

Glacial Runoff Rivers and the Climatology of Qeqertarsuaq

-Or-

The Muddy River Project

Fiamma & An's Project Group
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A wide-angle photograph of a rugged landscape. In the foreground, a river flows from the bottom right towards the center, cascading over rocks and creating a waterfall. The banks of the river are covered in green moss and low-lying vegetation. In the middle ground, the river continues through a narrow, rocky gorge. The background features a massive, layered mountain range with patches of snow on its peaks. The sky is clear and blue.

River Monitoring Project



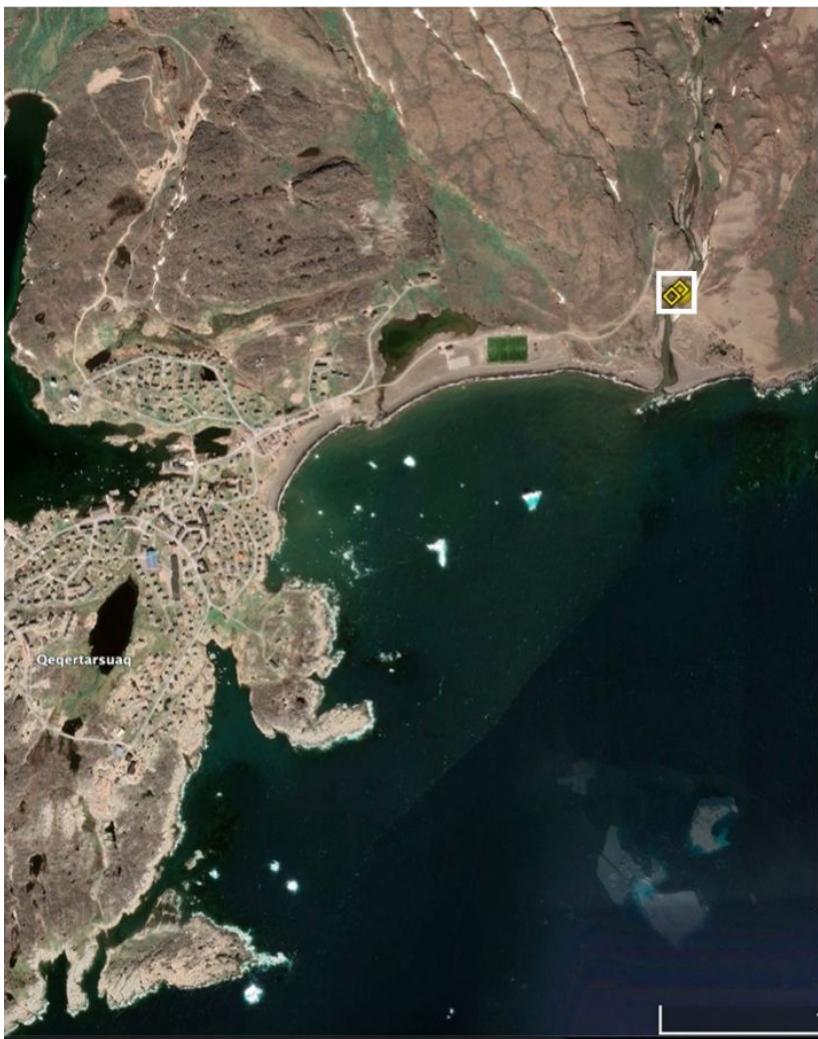




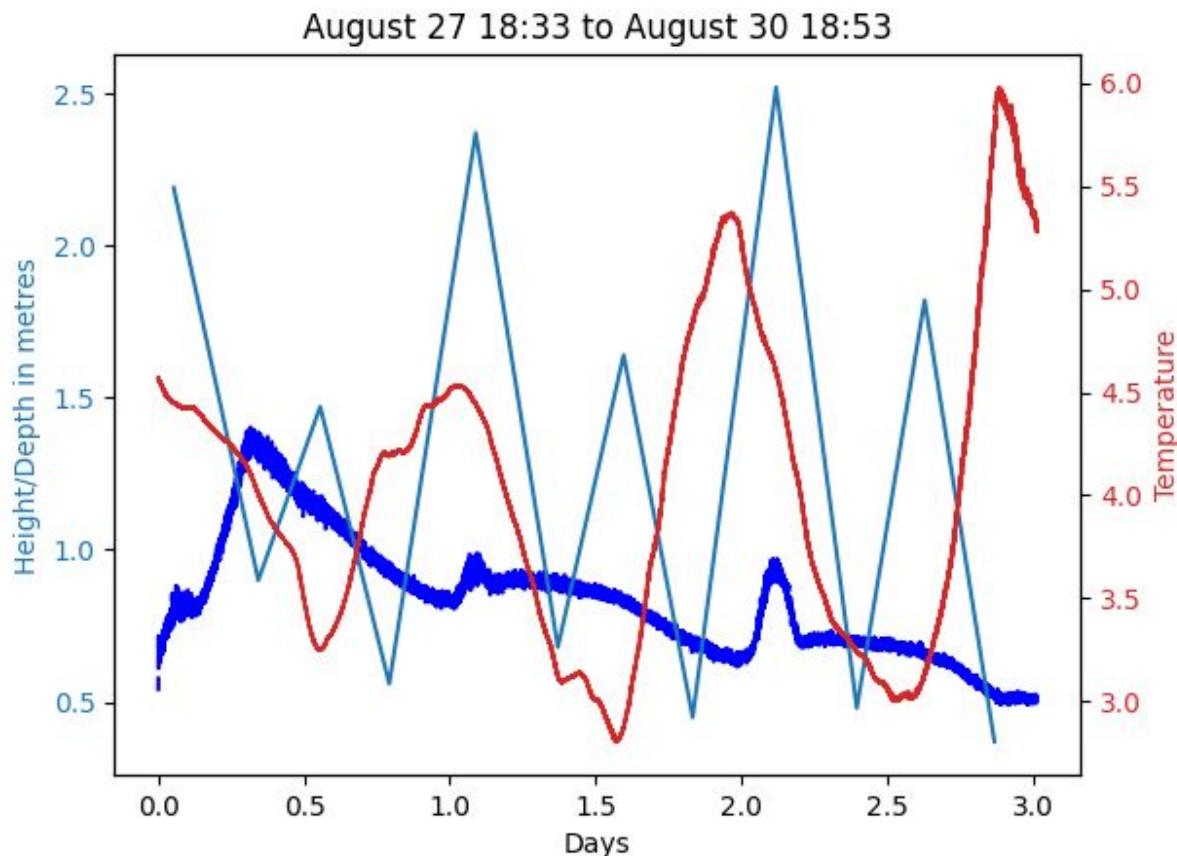








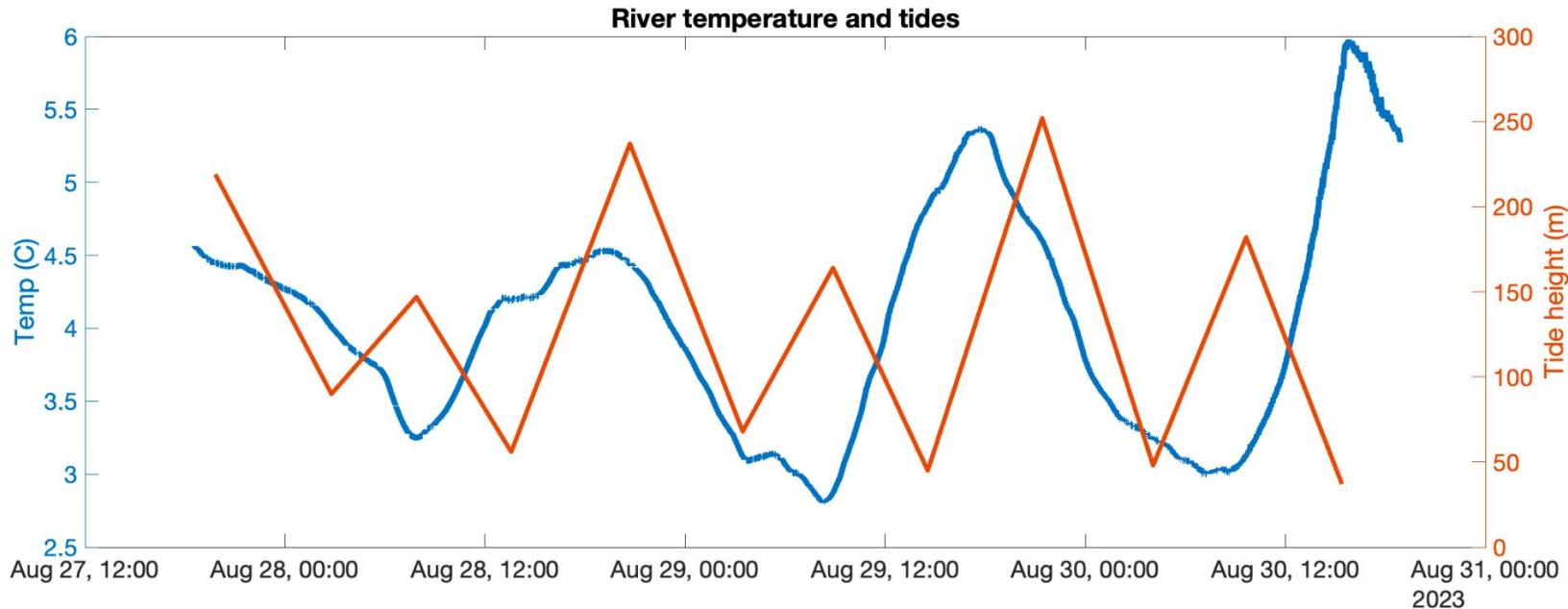
Temperature, Tide, and Depth



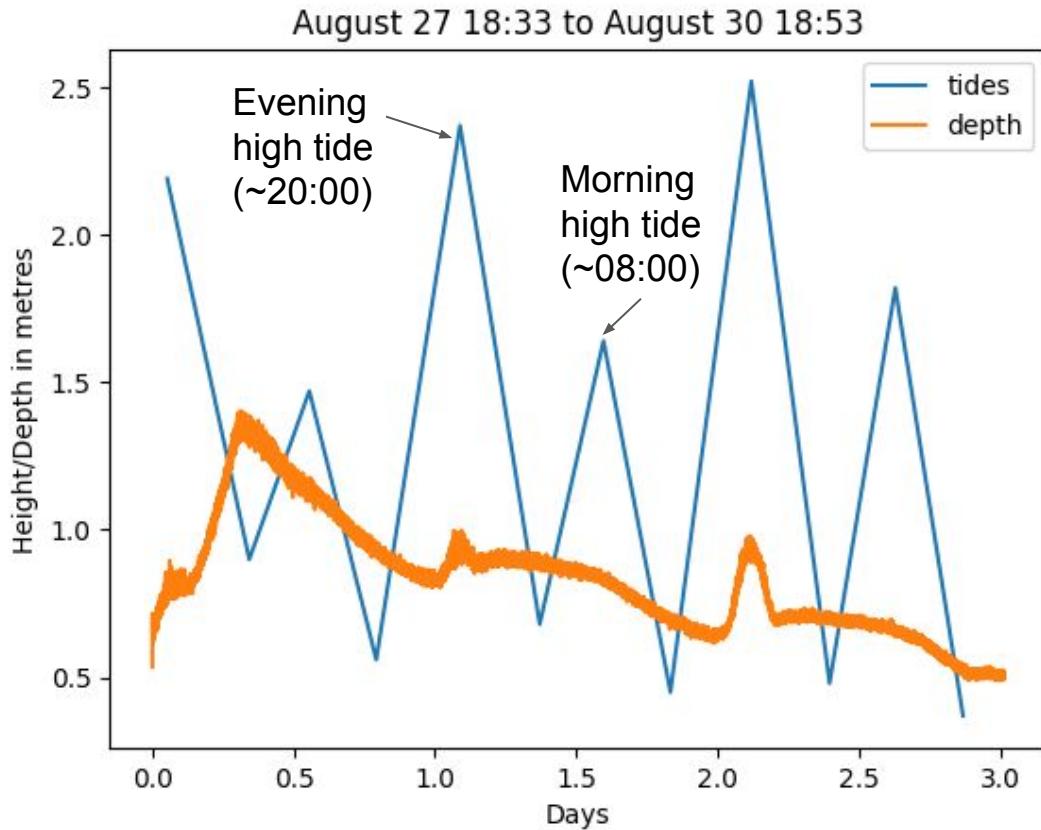
Temperature vs Tide

Questions for the audience:

- Do you think the peak temperatures are due to tides or solar heating looking at this data?
- When we put the sensor in there had been a lot of rain but then we had some cold, dry days. Do you think you can see this information in the temperature data?



