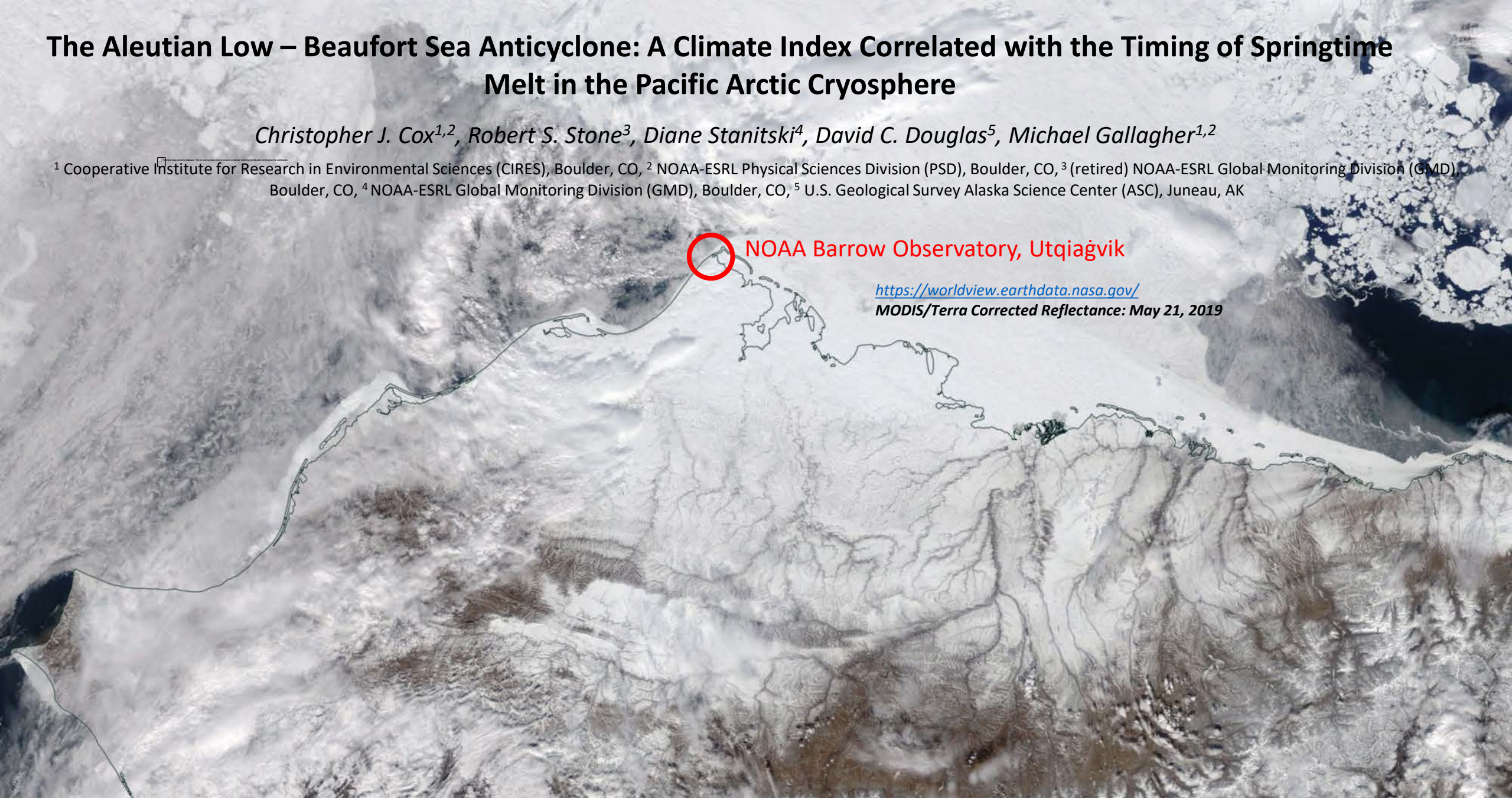


The Aleutian Low – Beaufort Sea Anticyclone: A Climate Index Correlated with the Timing of Springtime Melt in the Pacific Arctic Cryosphere

Christopher J. Cox^{1,2}, Robert S. Stone³, Diane Stanitski⁴, David C. Douglas⁵, Michael Gallagher^{1,2}

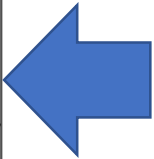
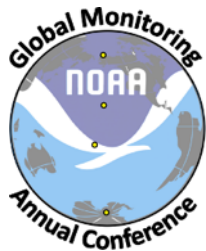
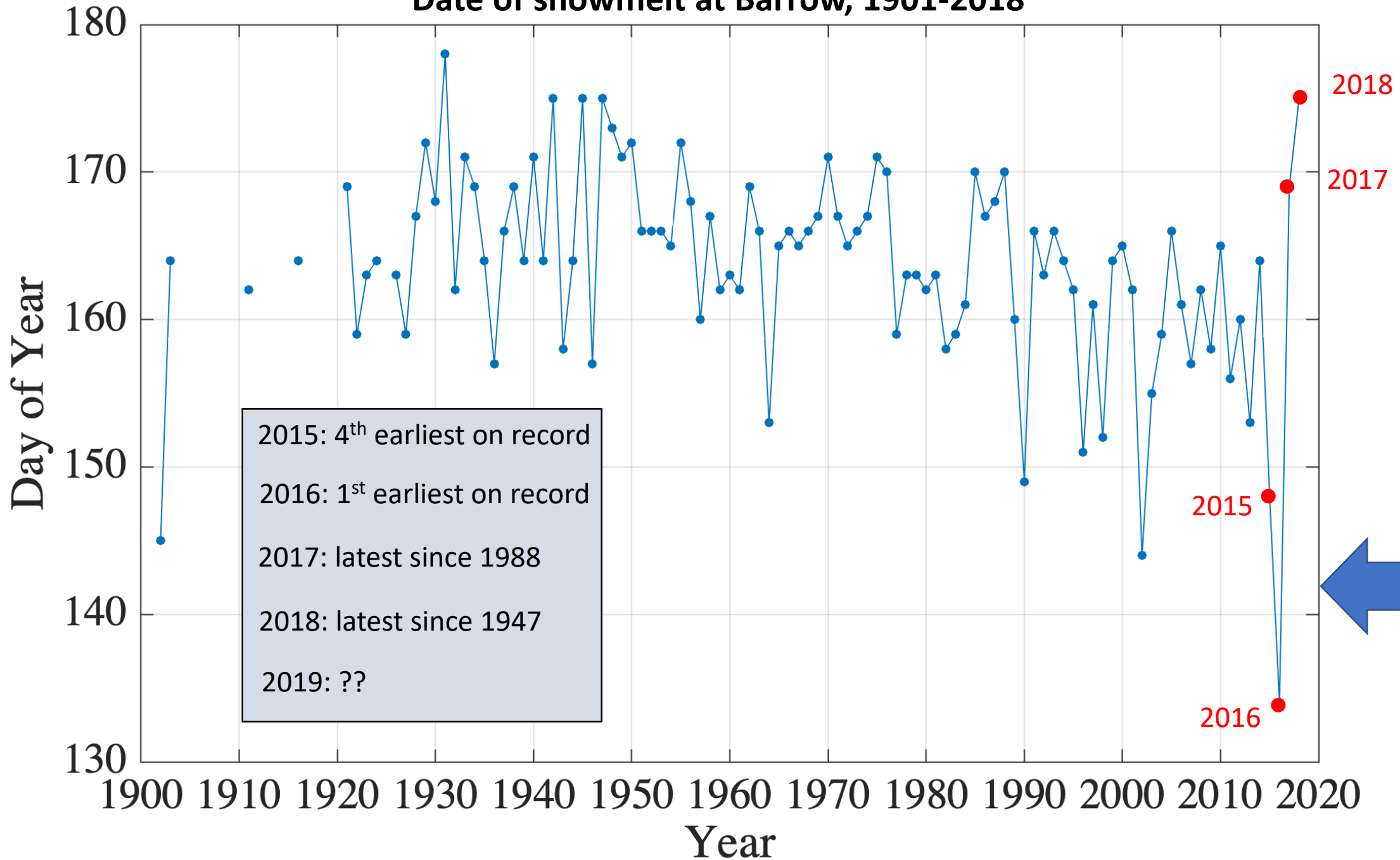
¹ Cooperative Institute for Research in Environmental Sciences (CIRES), Boulder, CO, ² NOAA-ESRL Physical Sciences Division (PSD), Boulder, CO, ³ (retired) NOAA-ESRL Global Monitoring Division (GMD), Boulder, CO, ⁴ NOAA-ESRL Global Monitoring Division (GMD), Boulder, CO, ⁵ U.S. Geological Survey Alaska Science Center (ASC), Juneau, AK

