

mean__days2

January 26, 2024

0.1 Importing

```
[ ]: import xarray as xr
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import os
import dill
import datetime
```

0.2 Datasets Preparation

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[ ]: def datasets_preparation():

    ds_name = ('/results2/SalishSea/nowcast-green.202111/' + i + '/'
↳SalishSea_1d_' + '20' + str(i[5:7]) + str(dict_month[i[2:5]])+str(i[0:2]) +
↳'_ ' + '20' + str(i[5:7]) + str(dict_month[i[2:5]]) + str(i[0:2]) + '_grid_T.
↳nc')

    ds_bio_name = ('/results2/SalishSea/nowcast-green.202111/' + i + '/'
↳SalishSea_1d_' + '20' + str(i[5:7]) + str(dict_month[i[2:5]])+str(i[0:2]) +
↳'_ ' + '20' + str(i[5:7]) + str(dict_month[i[2:5]]) + str(i[0:2]) + '_biol_T.
↳nc')

    ds = xr.open_dataset (ds_name)
    ds_bio = xr. open_dataset (ds_bio_name)

    date = pd.DatetimeIndex(ds['time_counter'].values)

    temp_i1 = ((ds.votemper.where(mask==1)[0,0:15] * ds.e3t.where(mask==1)
[0,0:15])).sum('deptht', skipna = True, min_count = 15) / mesh.
↳gdepw_0[0,15]).mean().values

    temp_i2 = ((ds.votemper.where(mask==1)[0,15:27] * ds.e3t.where(mask==1)
[0,15:27])).sum('deptht', skipna = True, min_count = 12) / (mesh.gdepw_0
[0,27] - mesh.gdepw_0[0,14])).mean().values
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    saline_i1 = ((ds.vosaline.where(mask==1)[0,0:15] * ds.e3t.where(mask==1)
    [0,0:15])).sum('deptht', skipna = True, min_count = 15) / mesh.
↳gdepw_0[0,15]).mean().values

    saline_i2 = ((ds.vosaline.where(mask==1)[0,15:27] * ds.e3t.where(mask==1)
    [0,15:27])).sum('deptht', skipna = True, min_count = 12) / (mesh.gdepw_0
    [0,27] - mesh.gdepw_0[0,14])).mean().values

    sil_i = ((ds_bio.silicon.where(mask==1)[0,0:27] * ds.e3t.where(mask==1)
    [0,0:27])).sum('deptht', skipna = True, min_count = 27) / mesh.
↳gdepw_0[0,27]).mean().values

    nitr_i = ((ds_bio.nitrate.where(mask==1)[0,0:27] * ds.e3t.where(mask==1)
    [0,0:27])).sum('deptht', skipna = True, min_count = 27) / mesh.
↳gdepw_0[0,27]).mean().values

    ammo_i = ((ds_bio.ammonium.where(mask==1)[0,0:27] * ds.e3t.where(mask==1)
    [0,0:27])).sum('deptht', skipna = True, min_count = 27) / mesh.
↳gdepw_0[0,27]).mean().values

    diat_i = ((ds_bio.diatoms.where(mask==1)[0,0:27] * ds.e3t.where(mask==1)
    [0,0:27])).sum('deptht', skipna = True, min_count = 27) / mesh.
↳gdepw_0[0,27]).mean().values

    flag_i = ((ds_bio.flagellates.where(mask==1)[0,0:27] * ds.e3t.where(mask==1)
    [0,0:27])).sum('deptht', skipna = True, min_count = 27) / mesh.
↳gdepw_0[0,27]).mean().values

    micro_i = ((ds_bio.microzooplankton.where(mask==1)[0,0:27] * ds.e3t.
↳where(mask==1)
    [0,0:27])).sum('deptht', skipna = True, min_count = 27) / mesh.
↳gdepw_0[0,27]).mean().values

    meso_i = ((ds_bio.mesozooplankton.where(mask==1)[0,0:27] * ds.e3t.
↳where(mask==1)
    [0,0:27])).sum('deptht', skipna = True, min_count = 27) / mesh.
↳gdepw_0[0,27]).mean().values

    return (date, temp_i1, temp_i2, saline_i1, saline_i2, sil_i, nitr_i,↳
↳ammo_i, diat_i, flag_i, micro_i, meso_i)

```

0.3 Plotting

```
[ ]: def plotting(variable,year_variable,title,y_label):

    fig, ax = plt.subplots()
    scatter= ax.scatter(dates_new,variable, marker='.', c=pd.
↳DatetimeIndex(dates_new).month)
    plt.ylabel(y_label)
    ax.legend(handles=scatter.legend_elements()[0],
↳labels=['February','March','April'])
    ax.plot(years2,year_variable,color='red',marker='*')
    fig.suptitle('Daily Mean ' + title + ' (15 Feb - 30 Apr)')
    fig.show()
```

0.4 Main Body

