

The Melting Arctic

Brian Magi

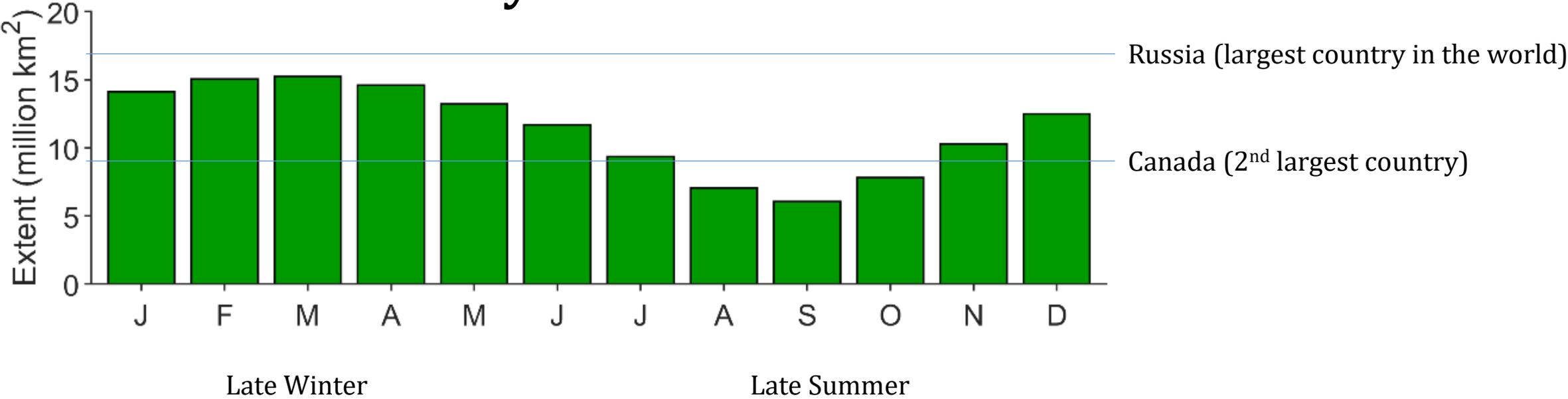
Department of Geography and Earth Sciences



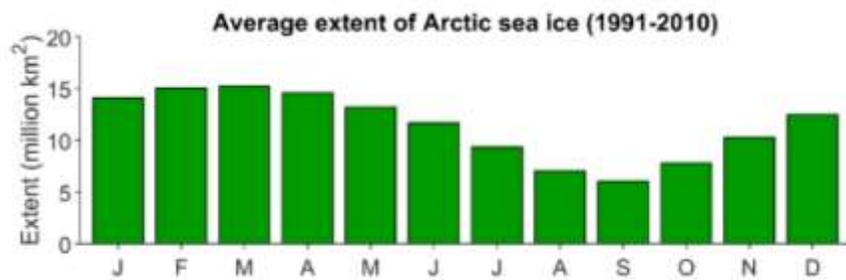
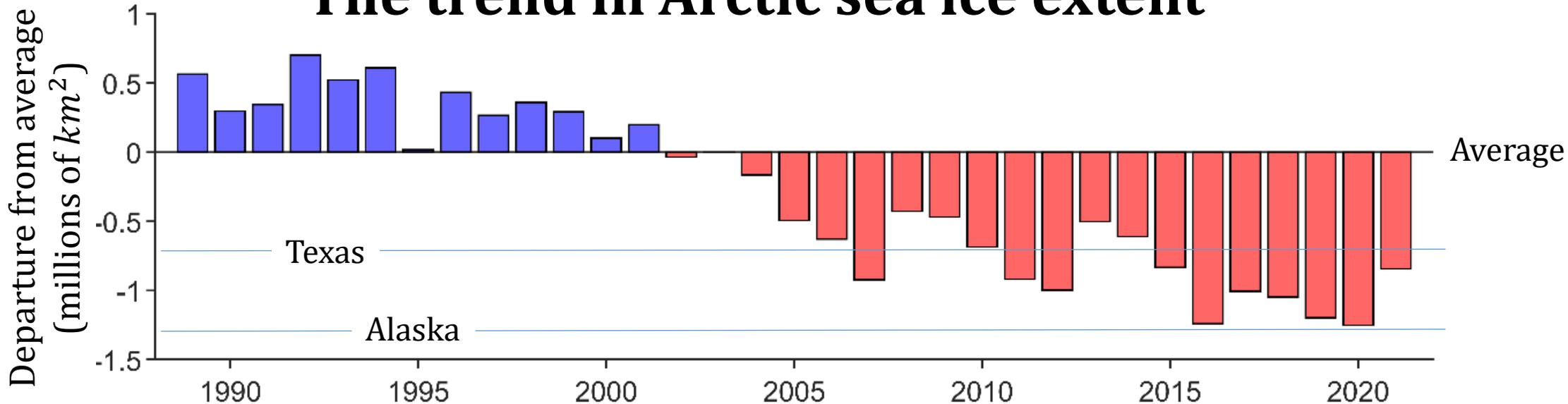