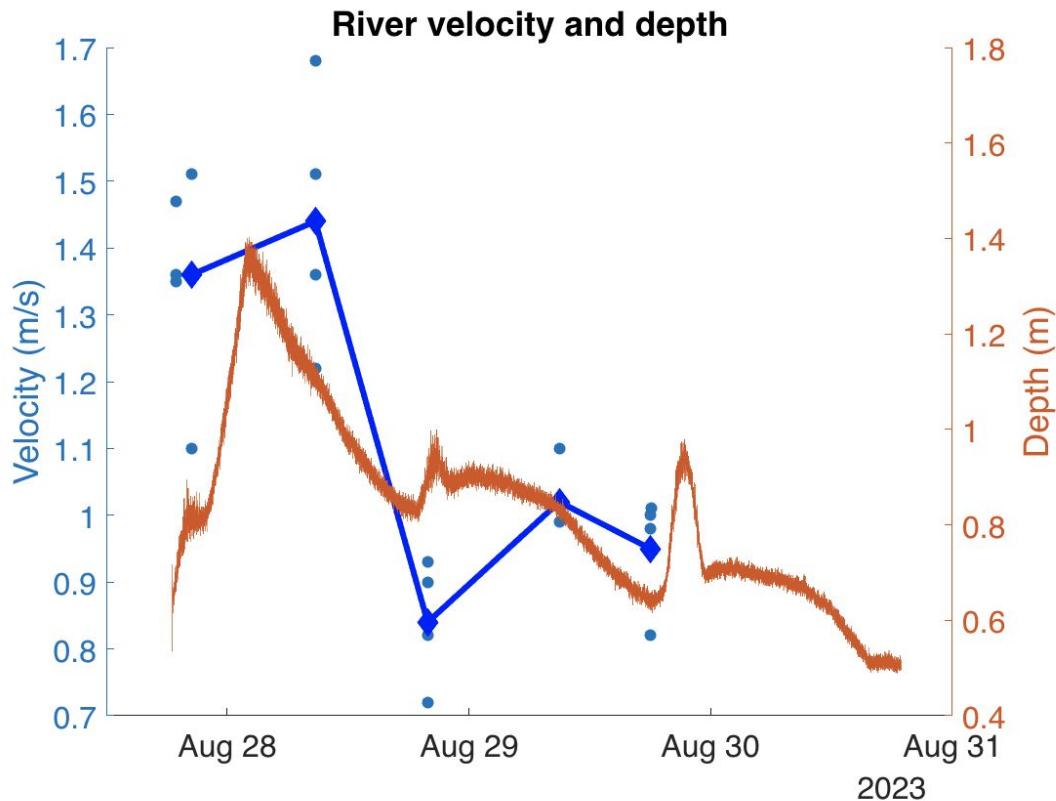
Depth vs tide comparison



Questions for the audience:

- There is an anomaly in the depth/pressure data every day at 8pm. This seems to correlate with a peak in the evening tide. Do you think this is a valid conclusion?
- Why is the amplitude of the morning tide smaller than the amplitude of the evening tide?
- Why don't we see any strong tidal signal in the data with the morning high tide?
- Why does the time period of the peak in depth of the anomaly not correspond with the time period of the tide?
- When we put the sensor in it had rained all day. Do you believe this data that the river was this high?

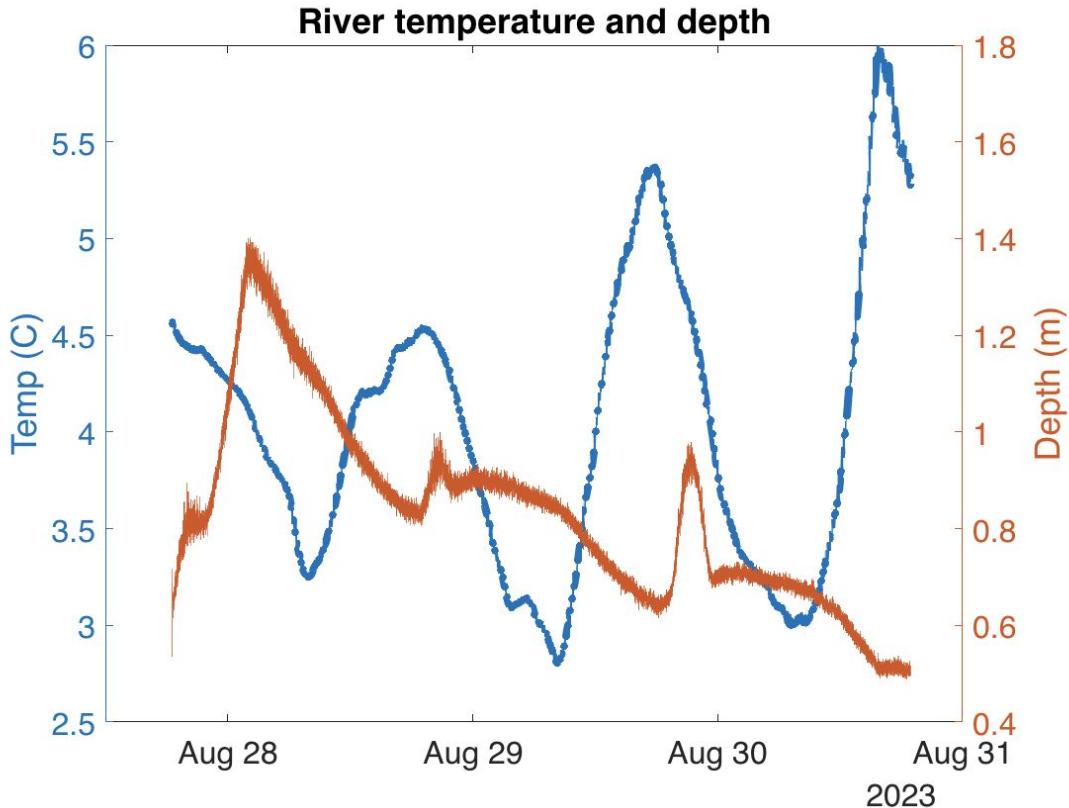
Depth vs Velocity



Notes:

- Velocity and depth measurements were not taken in the same place
- The blue diamonds are the average velocity for each set of measurements

Temperature vs Depth



Notes:

- Generally there is an increase in max temperature and decrease in depth through time



CTD Casts from Porsild

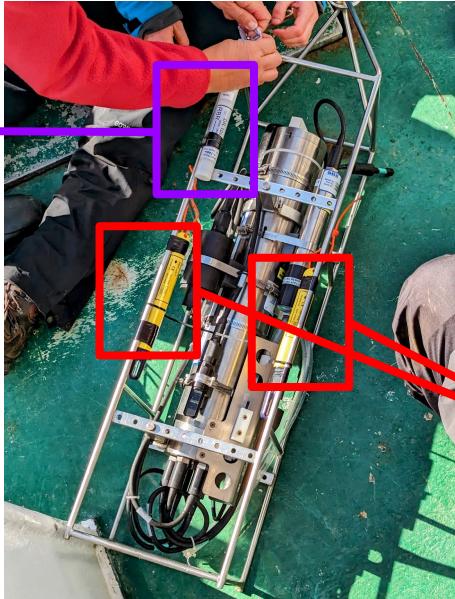
Some definitions

- What do we measure?
 - In-situ Temperature - More than potential temperature due to compression
 - In-situ Density - More than potential density (high temperature beats more pressure?)
 - Conductivity - Measure by passing a current through saline water
- Diagnostic fields we get from CTD
 - Practical Salinity - Function of temperature, pressure, and conductivity
- What's the reference fields?
 - Potential Temperature - Temperature if adiabatically brought to a reference pressure
 - Potential Density - Density if adiabatically brought to a reference pressure
 - Absolute Salinity - Correction to practical salinity to account for spatial variability in salt comp.
- Corrections to follow second law of thermodynamics (make no practical diff)
 - Conservative Temperature - Corrected potential temperature to make the entropy stuff work