```
[ ]: dict_month = {'jan': '01',
                  'feb': '02',
                  'mar': '03',
                  'apr': '04',
                  'may': '05',
                  'jun': '06',
                  'jul': '07',
                  'aug': '08',
                  'sep': '09',
                  'oct': '10',
                  'nov': '11',
                  'dec': '12'}

path = os.listdir('/results2/SalishSea/nowcast-green.202111/')

folders = [x for x in path if (x[2:5]=='mar' or x[2:5]=='apr') or (x[2:
↳5]=='feb' and x[0:2] > '14')]
folders.sort()

# Open the mesh mask
mesh = xr.open_dataset('/home/sallen/MEOPAR/grid/mesh_mask202108.nc')
mask = mesh.tmask.to_numpy()

dates = np.array([])

temp_i1_mean = np.array([])
temp_i2_mean = np.array([])
saline_i1_mean = np.array([])
saline_i2_mean = np.array([])
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sil_i_mean = np.array([])
nitr_i_mean = np.array([])
ammo_i_mean = np.array([])

diat_i_mean = np.array([])
flag_i_mean = np.array([])

micro_i_mean = np.array([])
meso_i_mean = np.array([])

for i in folders:

    date, temp_i1, temp_i2, saline_i1, saline_i2, sil_i, nitr_i, ammo_i,
    ↪ diat_i, flag_i, micro_i, meso_i = datasets_preparation()

    dates = np.append(dates, date.date)

    temp_i1_mean = np.append(temp_i1_mean, temp_i1)
    temp_i2_mean = np.append(temp_i2_mean, temp_i2)
    saline_i1_mean = np.append(saline_i1_mean, saline_i1)
    saline_i2_mean = np.append(saline_i2_mean, saline_i2)

    sil_i_mean = np.append(sil_i_mean, sil_i)
    nitr_i_mean = np.append(nitr_i_mean, nitr_i)
    ammo_i_mean = np.append(ammo_i_mean, ammo_i)

    diat_i_mean = np.append(diat_i_mean, diat_i)
    flag_i_mean = np.append(flag_i_mean, flag_i)

    micro_i_mean = np.append(micro_i_mean, micro_i)
    meso_i_mean = np.append(meso_i_mean, meso_i)

    print(i)

# Sorting the time-series

dates_new= dates[np.argsort(dates)]

temp_i1_mean = temp_i1_mean[np.argsort(dates)]
temp_i2_mean = temp_i2_mean[np.argsort(dates)]
saline_i1_mean = saline_i1_mean[np.argsort(dates)]
saline_i2_mean = saline_i2_mean[np.argsort(dates)]

sil_i_mean = sil_i_mean[np.argsort(dates)]
nitr_i_mean = nitr_i_mean[np.argsort(dates)]
ammo_i_mean = ammo_i_mean[np.argsort(dates)]

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diat_mean = diat_i_mean[np.argsort(dates)]
flag_mean = flag_i_mean[np.argsort(dates)]

micro_i_mean = micro_i_mean[np.argsort(dates)]
meso_i_mean = meso_i_mean[np.argsort(dates)]

# Calculating the monthly means

years2 = []

temp_i1_year = []
temp_i2_year = []
saline_i1_year = []
saline_i2_year = []

sil_i_year = []
nitr_i_year = []
ammo_i_year = []

diat_i_year = []
flag_i_year = []

micro_i_year = []
meso_i_year = []

years = range(2007,2024)

for i in years:
    years2.append(datetime.datetime(i,4,15))

    temp_i1_year.append(temp_i1_mean[pd.DatetimeIndex(dates_new).year==i].
↪mean())
    temp_i2_year.append(temp_i2_mean[pd.DatetimeIndex(dates_new).year==i].
↪mean())
    saline_i1_year.append(saline_i1_mean[pd.DatetimeIndex(dates_new).year==i].
↪mean())
    saline_i2_year.append(saline_i2_mean[pd.DatetimeIndex(dates_new).year==i].
↪mean())

    sil_i_year.append(sil_i_mean[pd.DatetimeIndex(dates_new).year==i].mean())
    nitr_i_year.append(nitr_i_mean[pd.DatetimeIndex(dates_new).year==i].mean())
    ammo_i_year.append(ammo_i_mean[pd.DatetimeIndex(dates_new).year==i].mean())

    diat_i_year.append(diat_i_mean[pd.DatetimeIndex(dates_new).year==i].mean())
    flag_i_year.append(flag_i_mean[pd.DatetimeIndex(dates_new).year==i].mean())

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    micro_i_year.append(micro_i_mean[pd.DatetimeIndex(dates_new).year==i].
↪mean())
    meso_i_year.append(meso_i_mean[pd.DatetimeIndex(dates_new).year==i].mean())