Data source: NSIDC

The seasonality of Arctic sea ice extent



The trend in Arctic sea ice extent



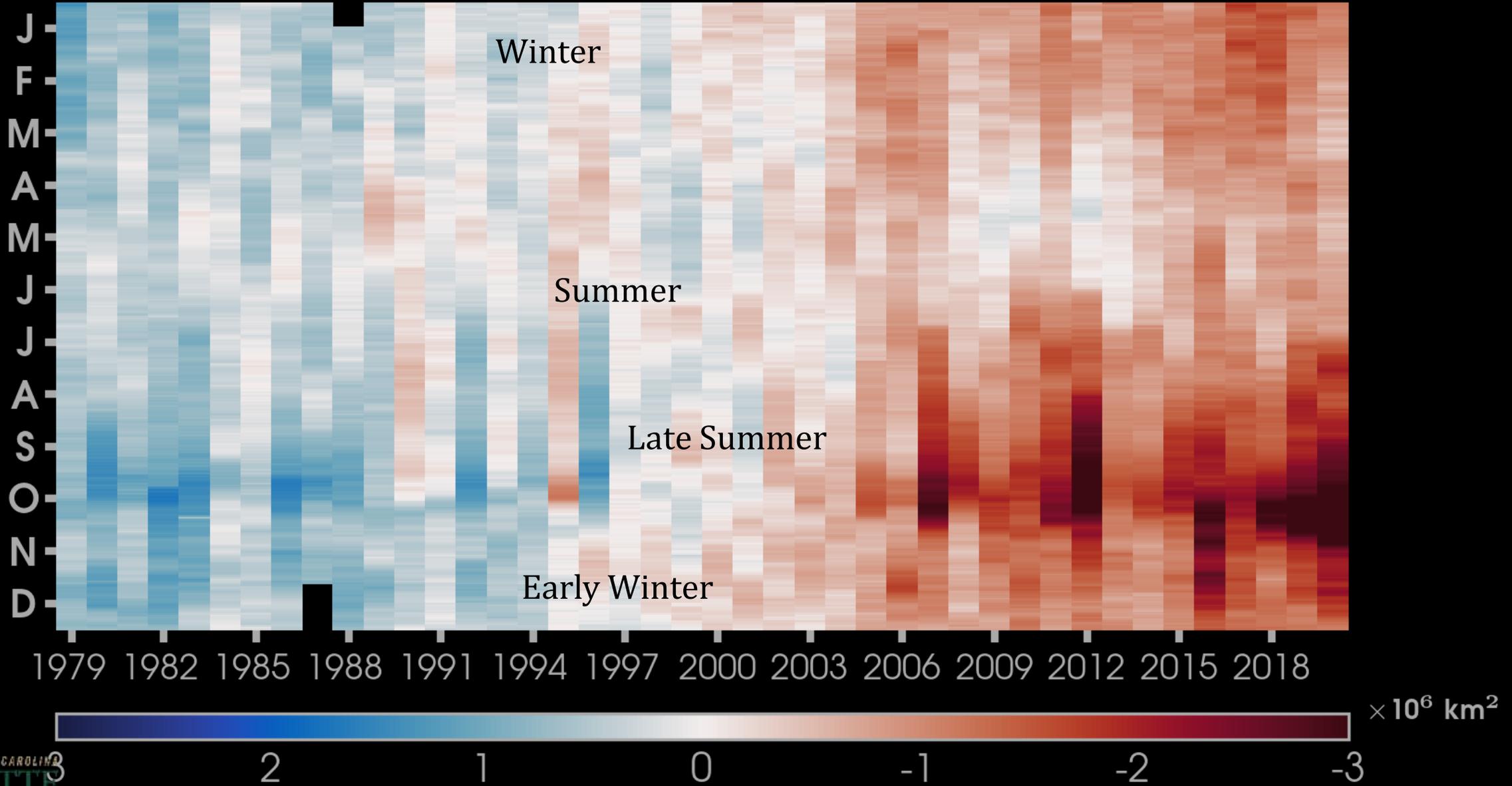
Arctic sea ice is disappearing fast

Arctic sea ice is decreasing quickly in all seasons

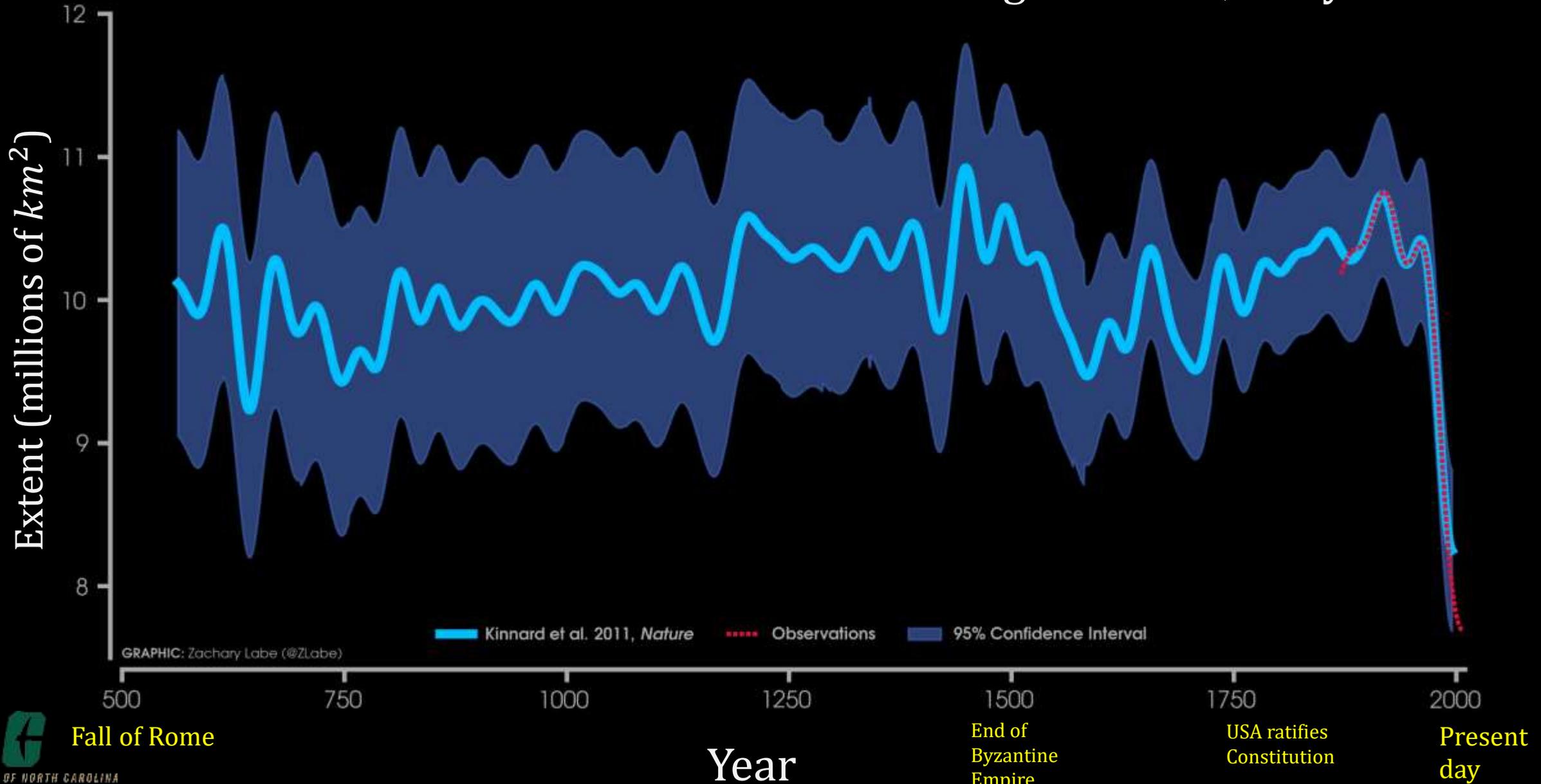
DATA: National Snow & Ice Data Center, Boulder CO (Sea Ice Index v3; **BASELINE:** 1981-2010)

SOURCE: <ftp://sidads.colorado.edu/DATASETS/NOAA/G02135>

GRAPHIC: Zachary Labe (@ZLabe)

