

Understanding Flash Drought Occurrence in the Coastal Carolinas

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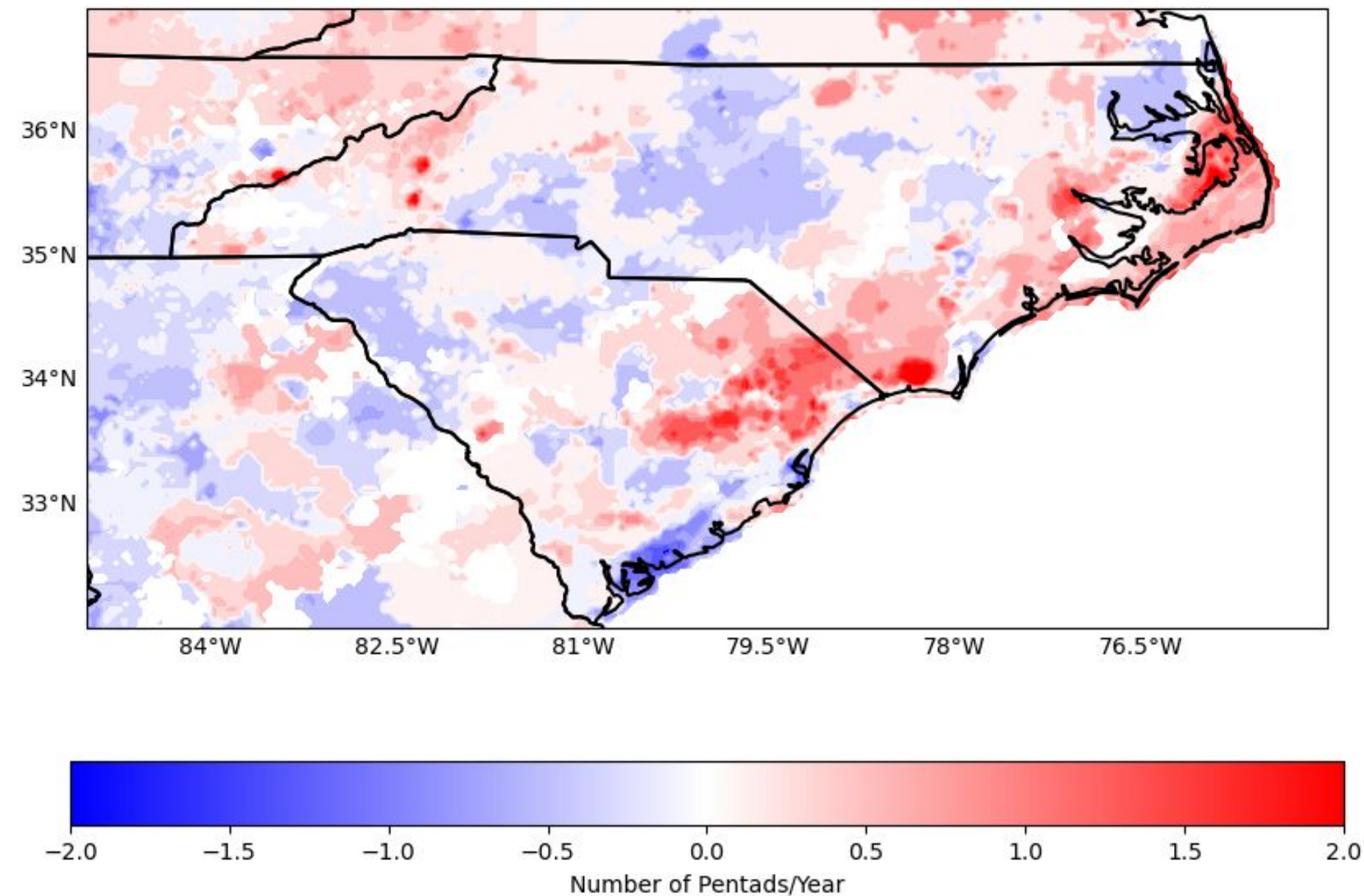
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Flash Drought Occurrence in the Coastal Carolinas Could Increase in the Future

Are These Flash Droughts Really Increasing?

- My initial studies focused on the short duration of these flash droughts.
- This led to the identification of areas in the coastal Carolinas where these flash droughts were increasing over time.
- As the definition for flash droughts was refined, the consensus was to focus on the rapid onset of the flash droughts.
- Which could lead to different results...

Flash Drought Trends Based on Short Duration



Flash Droughts

- Previous literature has identified two approaches to flash drought detection: **rapid intensification** and short duration (Otkin et al. 2018).
- A past study of flash drought occurrence in the eastern U.S. and identified stations in the Southeast as having an overall higher frequency of flash drought occurrence (Ford and Laboiser 2017).