# Plotting

plotting(temp_i1_mean, temp_i1_year, 'Conservative Temperature (0-15m)',
'Conservative Temperature [degree_C m-1]')
plotting(temp_i2_mean, temp_i2_year, 'Conservative Temperature (15-100m)',
'Conservative Temperature [degree_C m-1]')
plotting(saline_i1_mean, saline_i1_year, 'Reference Salinity (0-15m)',
'Reference Salinity [g kg-1 m-1]')
plotting(saline_i2_mean, saline_i2_year, 'Reference Salinity (15-100m)',
'Reference Salinity [g kg-1 m-1]')

plotting(sil_i_mean, sil_i_year, 'Silicon Concentration',
'Silicon Concentration [mmol m-2]')
plotting(nitr_i_mean, nitr_i_year, 'Nitrate Concentration',
'Nitrate Concentration [mmol m-2]')
plotting(ammo_i_mean, ammo_i_year, 'Ammonium Concentration',
'Ammonium Concentration [mmol m-2]')

plotting(diat_i_mean, diat_i_year, 'Diatom Concentration',
'Diatom Concentration [mmol m-2]')
plotting(flag_i_mean, flag_i_year, 'Flagellate Concentration',
'Flagellate Concentration [mmol m-2]')

plotting(micro_i_mean, micro_i_year, 'Microzooplankton Concentration',
'Microzooplankton Concentration [mmol m-2]')
plotting(meso_i_mean, meso_i_year, 'Meso zooplankton Concentration',
'Meso zooplankton Concentration [mmol m-2]')