 NOAA Barrow Observatory, Utqiagvik

<https://worldview.earthdata.nasa.gov/>

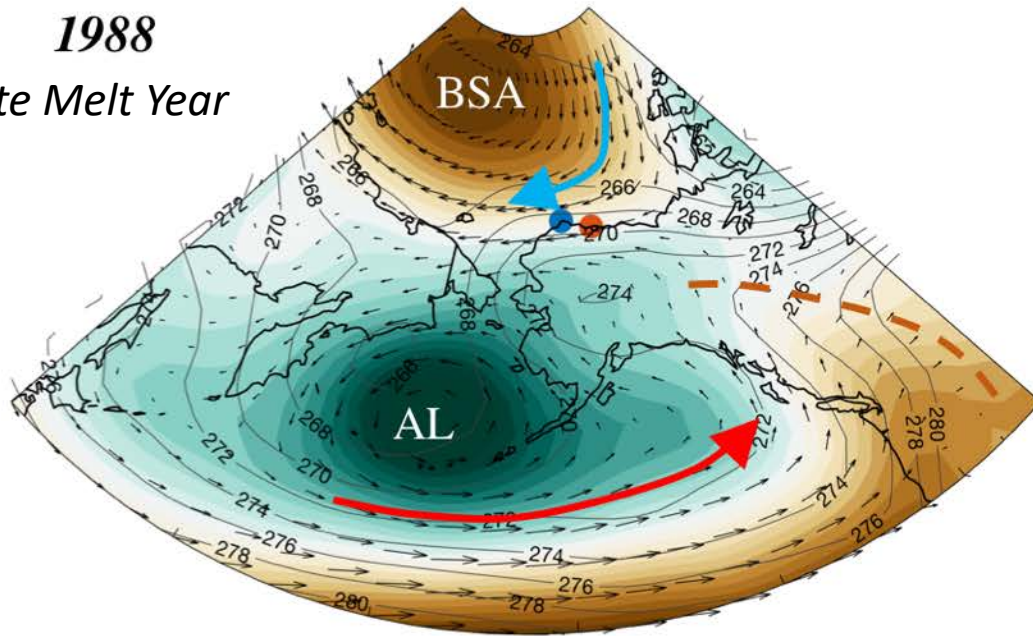
MODIS/Terra Corrected Reflectance: May 21, 2019

Date of snowmelt at Barrow, 1901-2018

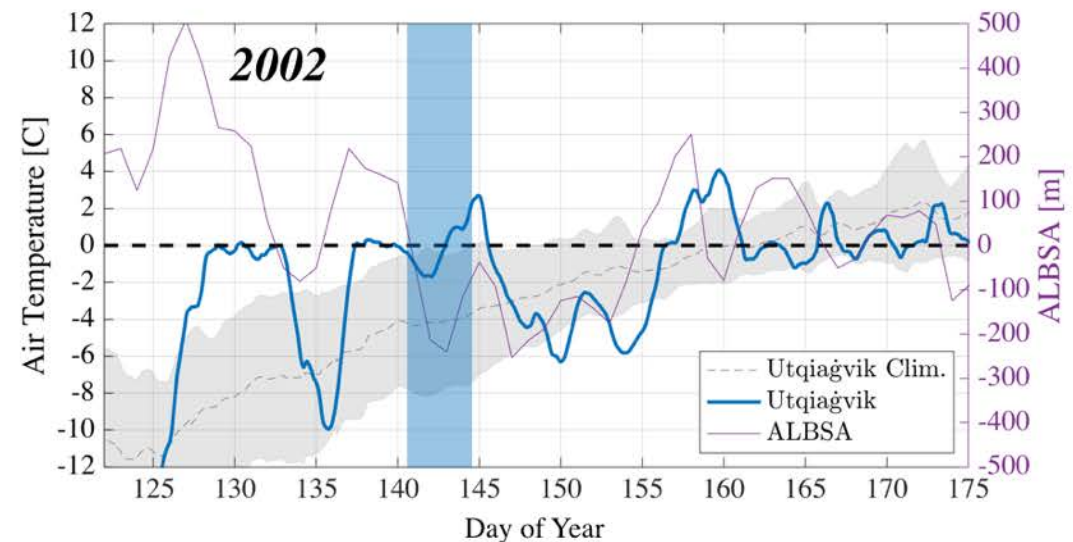
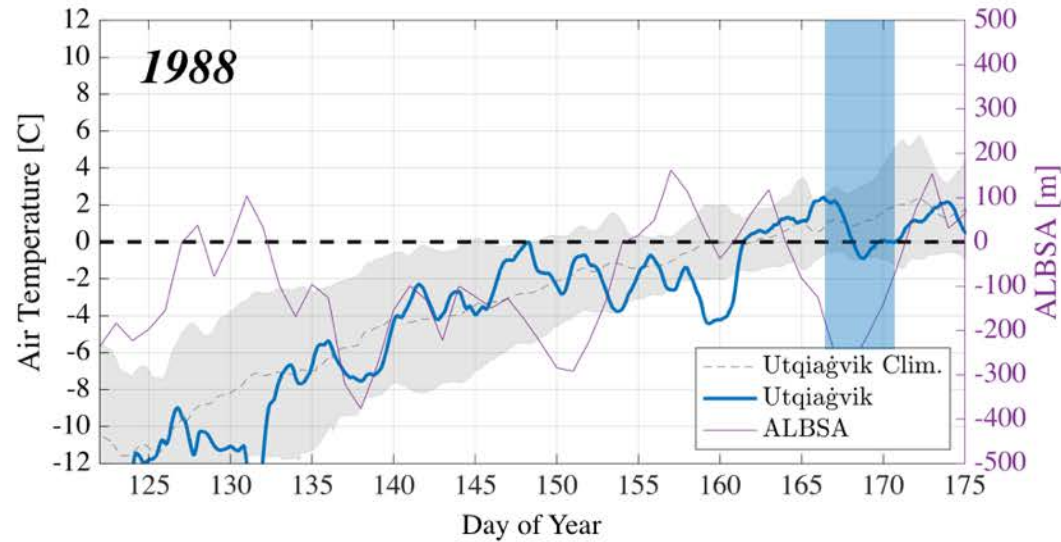
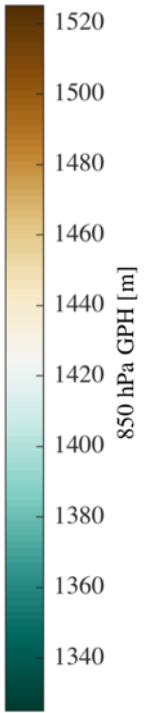
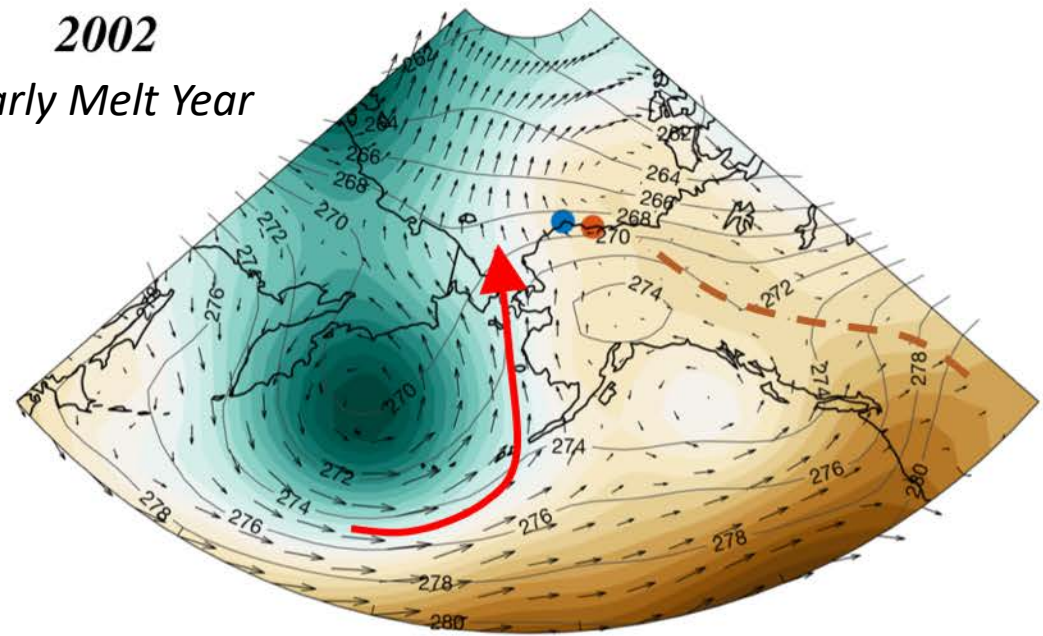


