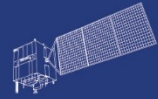


HY



HJ-1AB



CBERS



Gaofen



Beijing-2



Sentinel-1



Sentinel-2



Sentinel-3



Sentinel-5p



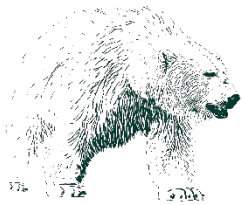
Aeolus

2023 DRAGON 5 SYMPOSIUM
3rd YEAR RESULTS REPORTING
11-15 SEPTEMBER 2023

PROJECT ID. 59376

Pacific modulation of the Sea level variability of the Beaufort Gyre System in the Arctic Ocean and Nordic Seas

- **THURSDAY 14 SEPTEMBER 2023**
- **PROJECT ID. 59376**
- **PROJECT TITLE: Pacific Modulation of the Sea level variability of the Beaufort Gyre System in the Arctic Ocean.**
- **PRINCIPAL INVESTIGATORS: Johnny A. Johannessen**
- **CO-AUTHORS: Jianqi Sun, Roshin. P. Raj, Yang Liu, Heather Regan, Antonio Bonaduce, Kristin Richter, Lluisa Puig Moner and Yongqi Gao (deceased in 2021).**
- **PRESENTED BY: Johnny A. Johannessen**



ESA Third Party Missions

1. SSMI
2. AMSR
3. IceSAT
- 4.
- 5.
- 6.

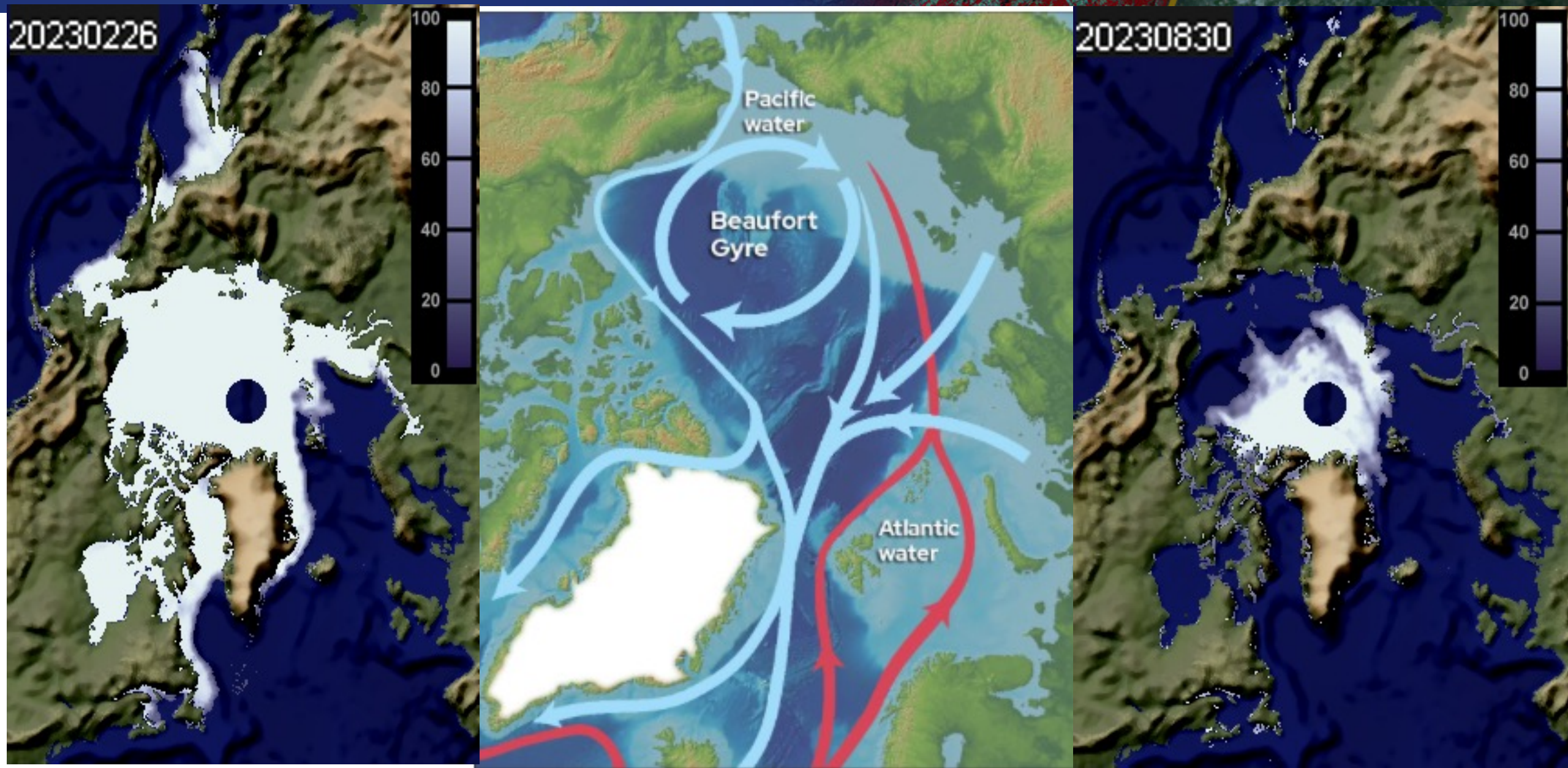
ESA Missions

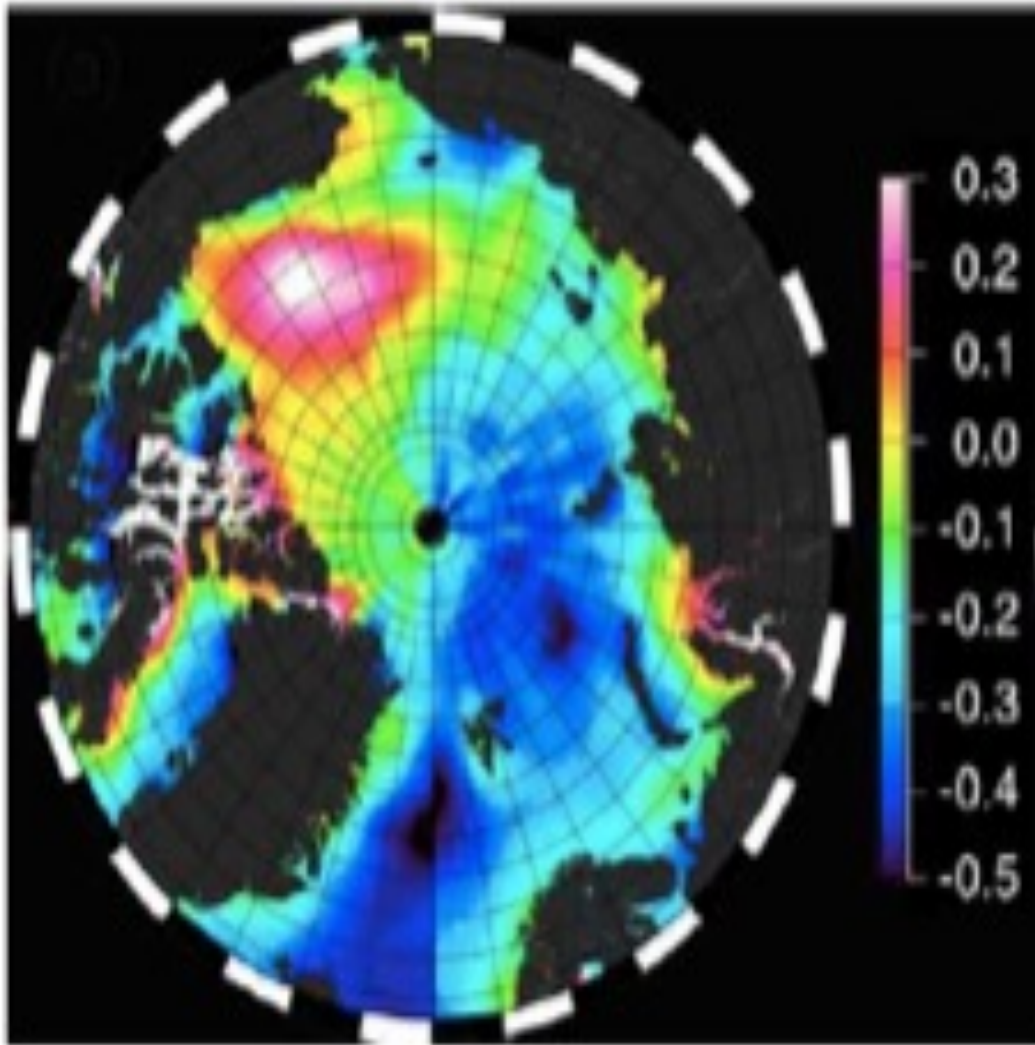
1. ERS
2. Envisat
3. Cryosat
4. Sentinel-3
5. SMOS
6. GOCE

Chinese Missions

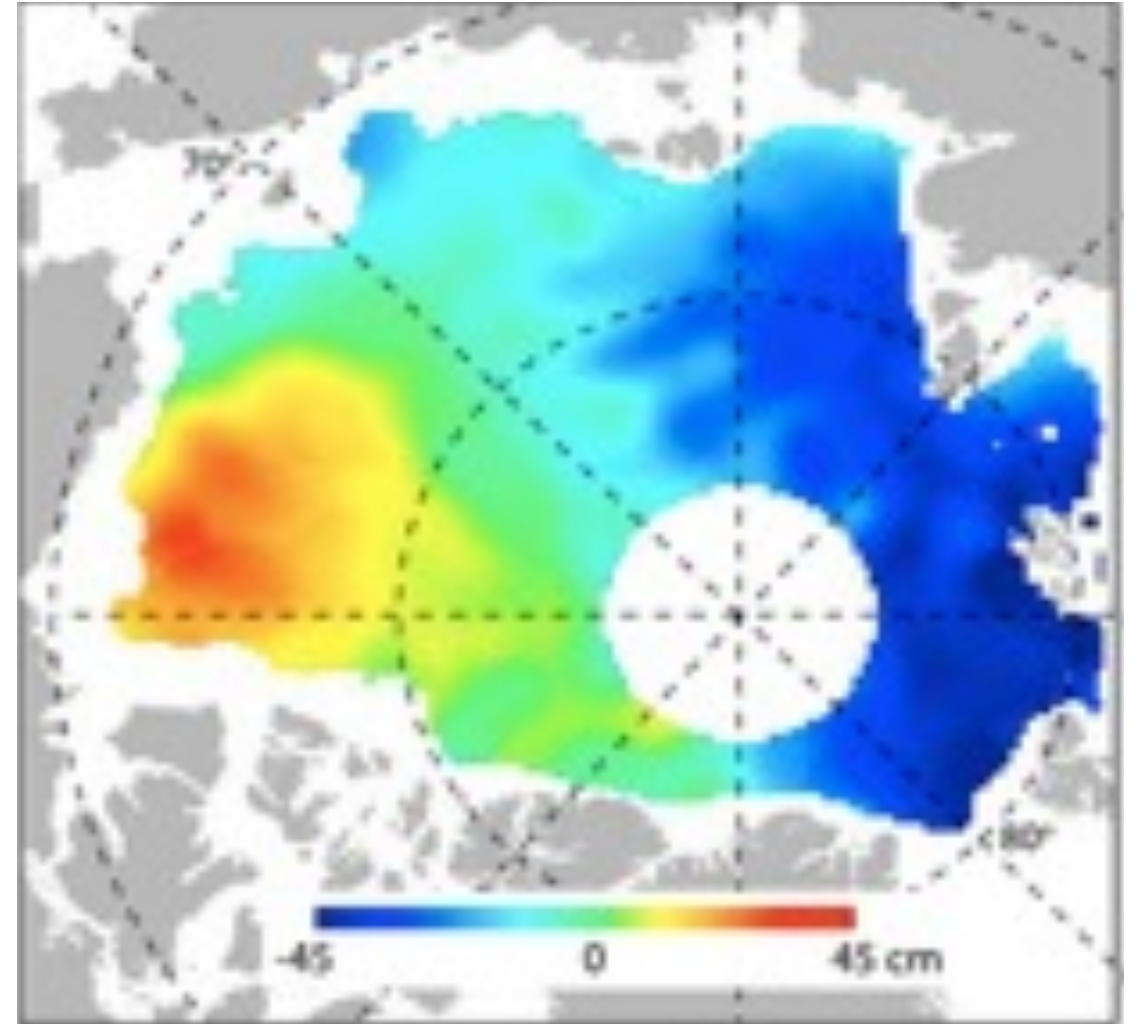
1. HY
- 2.
- 3.
- 4.
- 5.
- 6.