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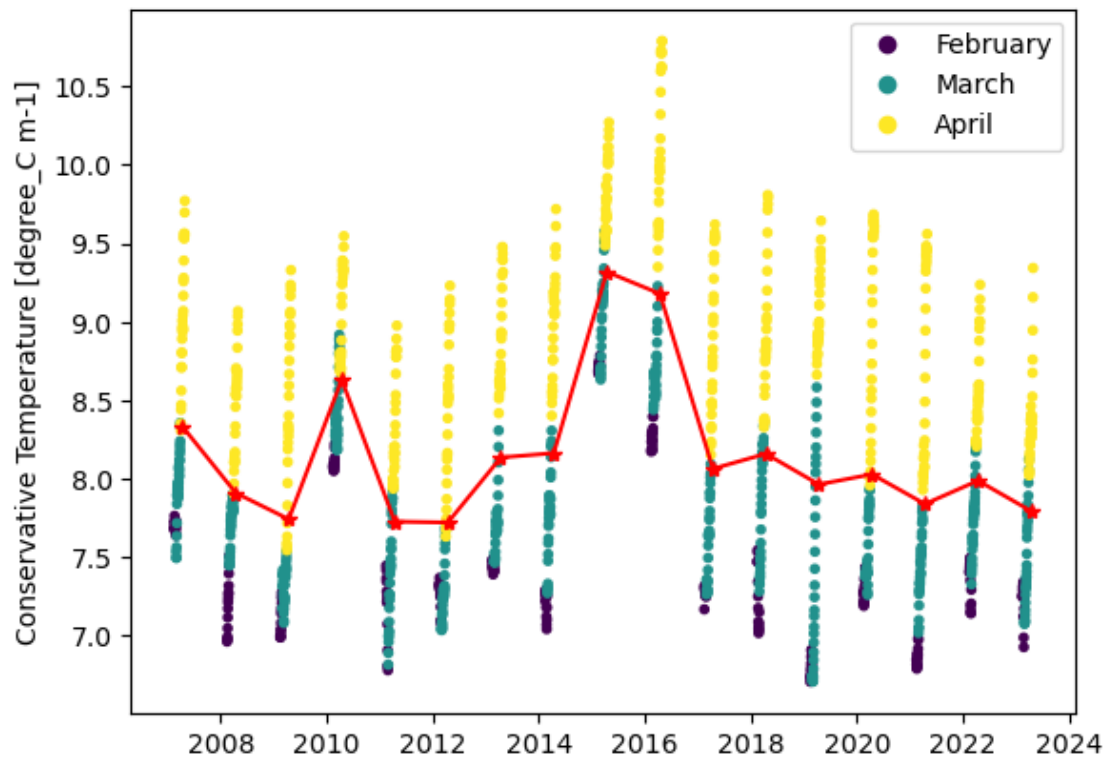
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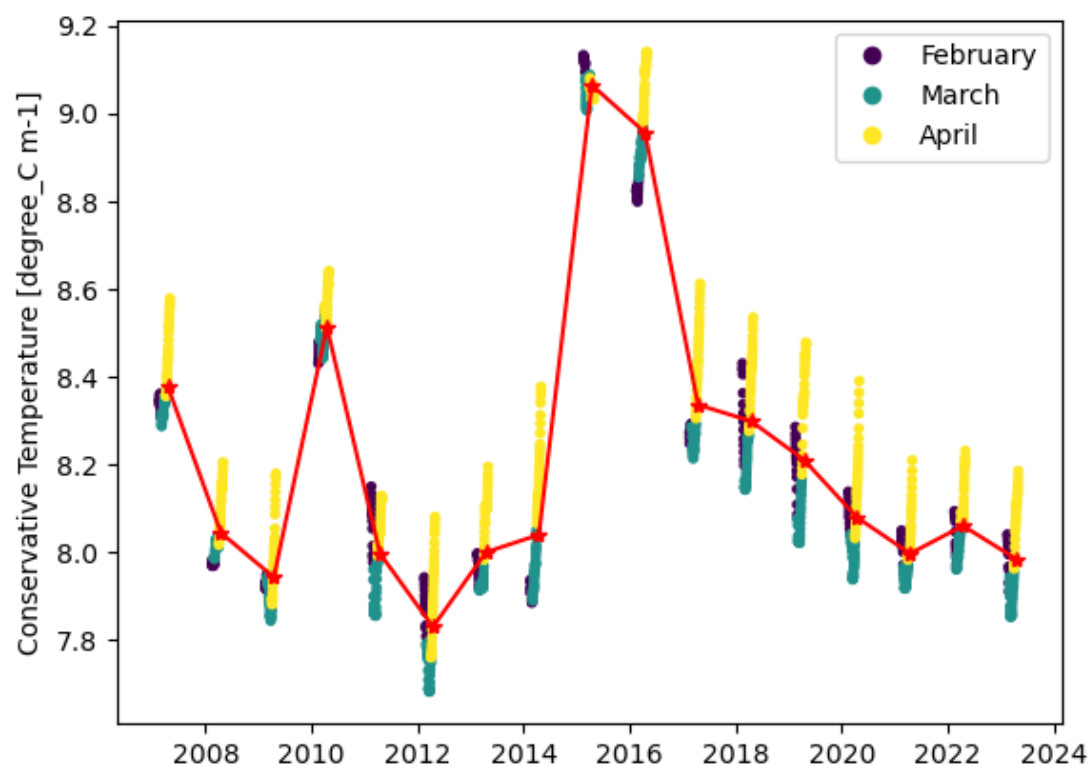
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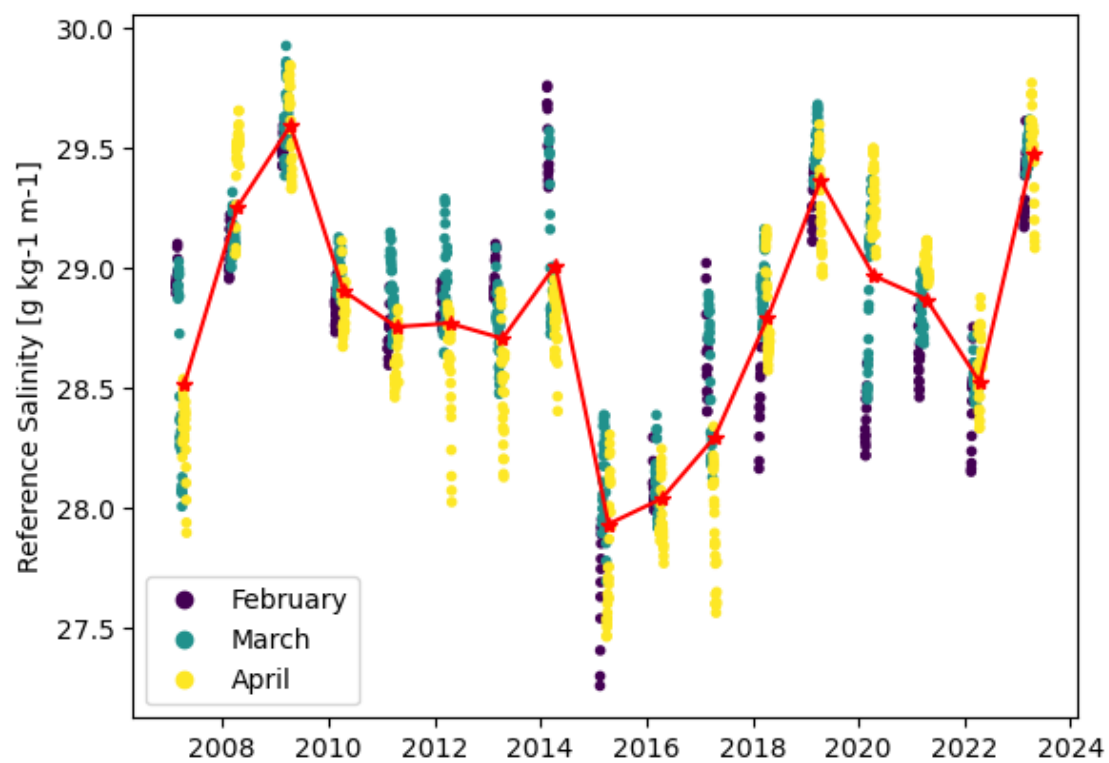
Daily Mean Conservative Temperature (0-15m) (15 Feb - 30 Apr)