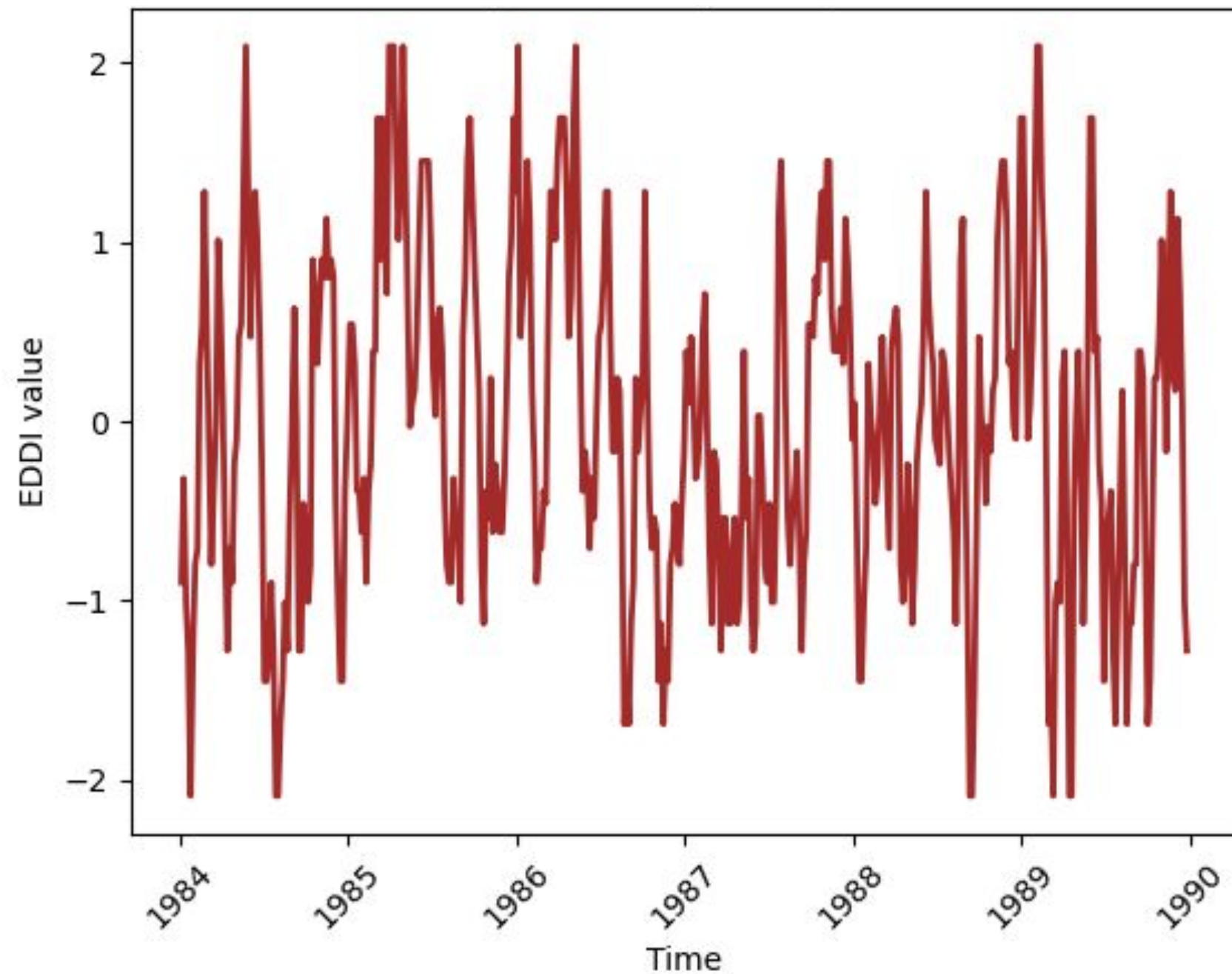
- Impacts of flash droughts:



- One factor causing flash droughts is abnormally high evapotranspiration which quickly depletes soil water (Yuan et al. 2023).

Methods

EDDI values in Onslow County, NC from January 1, 1984 to December 31, 1989



Evaporative Demand Drought Index (EDDI):

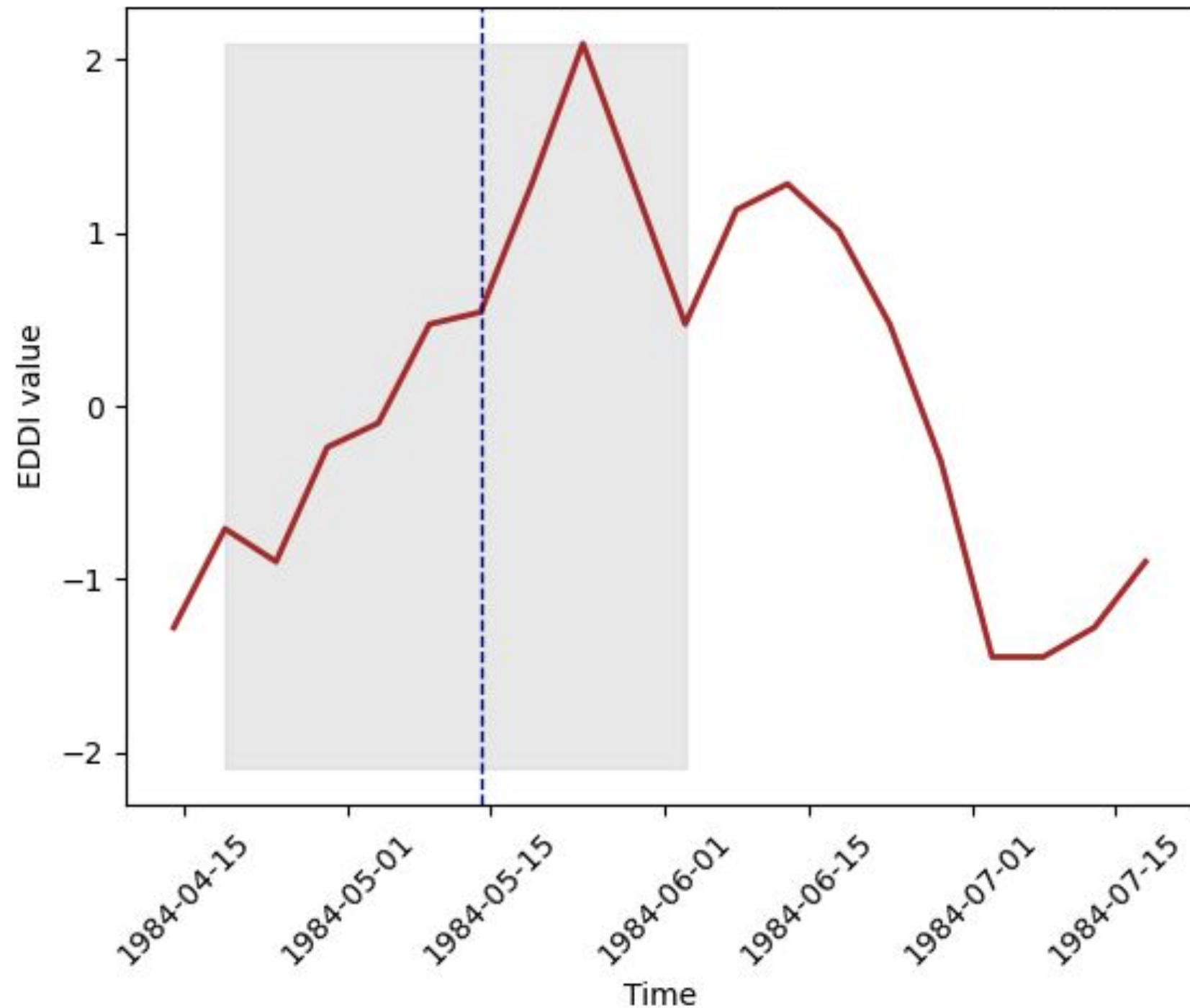
- Representation of evaporative demand of the atmosphere
- Atmospheric anomalies captured on shorter timescales and can capture faster onset

