LONG-TERM TRENDS IN TIDAL WETLAND GROSS PRIMARY PRODUCTION OBSERVED FROM SATELLITE

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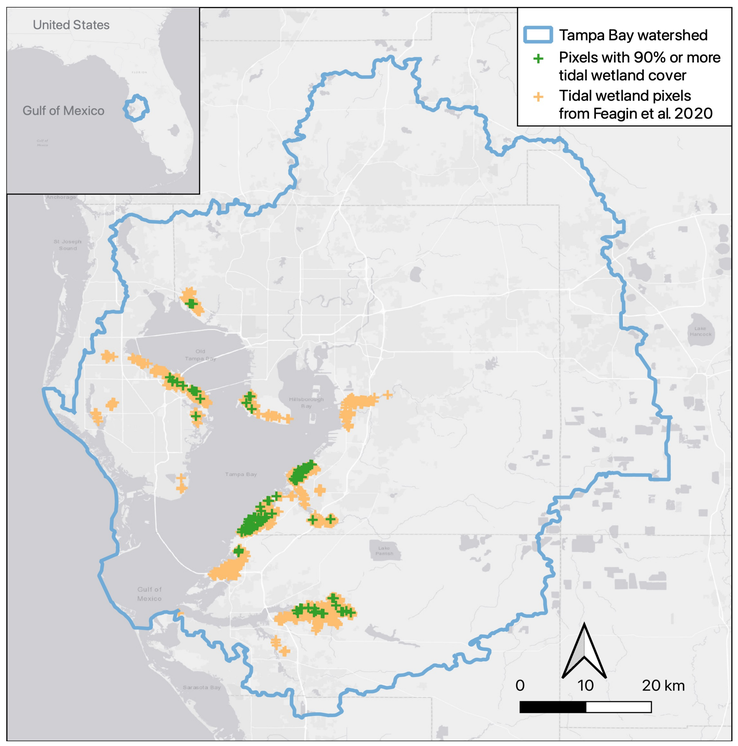
1. Motivation

- Tidal wetlands play an important role in coastal carbon cycling
- A key process in tidal wetland carbon cycling is gross primary production (GPP)
- Long-term tidal wetland GPP data sets are rare but are necessary for understanding how tidal wetland carbon cycling is changing in response to climate and land use
- Here, we analyze long-term trends in a new contiguous-US remote-sensing tidal wetland GPP product, the Blue Carbon (BC) model (Feagin et al., 2020)
- We seek to understand how long-term GPP trends are influenced by the BC model's three input variables: Enhance Vegetation Index (EVI), air temperature (T), and shortwave radiation (SWR).

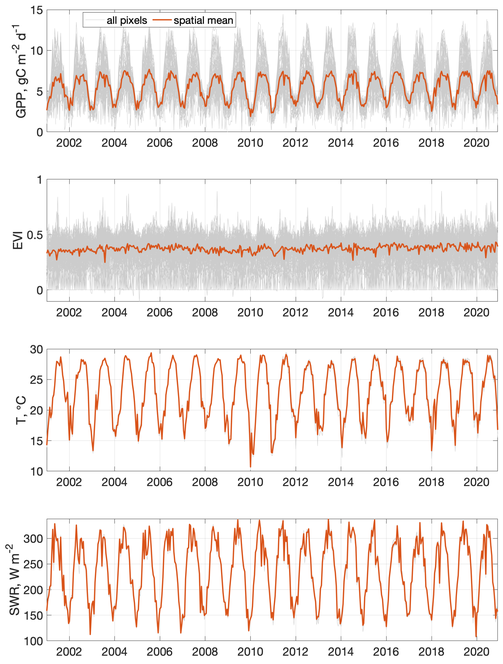
2. Study domain: Tampa Bay

- We limit the analysis to pixels around Tampa Bay that are at least 90% tidal wetlands
- Resolution is 250 m and 16 days