May Average 850 hPa GPH

1988
Late Melt Year

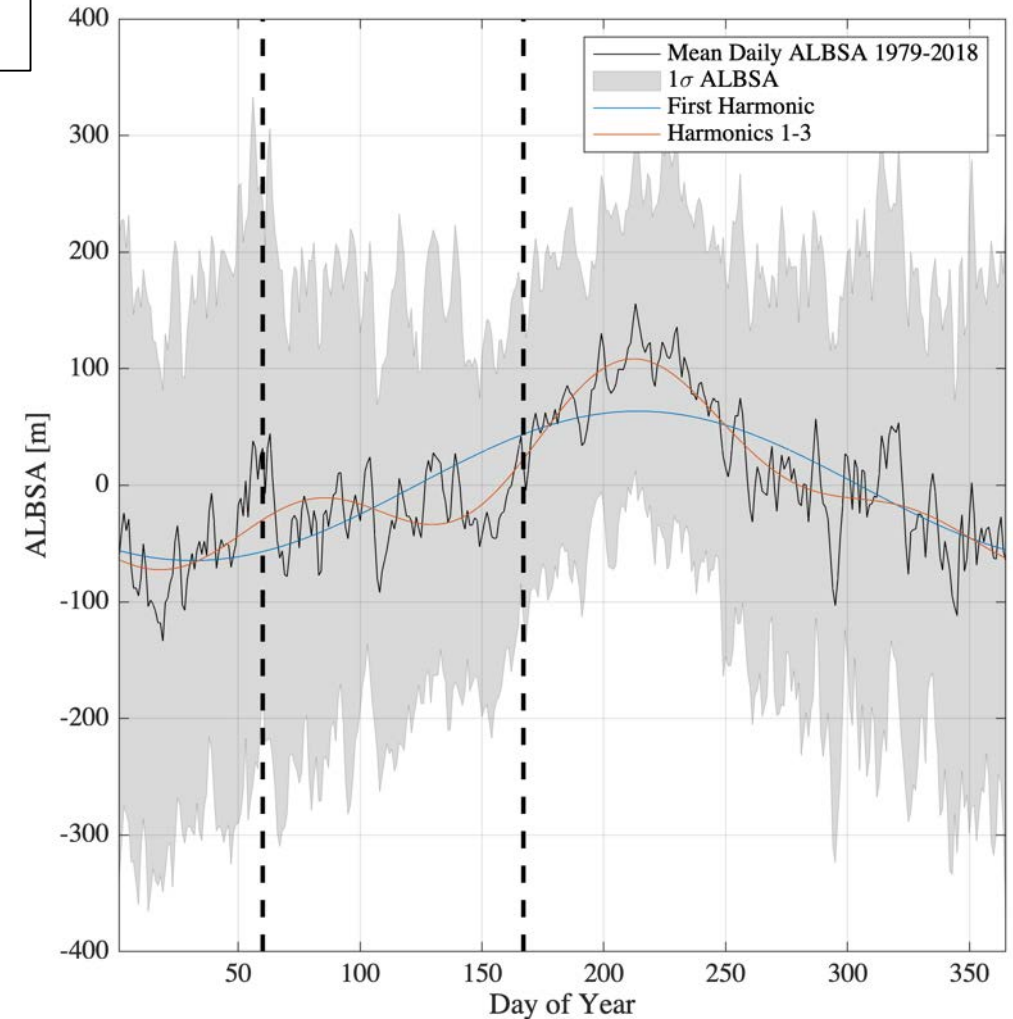
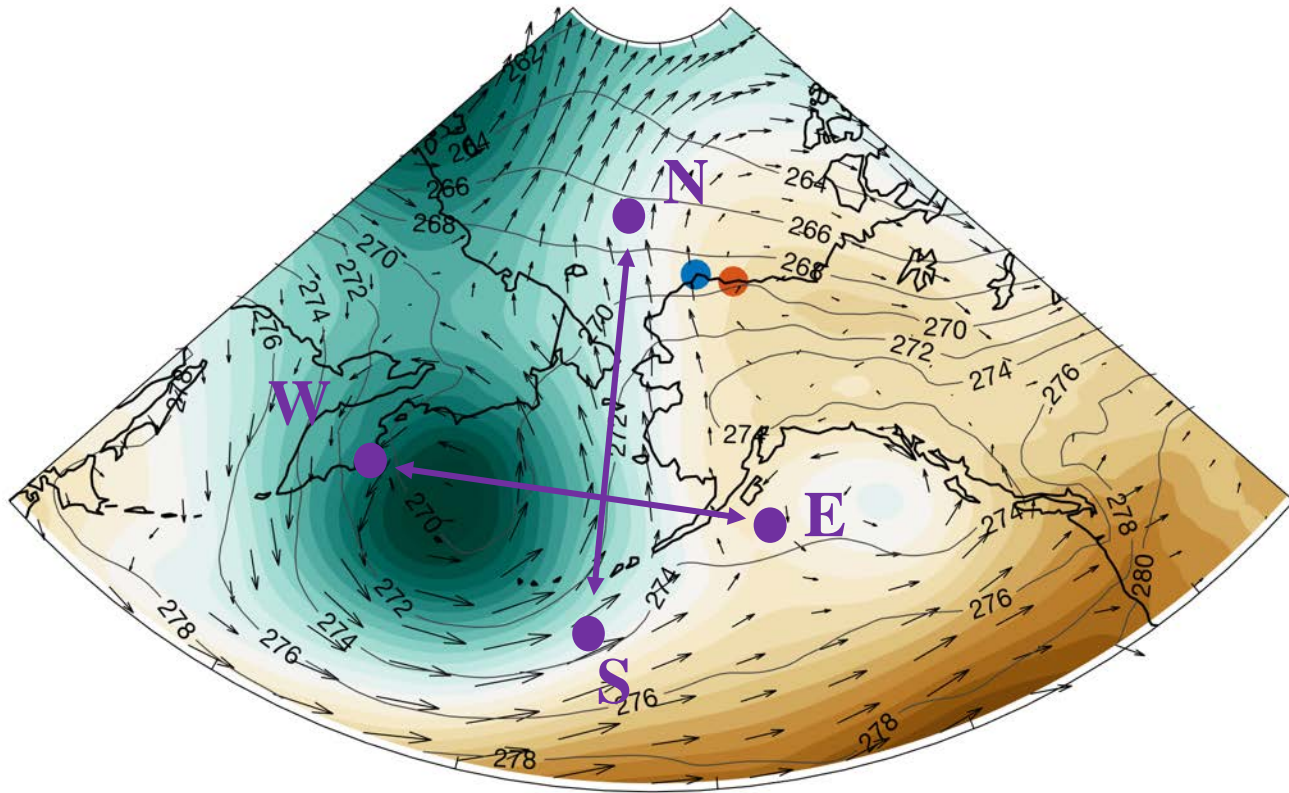