In addition we have used reanalyses data from ECMWF and TOPAZ

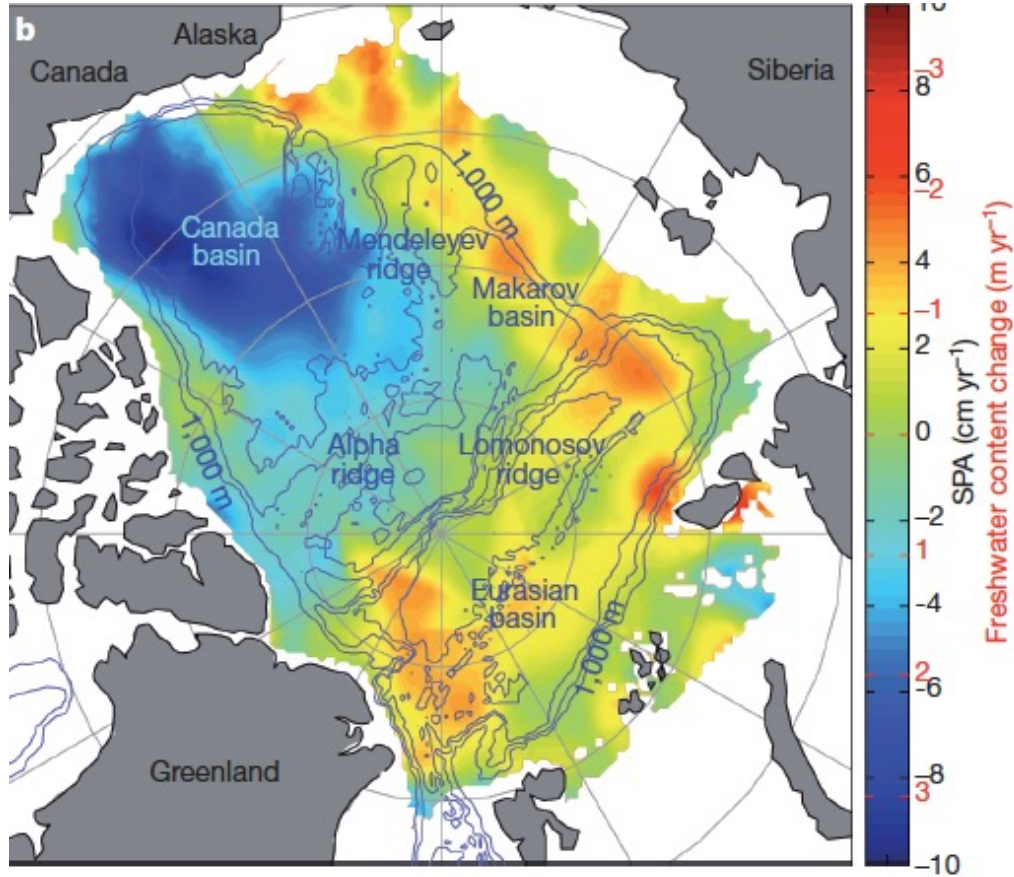




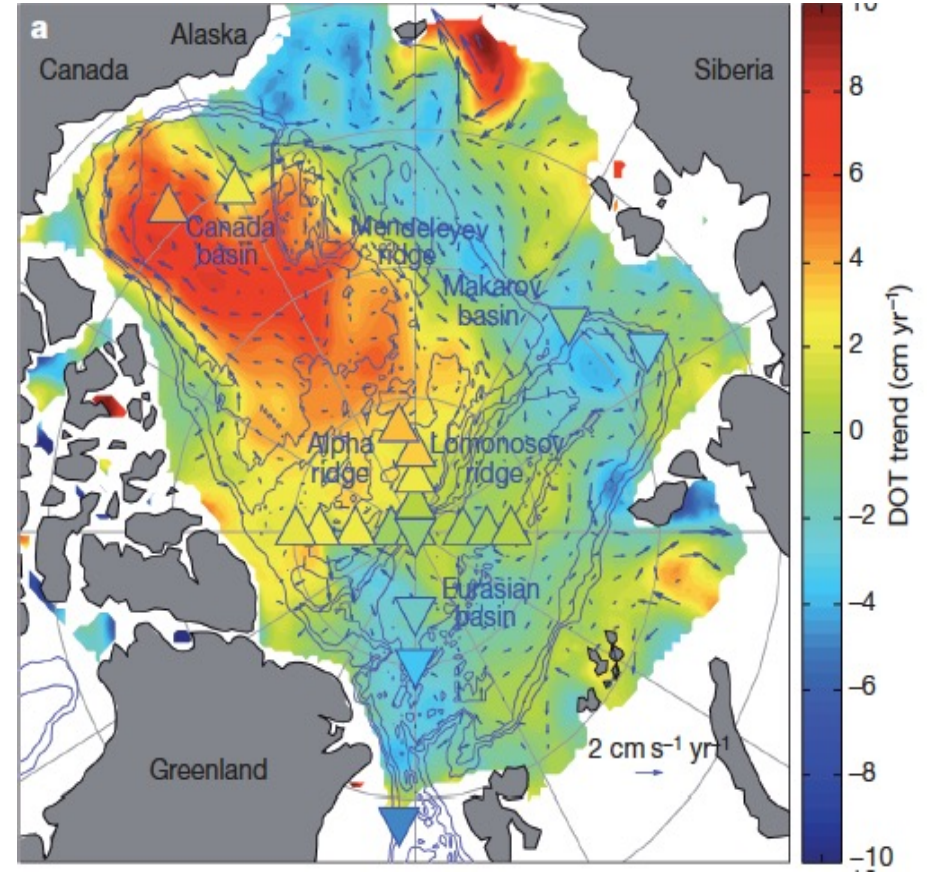
From Cryosat 2 and
Envisat RA 2004-2008 (Laxon et al, 2012)



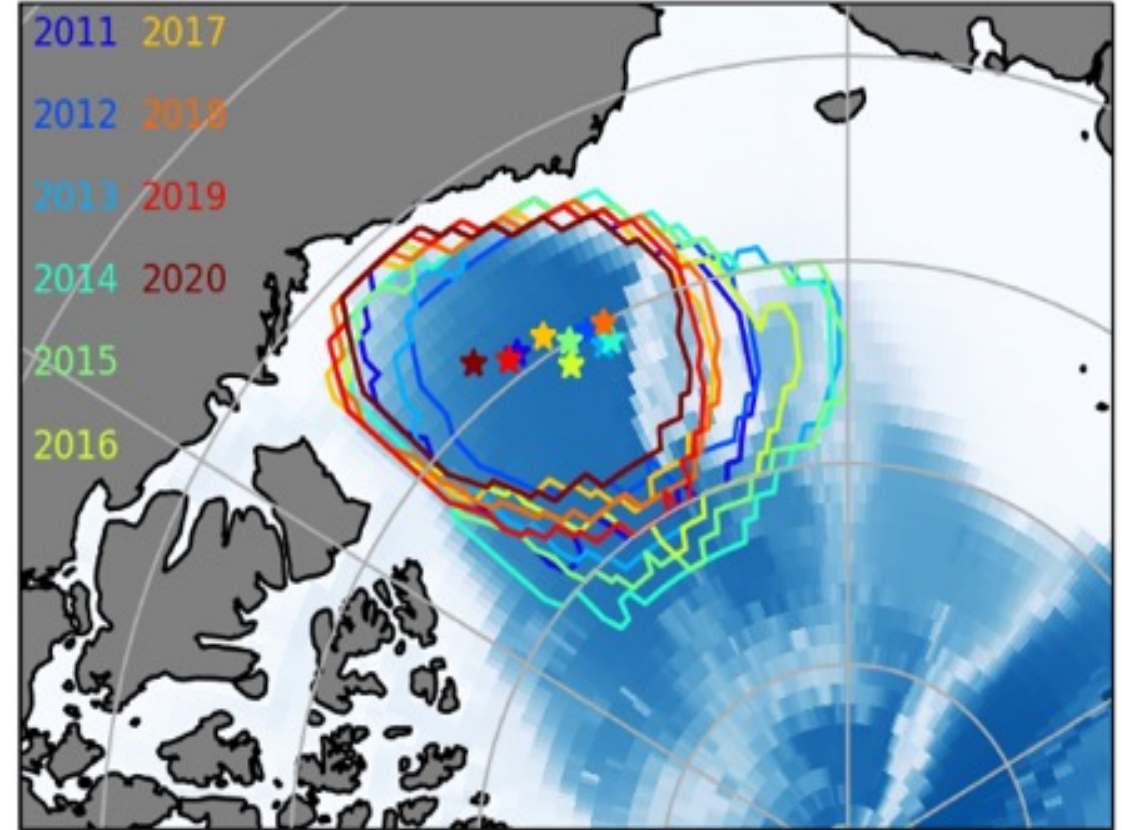
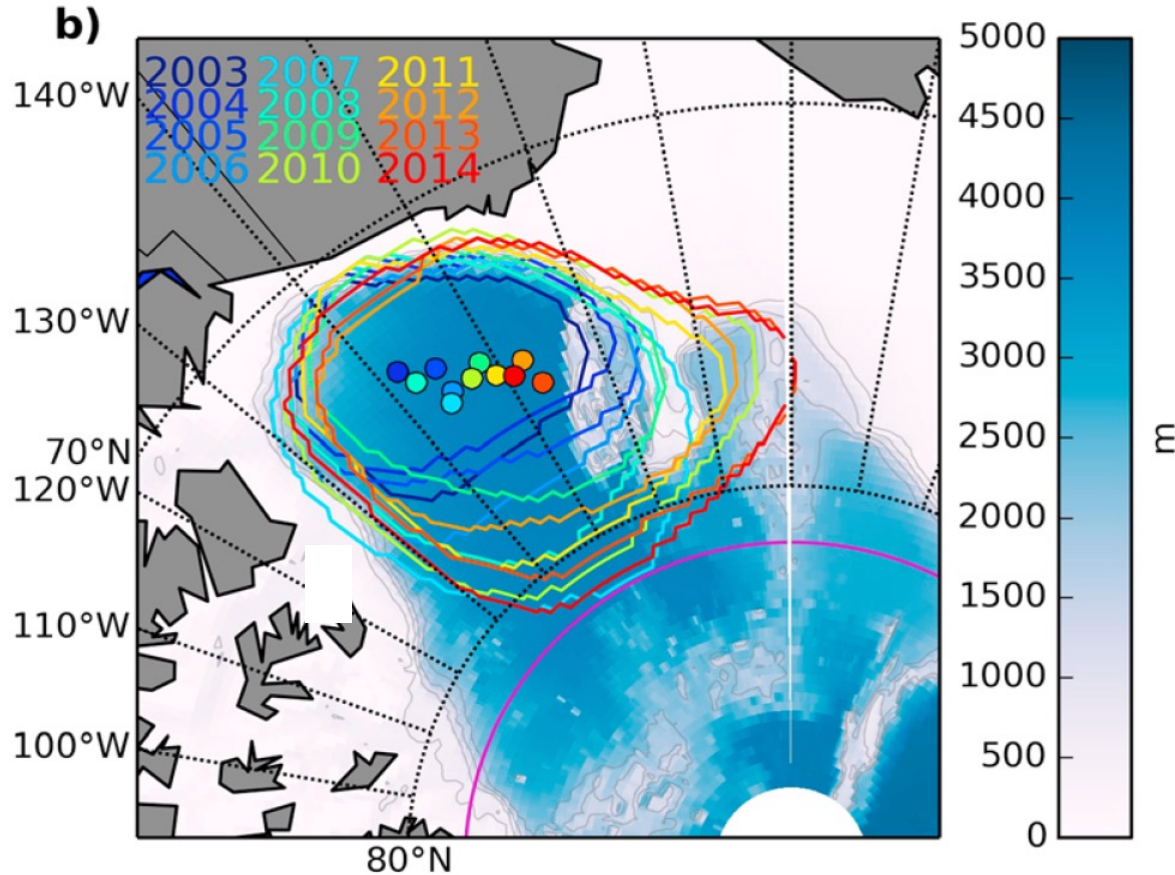
From IceSAT 2004-2008 (Kwok et al., (2011)



