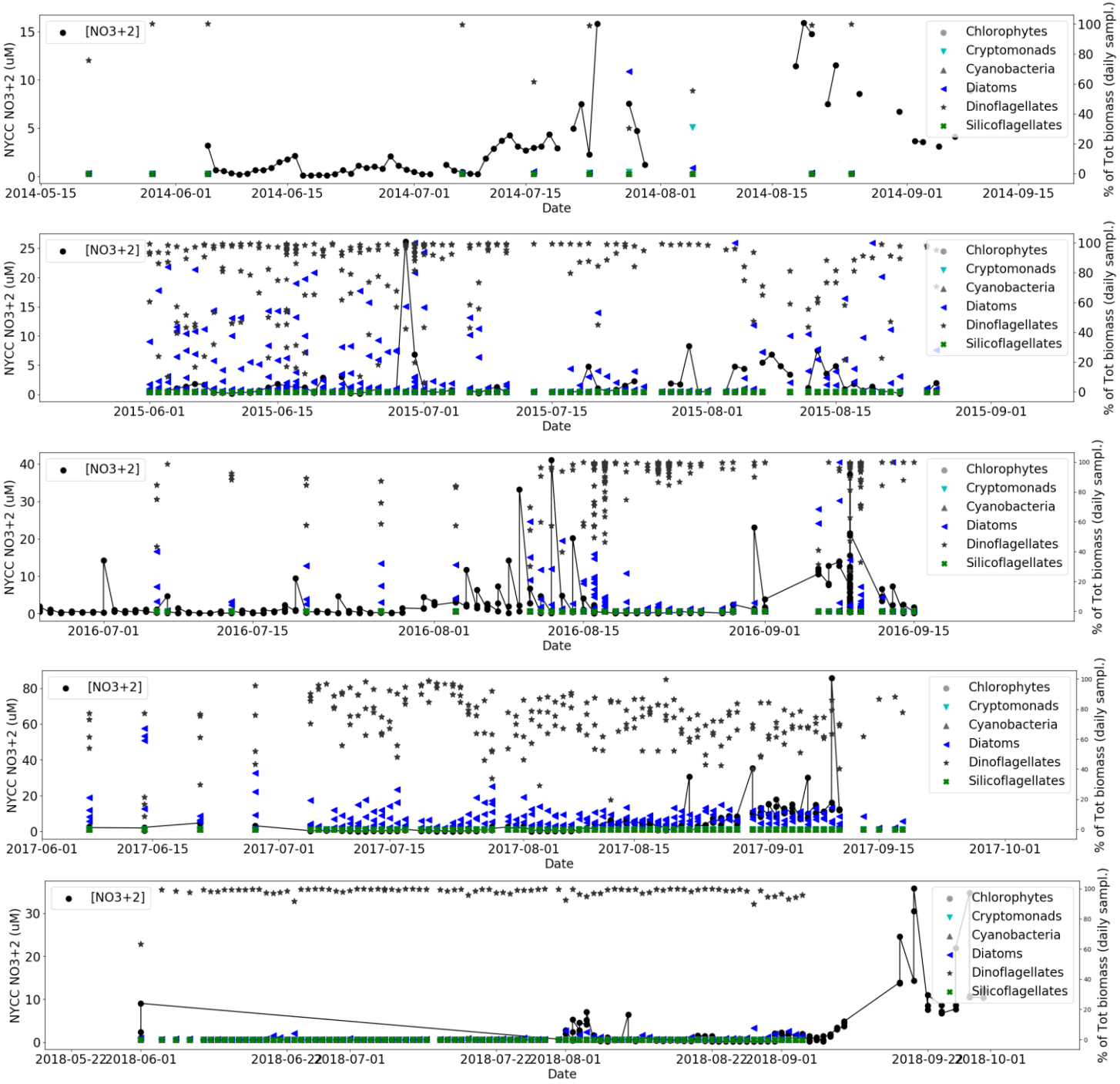




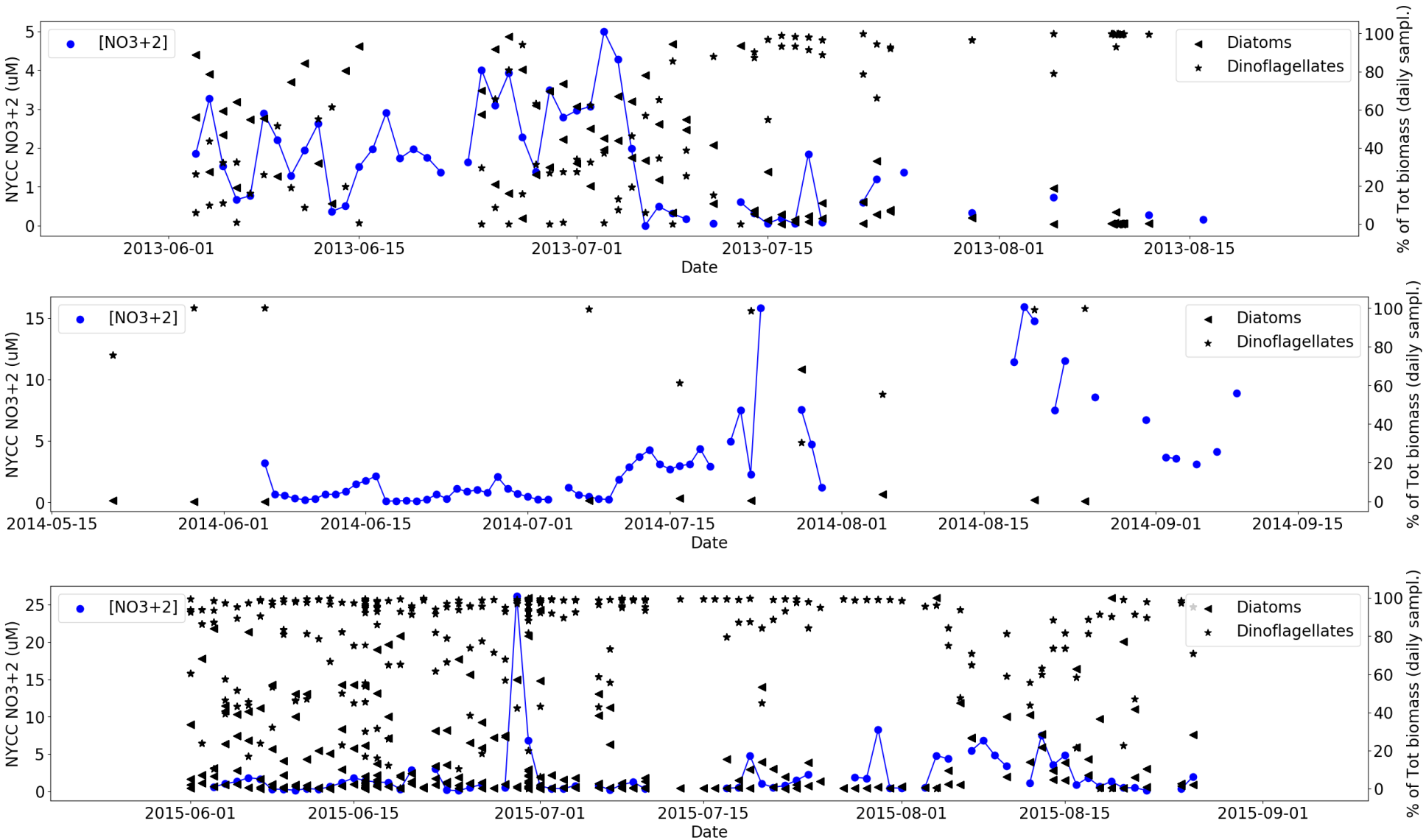


Different nutrient (i.e. urea) data is available from the summer sampling campaigns. From this sampling, also cell counts at different levels (i.e. species) are available at the same site.