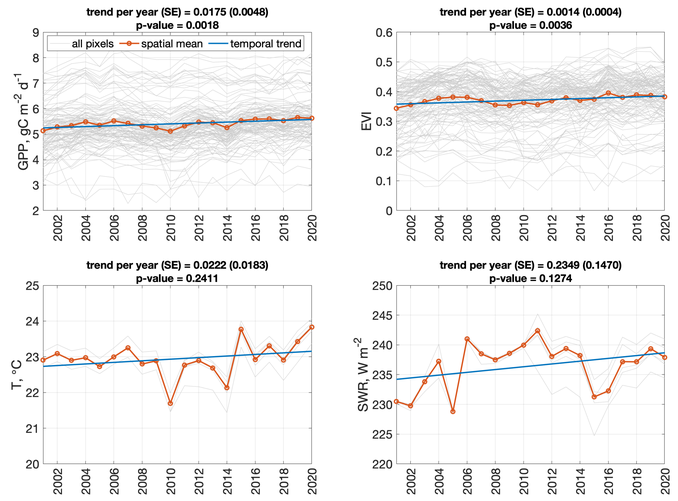


3. Time series of GPP and input variables

- GPP has a prominent annual cycle driven by T and SWR; EVI shows little seasonality
- Spatial variability in GPP is driven completely by EVI

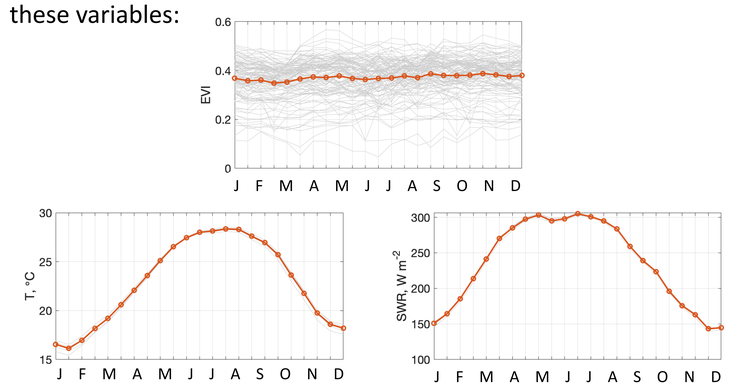


- From 2001 to 2019, the spatial average of annual-mean GPP increased by 6%
- Annual mean EVI, T, and SWR also increased

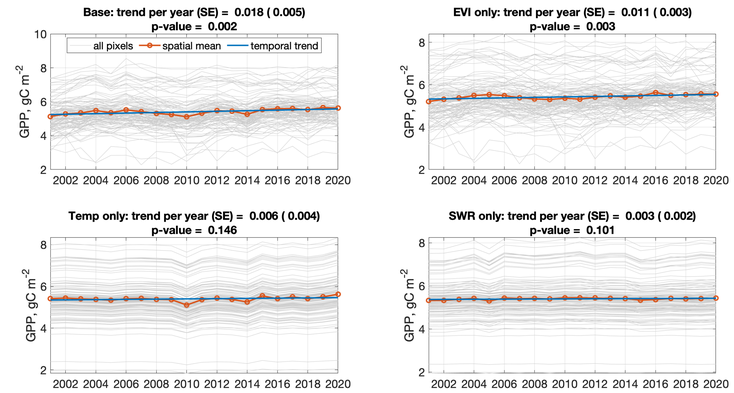


4. What's driving the GPP increase?

To determine the contributions of input variables (EVI, T, and SWR) to the GPP increase, we first constructed mean annual cycles of these variables:



- We then reran the BC model by replacing two of the input variables with their mean annual cycles
- For example, the "EVI only" simulation fixes T and SWR at their mean annual cycles and allows only EVI to vary from one year to the next
- The results show that EVI, T, and SWR contribute 55%, 35%, and 15%, respectively, to the long-term GPP increase



5. Future work

- We plan to apply the same analytic approach to all tidal wetlands in the contiguous US.
- We will investigate possible causes for long-term EVI increases

Reference: Feagin et al., 2020. Tidal wetland gross primary production (GPP) across the continental United States, 2000–2019, Global Biogeochemical Cycles, 34, doi: 10.1029/2019GB006349.

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