Rate of Freshwater content change
From 2005 to 2008



Rate of dynamic topography change
from 2005 to 2008



The Beaufort Gyre Extent, Shape, and Location Between 2003 and 2014 From Satellite Observations

Heather C. Regan¹ , Camille Lique¹ , and Thomas W. K. Armitage²

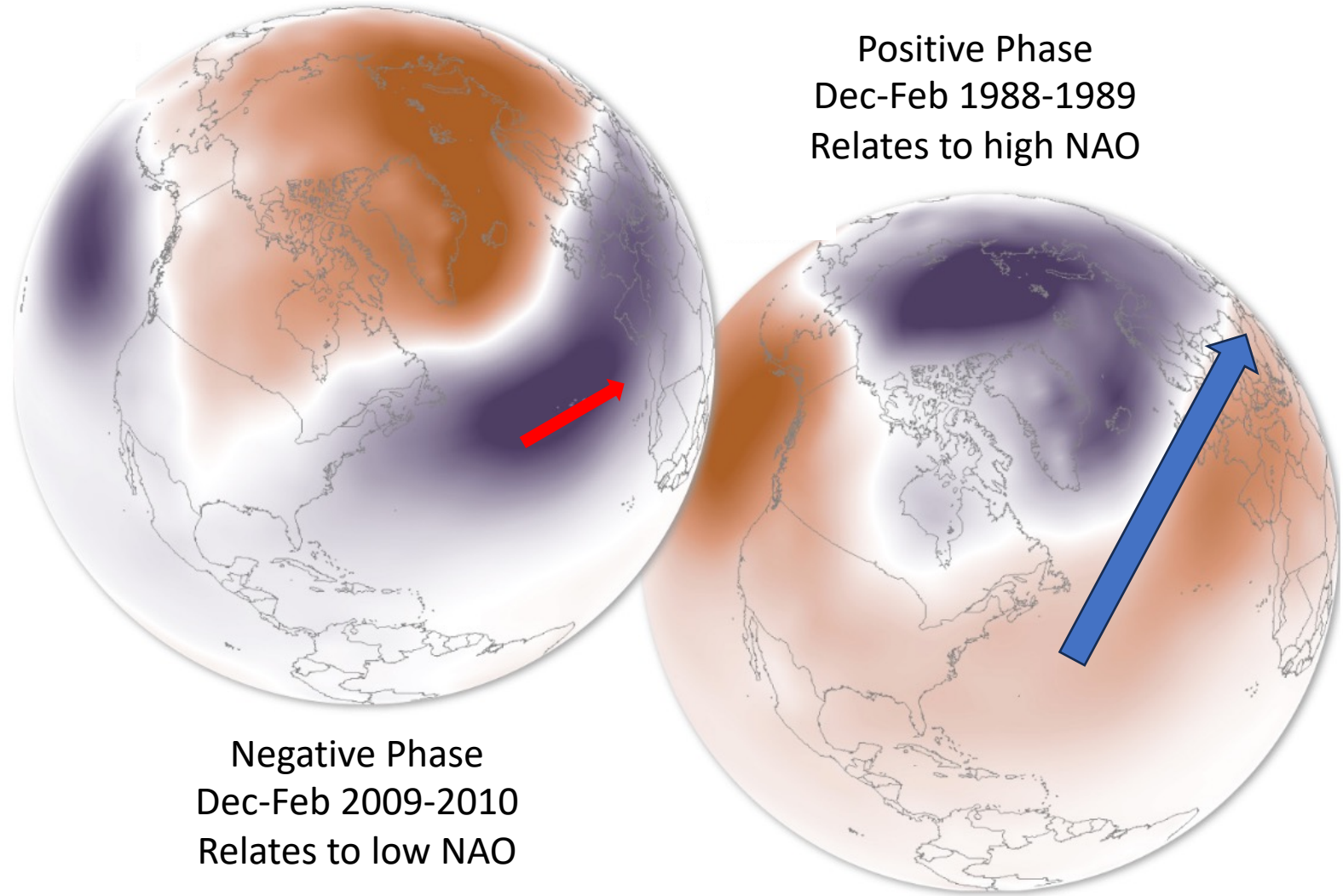
Cryo-TEMPO data: 2011-2020

Expansion of the Gyre ceased after 2016

Arctic Oscillation (AO) can have a strong influence on weather and climate in North America, Europe, and Asia, especially during winter.

Winter surface pressure across the Northern Hemisphere compared to the 1981-2010

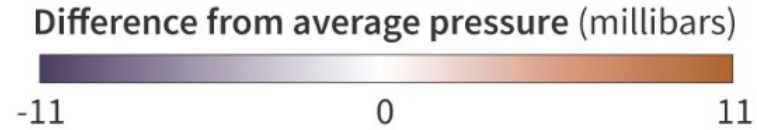
Negative/Positive AO favors a warm/cold Arctic and cold/warm conditions across U.S. and Europe..



Positive Phase
Dec-Feb 1988-1989
Relates to high NAO

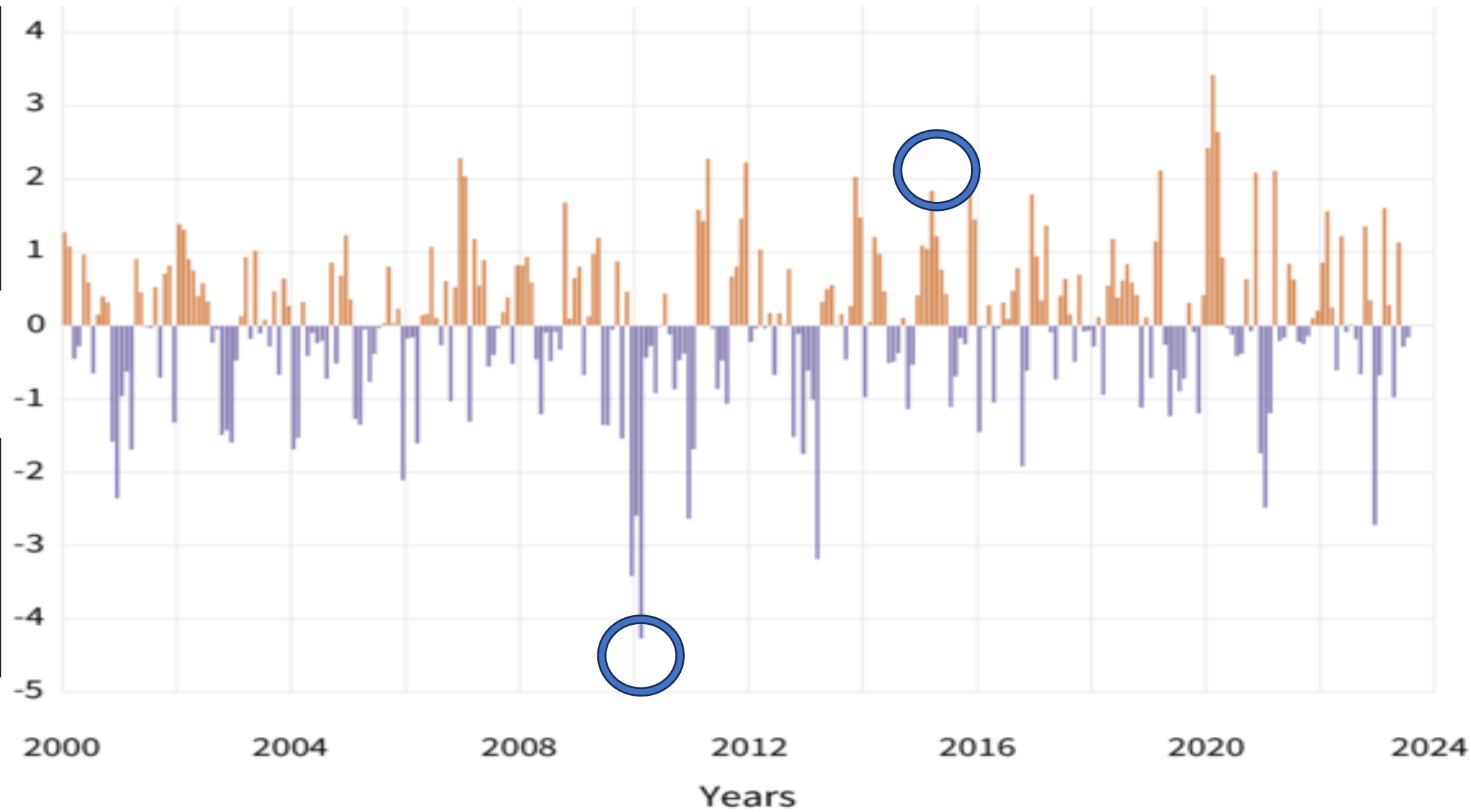
Negative Phase
Dec-Feb 2009-2010
Relates to low NAO

Dec-Feb 2009-10 (left)
Dec-Feb 1988-89 (right)



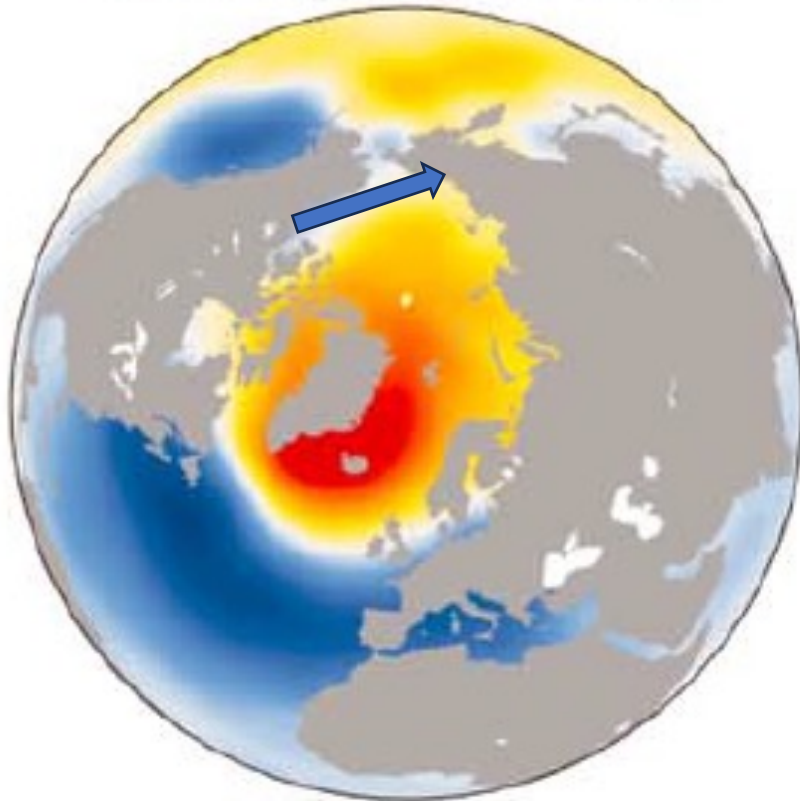
The jet stream stays farther north, and mid-latitude winters are milder than usual.