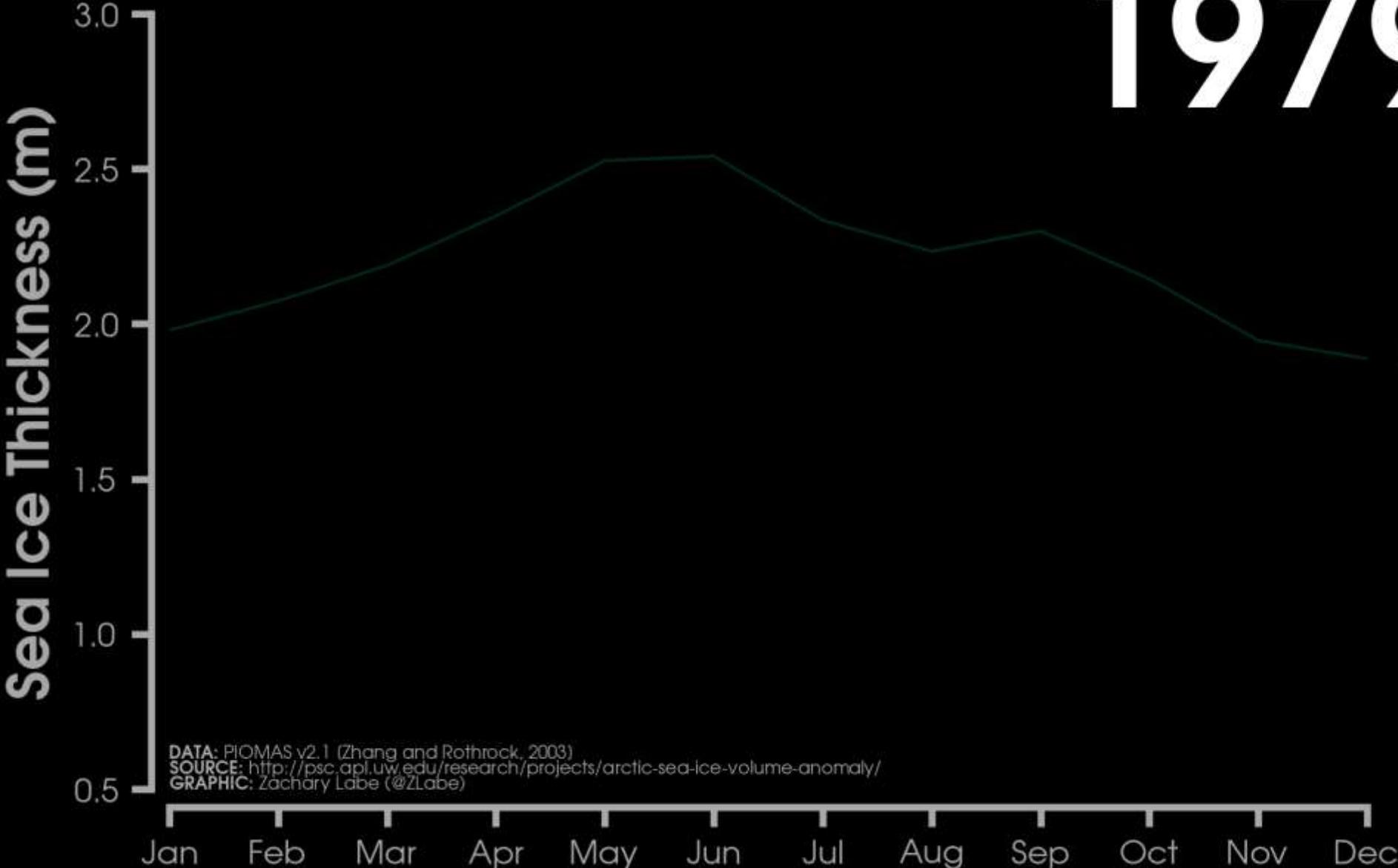


Extent of late-summer Arctic sea ice during the last 1,450 years



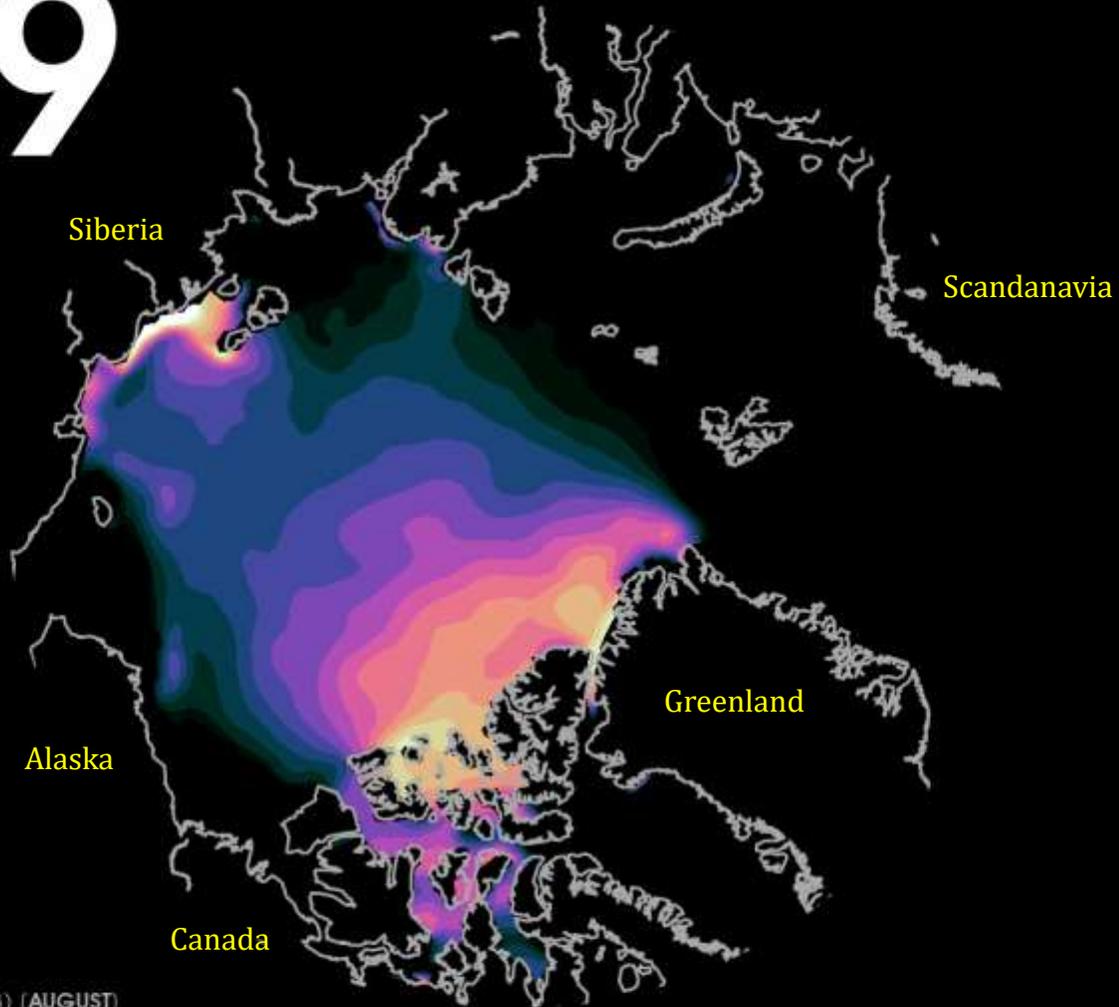
Arctic sea ice is also getting thinner

1979



DATA: PIOMAS v2.1 (Zhang and Rothrock, 2003)
SOURCE: <http://psc.apl.uw.edu/research/projects/arctic-sea-ice-volume-anomaly/>
GRAPHIC: Zachary Labe (@ZLabe)

