

El Niño and seasonal sea ice loss in the Arctic and Antarctic

Ariana Cahuana, Cassidy Charles, Juliana dos Santos, Lara Schlumbom, Mariana Barros, Murilo Vaz



Climatematch
Academy

Background

- El Niño is the warm phase of ENSO cycle
 - Warm water builds up along the equator in the eastern Pacific
 - Can lead to changes in sea surface temperatures and land temperatures in the tropics
 - Research suggests that El Niño events are becoming stronger
- Arctic sea ice is rapidly melting due to the warming climate
 - Climate models must estimate the rate of sea ice loss based on observations
- As El Niño events are getting stronger, it is important to study how these events could affect Arctic and Antarctic sea ice



Context and motivation

- Previous research:
 - The Arctic sea ice is influenced by changes in atmospheric patterns due to ENSO. (Liu et. al. 2004)
 - There is a delayed reaction of Arctic sea ice extent in response to El Niño events. (Clancy et. al. 2021)
 - The relationship between ENSO and Arctic sea ice depends on the model used. (Clancy et. al. 2021)
- Gaps in knowledge:
 - What about the ENSO influence in the Antarctic?
 - Over what time frame does the delayed correlation between the variables occur over?



Research question

Is Arctic and Antarctic sea ice loss associated with extreme events?

Hypothesis

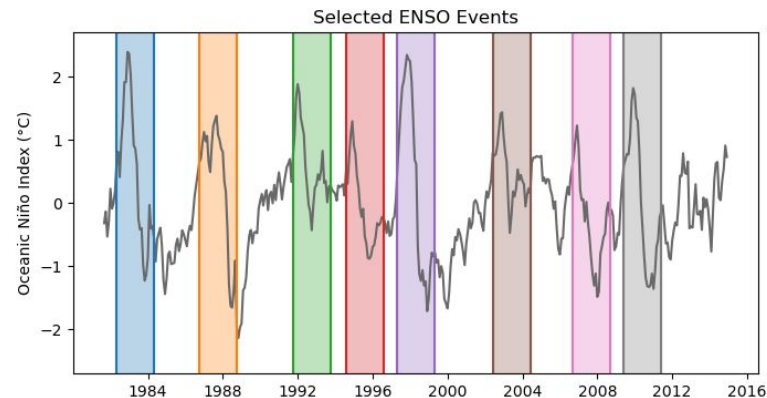
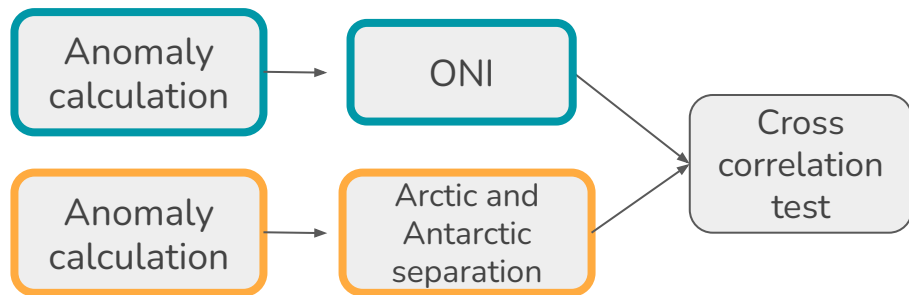
There is a lagged correlation between El Nino and seasonal sea ice loss in the Arctic and Antarctic.



Methods

[Speaker
video]

- ENSO data set
 - OISST NOAA - Monthly sea surface temperature in the Niño 3.4 Index region (1981-2023)
- Sea Ice data set
 - CMIP 6 - Monthly global sea ice extension data (1850 - 2014)