2002
Early Melt Year



Aleutian Low Beaufort Sea Anticyclone

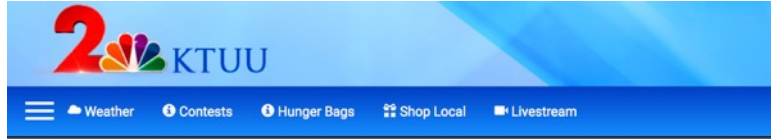
$$\text{ALBSA} = [\text{E-W}] - [\text{N-S}]$$



Aleutian Low– Beaufort Sea Anticyclone (ALBSA) index

Cox et al. (in review)

Betty Soolook, Feb 20, Diomed, AK



Tragedy of a village built on ice



VIDEO: Shishmaref road erodes away in storm

The Washington Post

Democracy Dies in Darkness

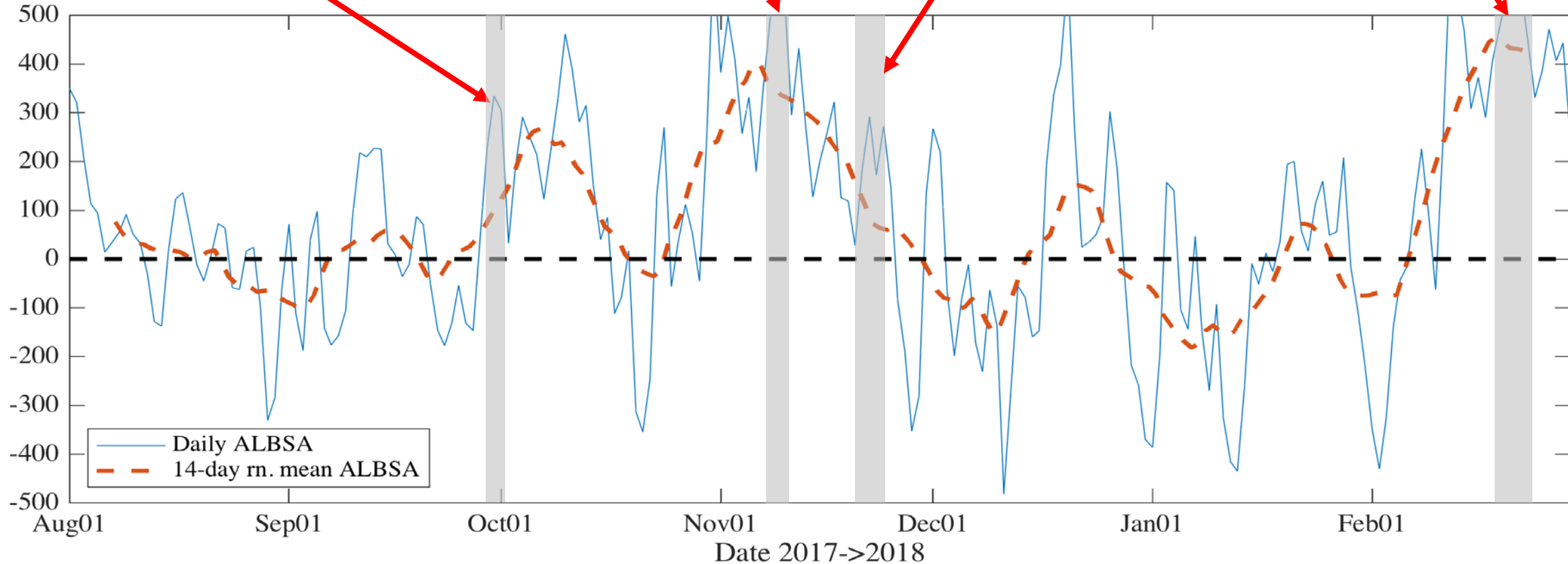


Storm off coast of Utqiagvik could cost over \$10 million in damages

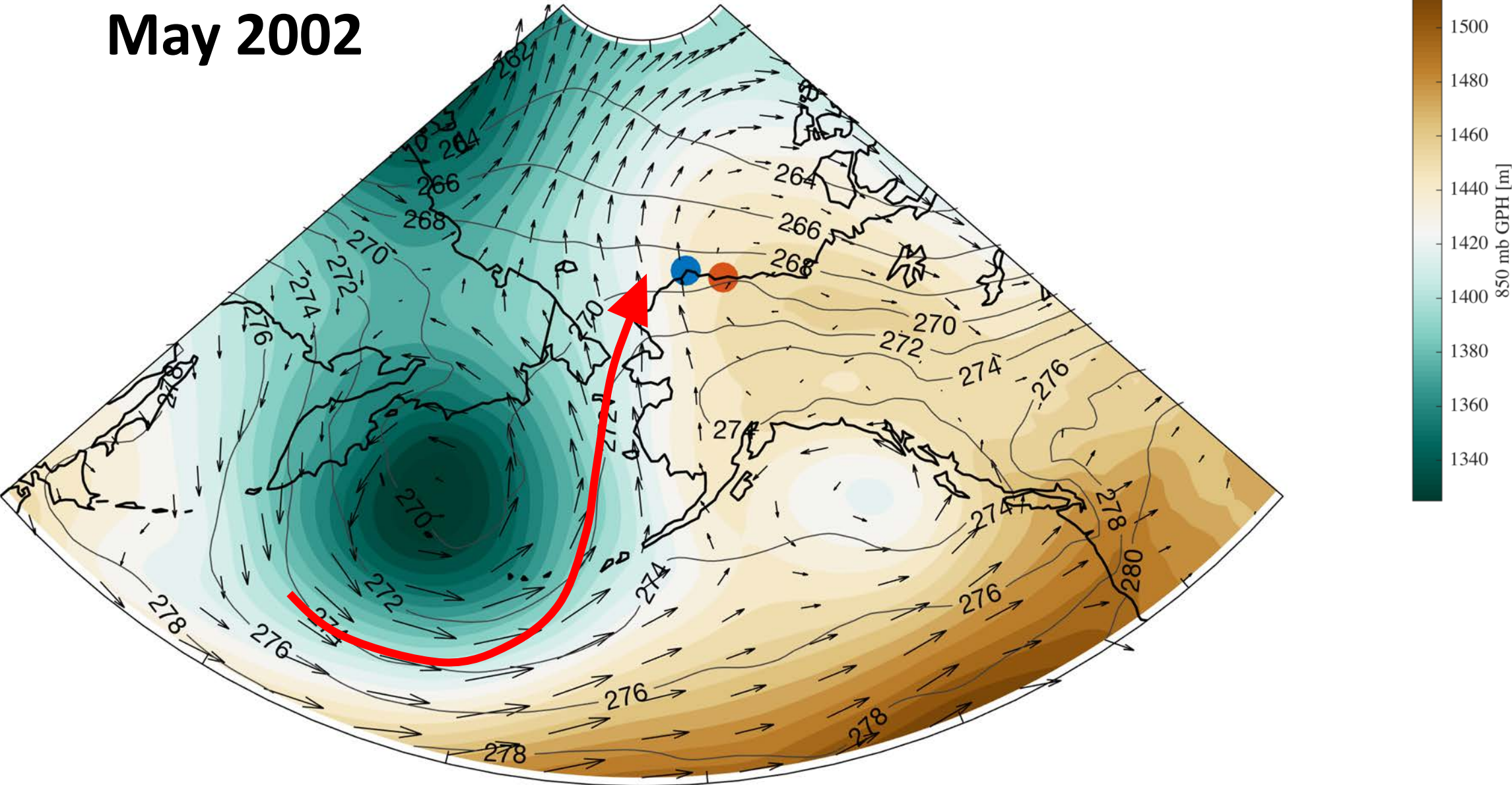
When positive storms directed through the Bering