Equipment

CTD1

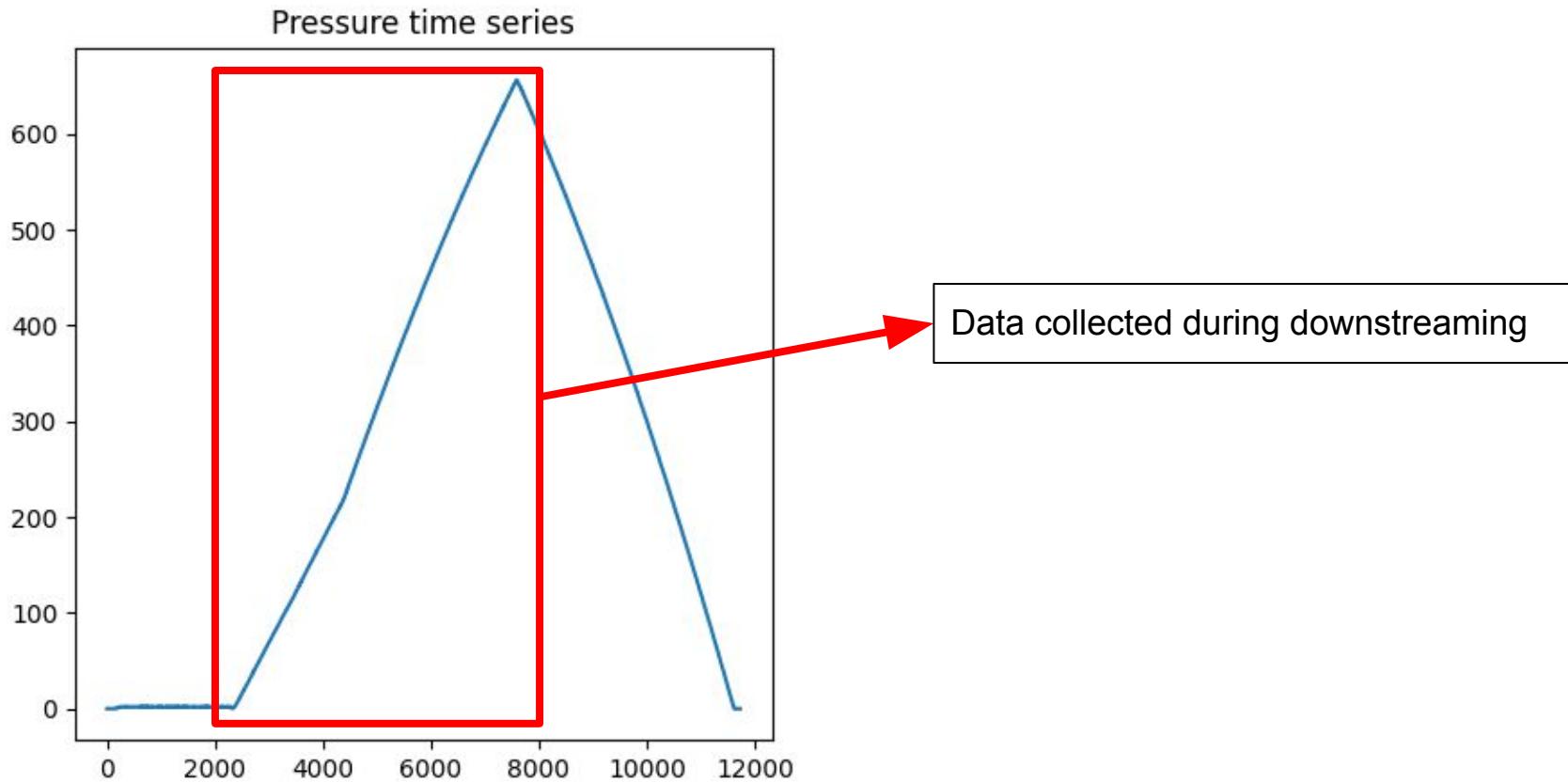
CTD2



RBF Temperature sensors x2

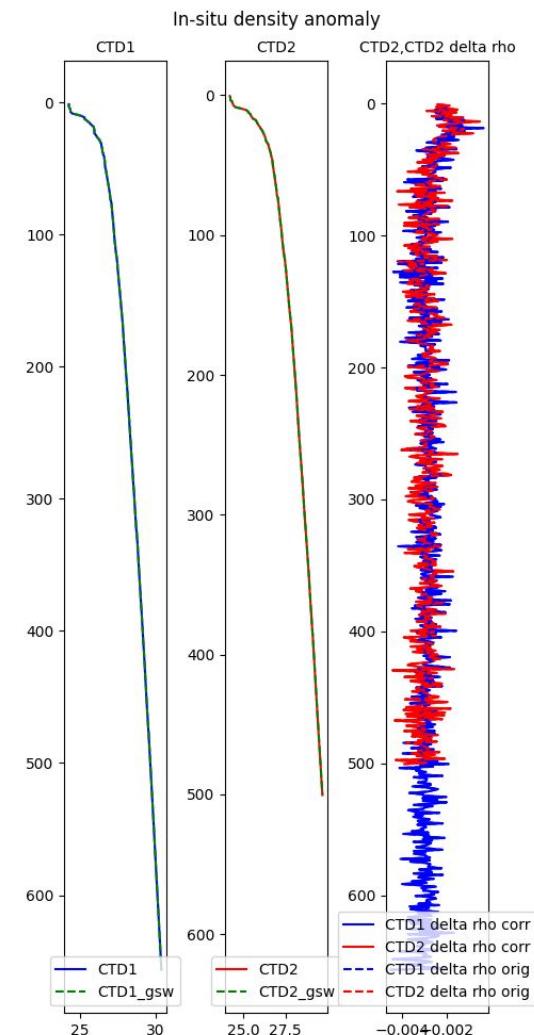
RBF Depth sensors x1

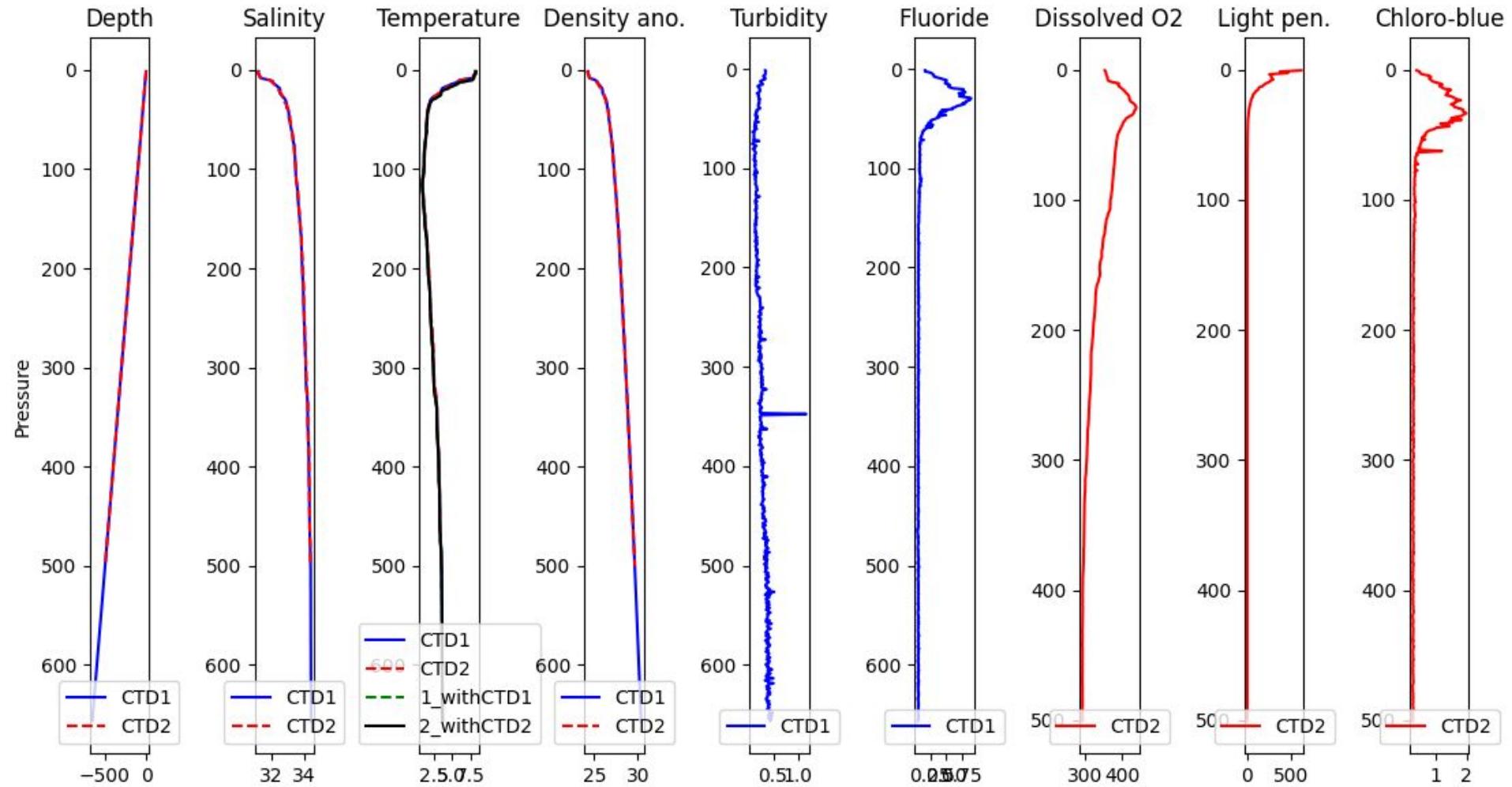
What part of data is actually used?



Sanity Check

- Steps -
 - Calculate absolute salinity from in-situ salinity
 - Calculate density anomaly from equation of state using absolute salinity, in-situ temperature and pressure
 - Plot calculated density anomaly against measured density anomaly (which is a diagnostic quantity given by CTD)
 - Errors should have a trend similar to white noise
- Actually helped find bugs in the code!



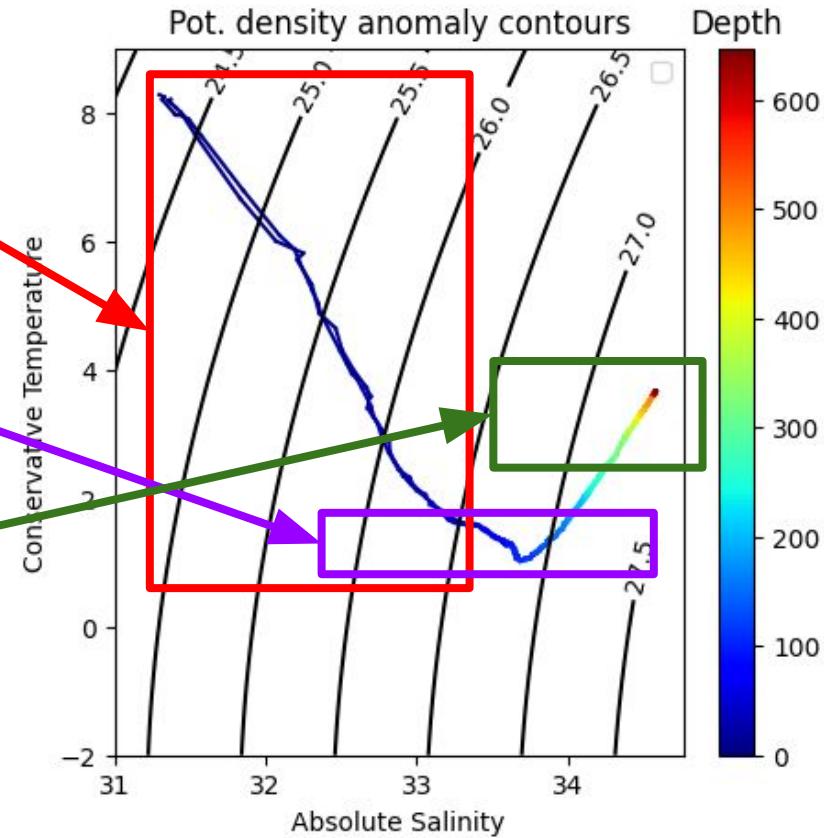


T-S Plot for the CTDs

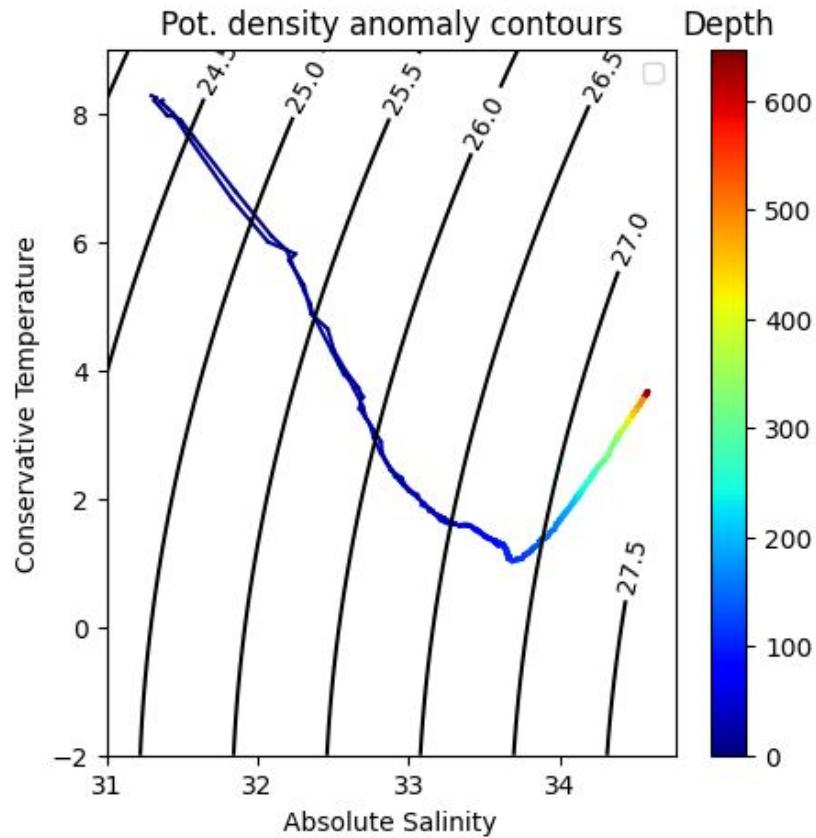
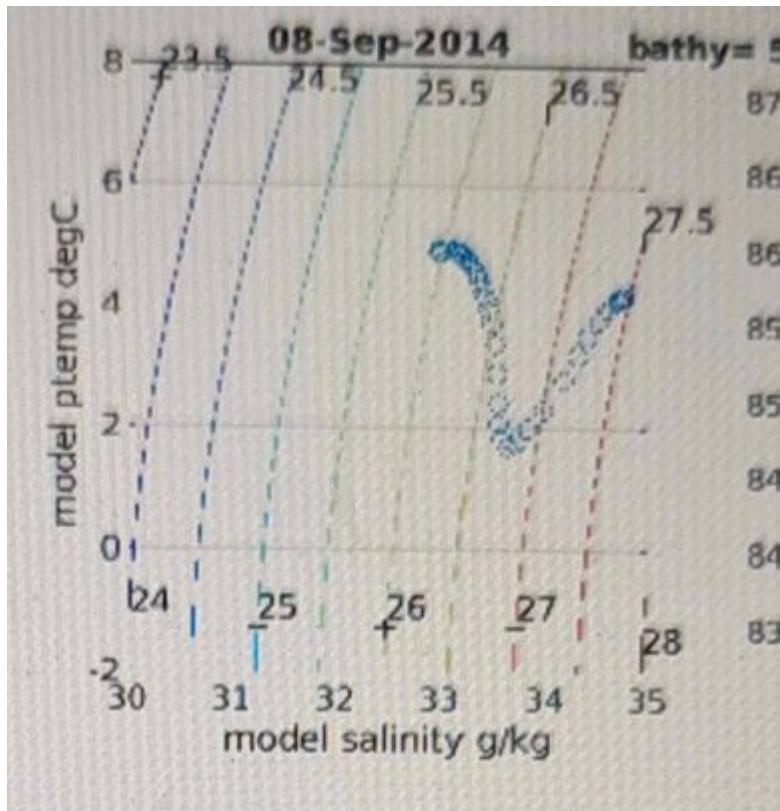
Mixed layer at very top (warmed by solar)