Pentads: 5-day measurements

Event: occurrence of successive pentads

Methods

EDDI values in Onslow County, NC from April 14, 1984 to July 18, 1984



Flash Droughts:

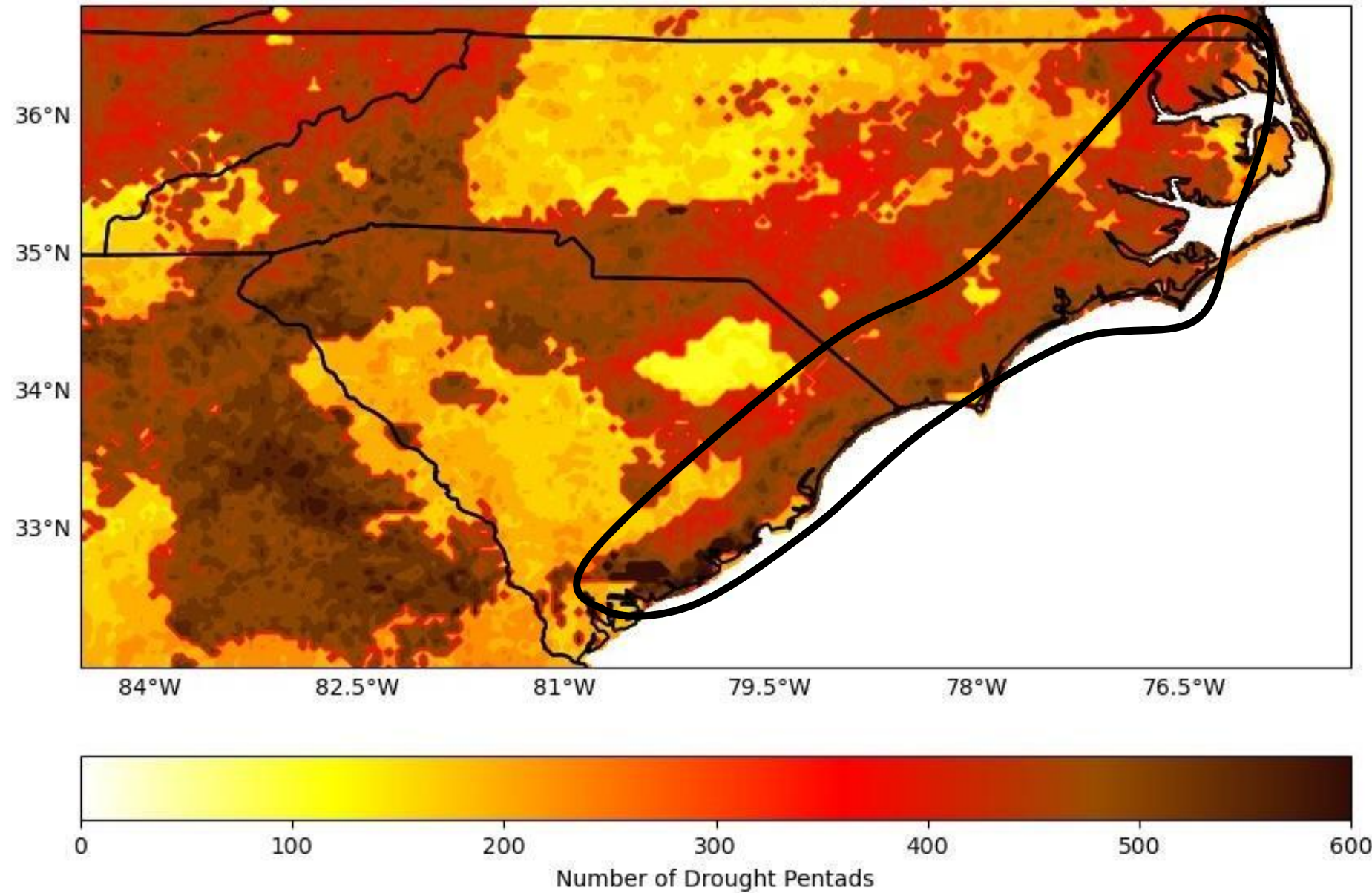
1. When the pentad-mean EDDI has a 50-percentile increase over 3 pentads and is maintained for the the following 3 pentads (Ramseyer and Miller 2023).
2. The drought is over when the final EDDI value falls below the 20th percentile (Christian et al. 2019).