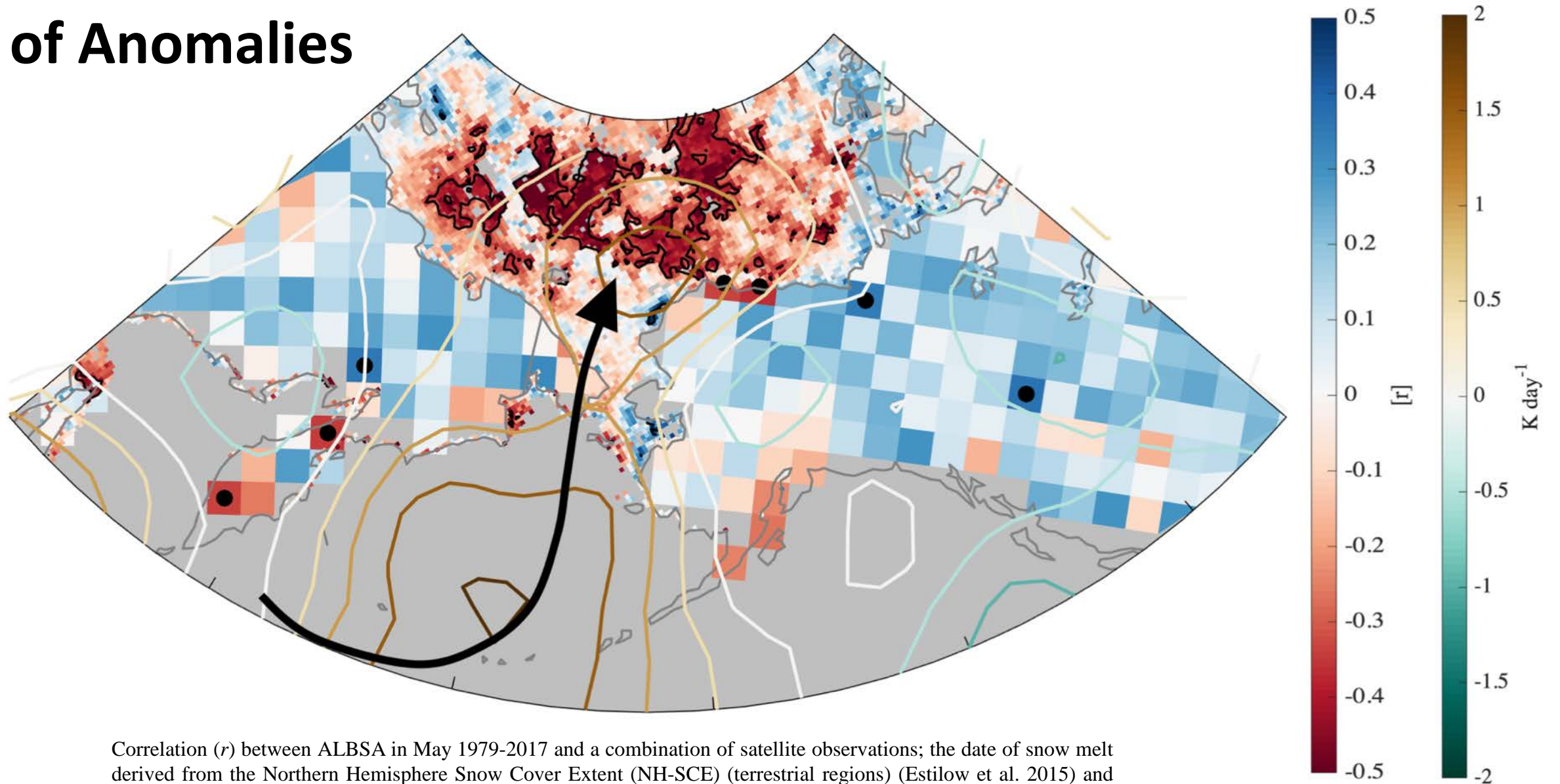
ALBSA



May 2002

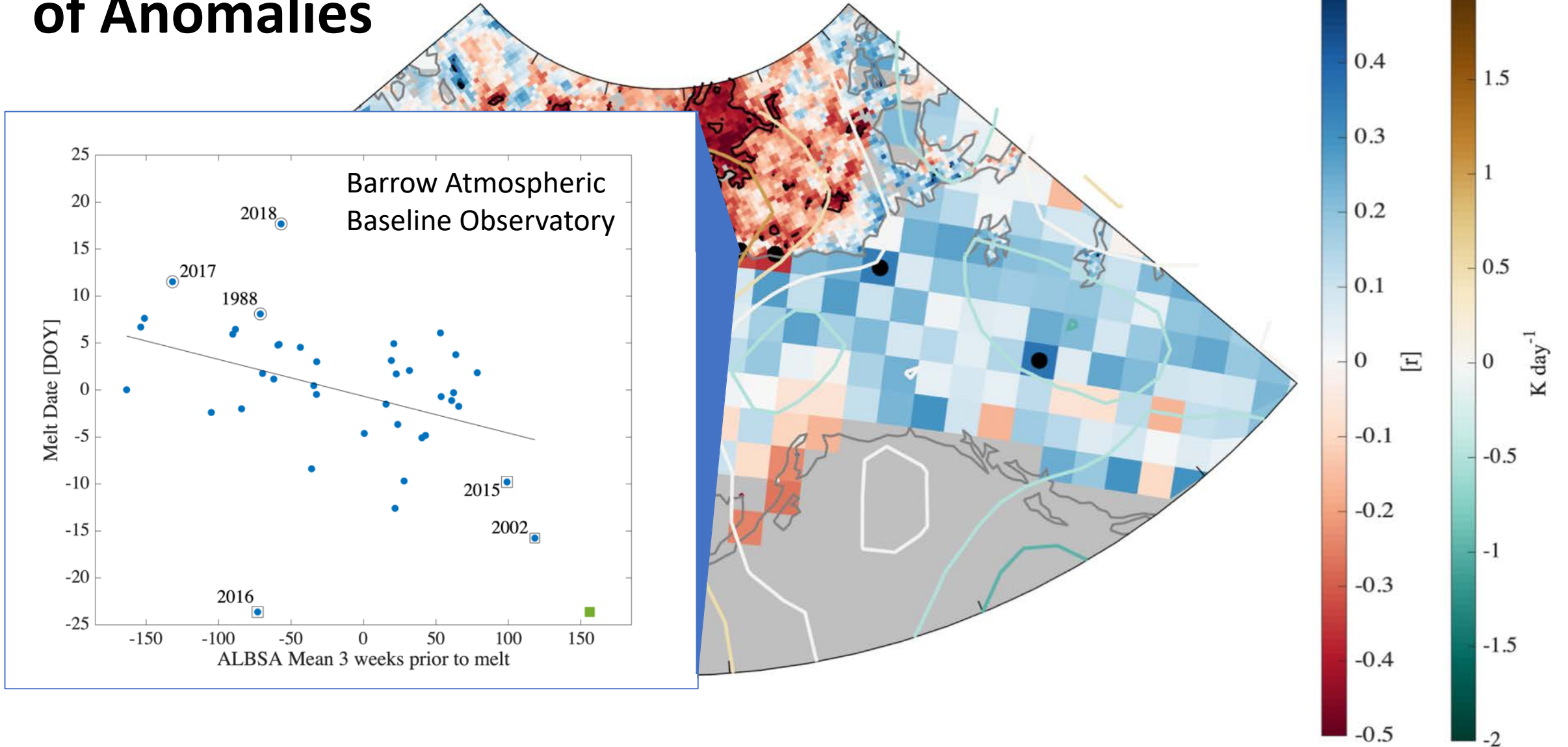


Spatial Distribution of Anomalies

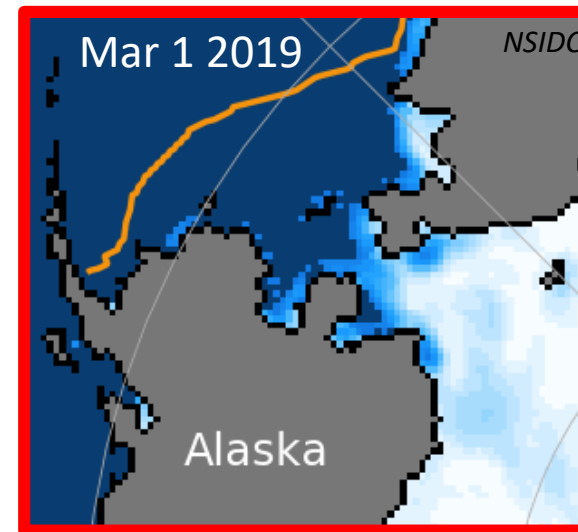
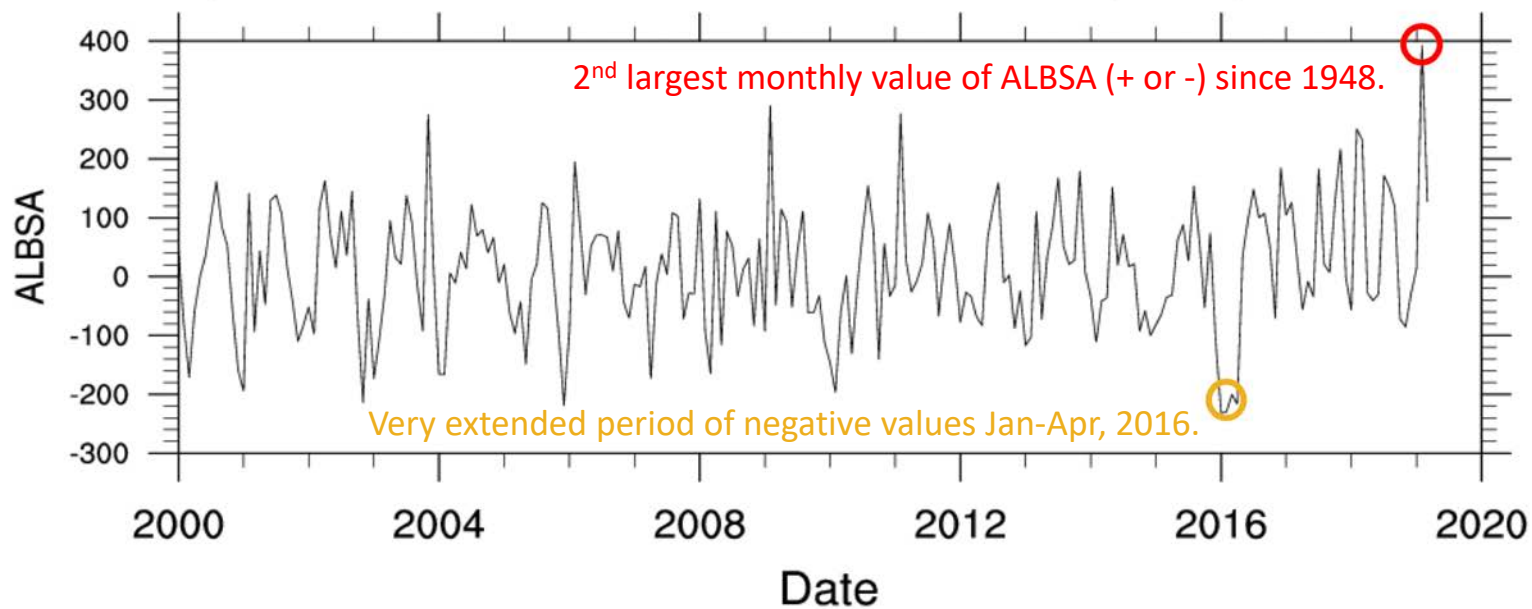


Correlation (r) between ALBSA in May 1979-2017 and a combination of satellite observations; the date of snow melt derived from the Northern Hemisphere Snow Cover Extent (NH-SCE) (terrestrial regions) (Estilow et al. 2015) and the date of melt onset over sea ice derived from SSM/I passive microwave data (sea ice regions) (Markus et al. 2009).