The jet stream dips into the mid-latitudes, creating cold-air outbreaks.

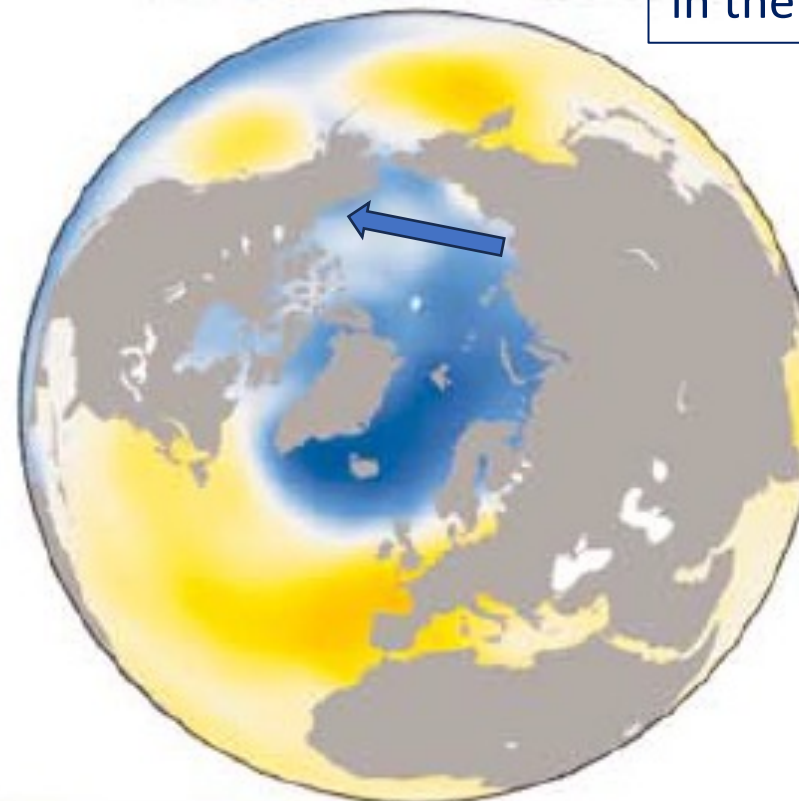


Favors clockwise
Flow direction

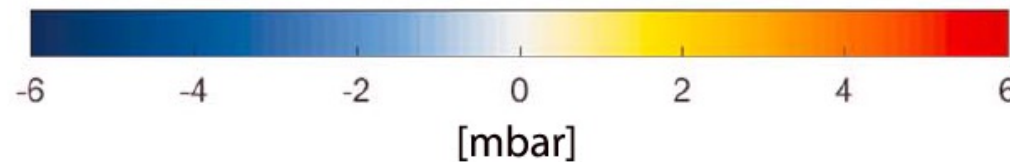
2010 SLP anom

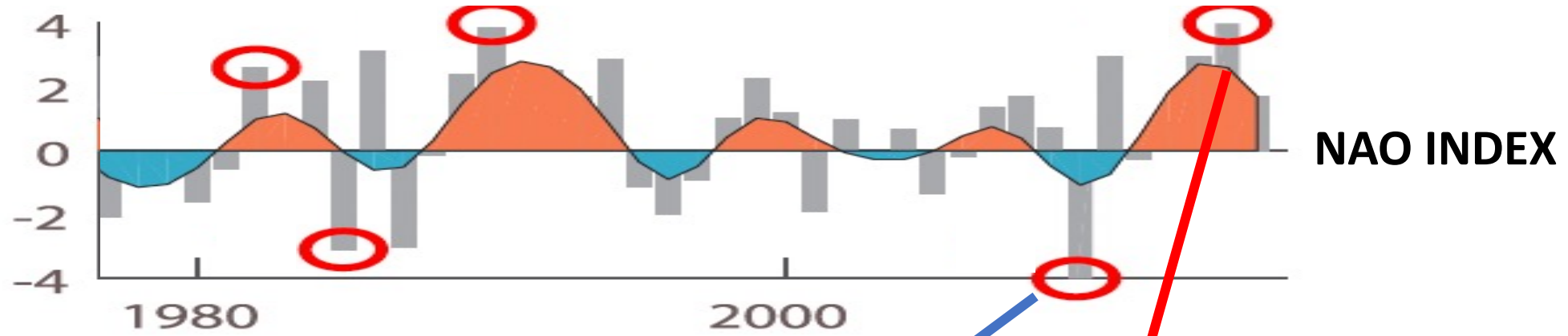


2015 SLP anom

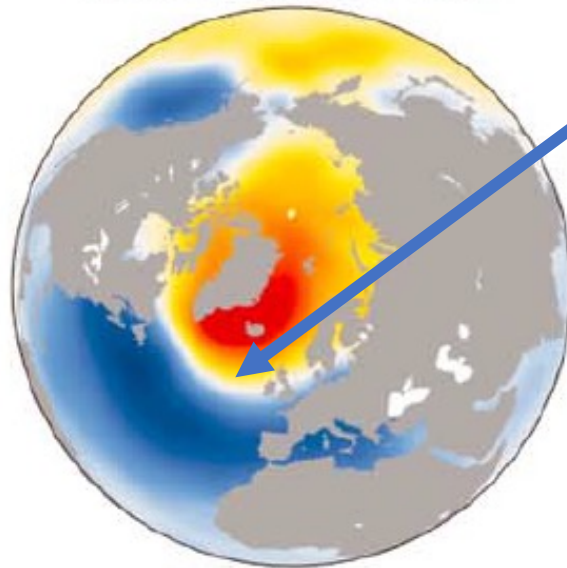


Favors persistent
southwesterly winds
in the Northeast Atlantic

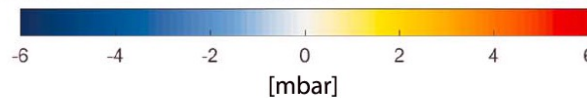
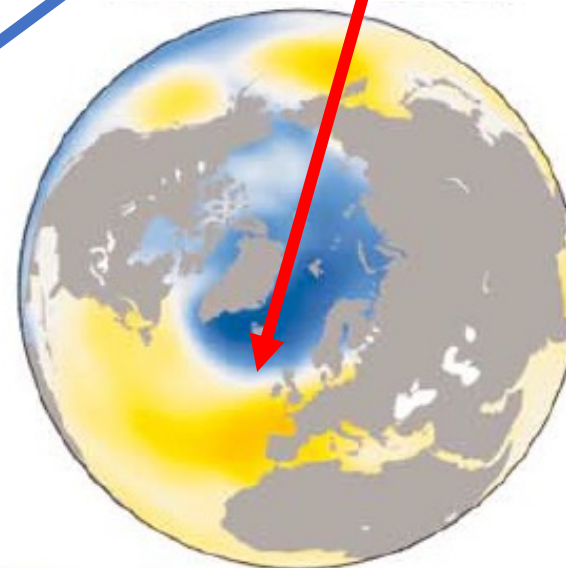