Objectives

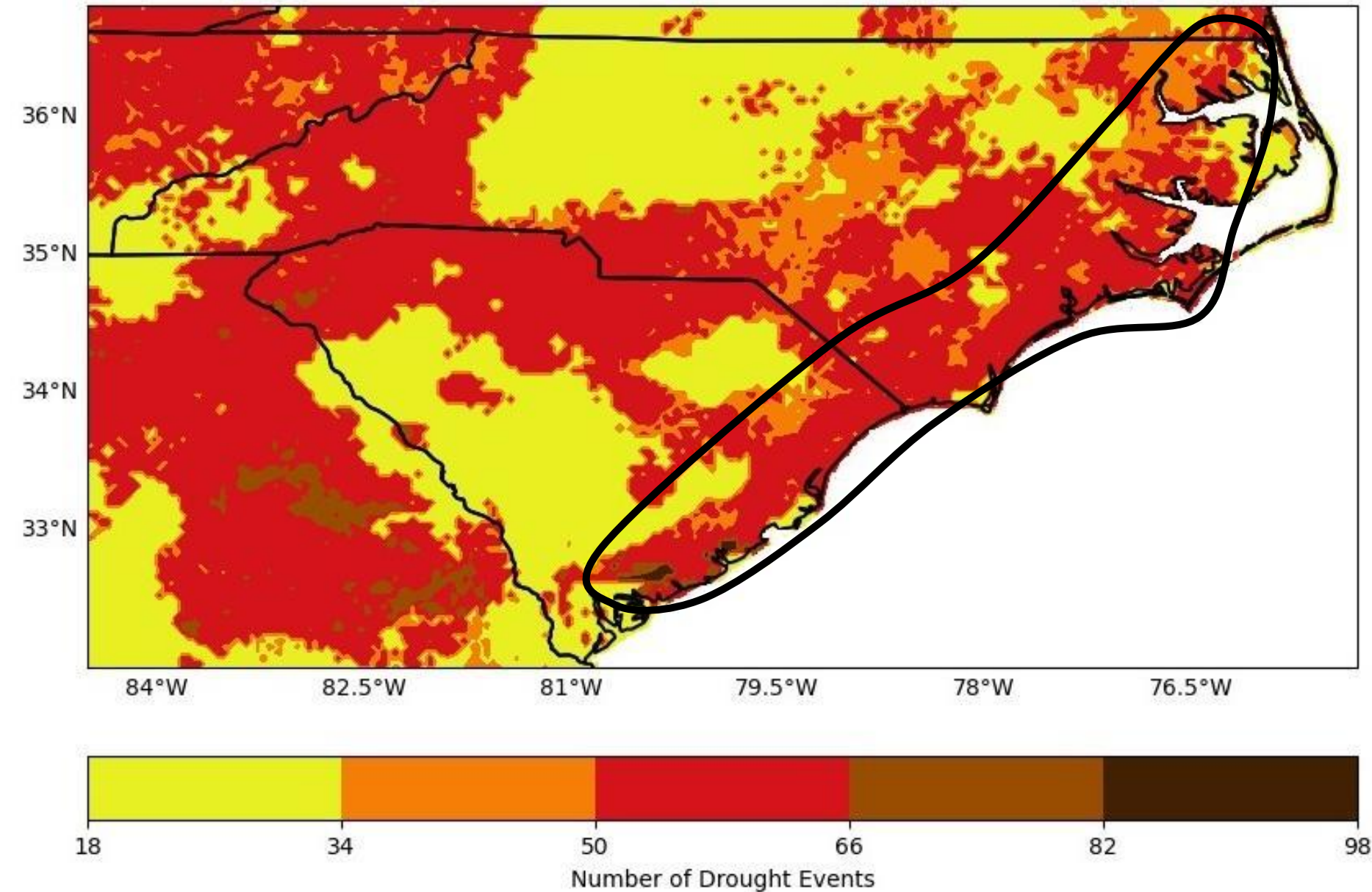
Identify:

- flash droughts across the Carolinas from January 1, 1980 to December 31, 2022.
- spatial variability of flash droughts occurrence across the region.
- trends in flash droughts over the 43 year period.
- potential impacts of flash droughts local to the Carolinas.