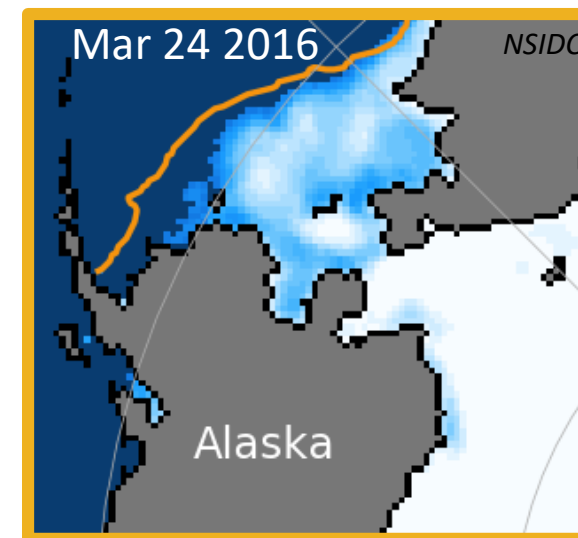
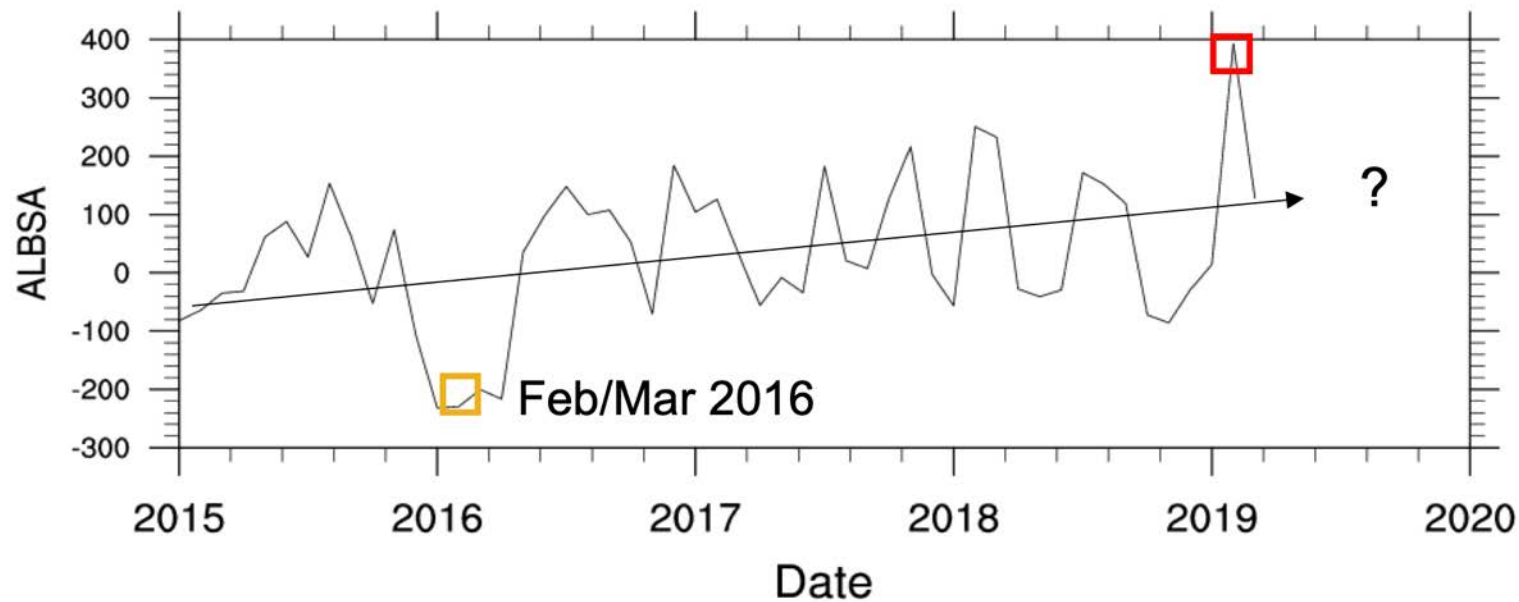
Spatial Distribution of Anomalies



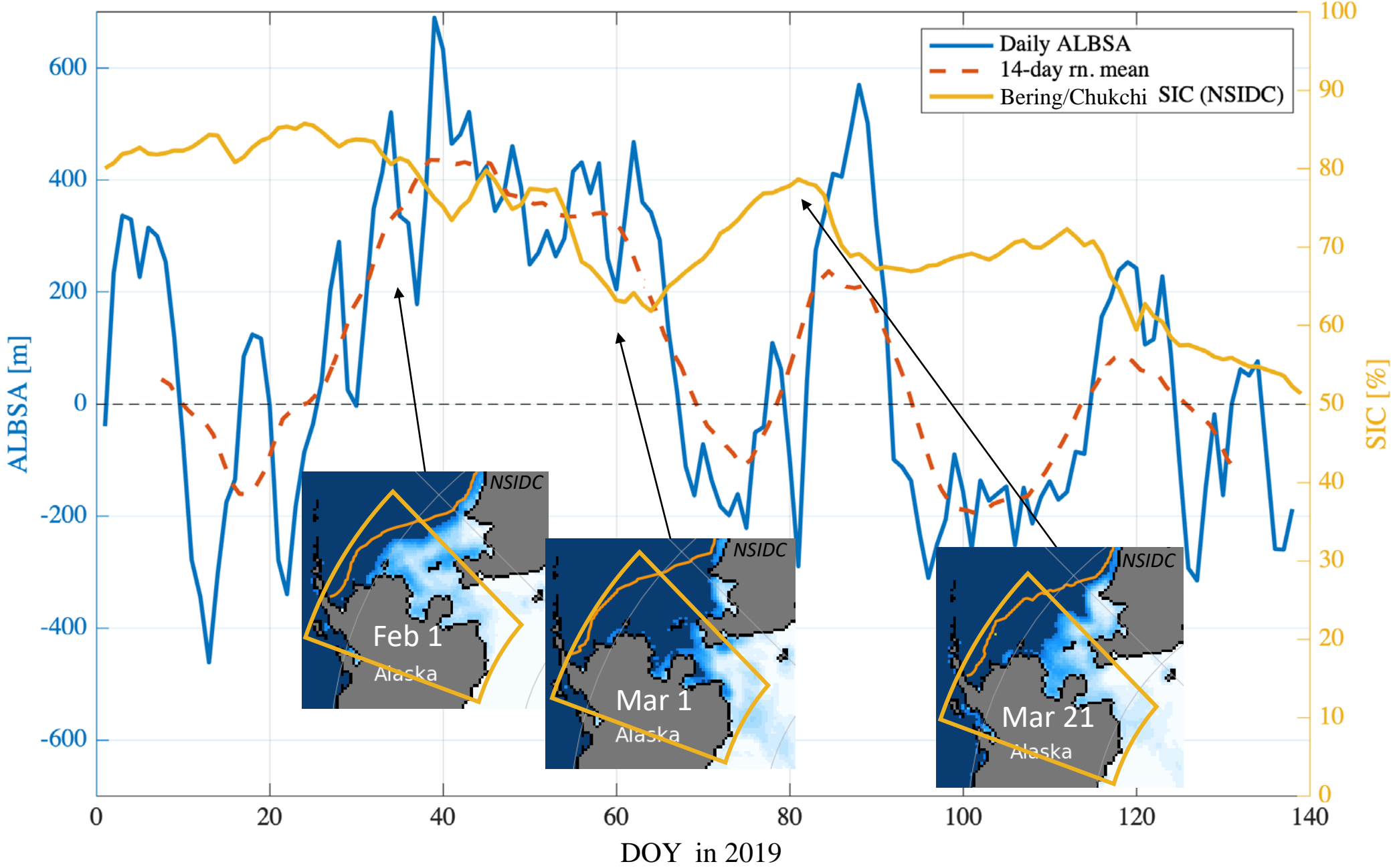
Monthly Mean ALBSA: Aleutian Low and Beaufort Sea Anticyclone (NOAA/ESRL PSD)