Fresh, cold polar waters at the top

Saline, warm Atlantic water at depth



ASTE high-res vs CTDs

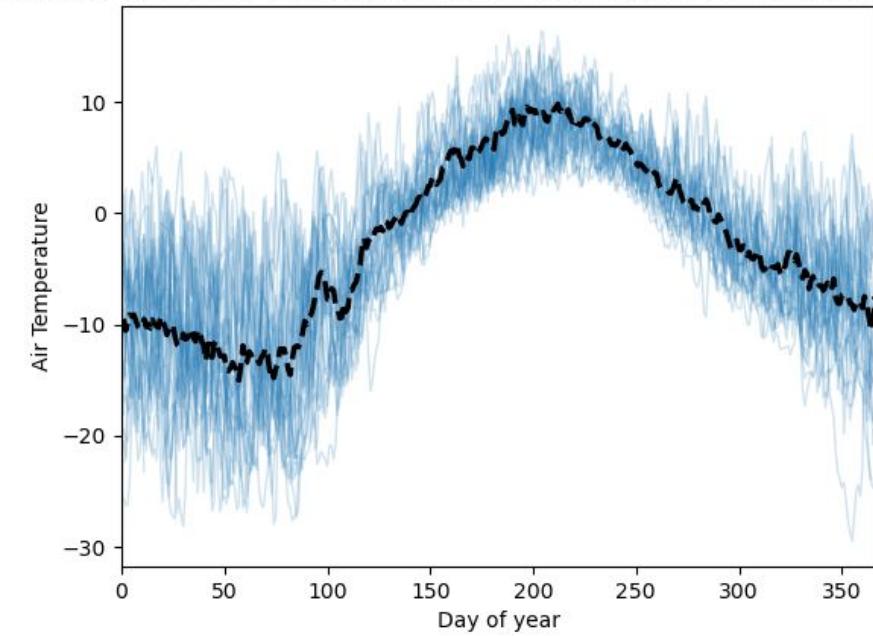


Learnings from the Porsild data

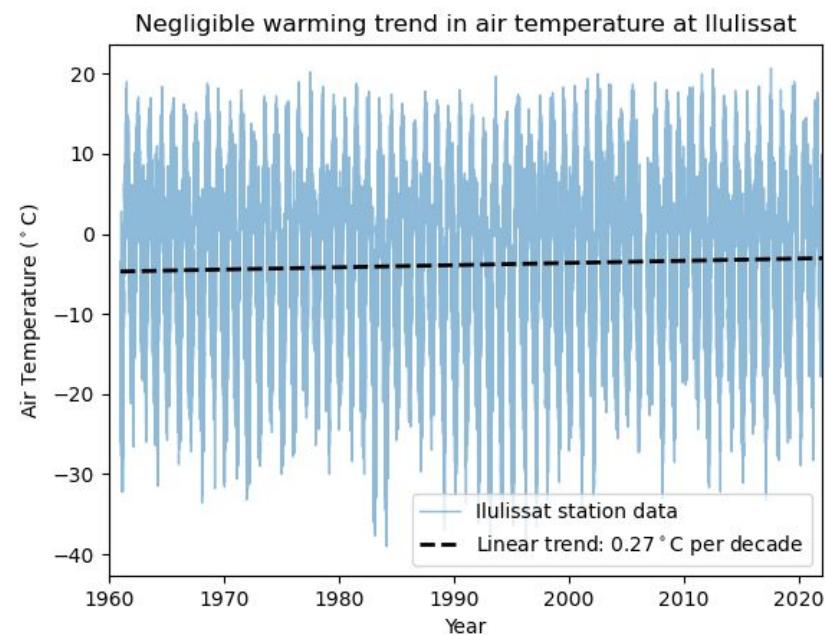
- Important to understand which temperature, density, salinity you are using
- Useful to validate equation of state and model data against each other (especially to check pressure offsets at surface!)
- T-S plots are a really unique and useful tool to have in your toolbox
 - Helpful way to think about T-S plots - depth does not vary linearly along the line, depth and density increase from left to right
- It is not easy to automate the process of cleaning data, mostly relies on manual inspection for each data sample
- A state estimate that leverages data assimilation does quite well

Climatology of Qeqertarsuaq and Ilulissat

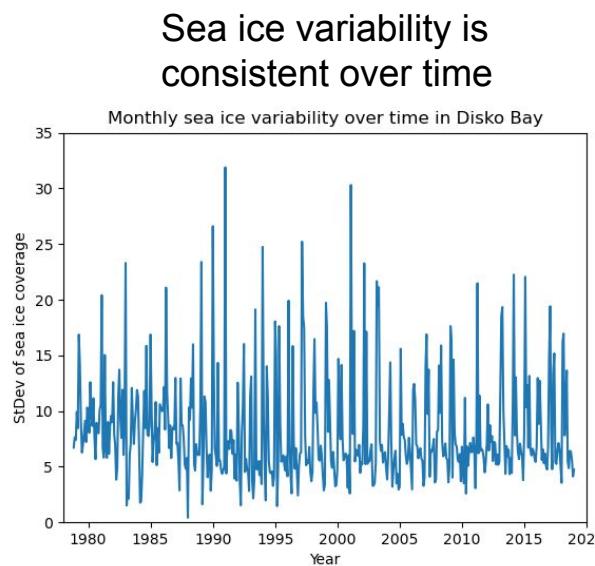
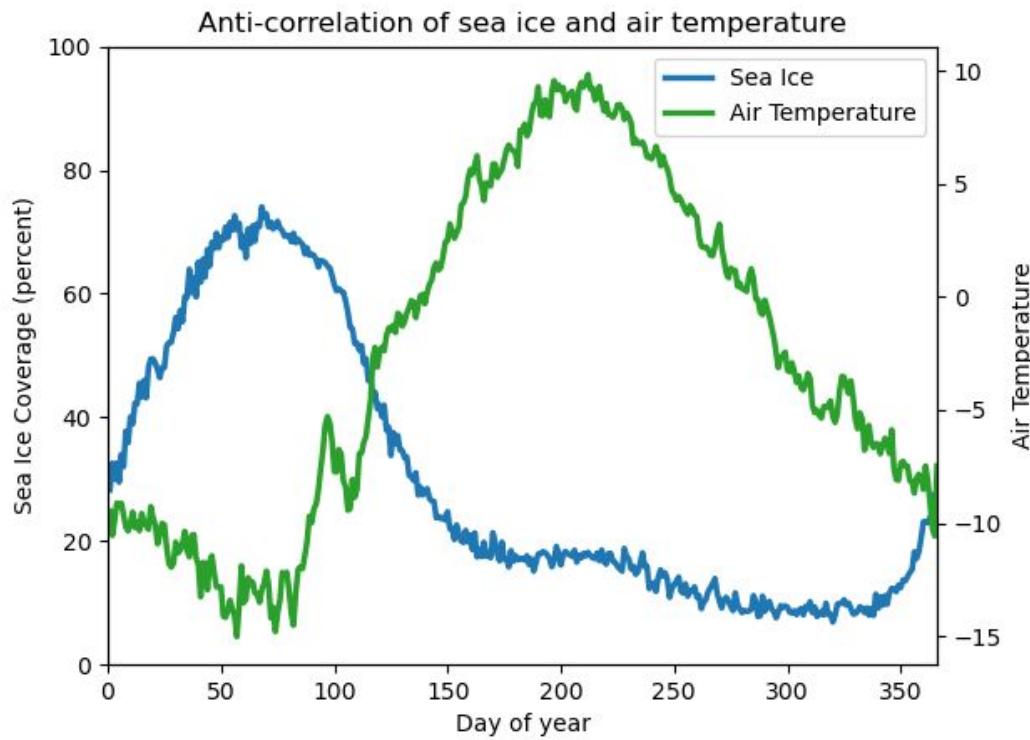
Seasonal Cycle of Air Temperature at Qeqertarsuaq, 1962-1980 and 2010-20



Air temperature rises abruptly after minimum in late March; related to sea ice retreat?

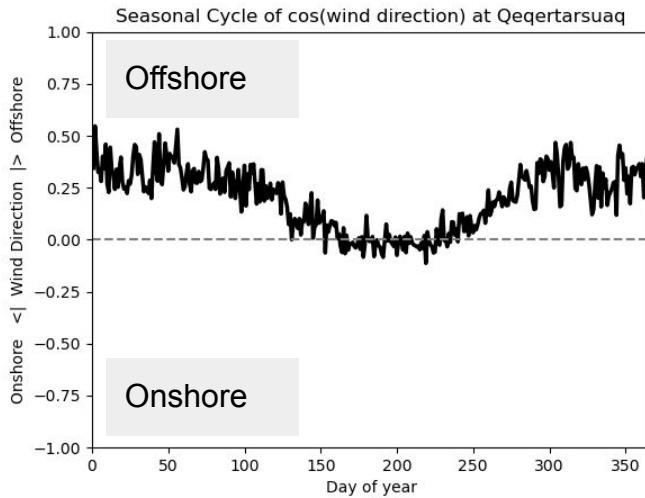
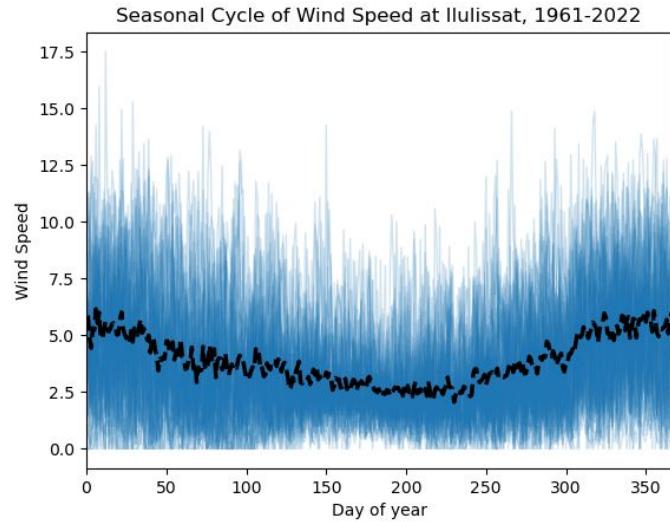
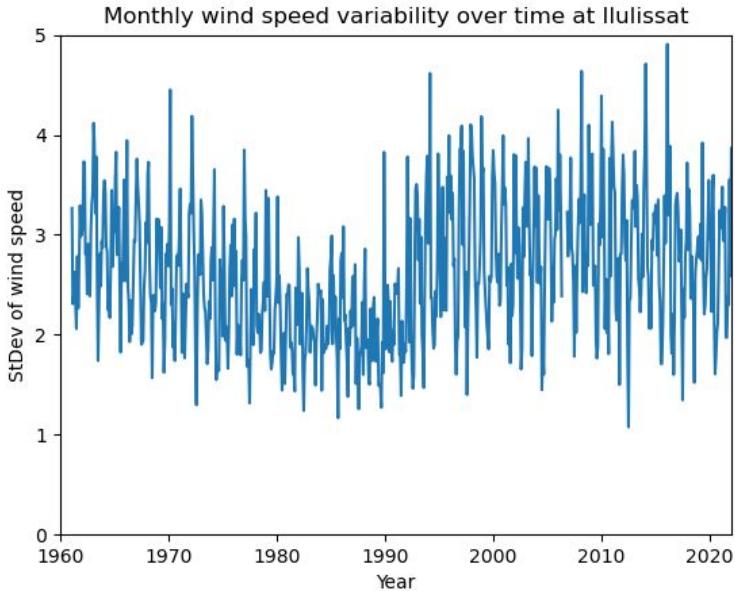


Ilulissat doesn't seem to show Arctic Amplification signal



Wind is strongest in winter (top right) and generally blows offshore at Qeqertarsuaq (bottom right)

Reduced wind speed variability in the '80s; why?