1979



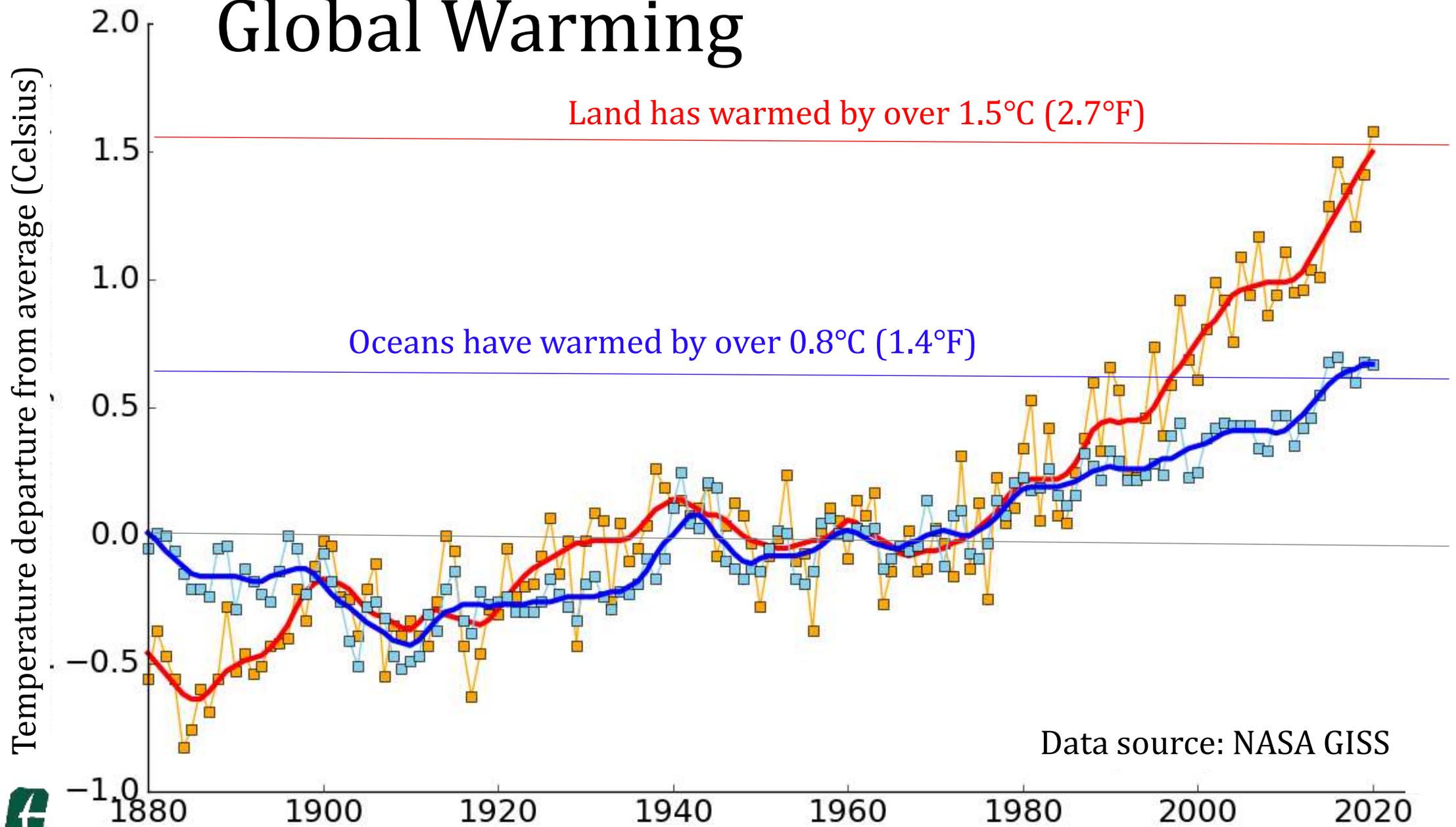
DATA: PIOMAS v2.1 (Zhang and Rothrock, 2003) (AUGUST)
SOURCE: <http://psc.apl.uw.edu/research/projects/arctic-sea-ice-volume-anomaly/>
GRAPHIC: Zachary Labe (@ZLabe)



SEA ICE THICKNESS (m)