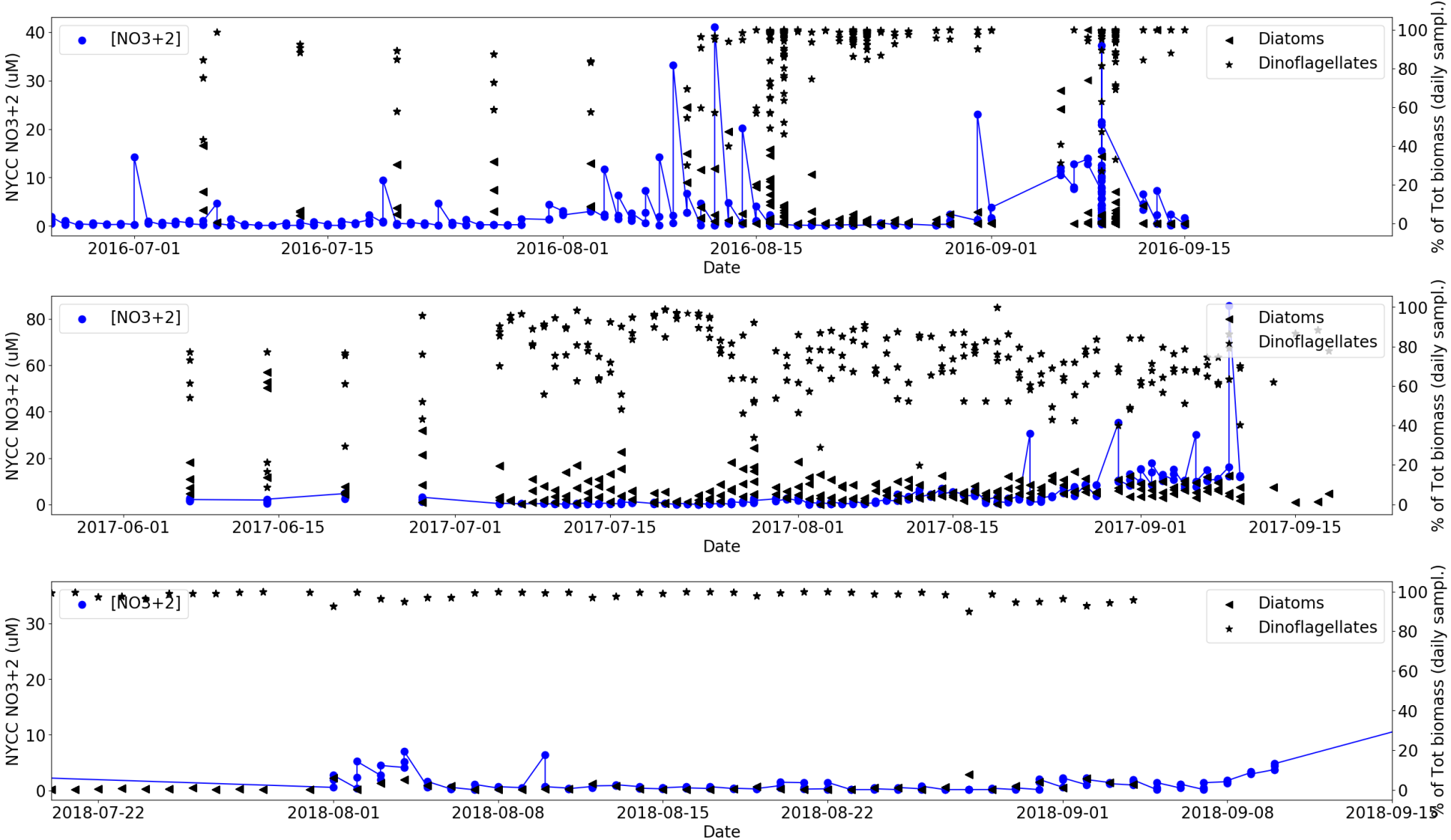
Nutrient ratios and the abundance of different organisms could be plotted to extract relationships. See following slides for examples.