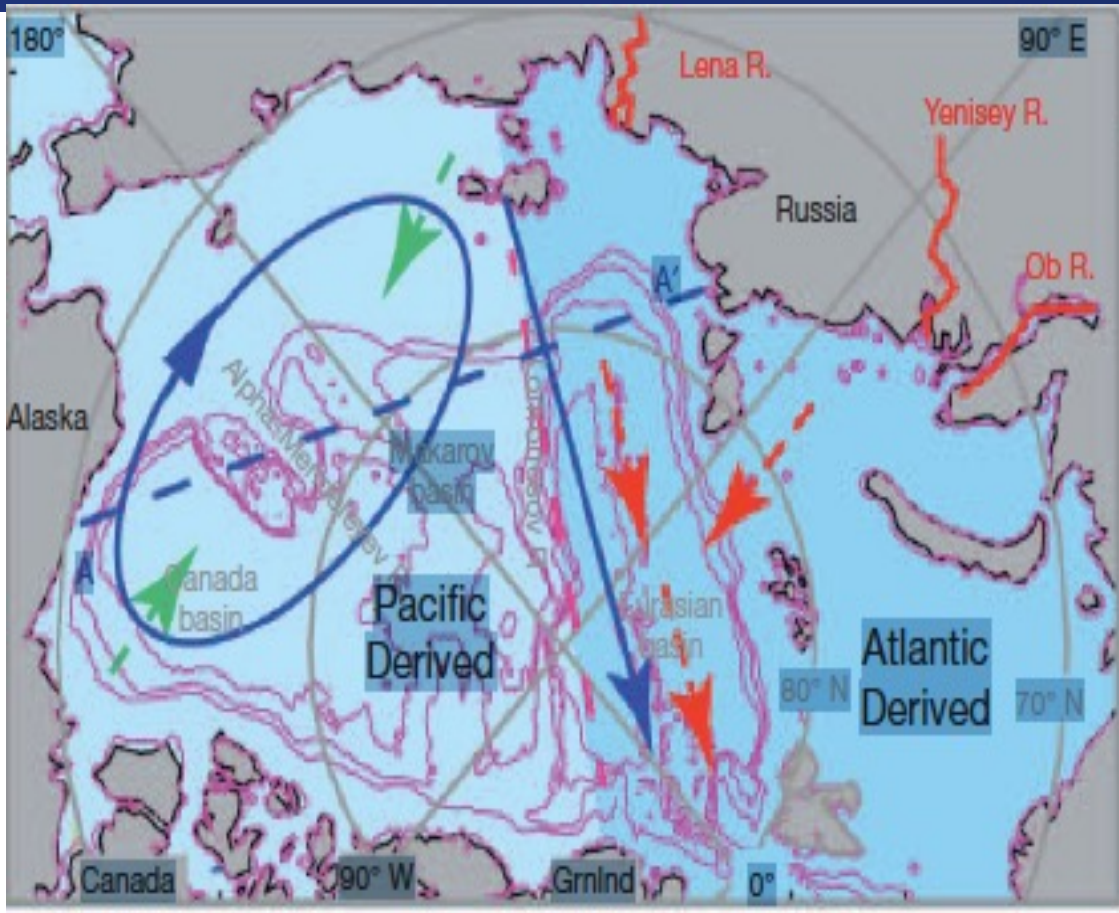


2010 SLP Anom

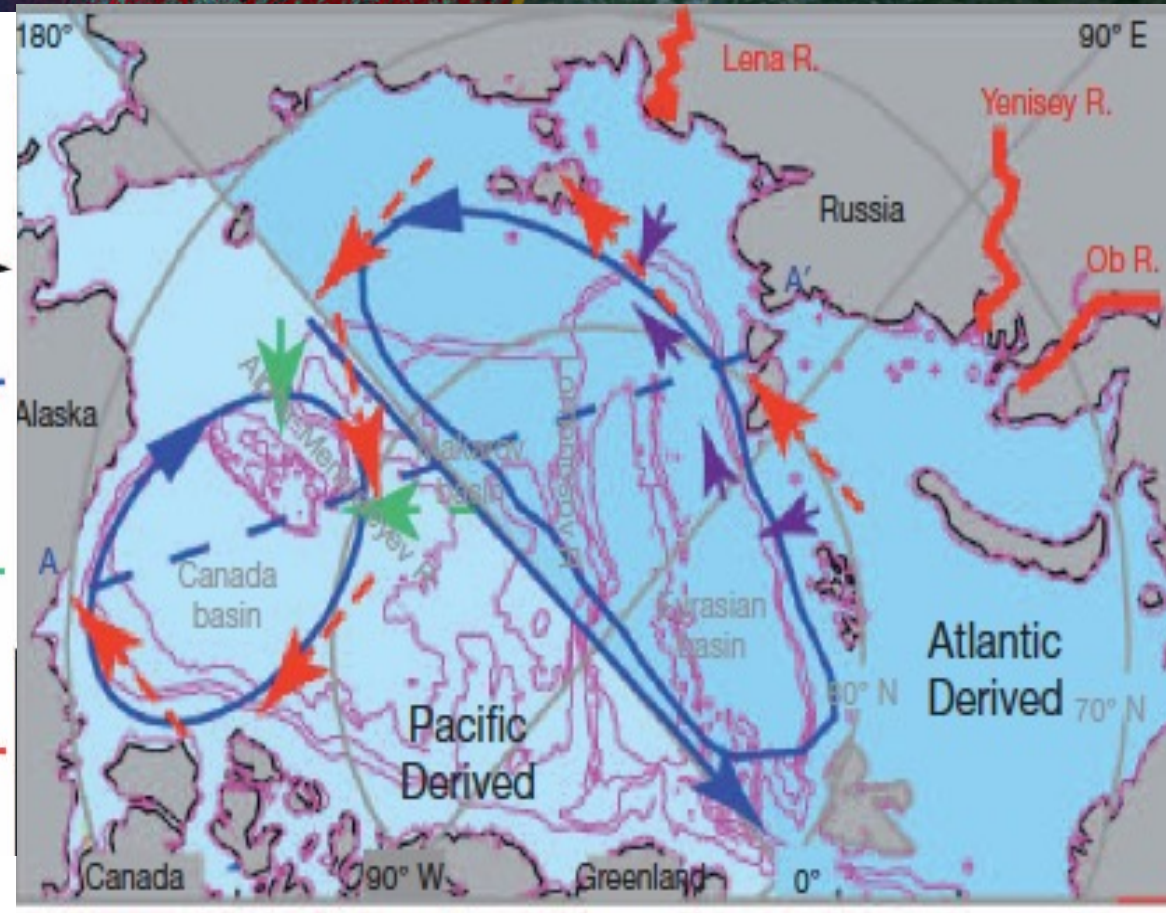


2015 SLP Anom



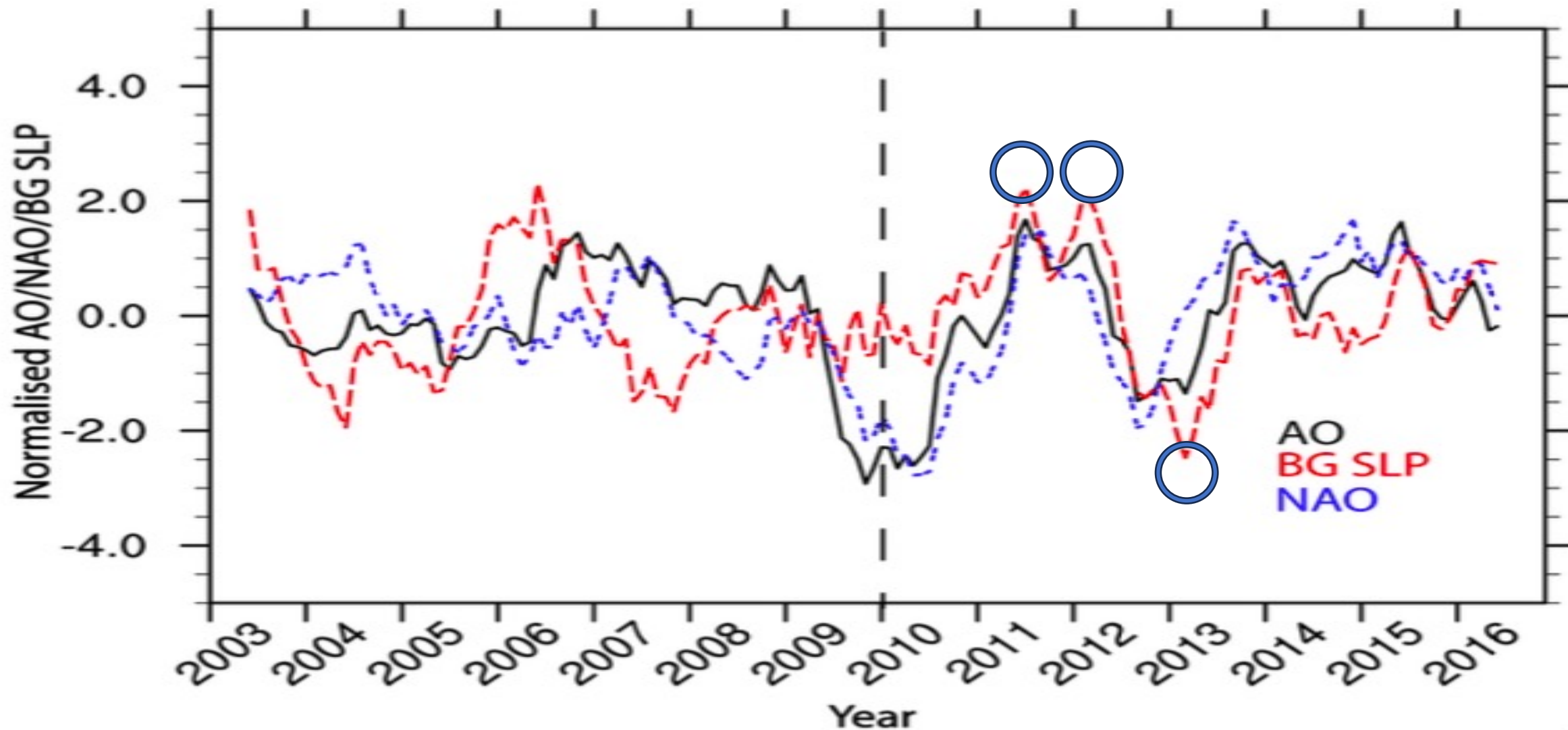


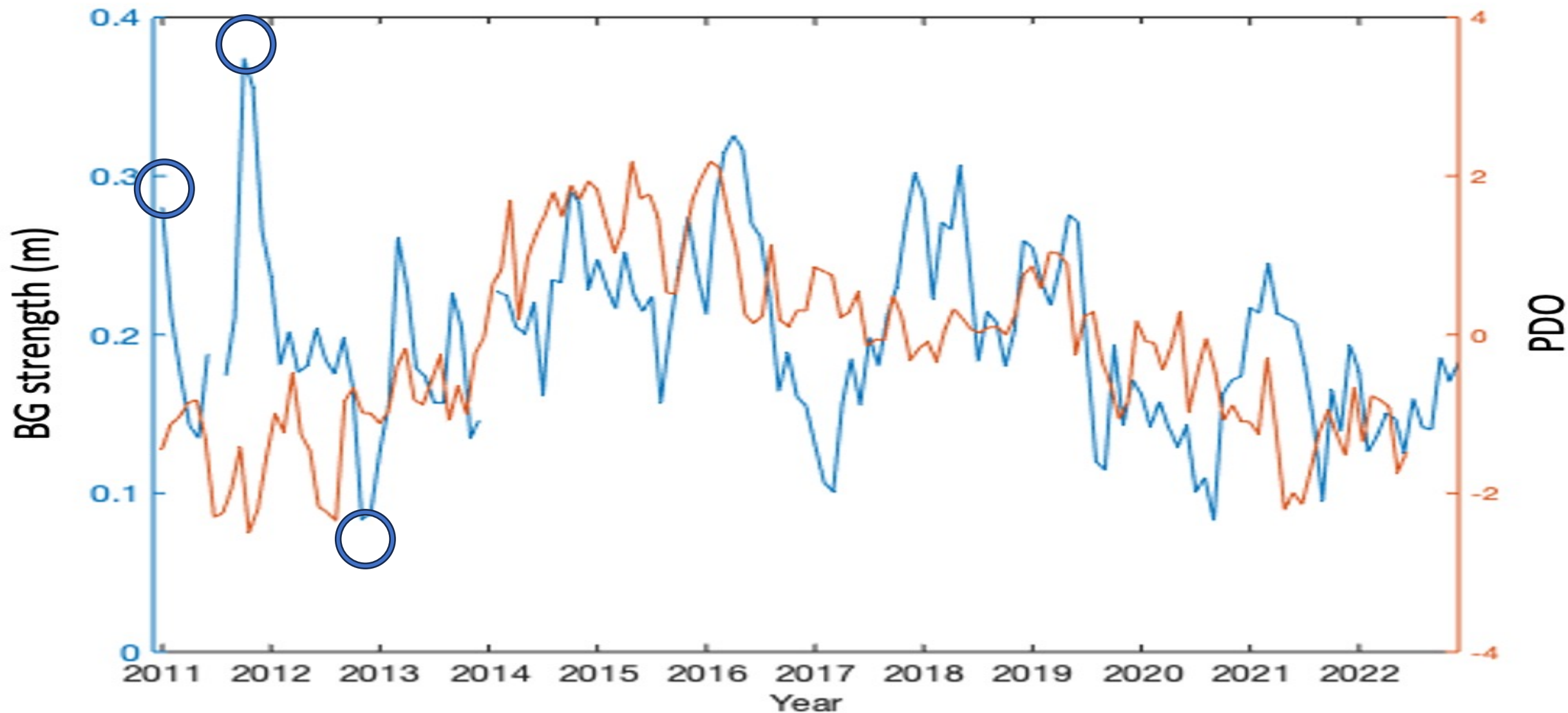
← Low AO anticyclonic mode
 High AO → cyclonic mode
 ← Idealized ocean circulation
 ← Convergence of Ekman transport
 ← Eurasian runoff geostrophic transport