Global Warming



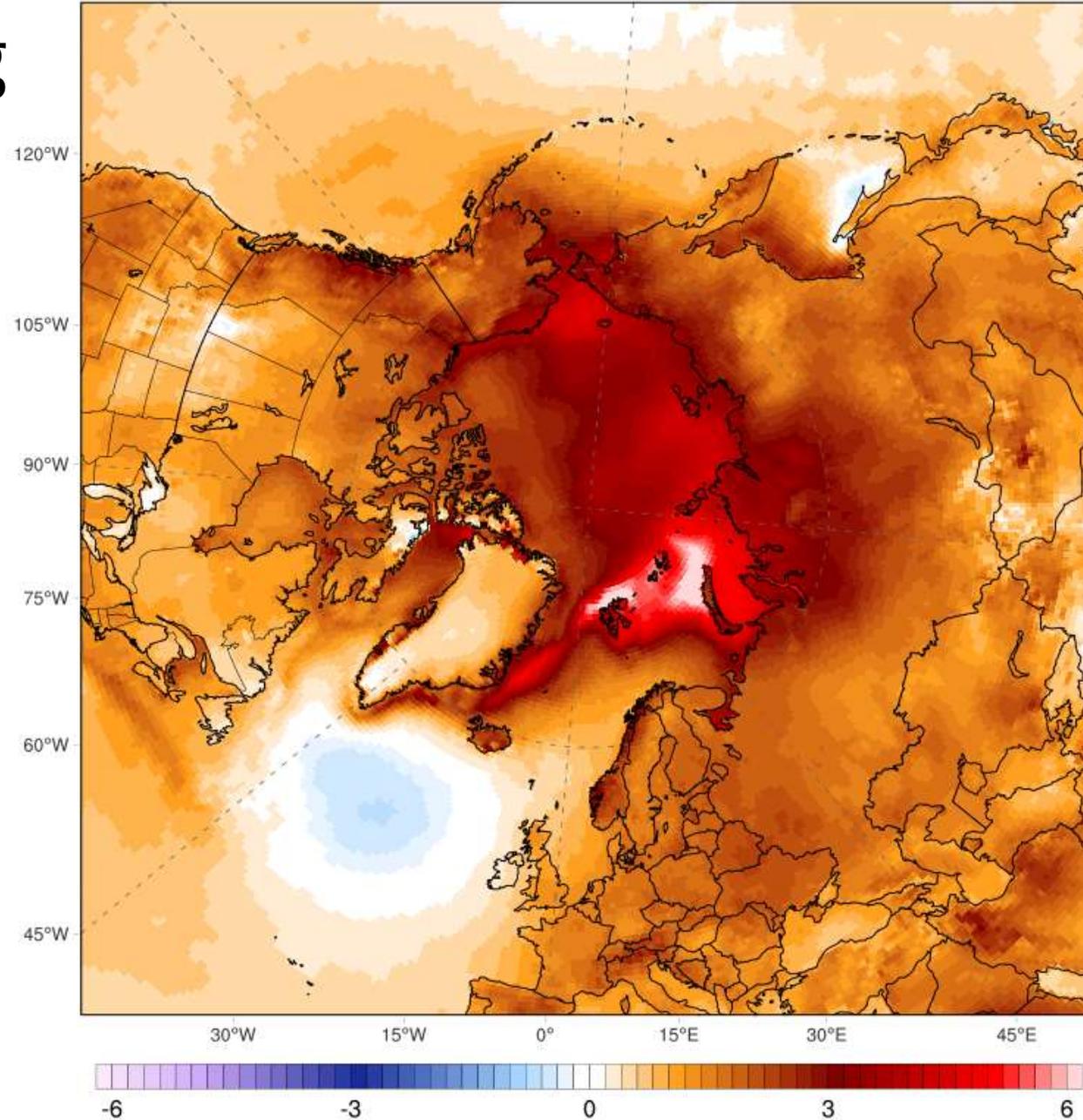
Data source: NASA GISS



Arctic Warming

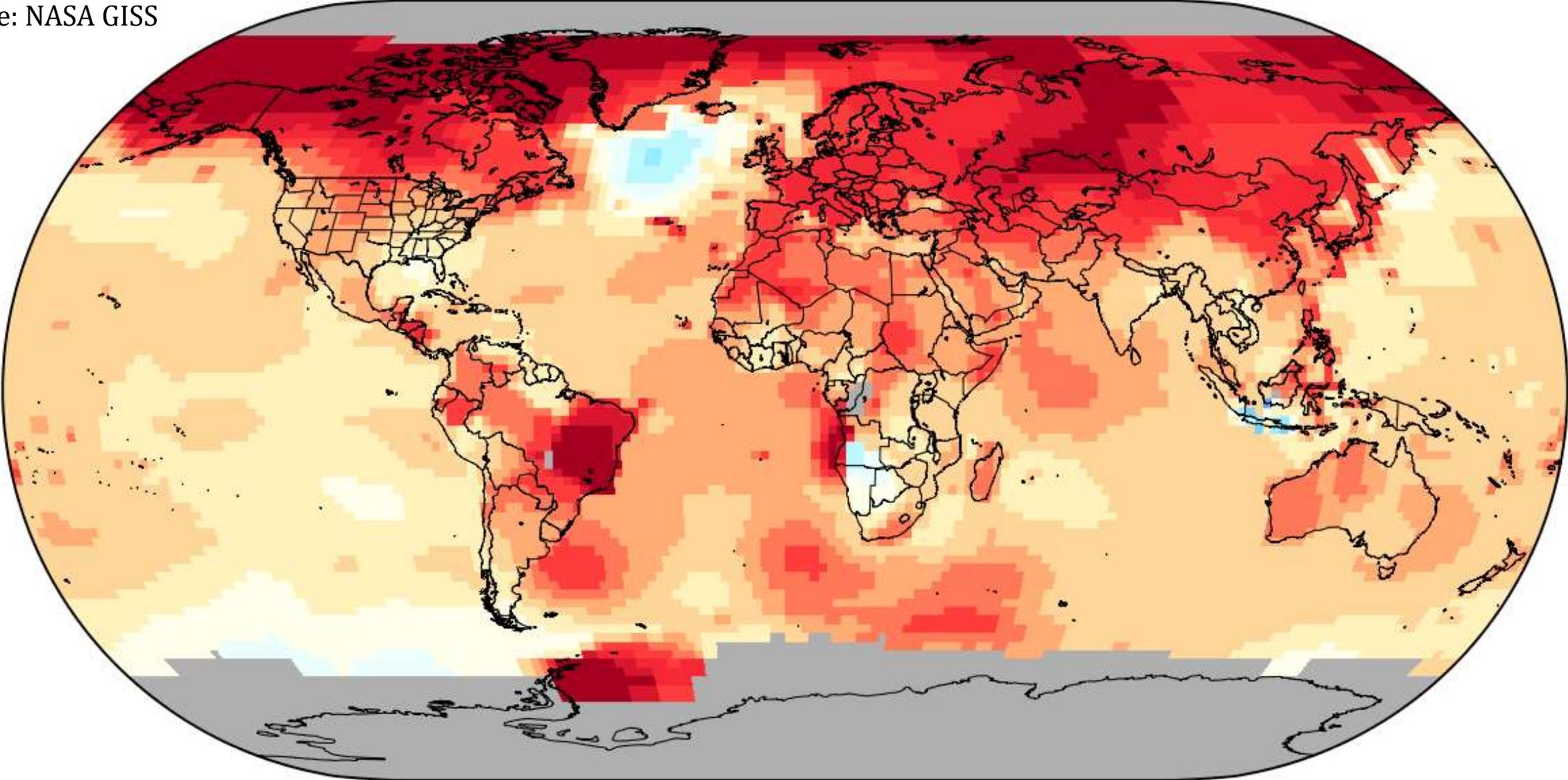
Decade by Decade

Data source: ECMWF ERA5

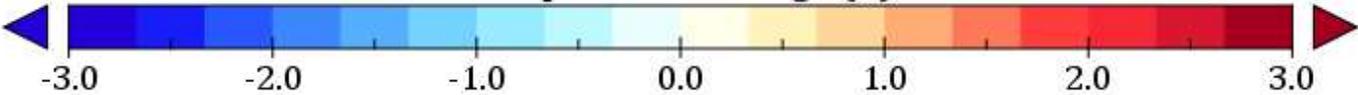


Mapping the trends in annual temperature from 1880-2020

Data source: NASA GISS



Rate of temperature change (Celsius/century)



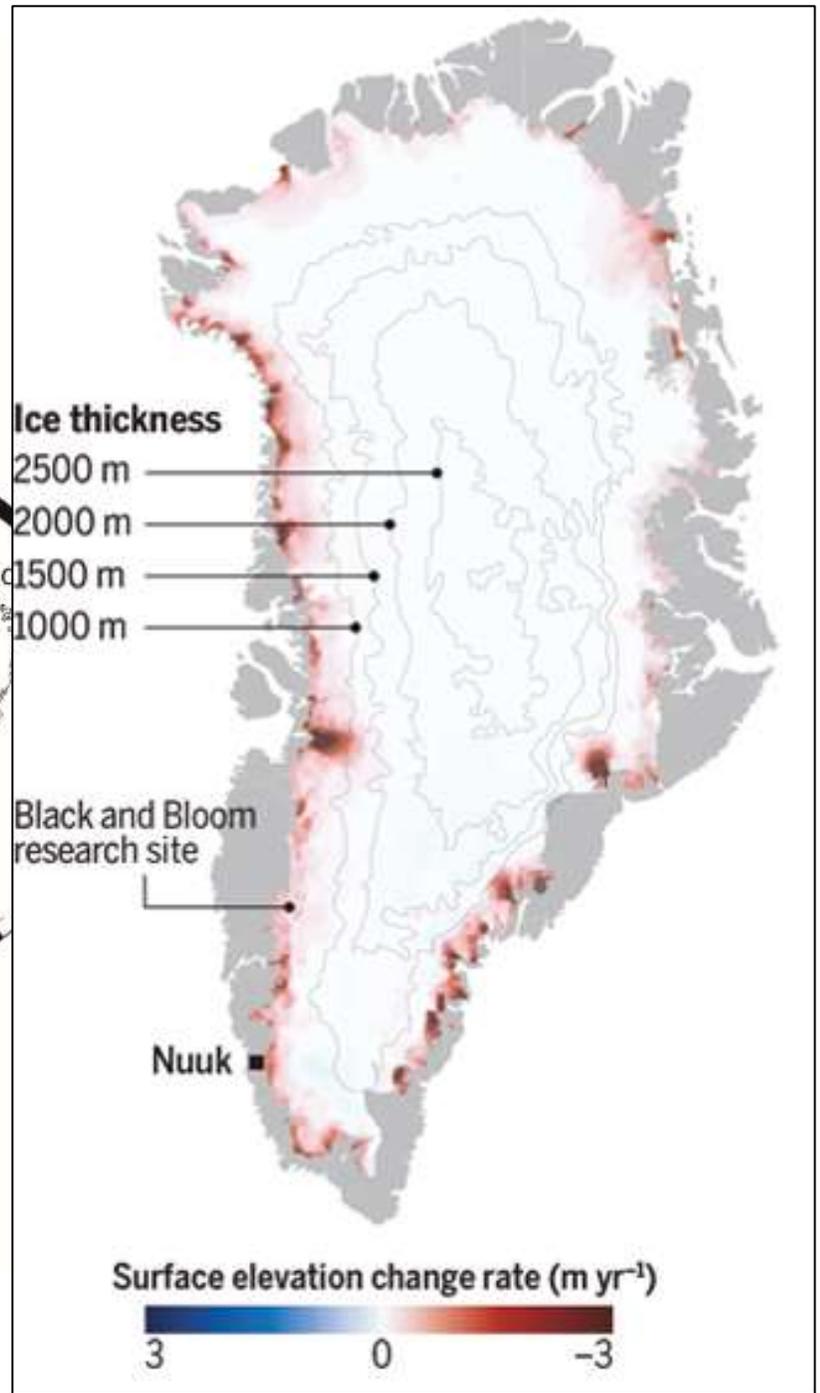
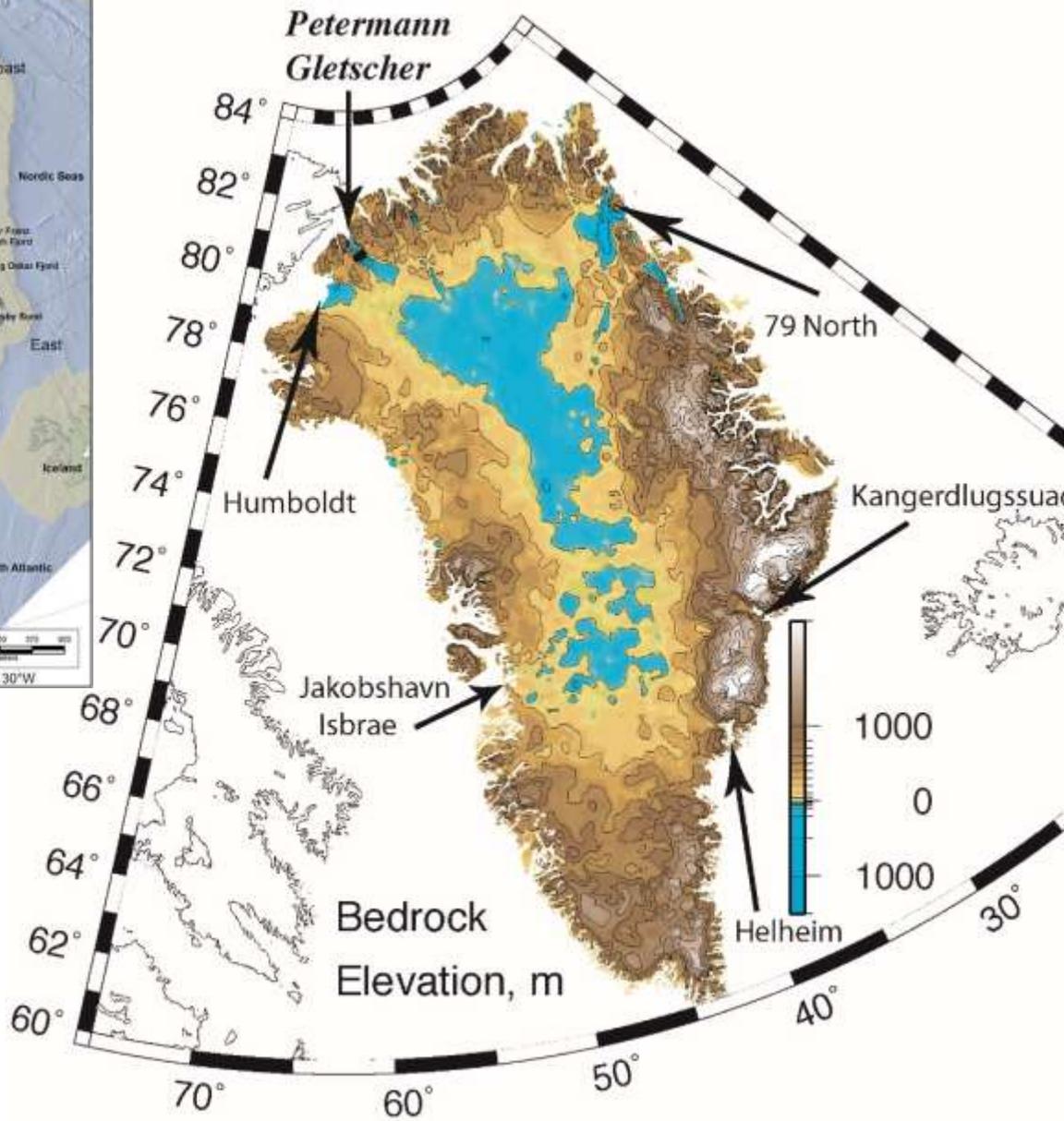