Monthly Mean ALBSA: Aleutian Low and Beaufort Sea Anticyclone (NOAA/ESRL PSD)

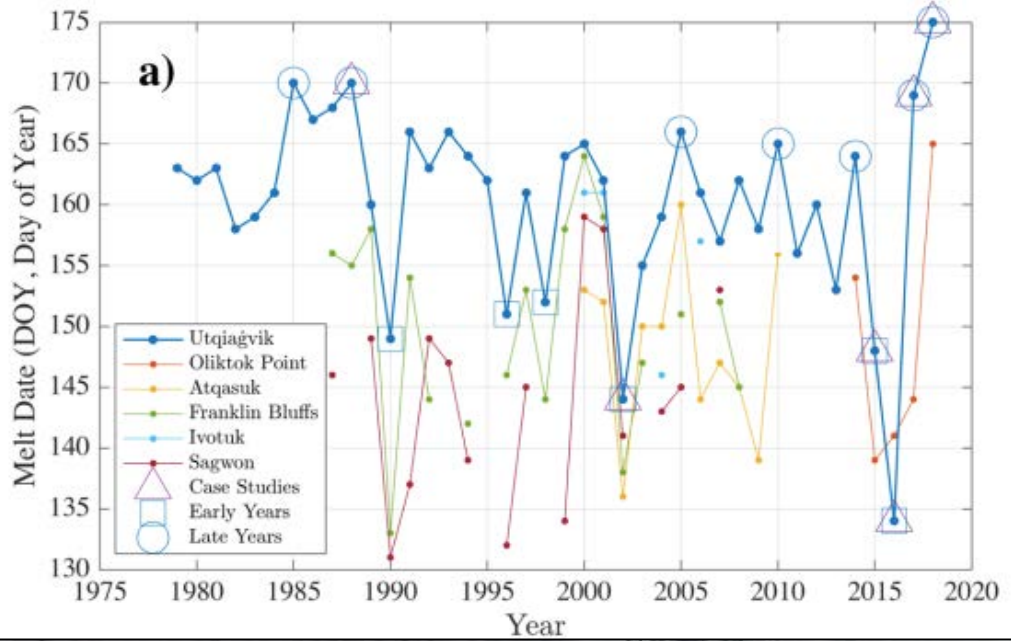


ALBSA, 2019



<https://worldview.earthdata.nasa.gov/>
MODIS/Terra Corrected Reflectance: May 21, 2019

NOAA Barrow Observatory, Utqiagvik



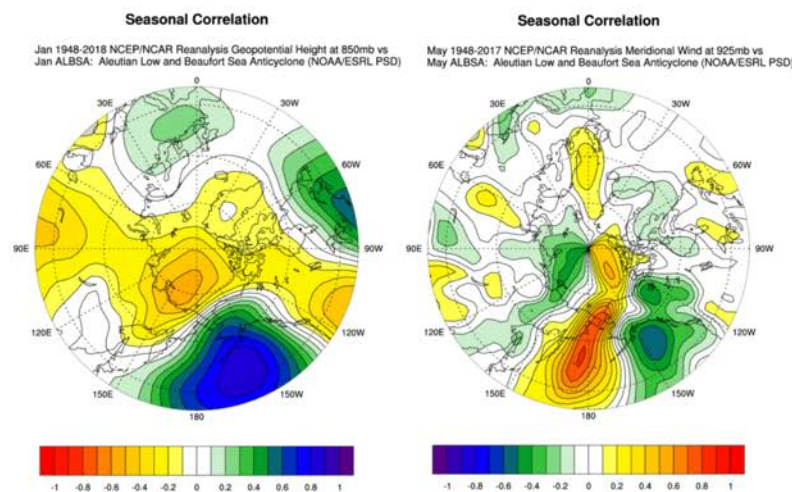
Conclusions

- The Aleutian Low – Beaufort Sea Anticyclone (ALBSA) climate index has been developed to help understand the role of atmospheric circulation in modulating the timing of the loss of seasonal snowpack on the North Slope of Alaska.
- ALBSA is based on 850 hPa GPH at 4 points located in the North Pacific and Alaskan Arctic and is sensitive to the juxtaposition of the Aleutian Low.
- The “see-saw” pattern of ice growth and retreat in the Bering and Chukchi during the 2019 winter was an opportunity to explore the sensitivity of the index to regional wintertime sea ice variability.
- Persistently positive (~ 4 weeks) ALBSA in February 2019 led a period of ice retreat. Two more periods of growth and retreat in March and April were also led by stretches negative and positive ALBSA of 1-2 weeks.
- We plan to expand the analysis of 2019 to other years to develop statistics on the relationship between ALBSA and Bering/Chukchi sea ice.
- Efforts still needed to assess predictability and persistence.

Download Climate Timeseries

ALBSA: Aleutian Low - Beaufort Sea Anticyclone

ALBSA is a 4-point index combining two orthogonal 850 mb differences (one meridional, one zonal). Collectively, this captures the variability in the North Pacific/Pacific Arctic tropospheric circulation quite well. The purpose is to track the juxtaposition of the Aleutian Low and Beaufort High pressure centers, specifically the strength/position of the former and the meridional dipole associated with the latter. This is useful because the index is sensitive to advection events from the north pacific into the Arctic and also how the pattern of circulation steers that advection. It captures the variability of the NPI, and also includes information specific to the advection across Alaska and up through the Bering Strait, and the East Siberian/Chukchi/Beaufort Seas. To date, it has been evaluated during the springtime transition to better understand how the regional circulation impacts the spatial-temporal characteristics of snowmelt timing and onset of melt over sea ice of the Pacific Arctic.



Time Interval: **Monthly and Daily**
Time Coverage: **1948 to present**
Update Status: **Static**

Get Data:

[ALBSA monthly time-series: Standard PSD Format](#) (*What is standard format?*)
[ALBSA monthly time-series: CSV format](#)
[ALBSA daily time-series: CSV format](#)

Source:

Data is available from **NOAA/ESRL PSD** using the NCEP/NCAR Reanalysis. It is updated daily and monthly. Method o

Thanks!

- Daily & monthly ALBSA indices based on NCEP-NCAR Reanalysis hosted online by Physical Sciences Division (PSD)

Thanks to Cathy Smith (CIRES/PSD)!

<https://www.esrl.noaa.gov/psd/data/timeseries/ALBSA/>