Total Flash Drought Pentads



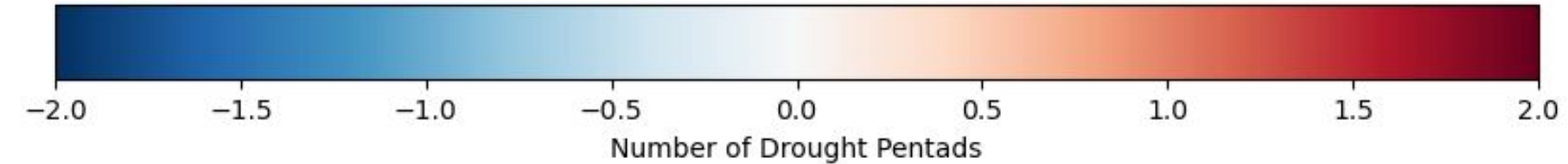
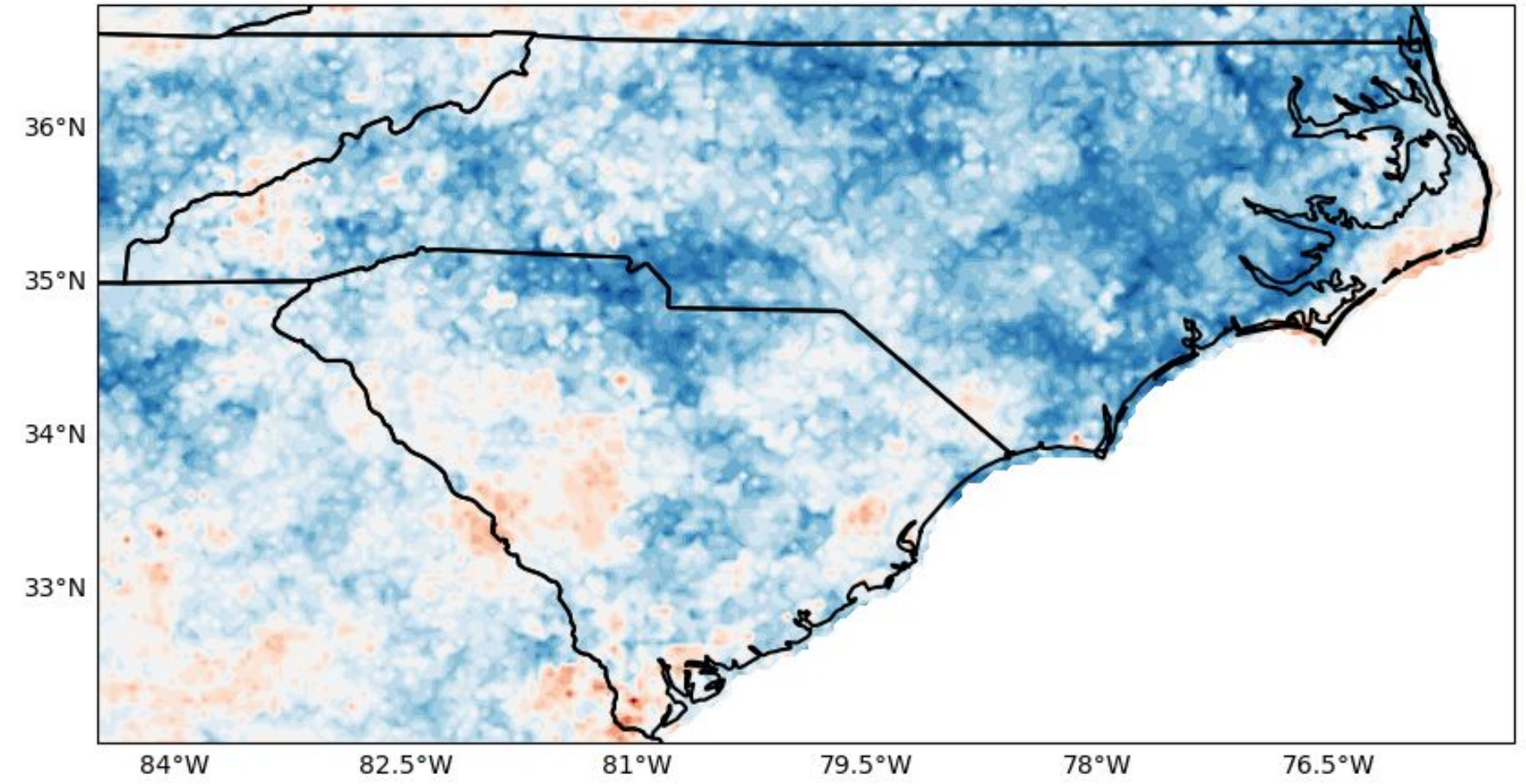
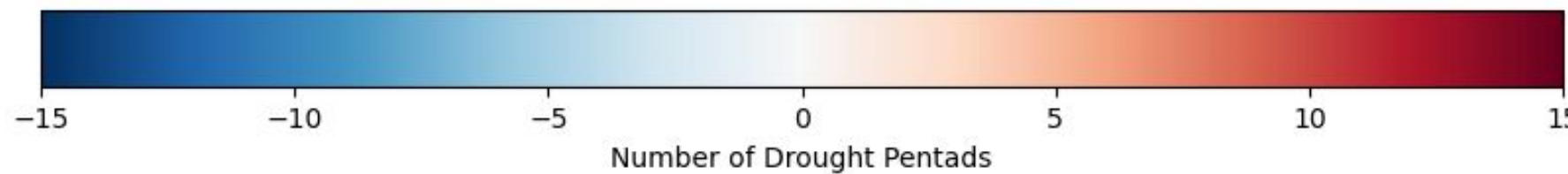
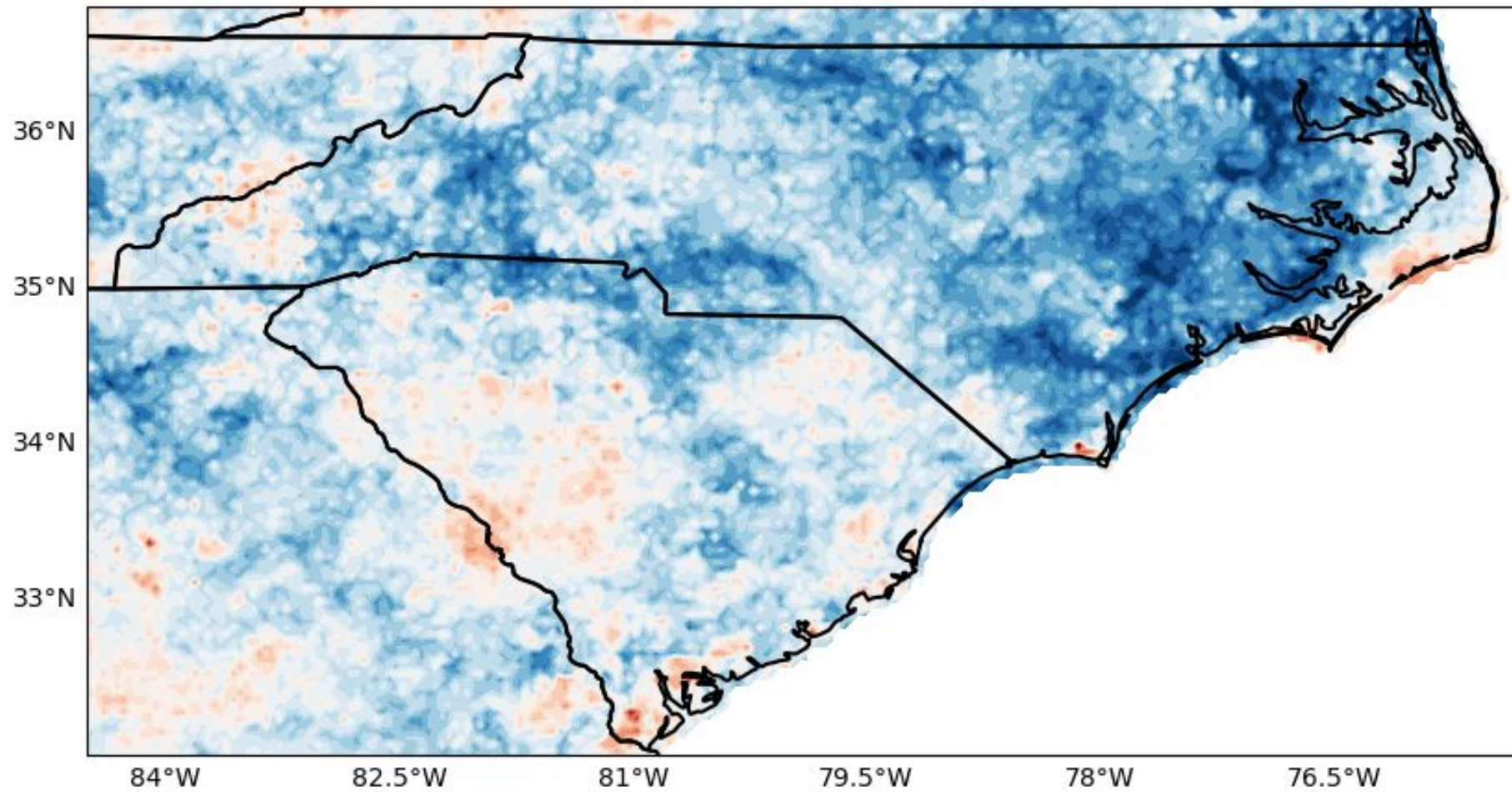
Total Flash Drought Events



Key Takeaway: High occurrence of flash droughts along most of the coast over the 43-year-period.

Flash Drought Pentads Trend

Flash Drought Events Trend



Key Takeaway: Across the majority of the Carolinas, including the coasts, the occurrence of flash droughts has decreased over time.