Dinoflagellates are the ones that dominate the timeseries, followed by diatoms. However, for the following plots, only those two are going to be used.

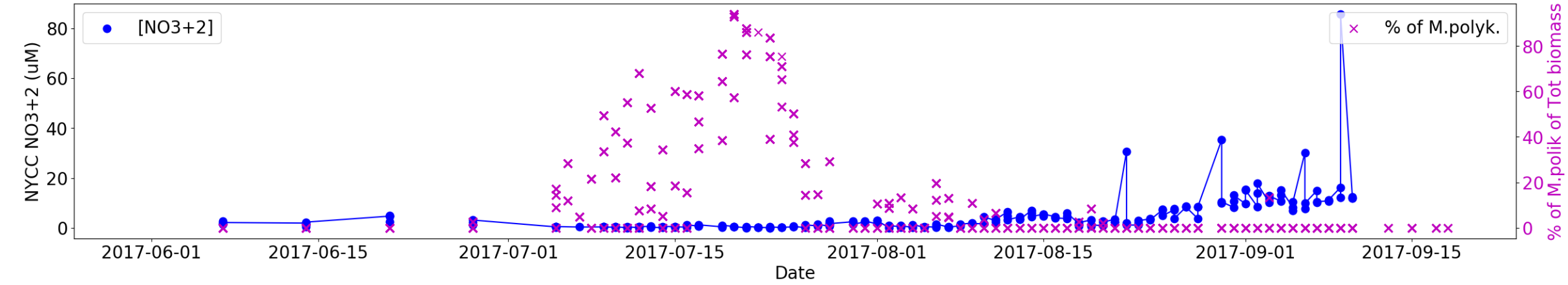


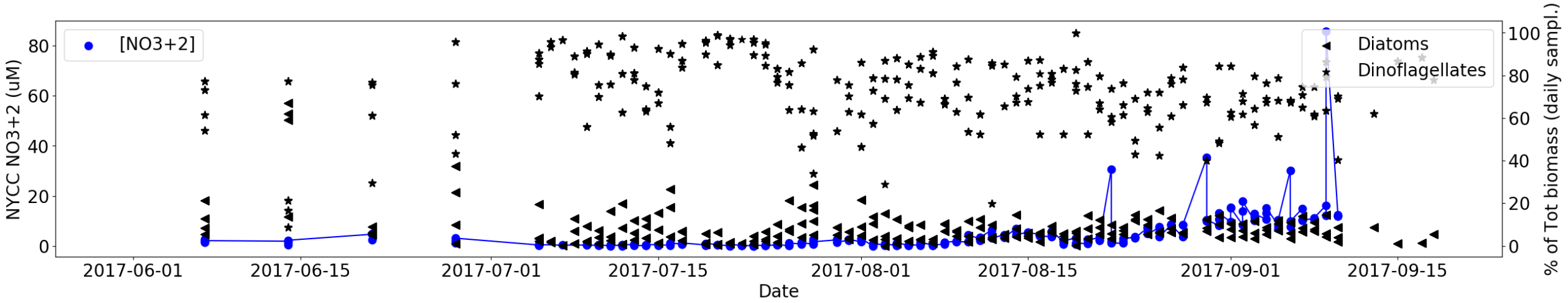
Time series showing dissolved nutrients (NOx specifically) and the percentage of diatoms/dinos of the total biomass. Data is separated by year, from 2013 to 2018, for a clearer presentation.