Bright ice melts, dark water is exposed, and leads to Arctic Amplification of global warming

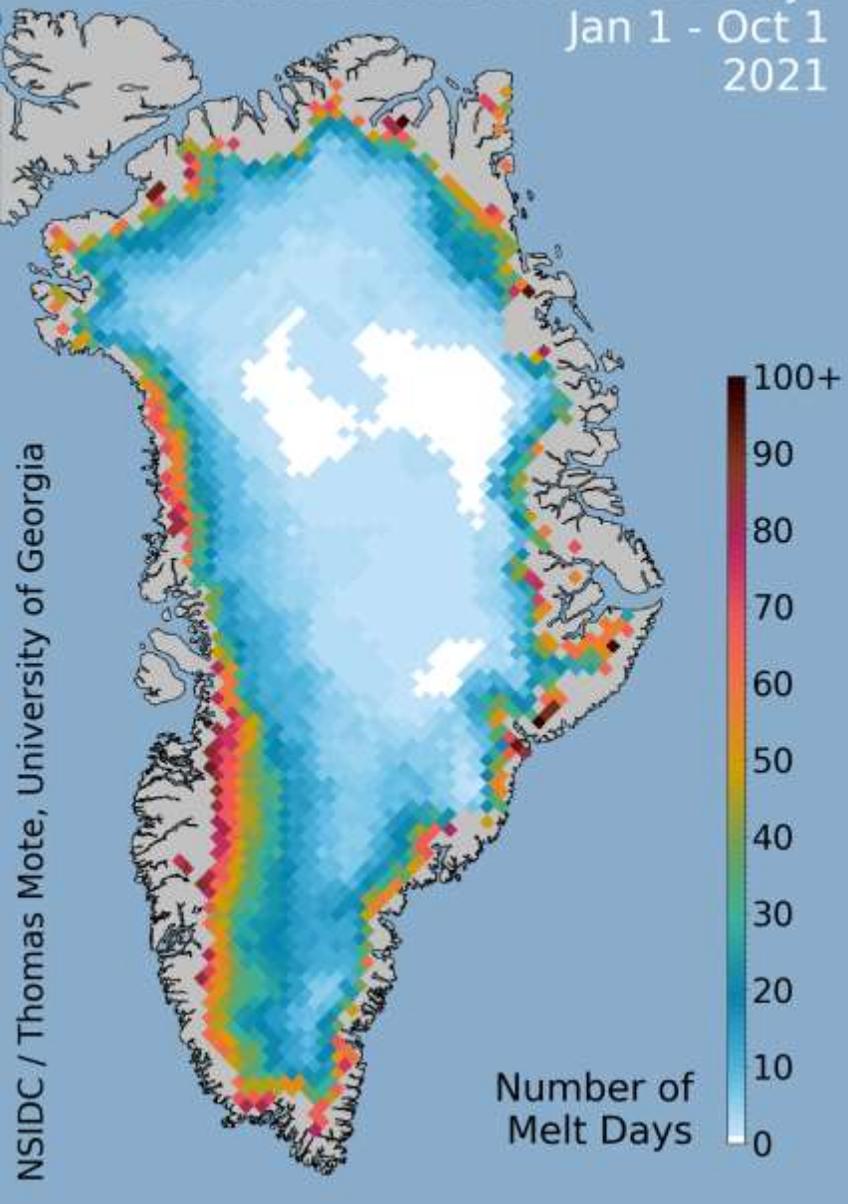
Climate models predict a **2 in 3 chance** that the summertime Arctic Ocean will be ice-free by 2050