Sea Ice variability
&
Correlations with River Discharge
(geobasis)



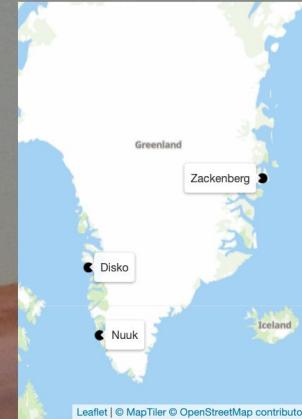
DATABASE

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The Greenland Ecosystem Monitoring (GEM) Database

Greenland Ecosystem Monitoring is an integrated monitoring and long-term research programme on ecosystems and climate change effects and feedbacks in the Arctic. The data collected by the participating institutions is updated yearly and made available on this website - as open data for everyone to access.

Try using the search box below (search for instance for ecosystem elements like temperature, soil, flux or for sites - Zackenberg, Nuuk, Disko). You can also explore the stations and data collected via the map.



DATA-TABLES

Page, sort, search, filter and export the data to Excel

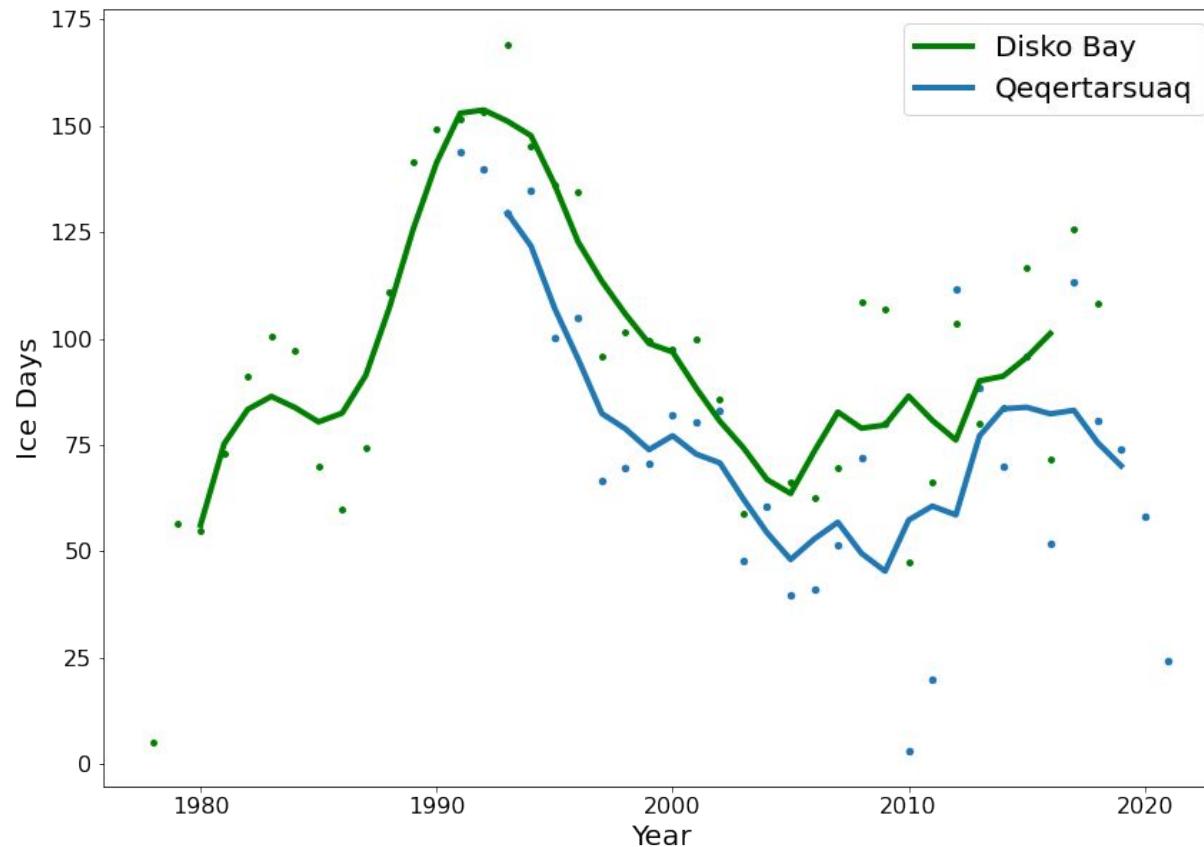
[More +](#)

LINE-CHARTS

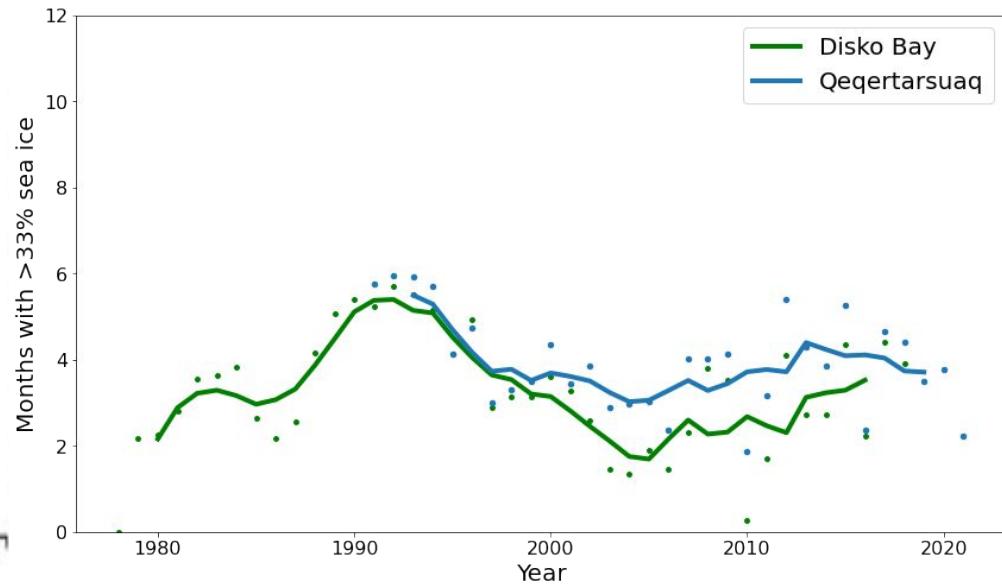
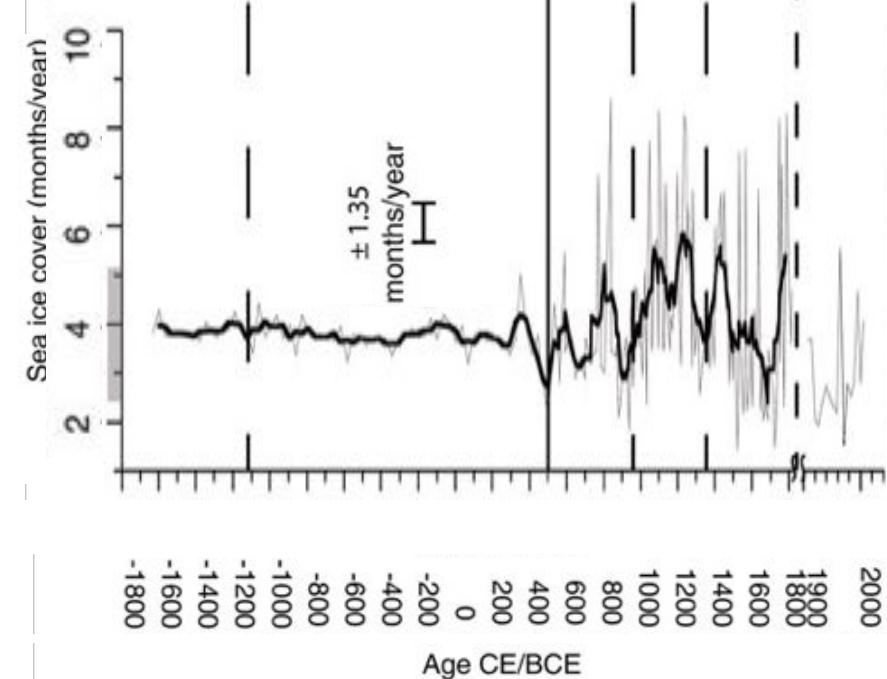
Data displayed in dynamic line-charts. View filtered data sets or see the progression over years

[More +](#)