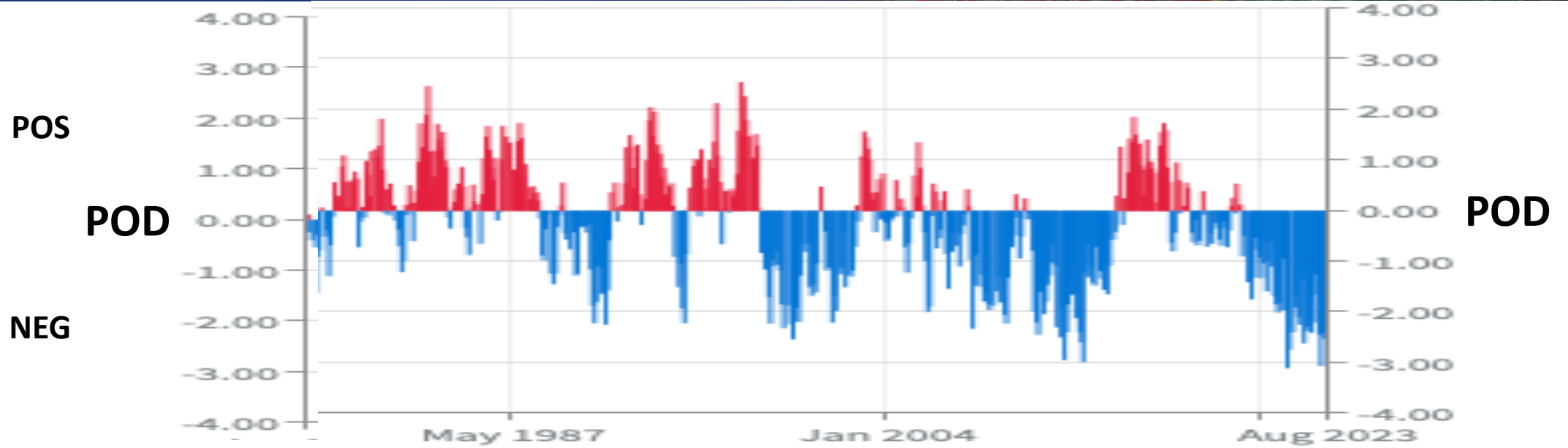


Negative AO

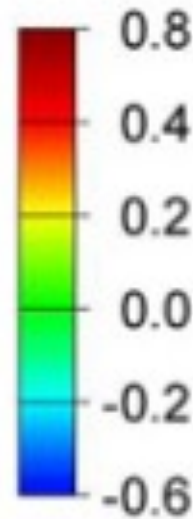
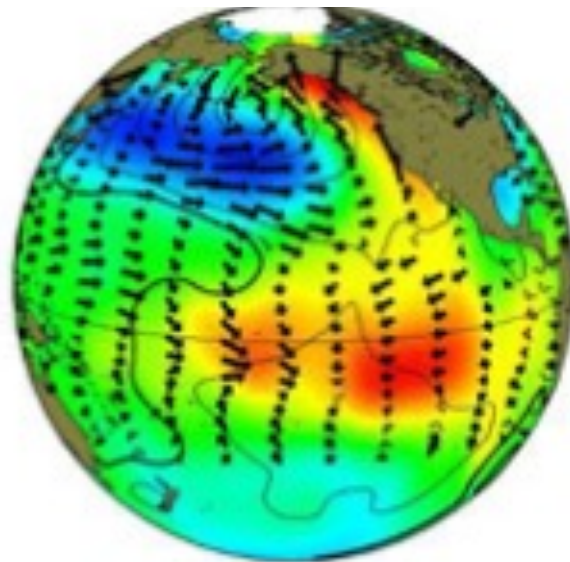
Positive AO



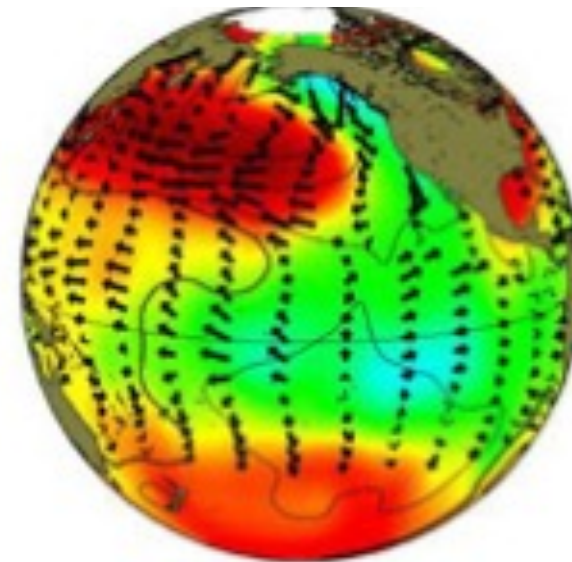


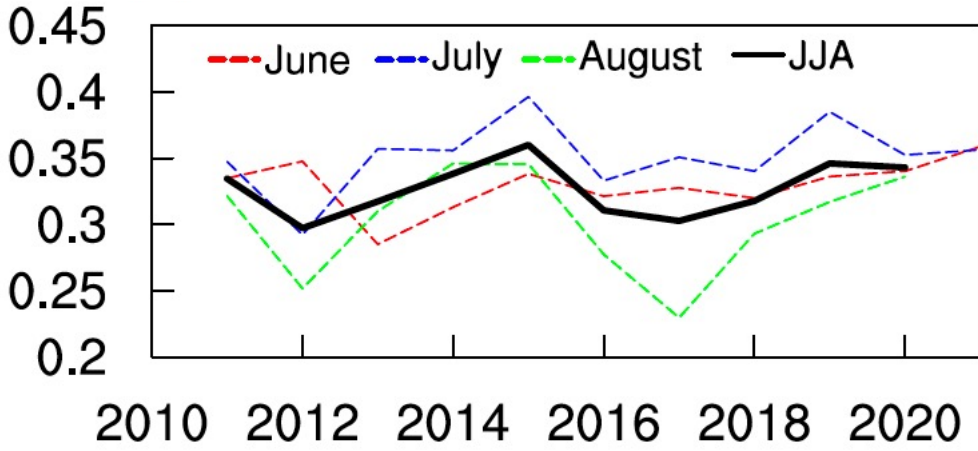


**Positive Phase
Cold North
Pacific SST**



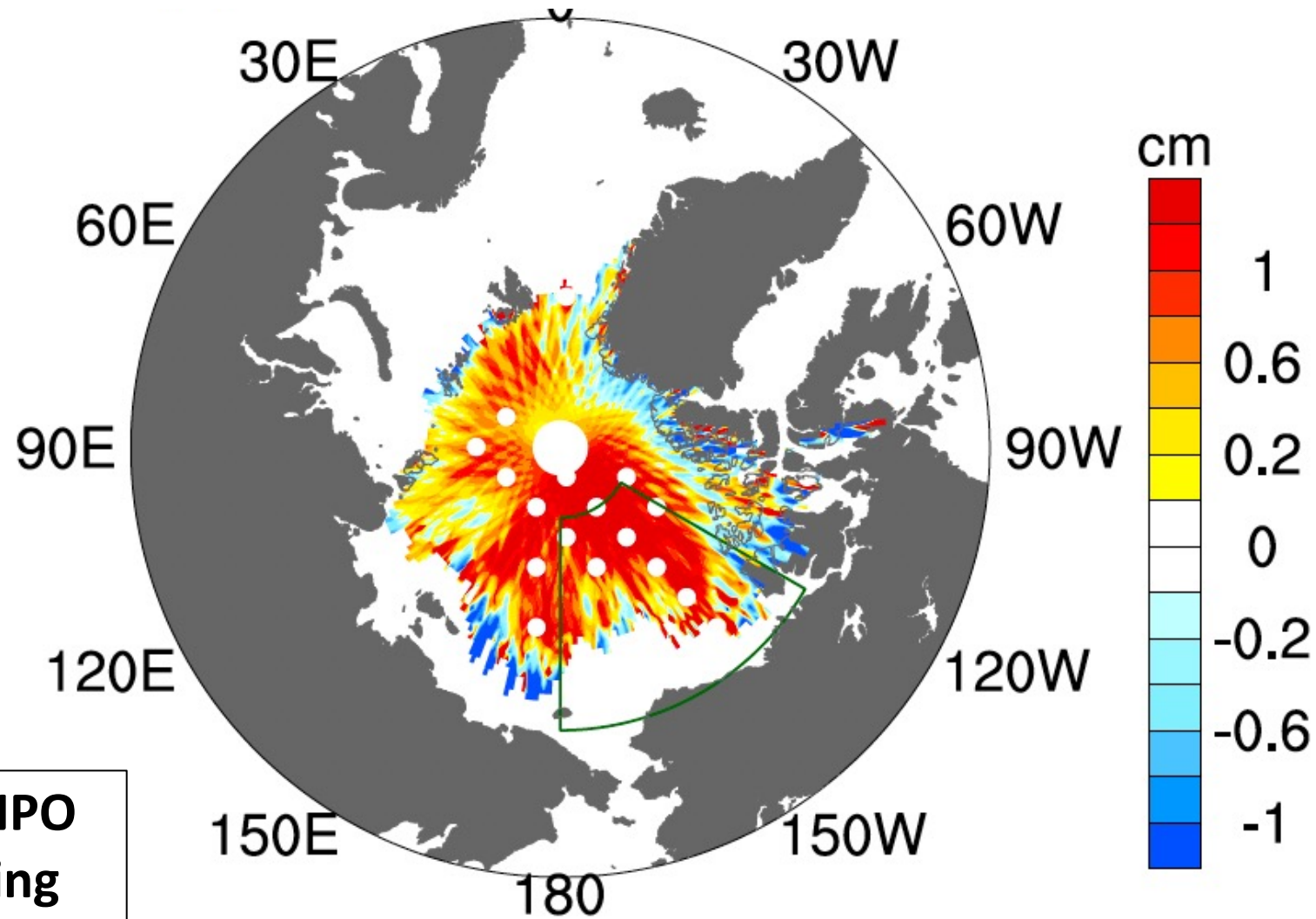
**Negative Phase
Warm North
Pacific SST**





From Yang Liu et al Poster Presentation

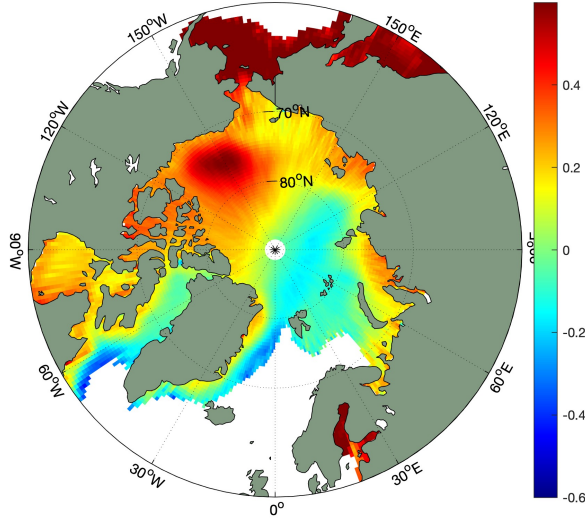
High SSH associated with negative NPO index 2011-2021 leading to increasing freshwater flux into the Beaufort Gyre.