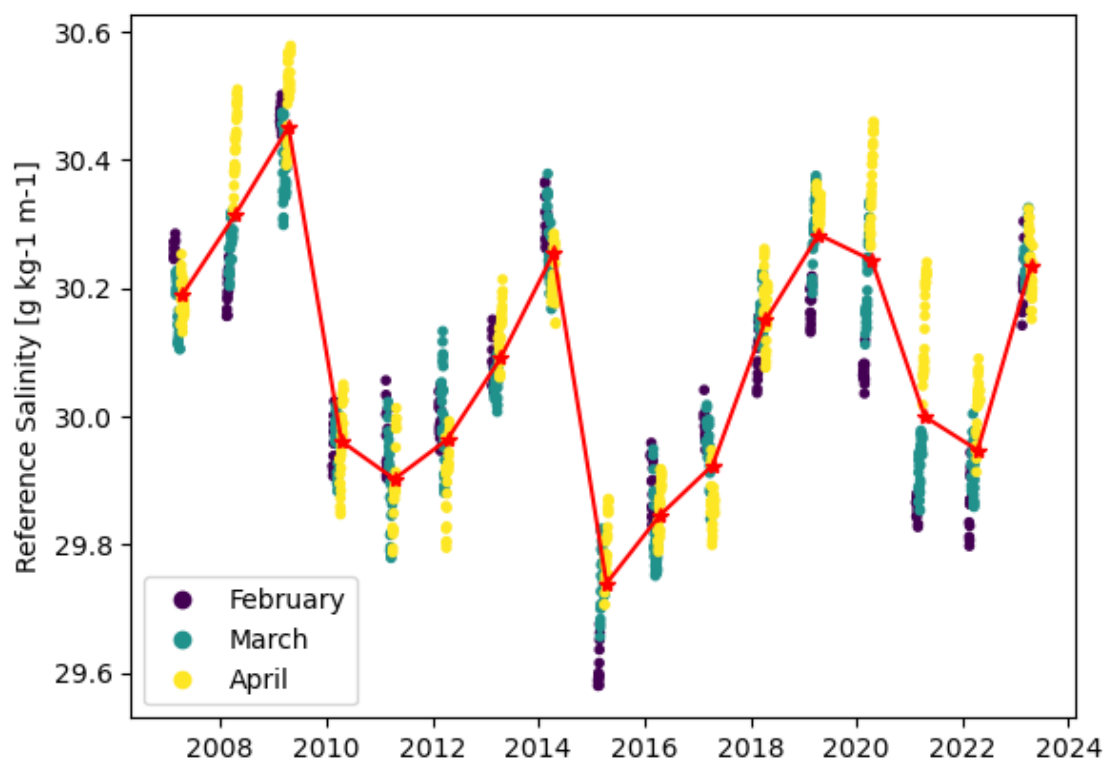
Daily Mean Conservative Temperature (15-100m) (15 Feb - 30 Apr)



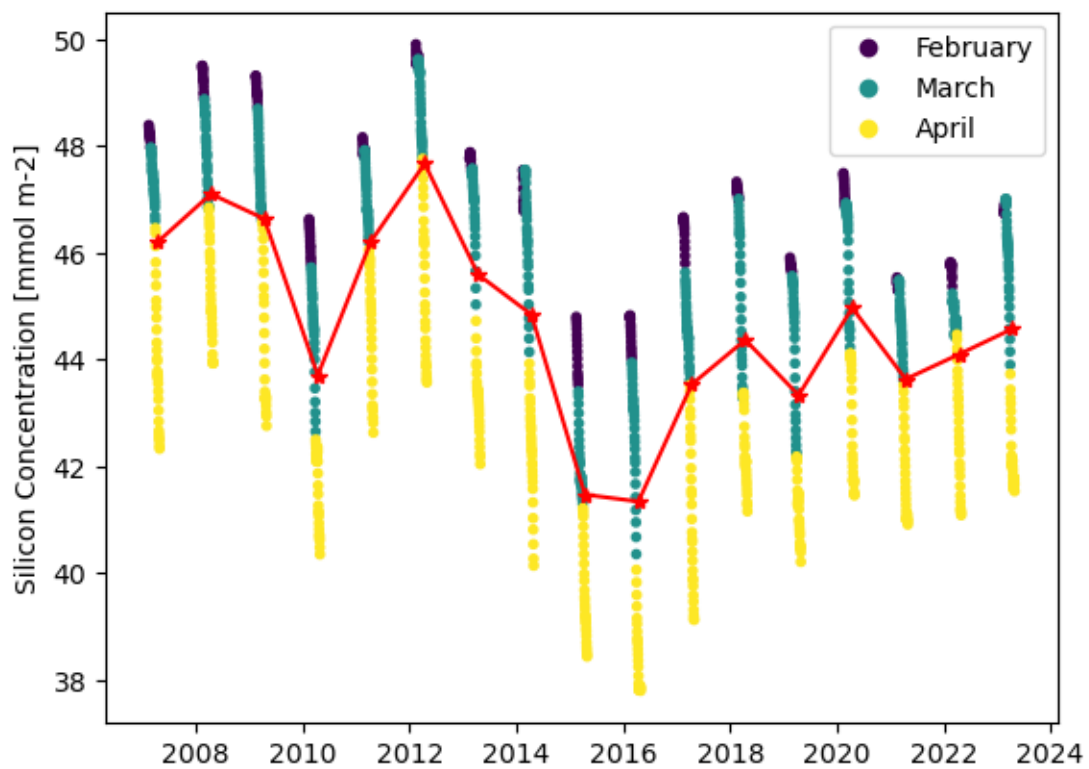
Daily Mean Reference Salinity (0-15m) (15 Feb - 30 Apr)