Sea ice variability in Disko Bay

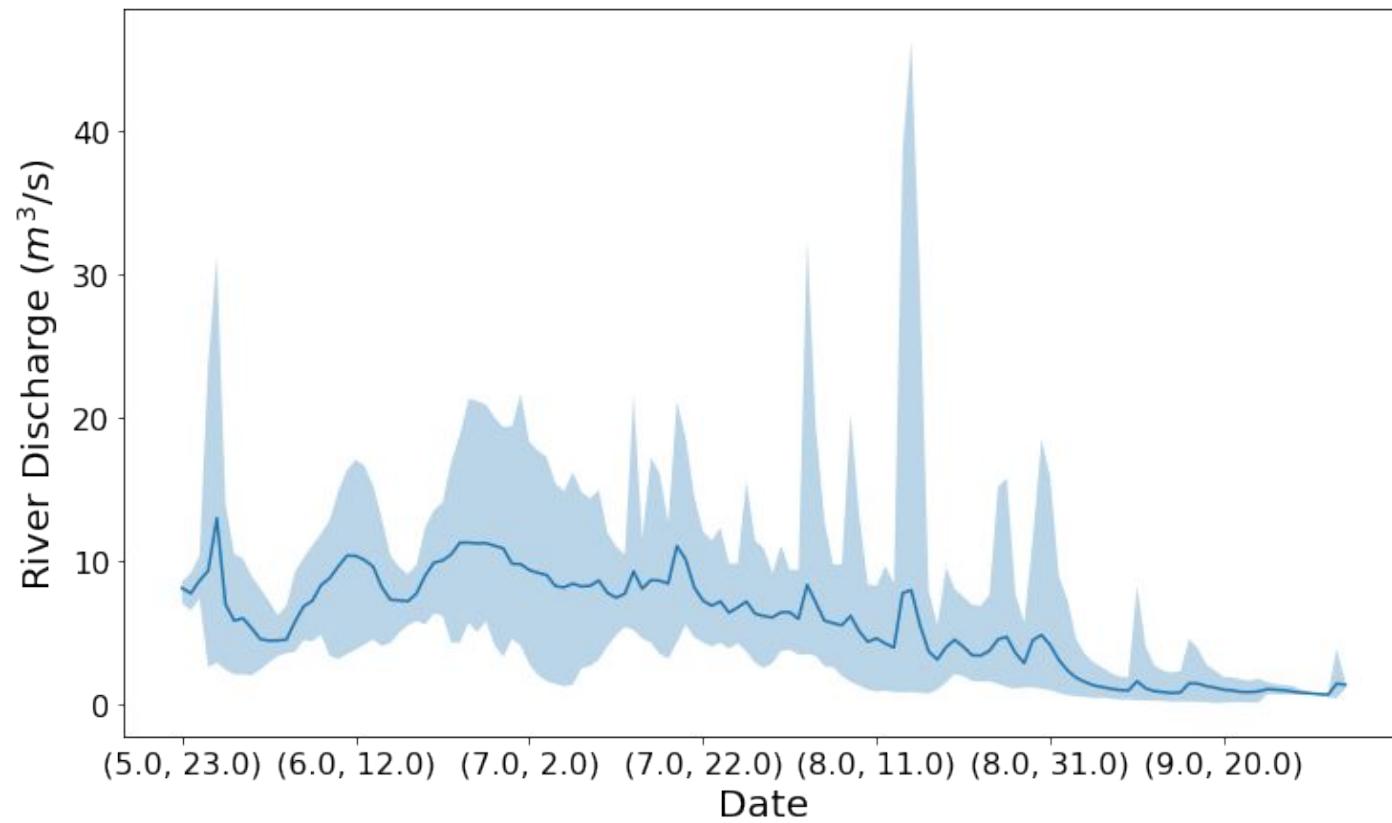


Sea ice variability in Disko Bay

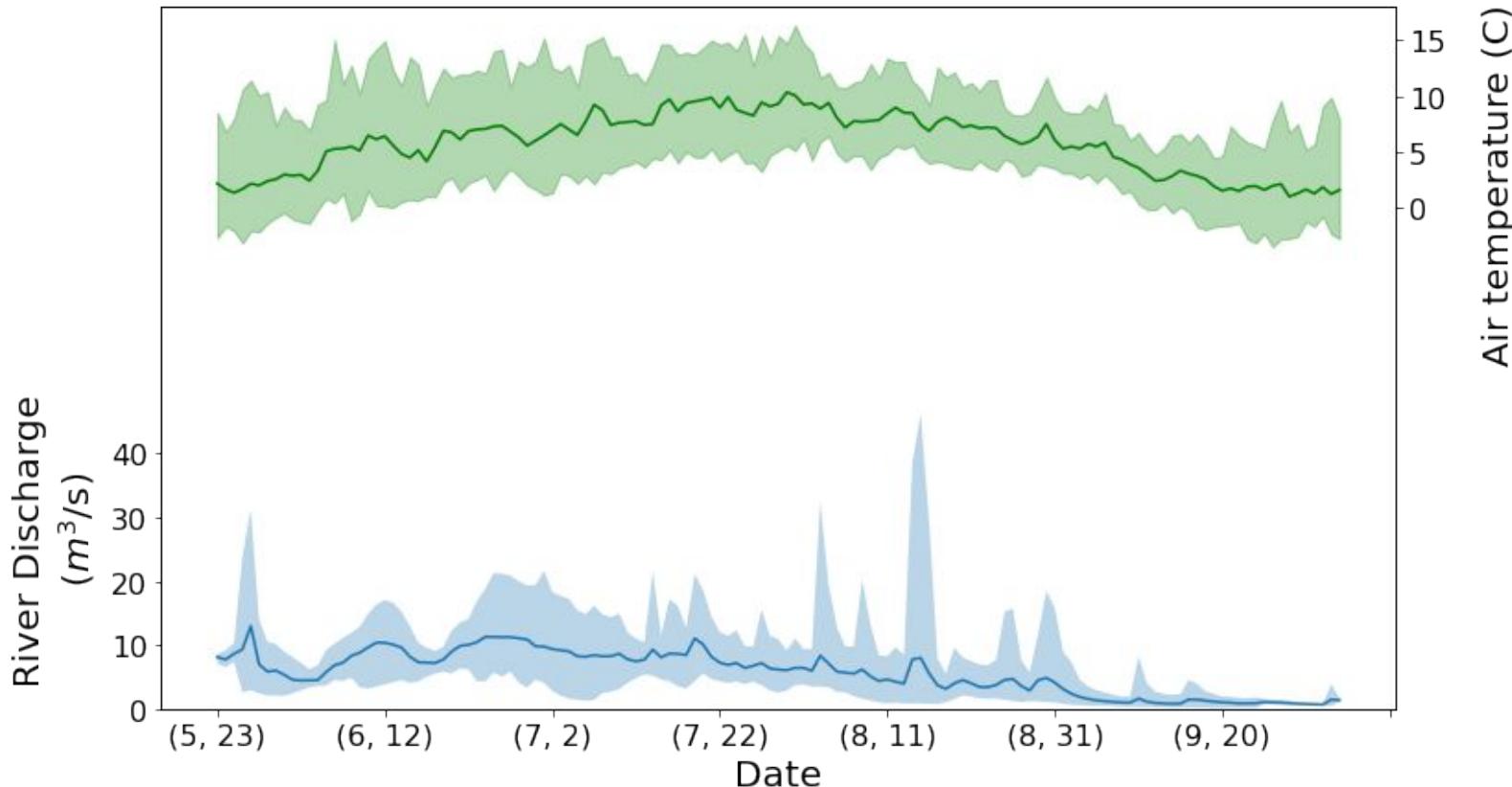


Allan et al. 2018

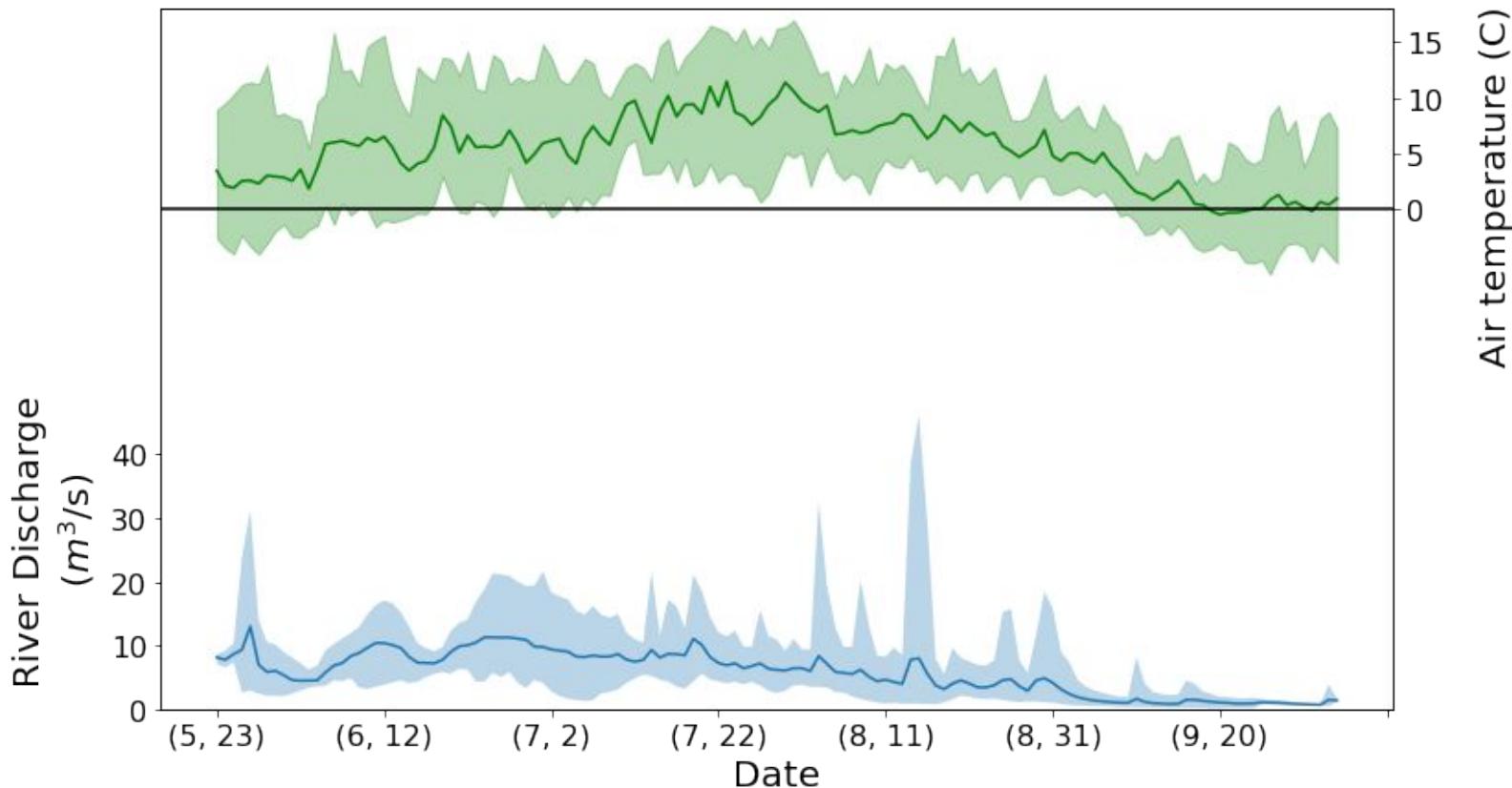
River Discharge



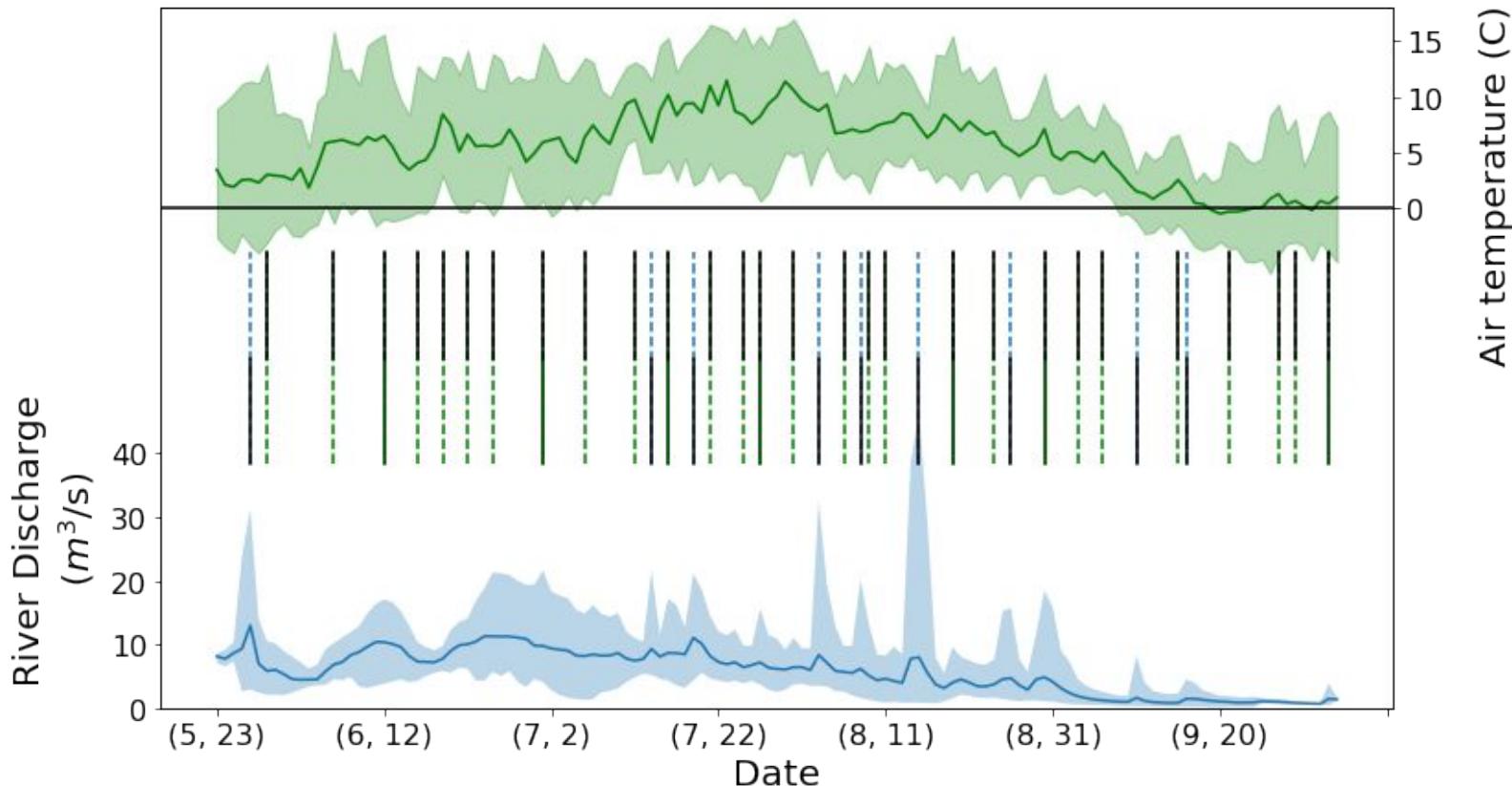
River Discharge & Air Temperature @ 20 m