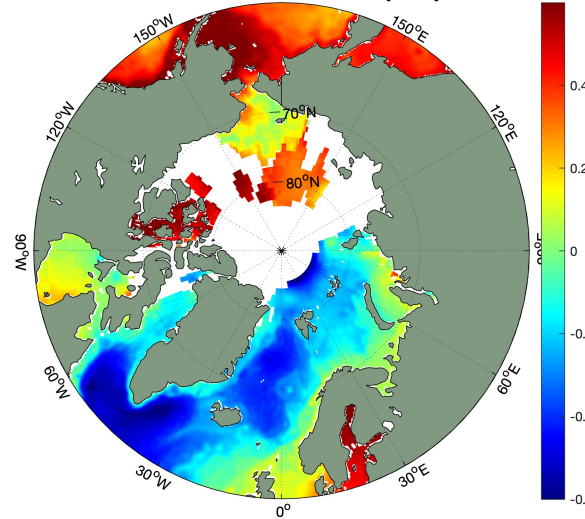
2011-2021: June - July - August

Winter
climatology
(2010-2020)

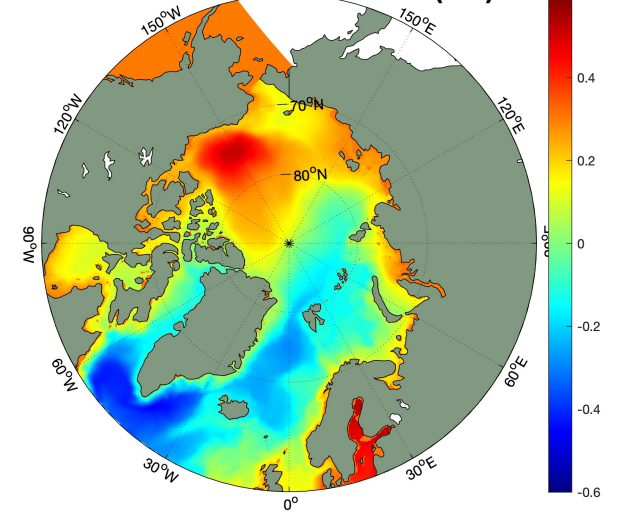
CryoTEMPO (m)



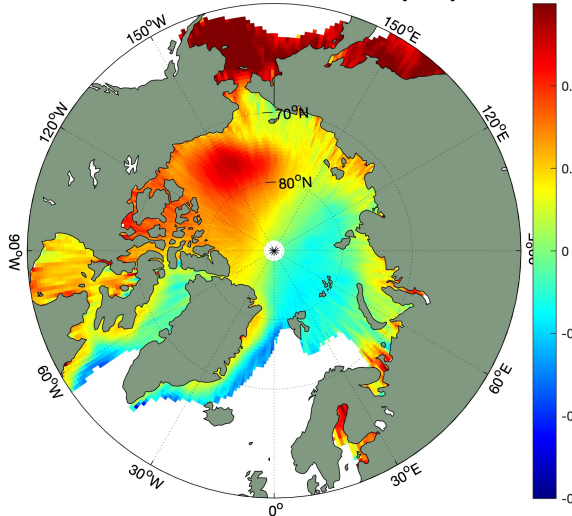
CMEMS (m)



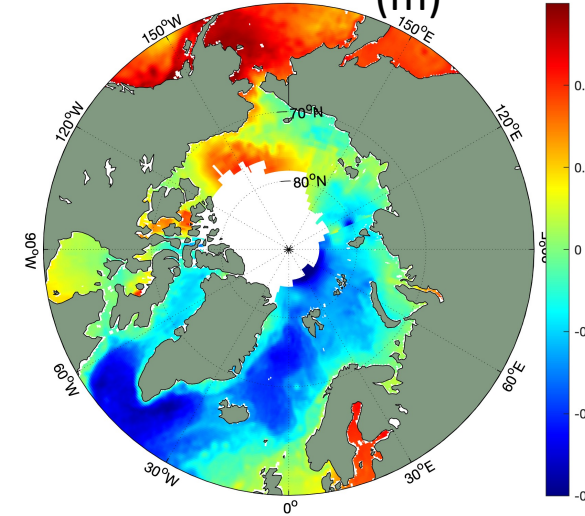
TOPAZ (m)



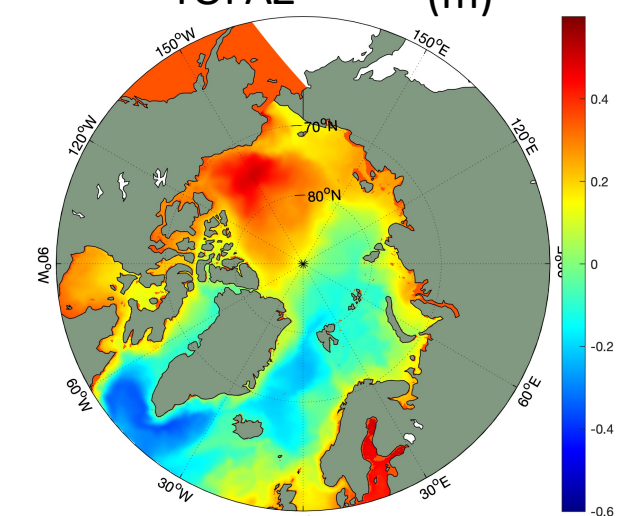
CryoTEMPO (m)



CMEMS (m)



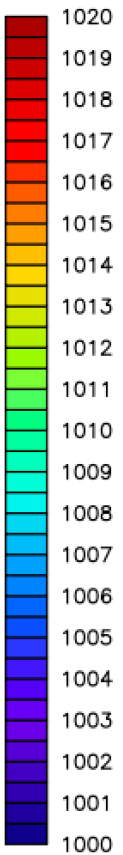
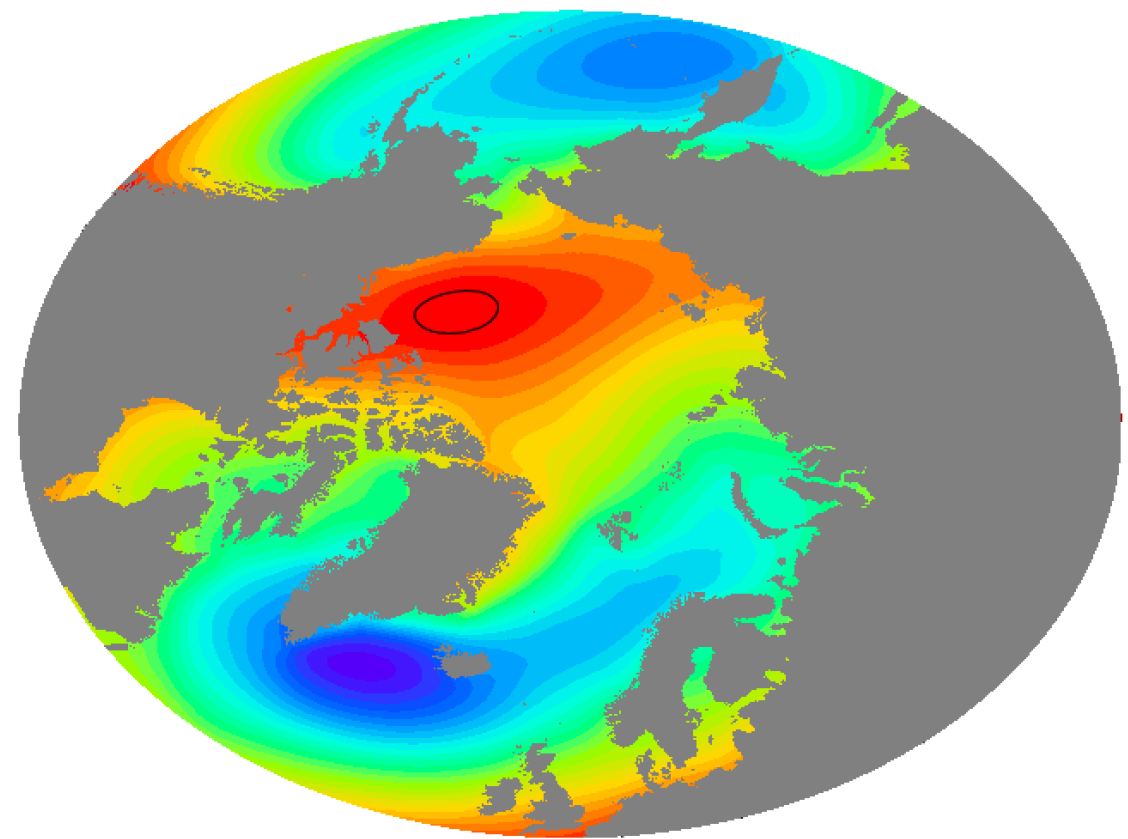
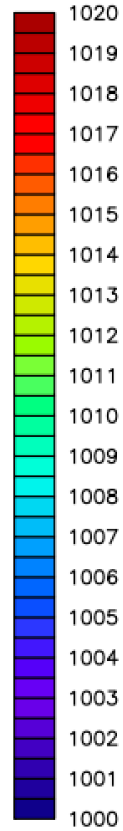
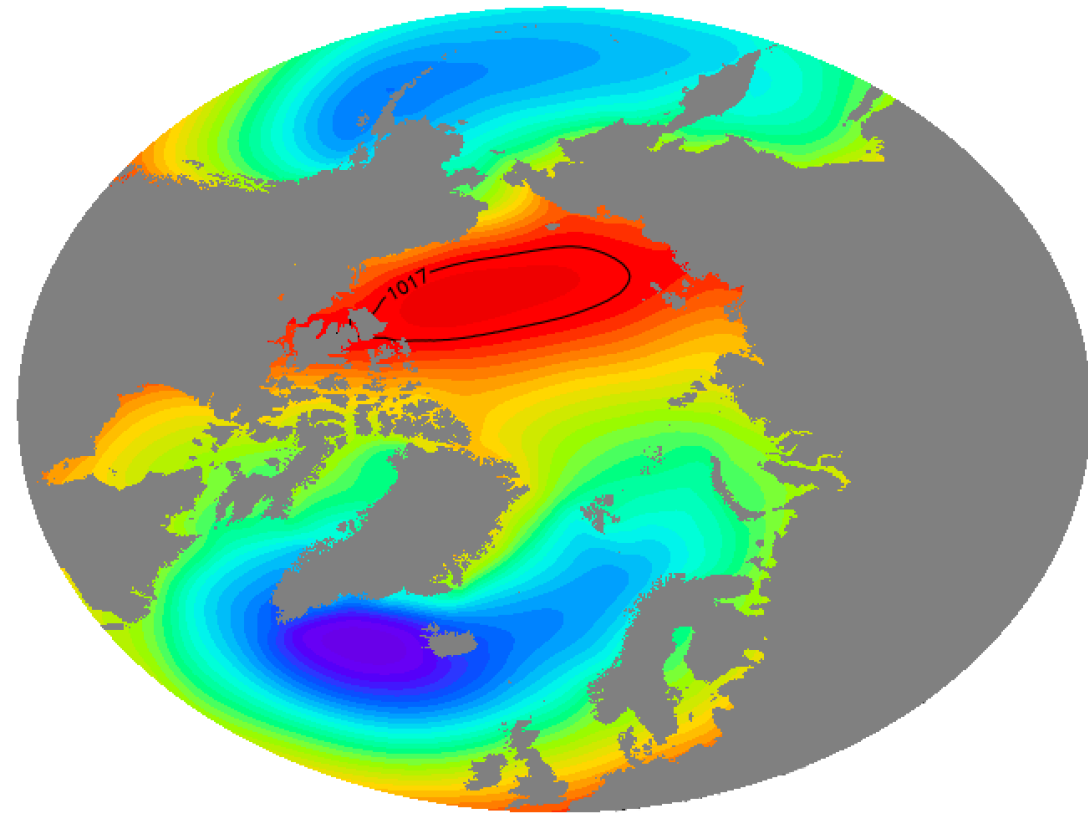
TOPAZ (m)