Methods

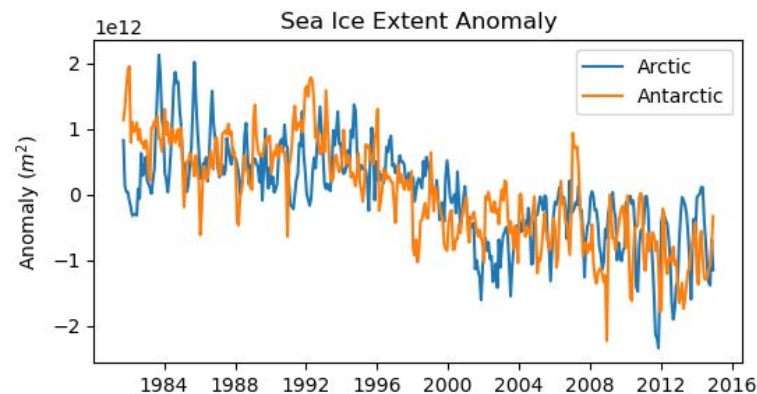
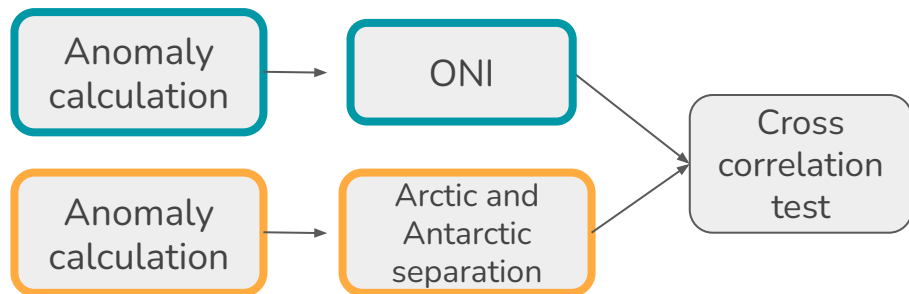
[Speaker
video]

● ENSO data set

- OISST NOAA - Monthly sea surface temperature in the Niño 3.4 Index region (1981-2023)

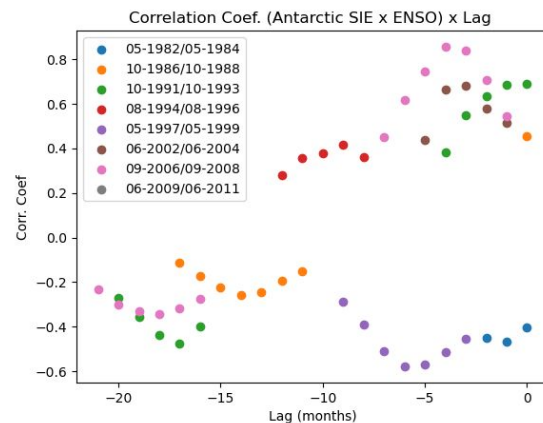
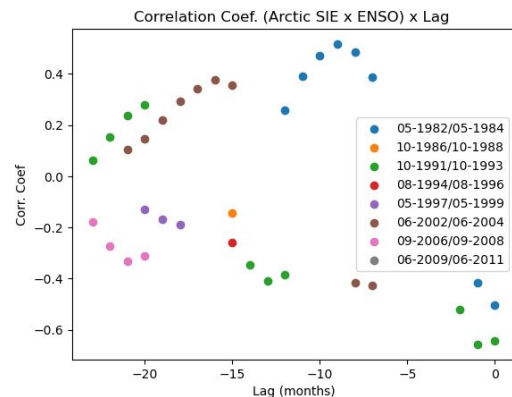
● Sea Ice data set

- CMIP 6 - Monthly global sea ice extension data (1850 - 2014)



Results

- The positive and negative correlations after ENSO events could be due to different regional responses.
- Changes in the atmospheric circulation of Hadley and Ferrel Cells, which limit or promote sea ice formation in the Arctic. (Liu et. al. 2004)
- This relationship could also be true for the Antarctic.



Preliminary conclusions

- Statistically, there is not a strong correlation between the El Niño events and the sea ice variations on Arctic and Antarctic
- The sea ice data available presented a short time series, resulting in a small sample of ENSO events
- More studies are needed to form a more accurate conclusion
 - Analysis of other oscillations (Arctic, Antarctic, etc) and their interactions would be helpful to understand why we found different correlations and lags between different events.
 - Differences in regional ice formation and its mechanisms.