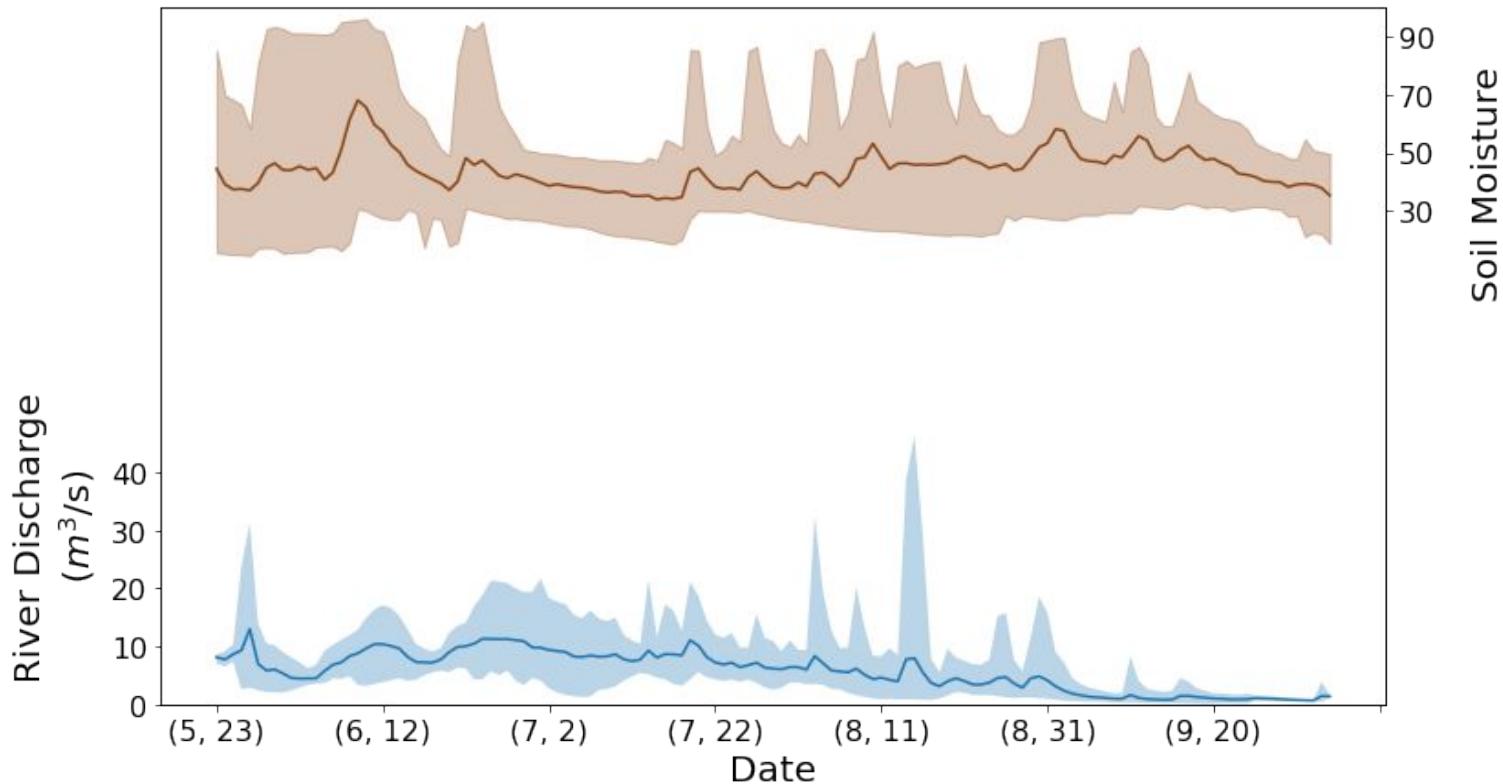
River Discharge & Air Temperature @ 250 m



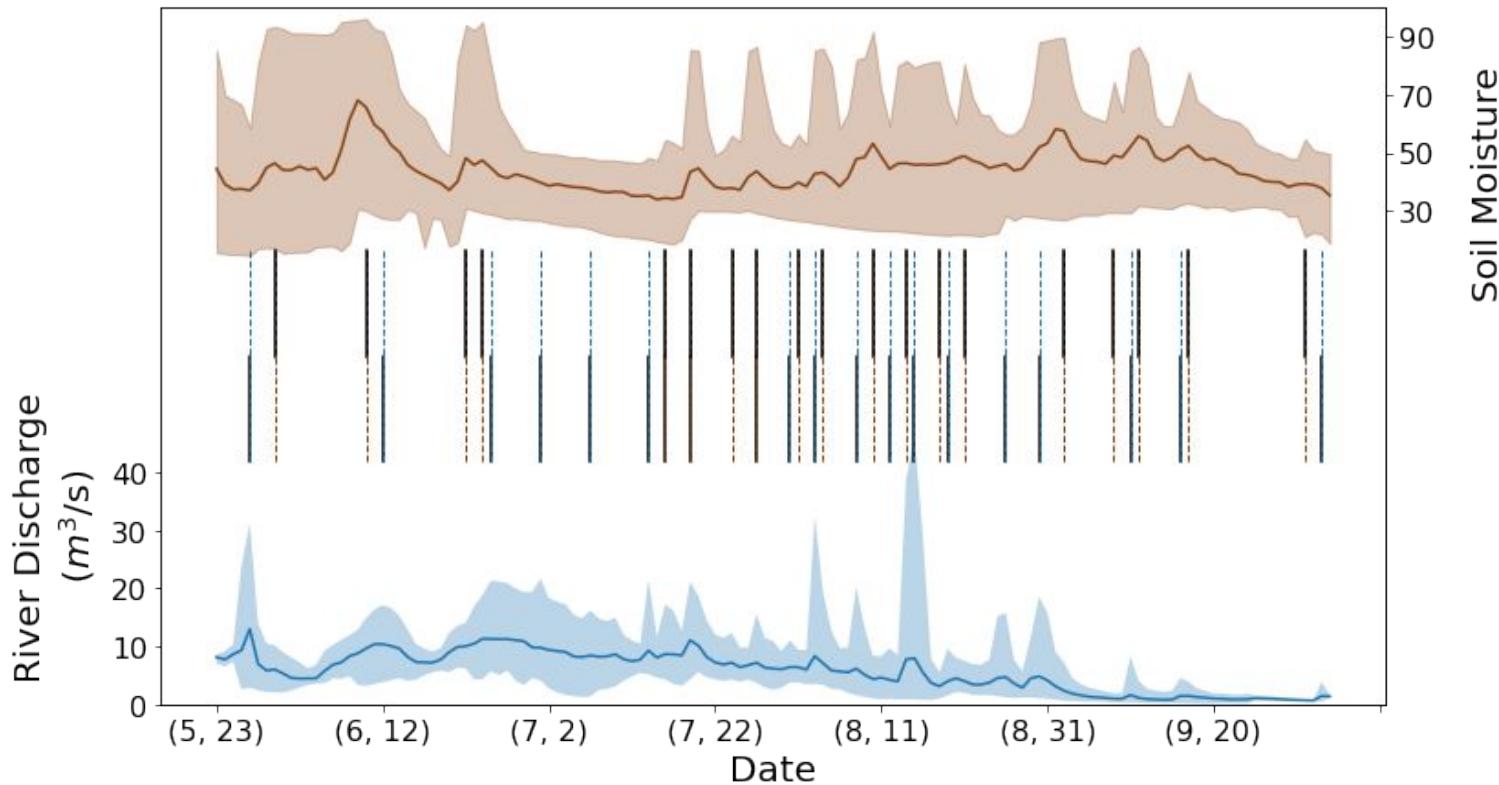
River Discharge & Air Temperature @ 250 m