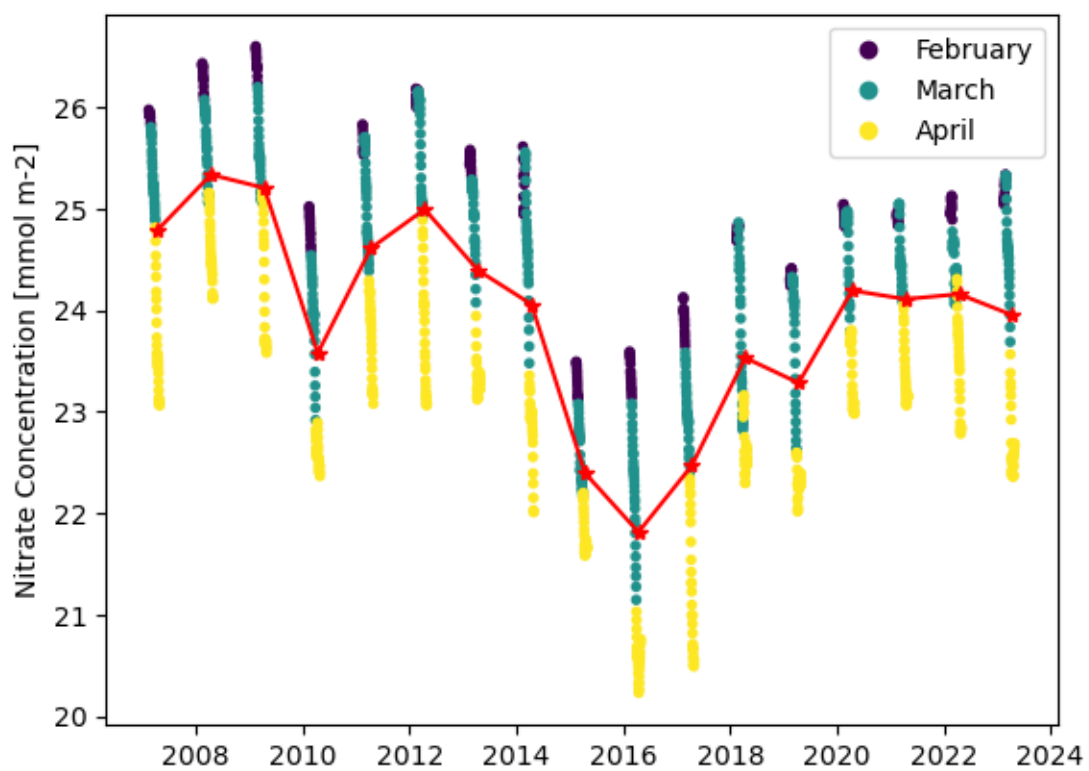
Daily Mean Reference Salinity (15-100m) (15 Feb - 30 Apr)



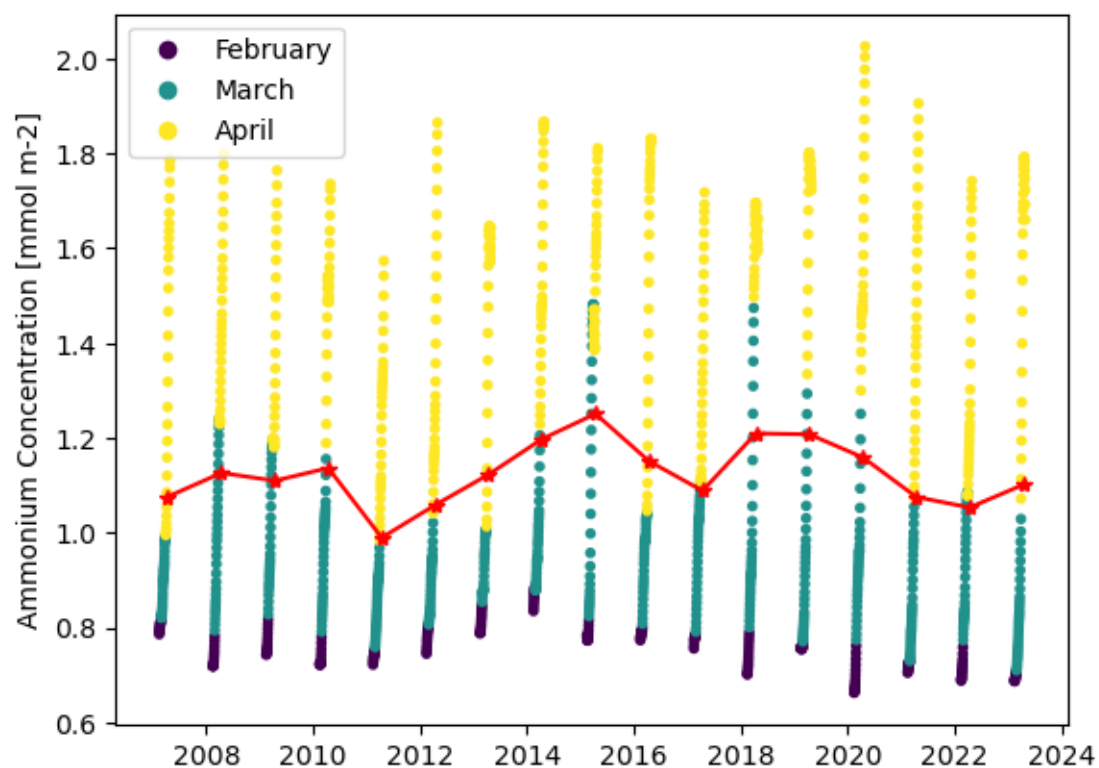
Daily Mean Silicon Concentration (15 Feb - 30 Apr)