Annual
mean 2013

2011-2016

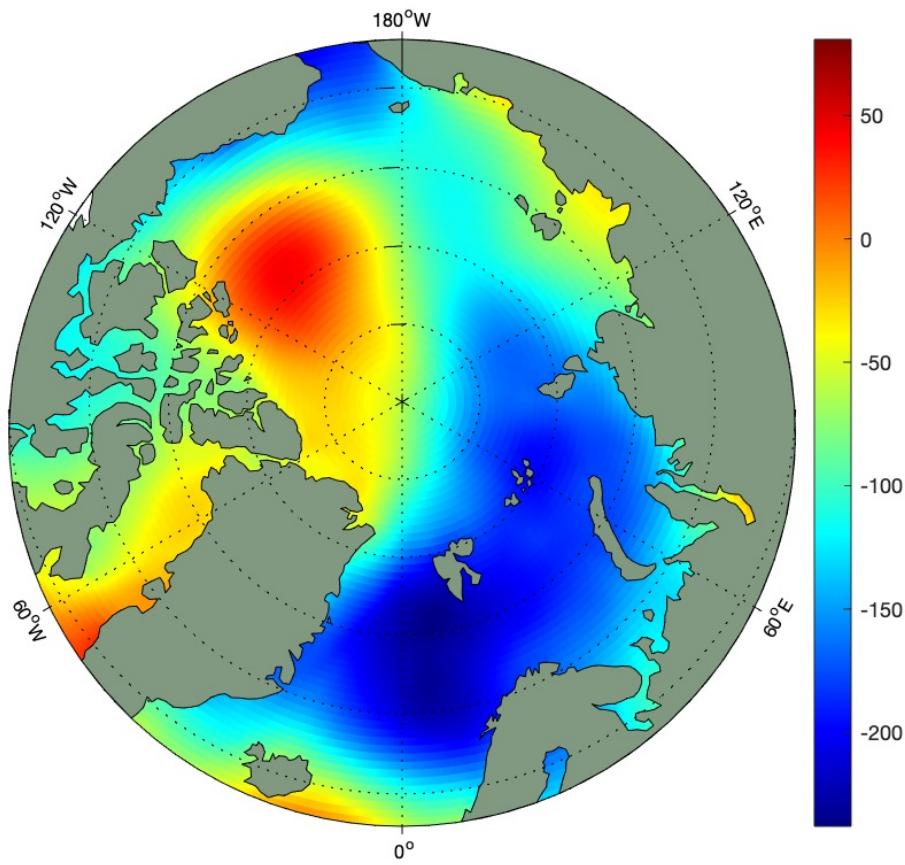
2017-2022



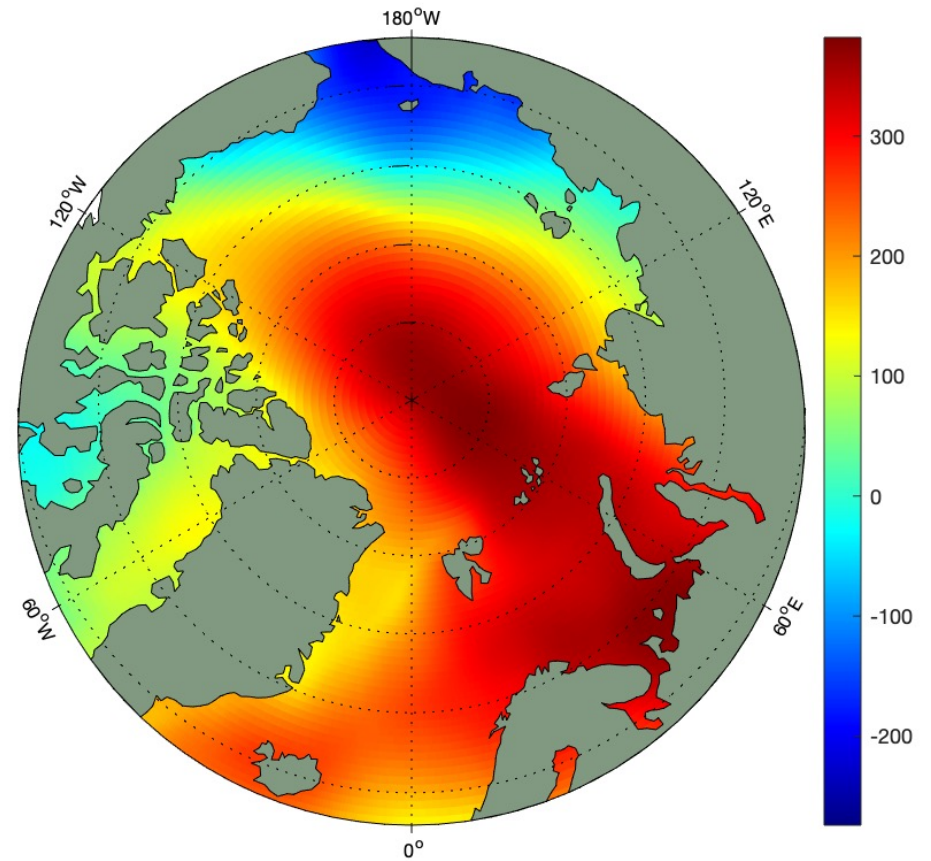
High MSLP pressure extend over a larger area.
BG strong and wide.

High MSLP pressure area is reduced.
BG weaker and smaller.

2011-2016

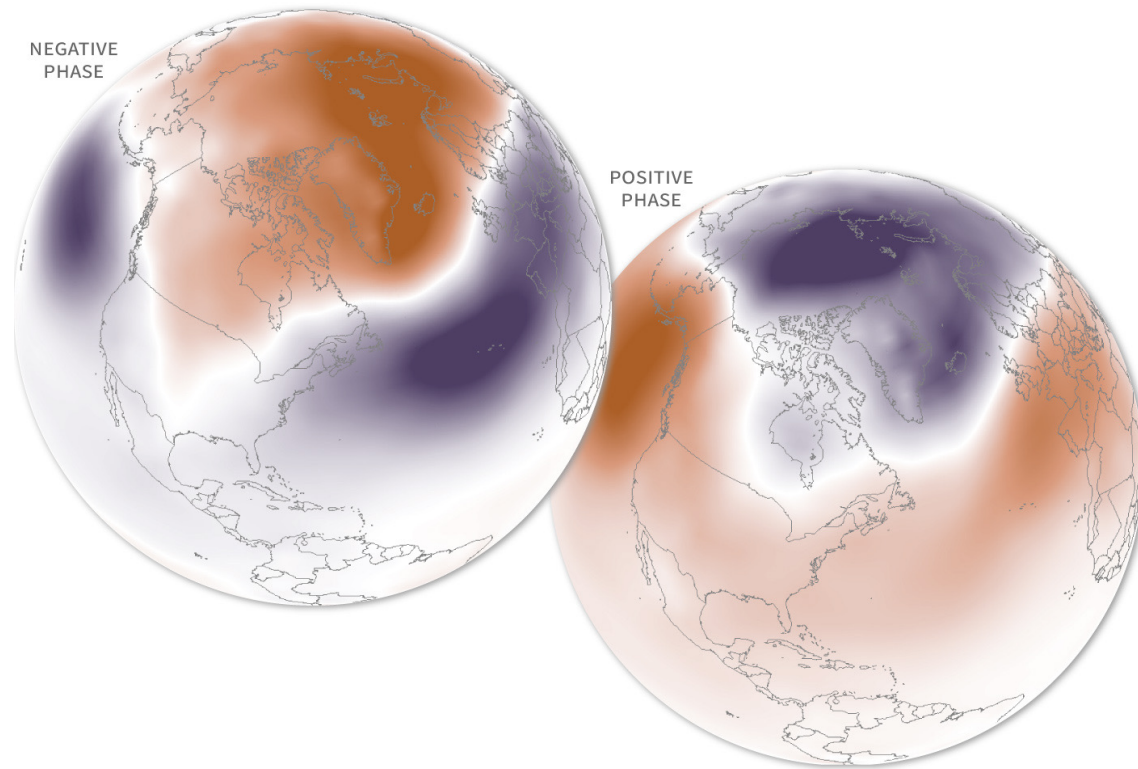


2017-2022

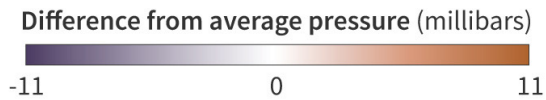


Regression analysis ERA5 MSLP anomalies and BG strength (max SSH – min SSH)

AO PRESSURE PATTERNS

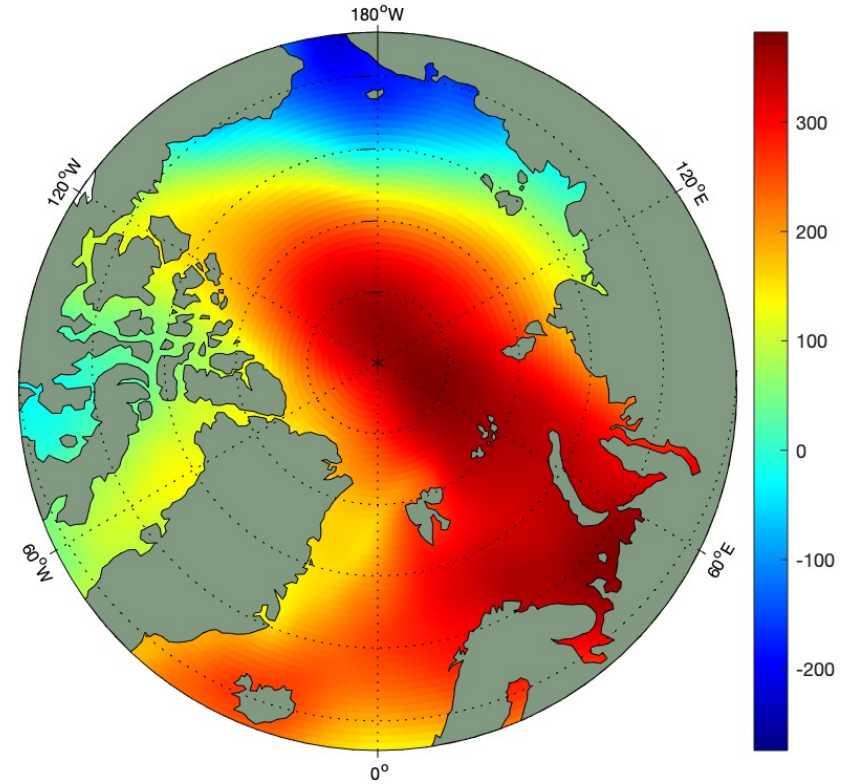


Dec-Feb 2009-10 (left)
Dec-Feb 1988-89 (right)



NOAA Climate.gov
Data: NCEP/NCAR

2017-2022



Regression analysis ERA5 MSLP and BG strength

Name	Institution	Poster title	Contribution including period of research
Lluisa Puig Moner	NERSC	<i>Exploring Mesoscale Eddies in the Nordic Seas with a Multiparameter Eddy Significance Index (MESI) and Singularity Exponent (SE) analysis</i>	January 2023 to June 2024

Name	Institution	Poster title	Contribution including period of research
Yang Liu	IAP	<i>The Role of North Pacific Teleconnection in the Beaufort Sea Level Change from Cryo-TEMPO Project</i>	2021 to 2024

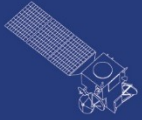
One scientific paper published as a book chapter (Chatterjee et al., 2022).

One manuscript in prep (Liu et al., 2023).

Collaboration with other ongoing ESA projects: (ESA Cryo-TEMPO and ESA Arctic+ Salinity) and completed ESA projects (ESA SLBC CCI).

The analyses will continue during the final year of the Dragon 5 program.

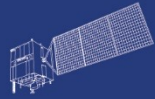
At least 2 more papers will be submitted for peer review publications



HY



HJ-1AB



CBERS



Gaofen



Beijing-2



Sentinel-1



Sentinel-2



Sentinel-3



Sentinel-5p



Aeolus

谢谢!

THANK YOU

PROJECT ID. 59376

Pacific modulation of the Sea level variability of the Beaufort Gyre System in the Arctic Ocean and Nordic Seas