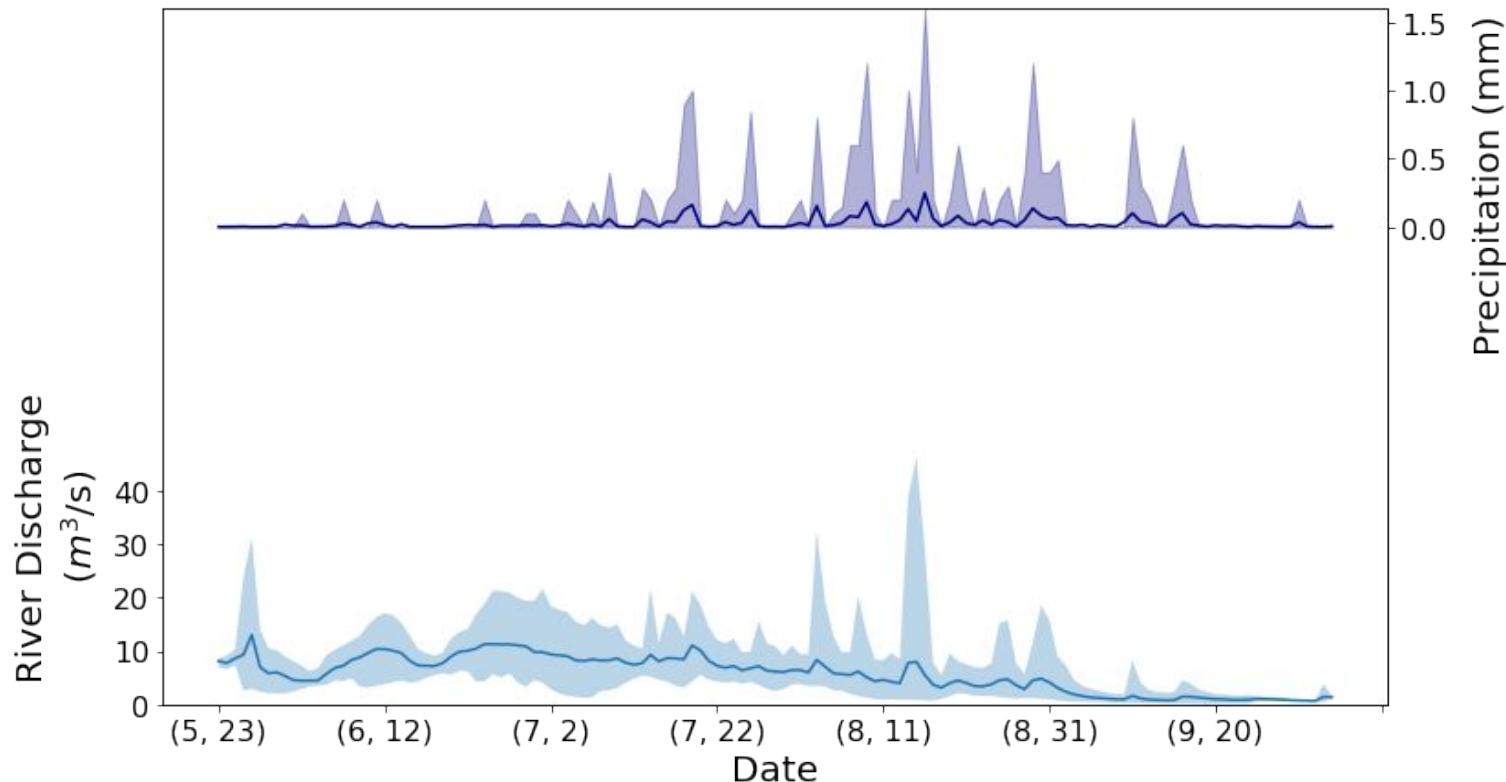
River Discharge & Soil Moisture



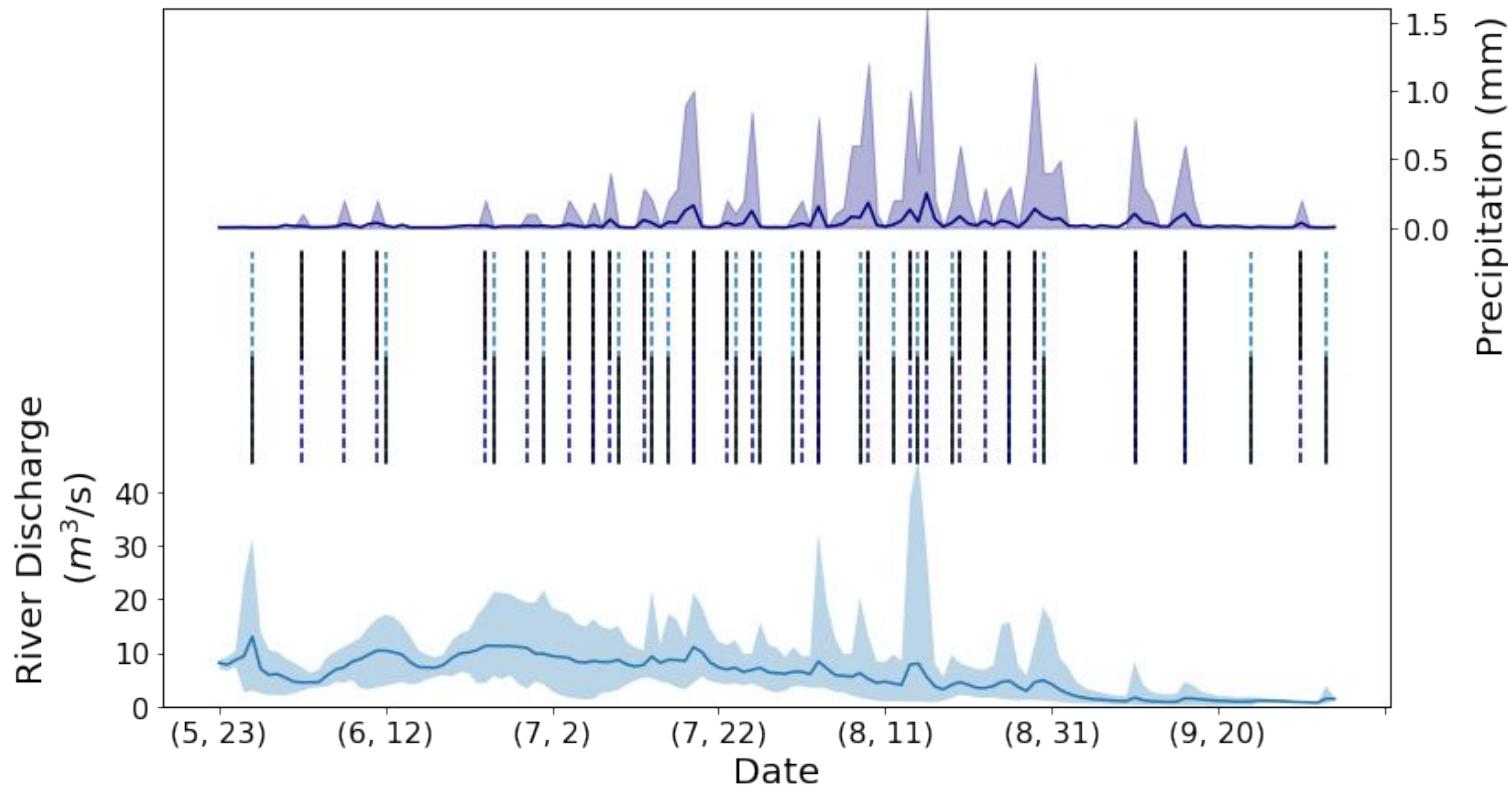
River Discharge & Soil Moisture



River Discharge & Precipitation

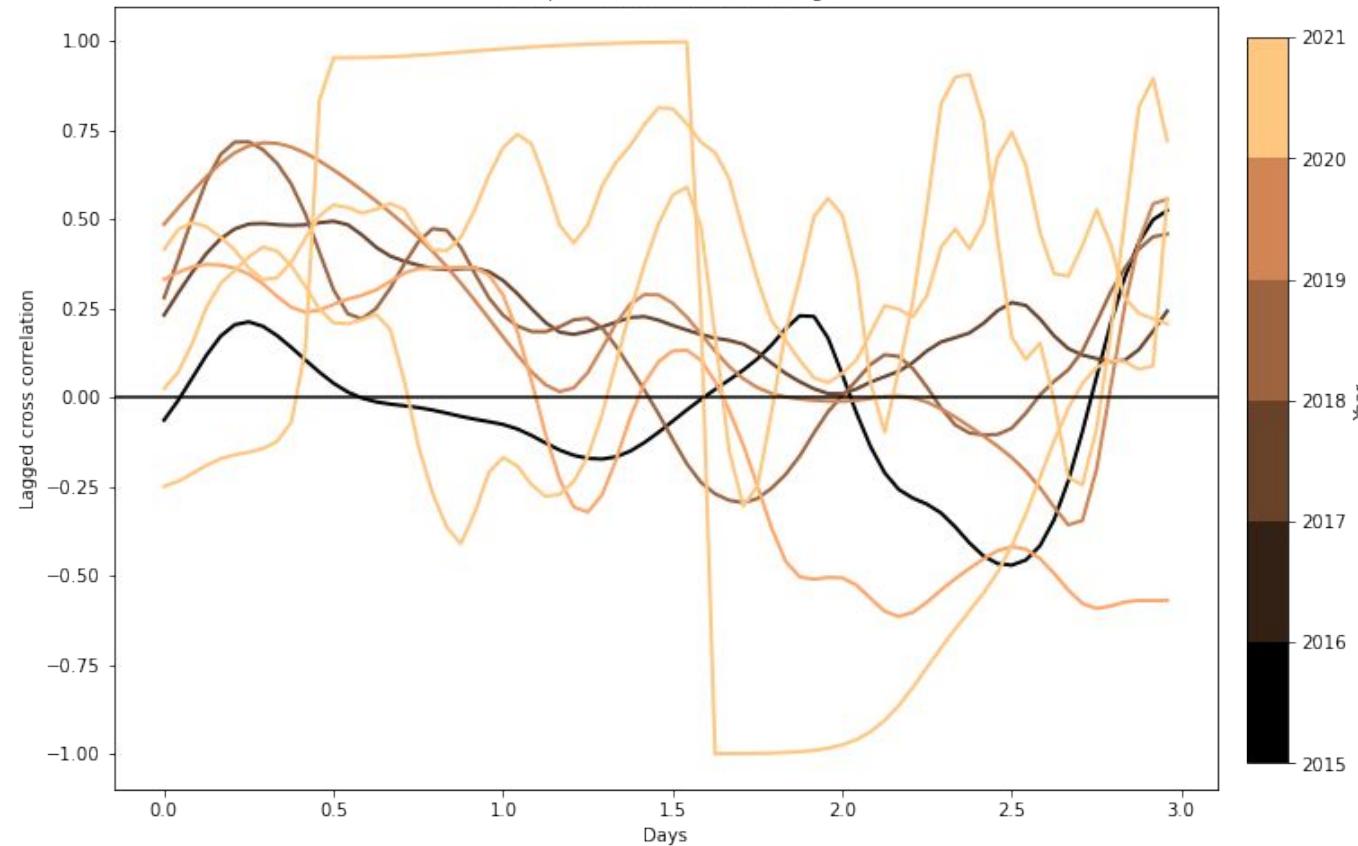


River Discharge & Precipitation



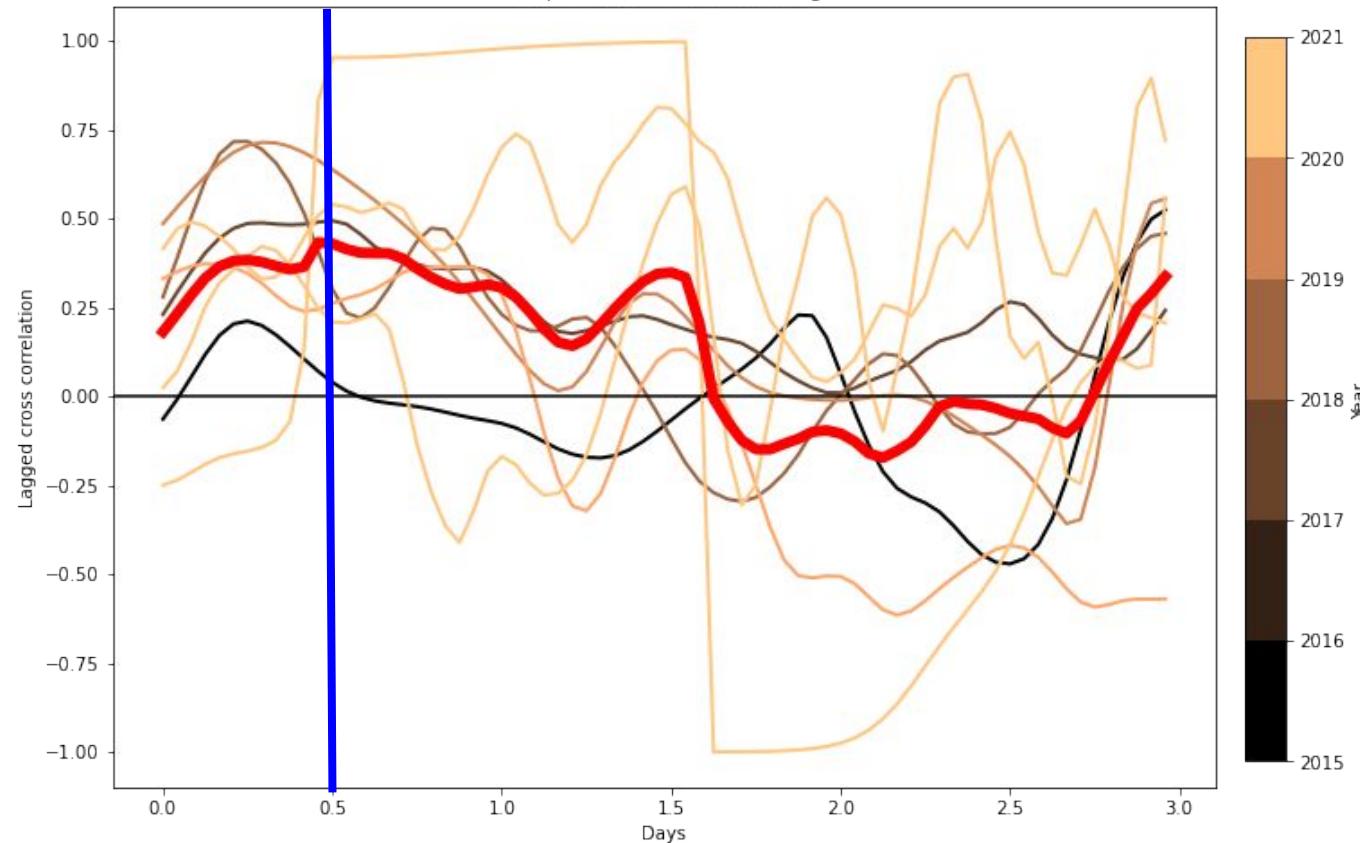
River Discharge

Precipitation vs. river discharge

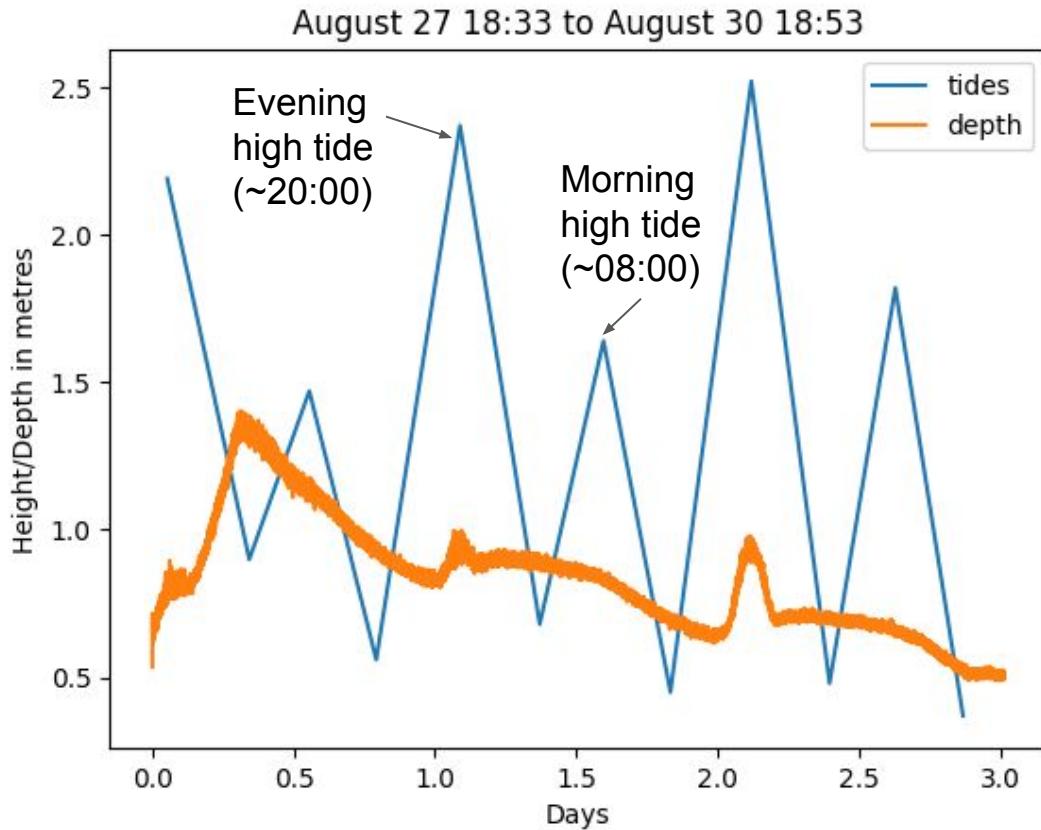


River Discharge

Precipitation vs. river discharge



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River turbidity