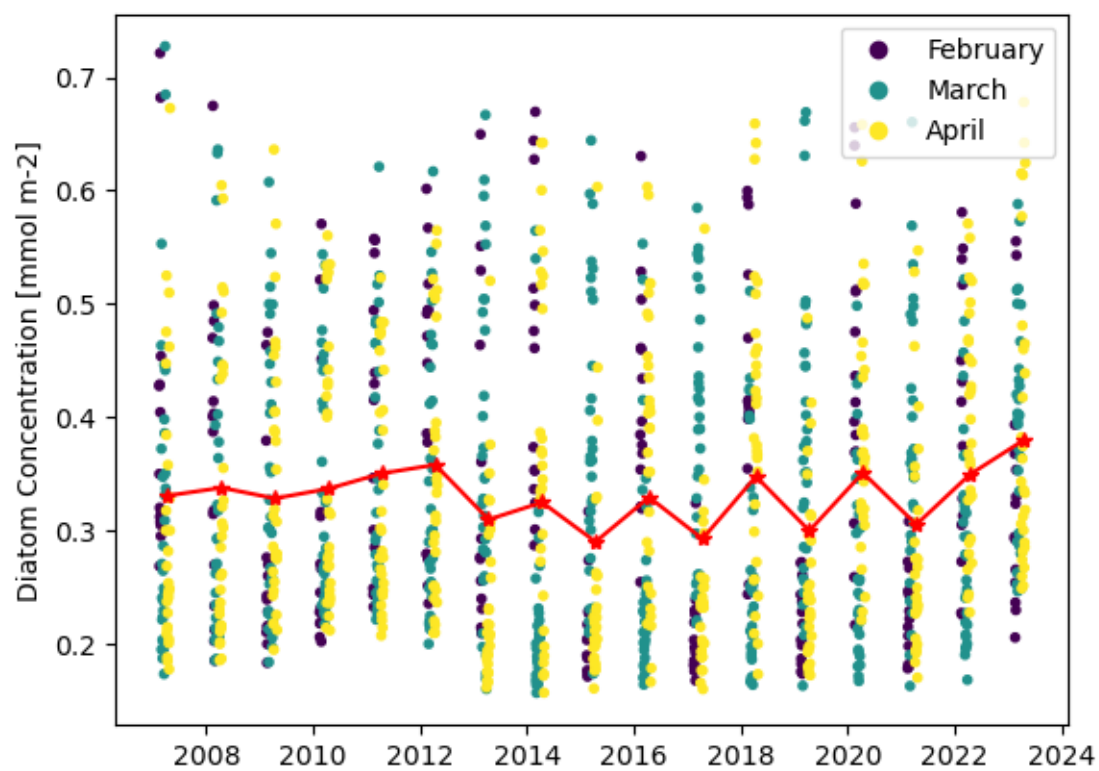
Daily Mean Nitrate Concentration (15 Feb - 30 Apr)