Summary

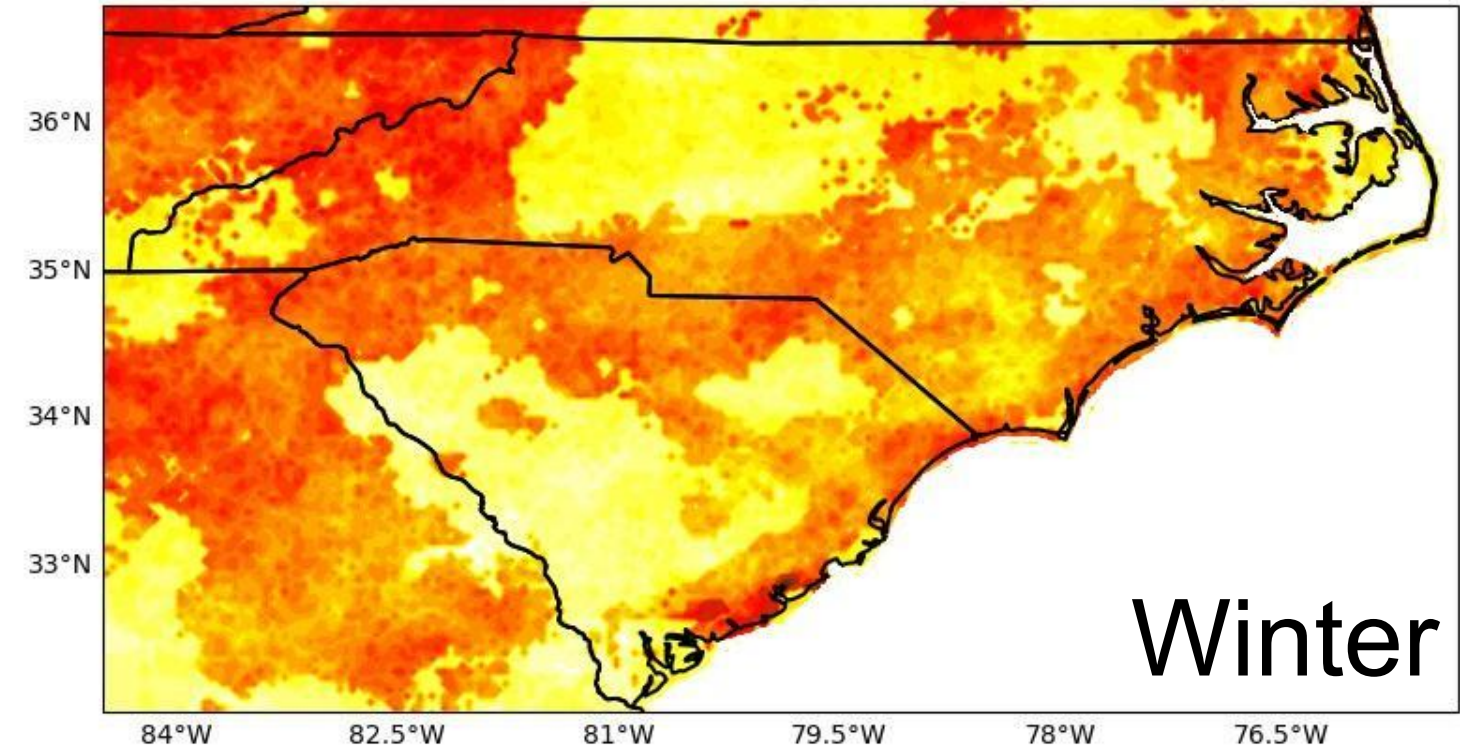
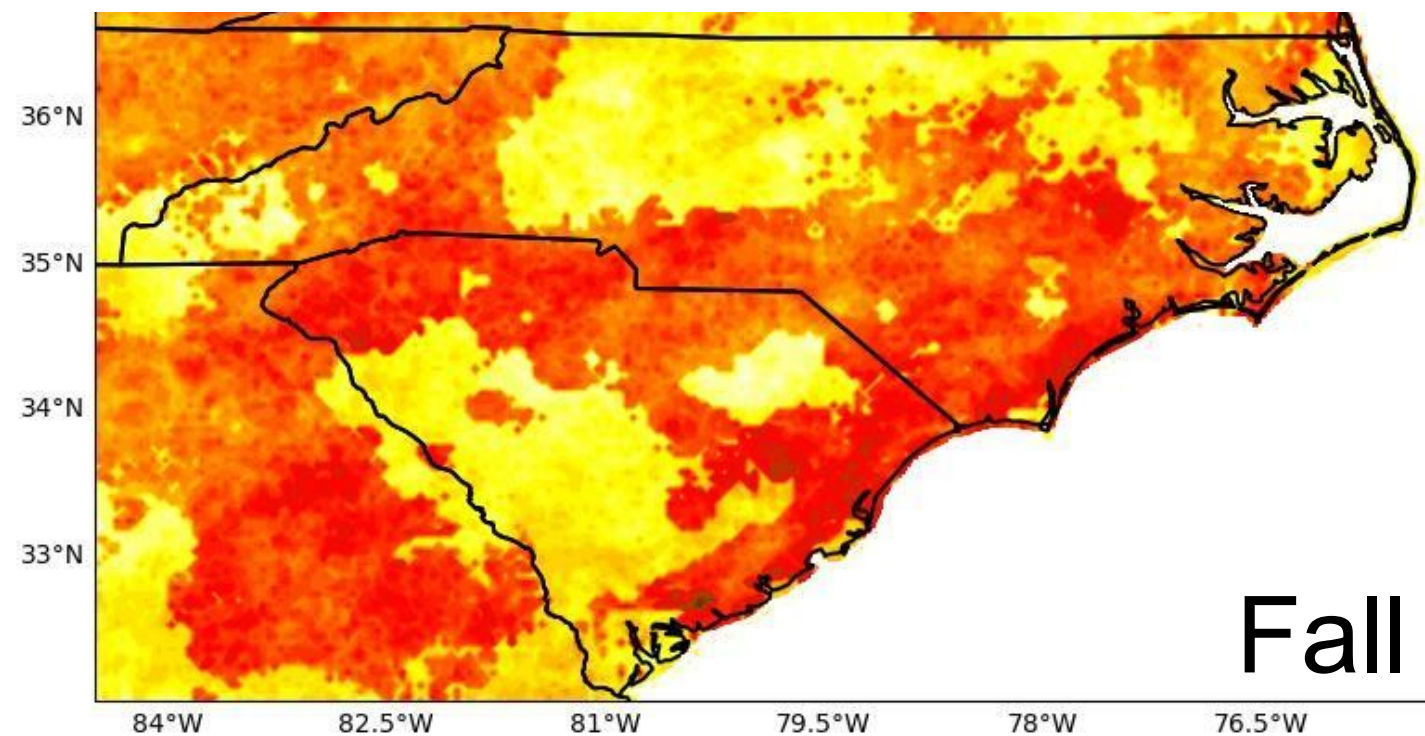
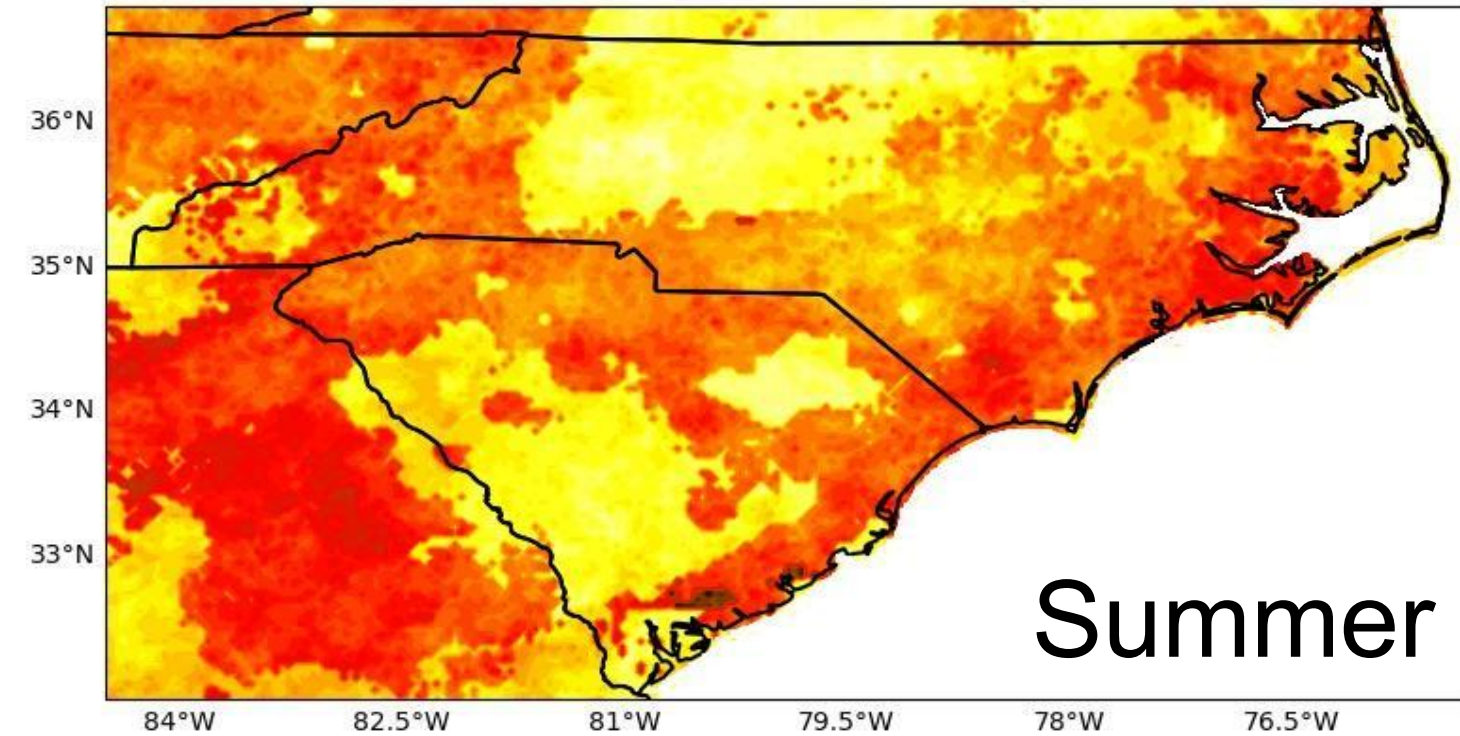
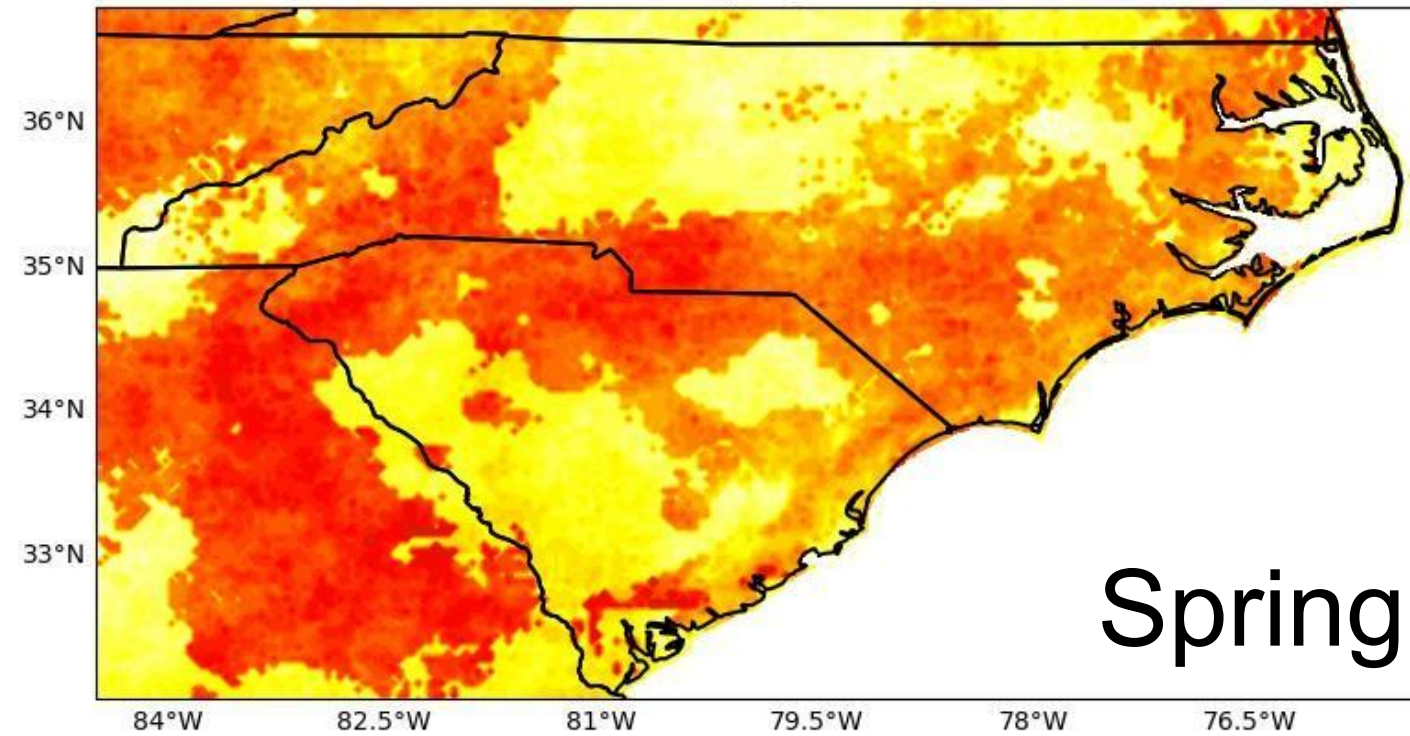
- Flash droughts are occurring across the Carolinas, but one area where they are occurring with a **high frequency is along the coastlines.**
- The majority of the Carolinas shows a decrease in flash drought occurrence.
 - There are some areas along the coast of South Carolina, where the trend in occurrence is positive.
 - However, the dominant trend **along the coastlines is decreasing over time.**