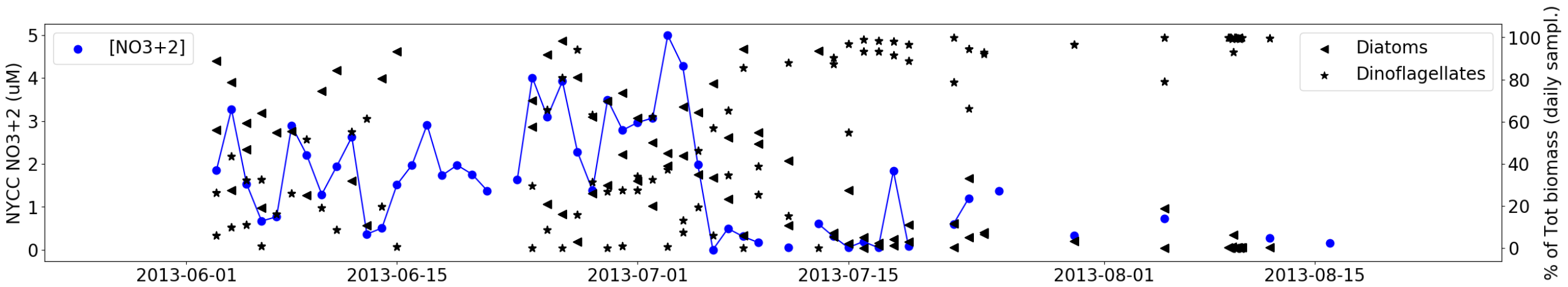


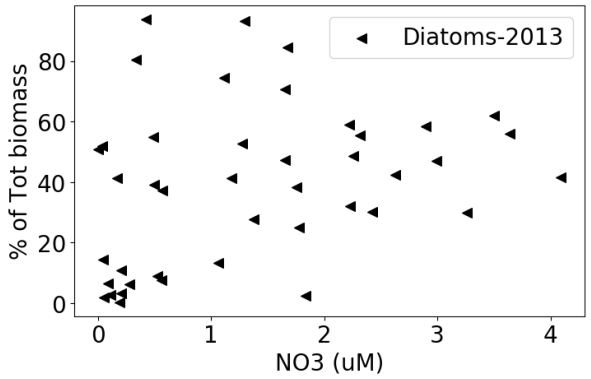
Similar to previous slide,
Time series showing dissolved nutrients (NOx specifically) and the percentage of diatoms/dinos of the total biomass.
Data is separated by year, from 2013 to 2018, for a clearer presentation.

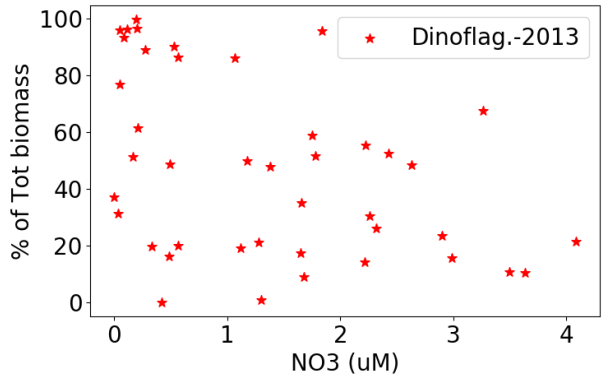
Most of the years, dinoflagellates abundance is not equal to M. polykrikoides abundance. This will make association with nutrient data (and other type of data) more complicated. Which one do we use depends in the question that we are asking, but I will recommend to use species numbers when available.