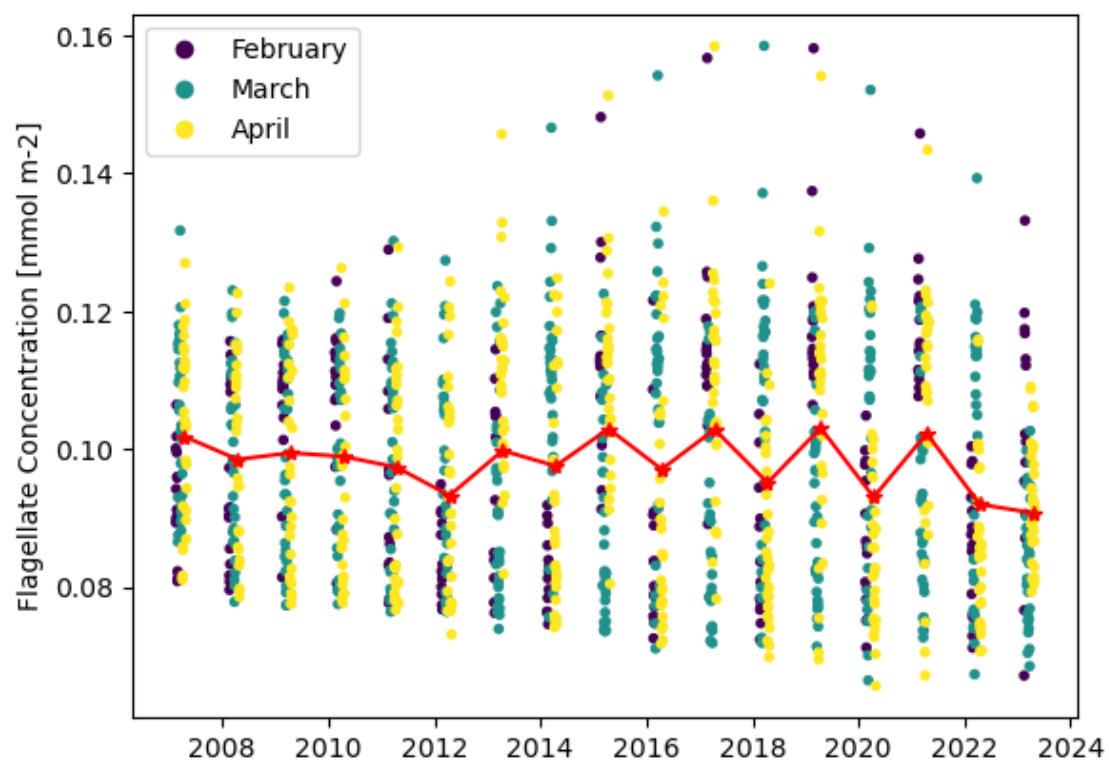
Daily Mean Ammonium Concentration (15 Feb - 30 Apr)



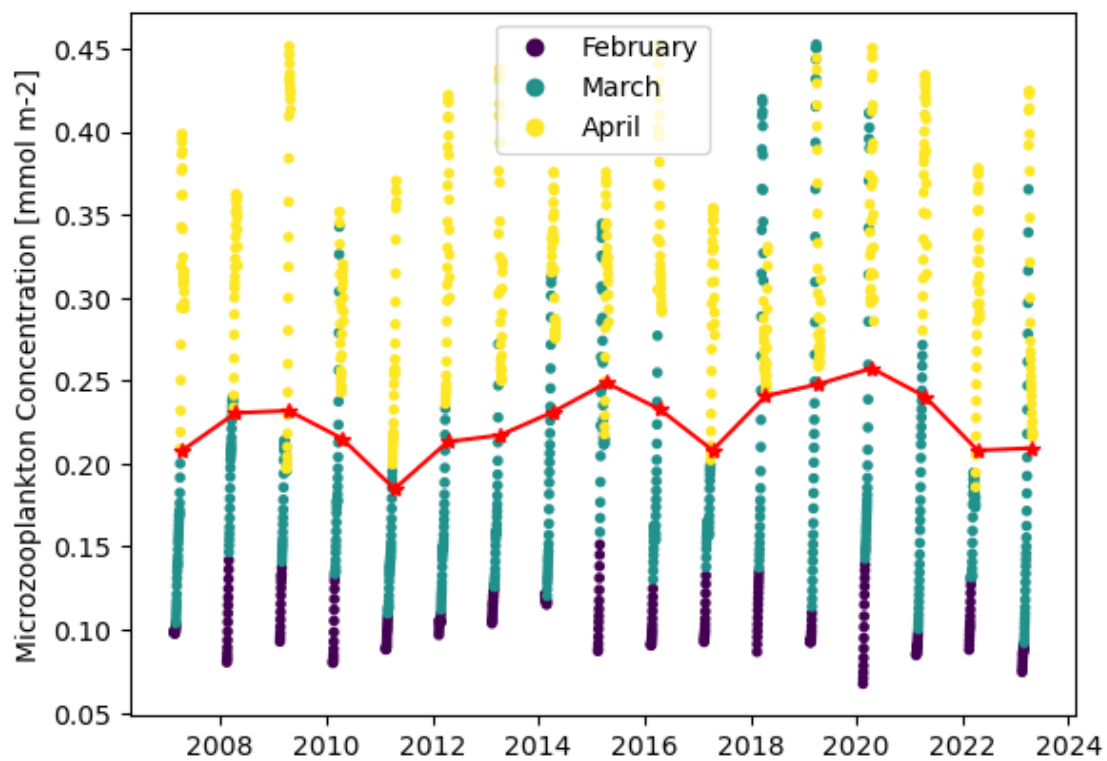
Daily Mean Diatom Concentration (15 Feb - 30 Apr)



Daily Mean Flagellate Concentration (15 Feb - 30 Apr)



Daily Mean Microzooplankton Concentration (15 Feb - 30 Apr)



Daily Mean Mesozooplankton Concentration (15 Feb - 30 Apr)