Linkage to Oyster Farming



- Oyster farmers expressed concerns about mass mortality events.
 - Mass mortality event: > 30% loss
- In 2022, one mass mortality event which impacted oyster farmers was preceded by a drought event.
 - Drought given as reason for ELAP payouts.

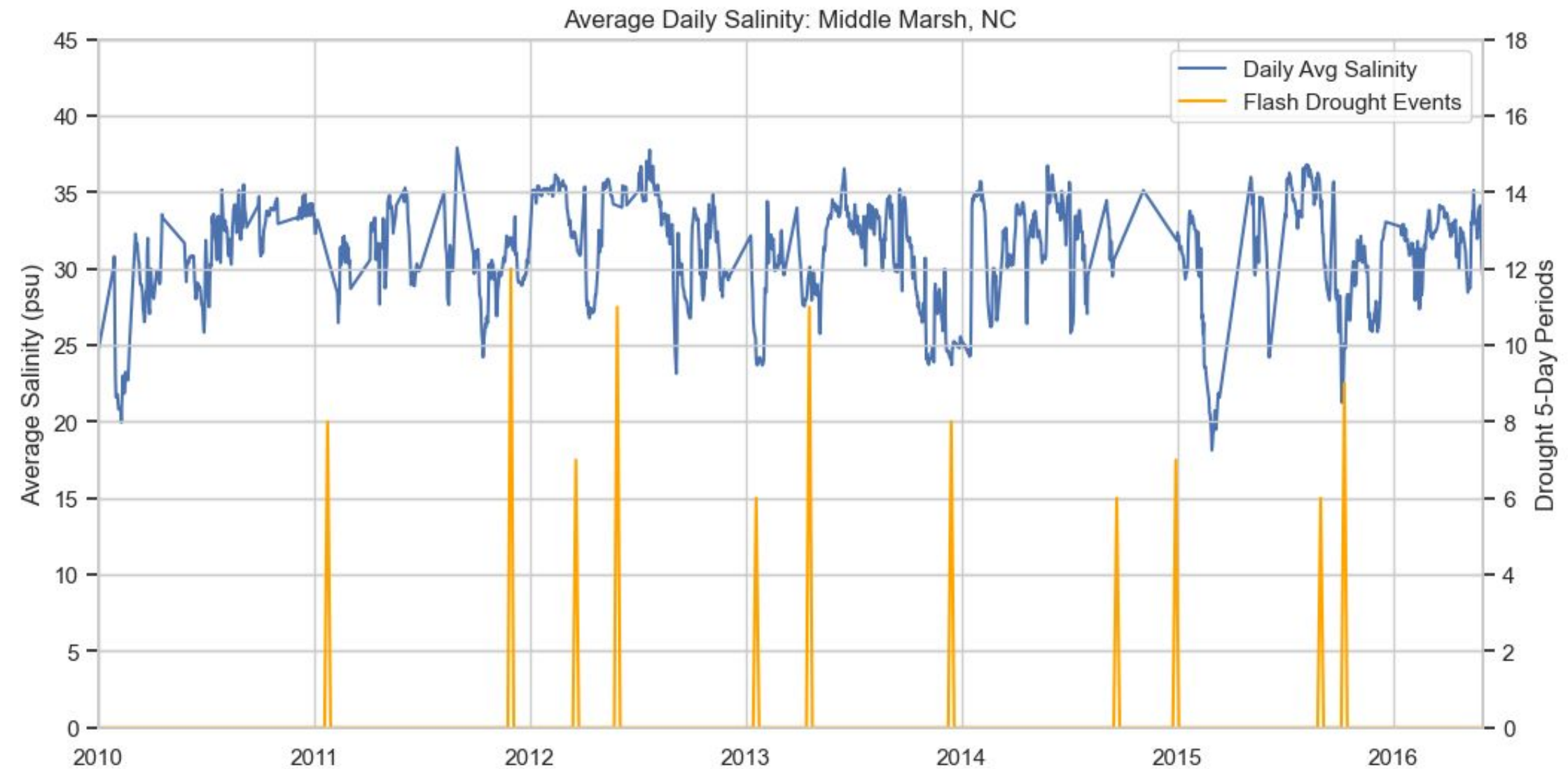
Flash Drought Pentads by Season



Key Takeaway: Most flash droughts occur from summer and fall, with high occurrences along the coastlines during both seasons.

Linkage to Oyster Farming

- Most oyster farmers believe the cause of these mass mortality events is salinity stress.
- Past studies have found that long-term droughts can increase salinity levels (Gilbert et al. 2012, Seisdodo-Losa et al. 2021).
- Future studies will analyze salinity changes related to flash drought in these coastal regions.



Questions?

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