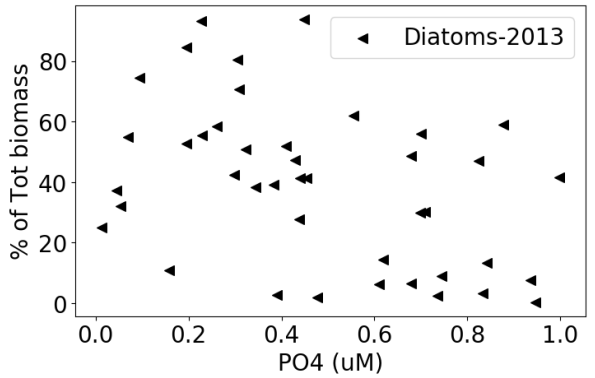


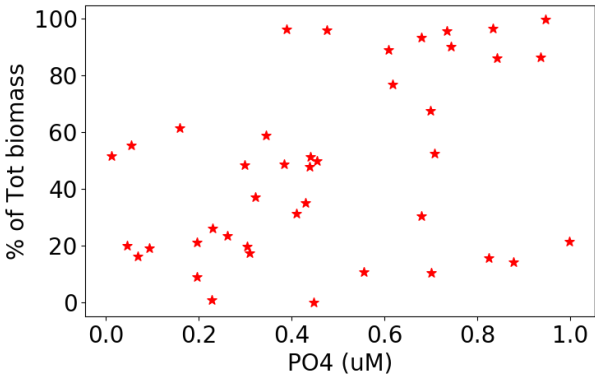


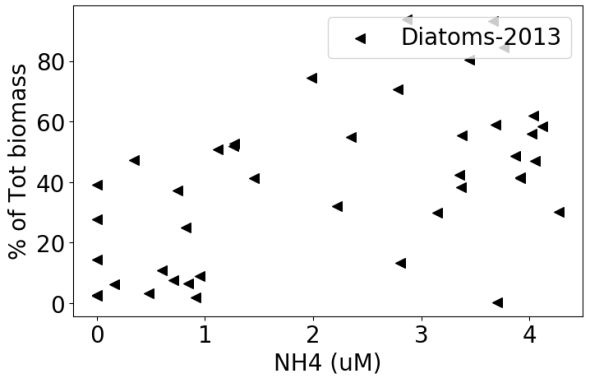


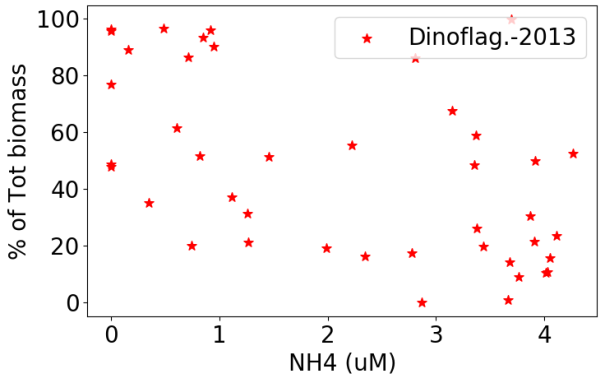


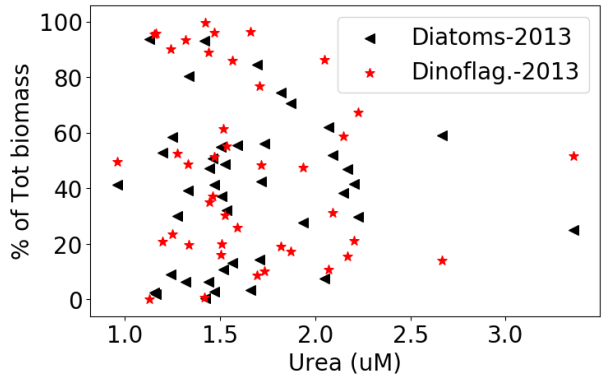




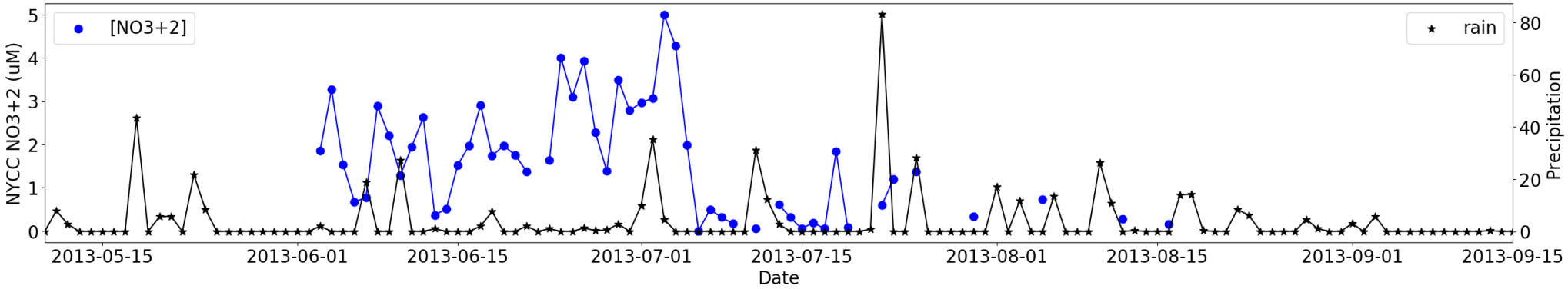


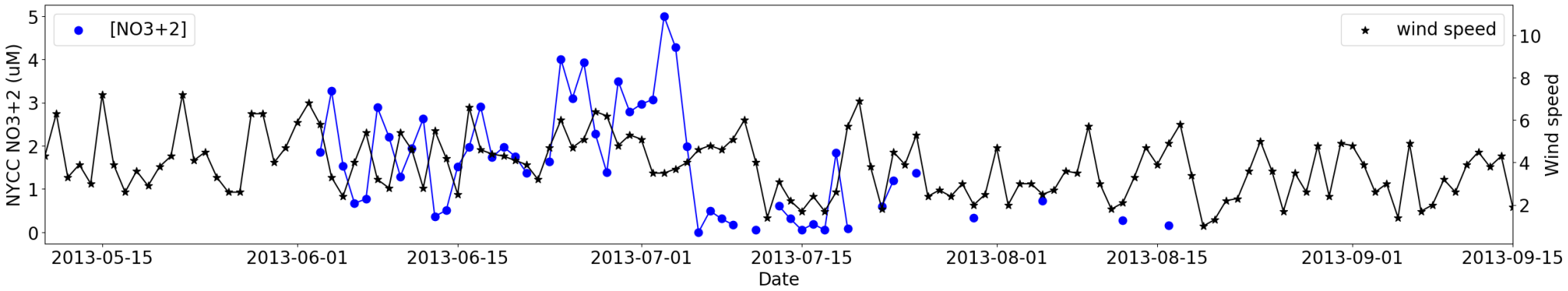


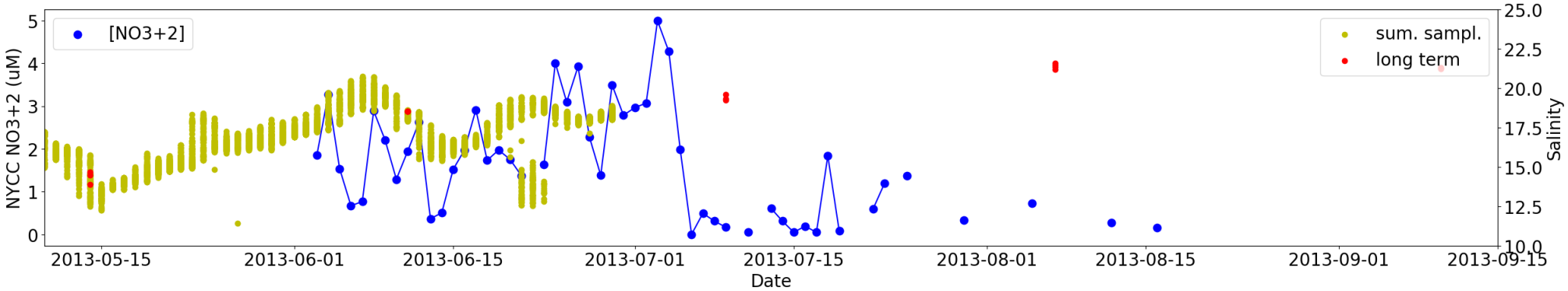




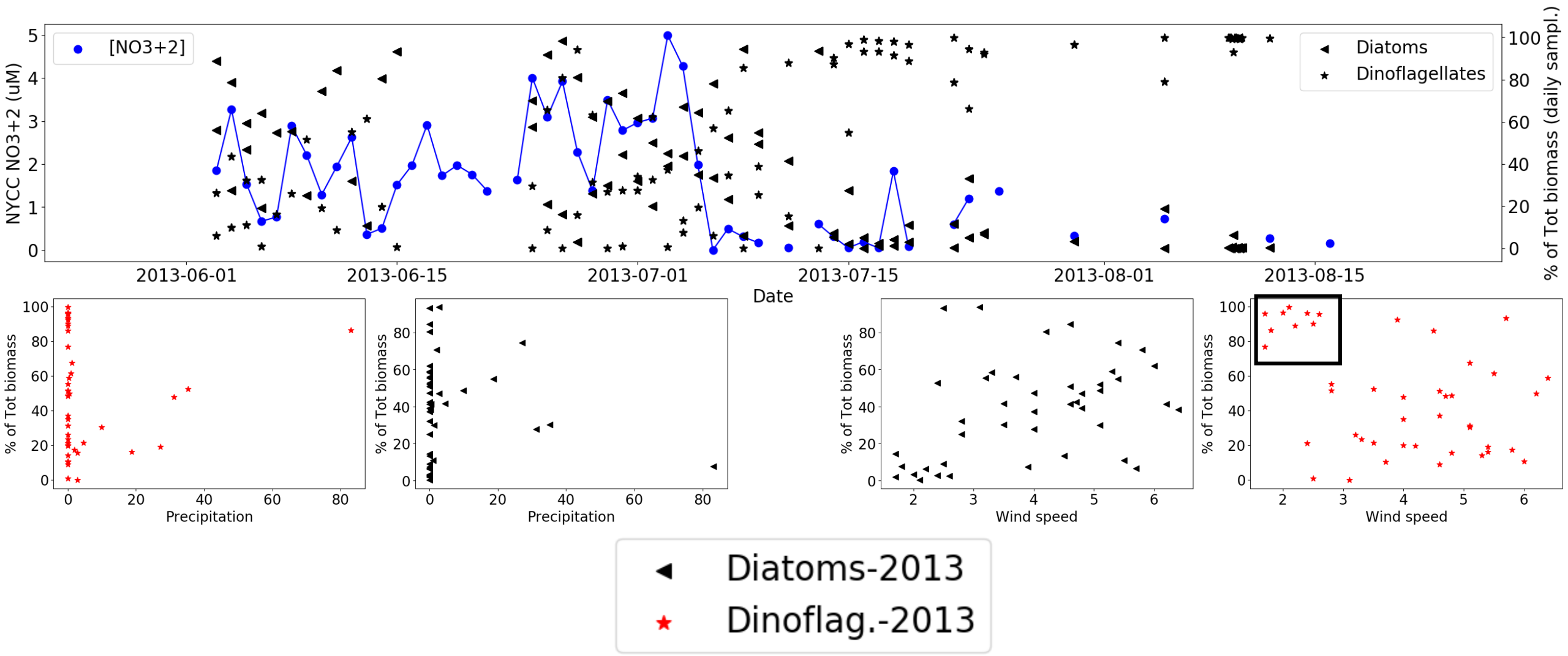
Only during 2013, there is clear trends/correlation between percentage of diatoms/dinoflagellates and dissolved nutrients. You can see on the upper graphic how diatoms dominate while NO32 is high, but it switch to dino dominance when NO32 is depleted.







If there seems to be some relationship between nutrients and % of diatoms/dinos, what is then controlling those nutrients?
Just for the sake of the exercise, I am plotting precipitation, wind speed and salinity for the same period of time in which nutrients data is available (only for 2013).
It seems that precipitation peaks correlate with some nutrient peaks, but that is not true for most of the time-line. However, windspeed seems to follow a more consistent pattern (see next slide).



Although I haven't don't a proper linear regression analysis, it seems that under some conditions precipitation has a positive correlation with dinos and negative with diatoms.

Windspeed seems to be affect the % of organisms more consistently, specially for diatoms