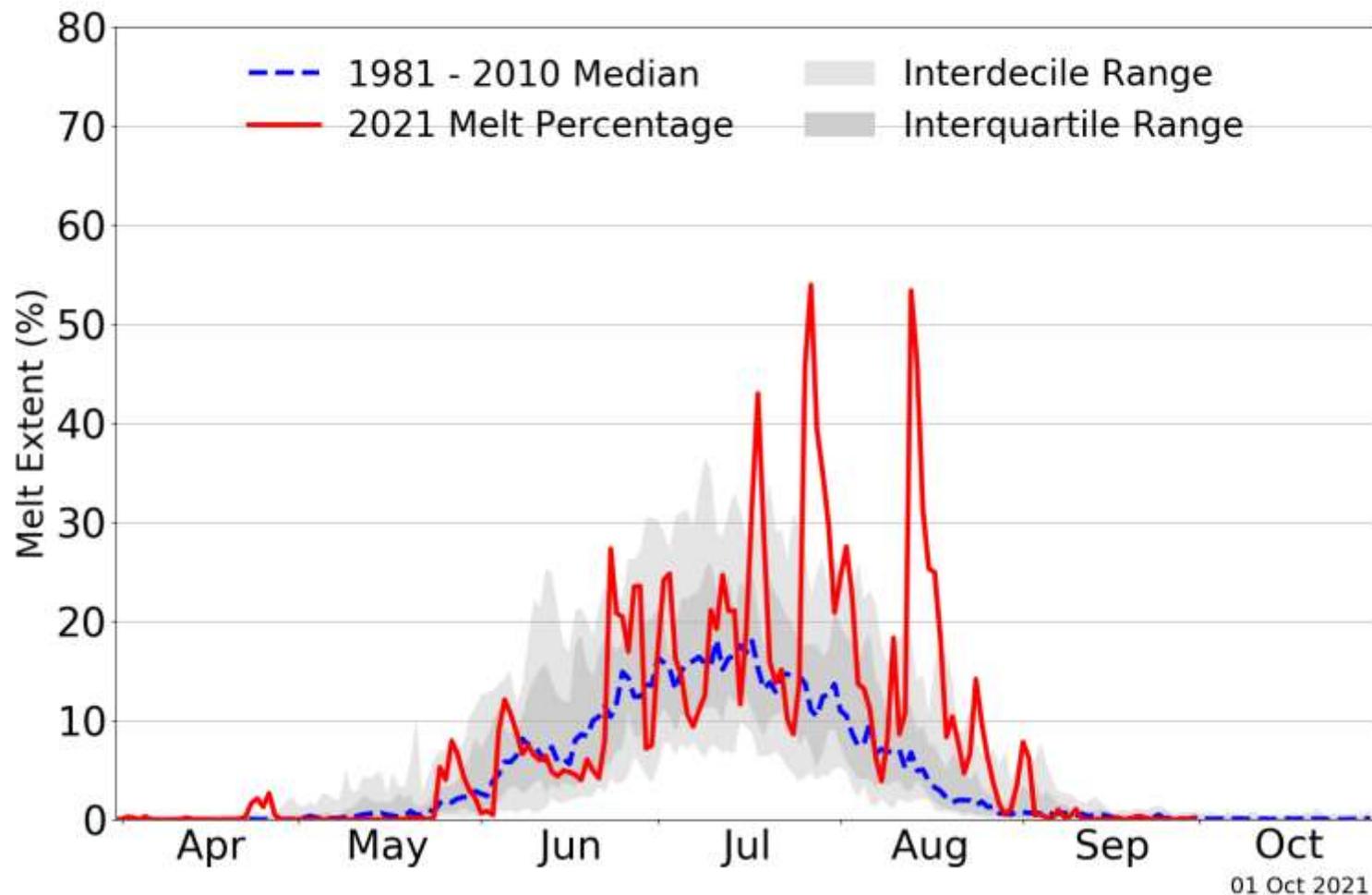


Greenland Cumulative Melt Days
Jan 1 - Oct 1
2021

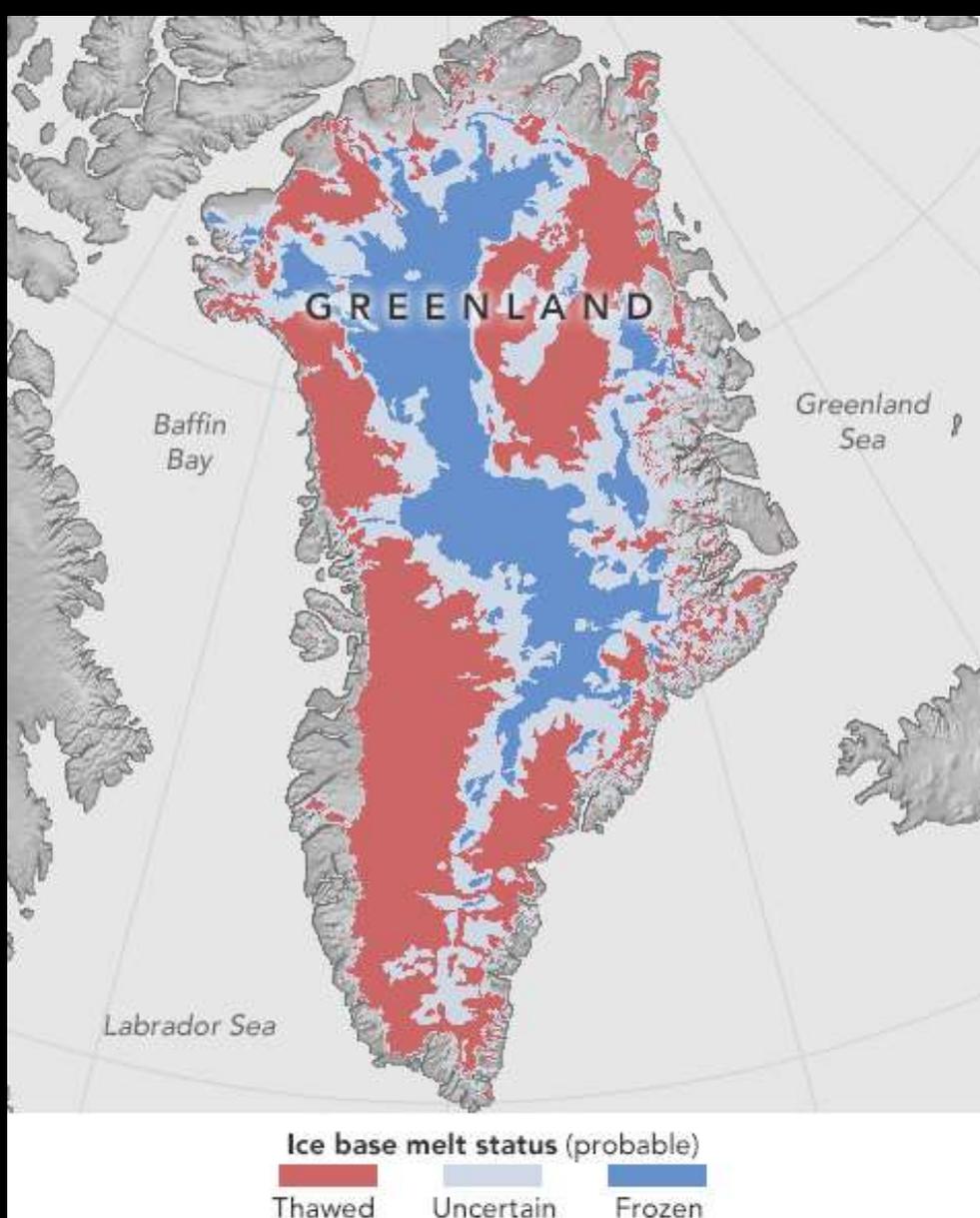


NSIDC / Thomas Mote, University of Georgia

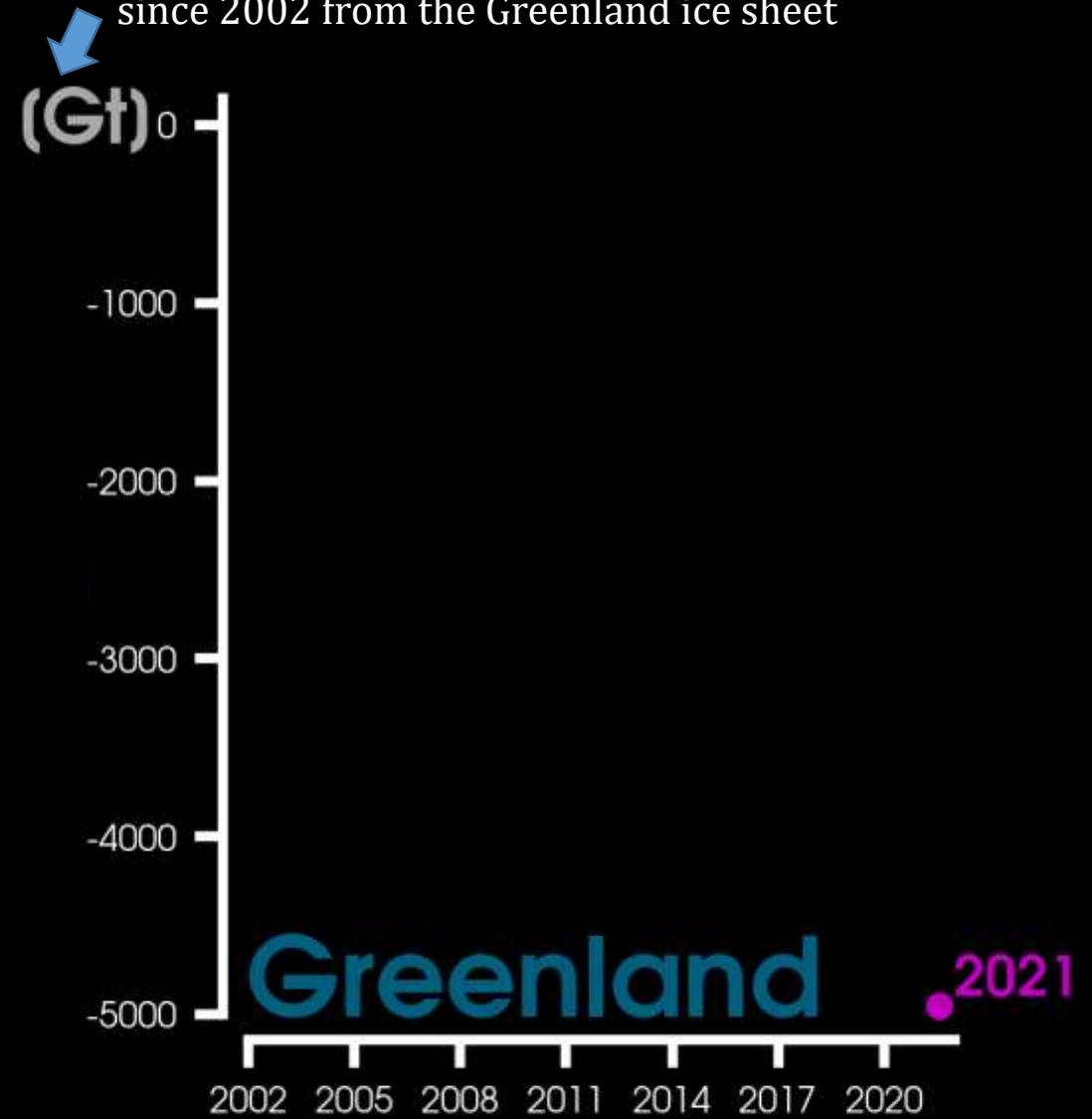
Greenland Melt Extent 2021



NSIDC / Thomas Mote, University of Georgia

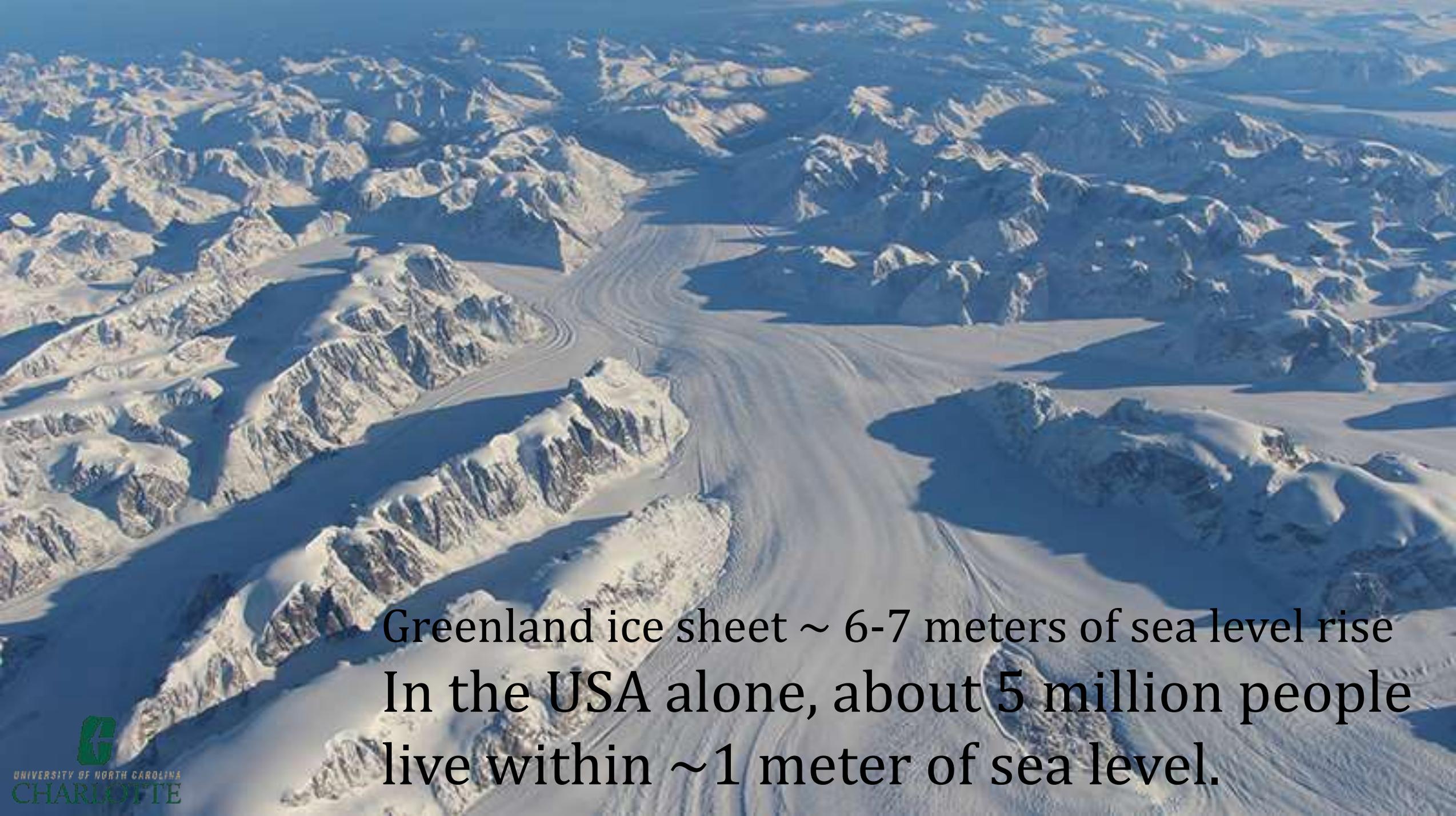


Gigatonne (billions of tonnes) of land ice lost since 2002 from the Greenland ice sheet



DATA: Gravity Recovery and Climate Experiment (GRACE/GRACE-FO)
 SOURCE: <https://climate.nasa.gov/vital-signs/land-ice/> (NASA JPL)
 REFERENCE: Wiese et al. (2015, 2019)

GRAPHIC: Zachary Labe (@ZLabe)



Greenland ice sheet ~ 6-7 meters of sea level rise
In the USA alone, about 5 million people
live within ~1 meter of sea level.





Photograph by Katie Orlinsky <https://twitter.com/KatieOrlinsky>
(for *National Geographic Magazine*)

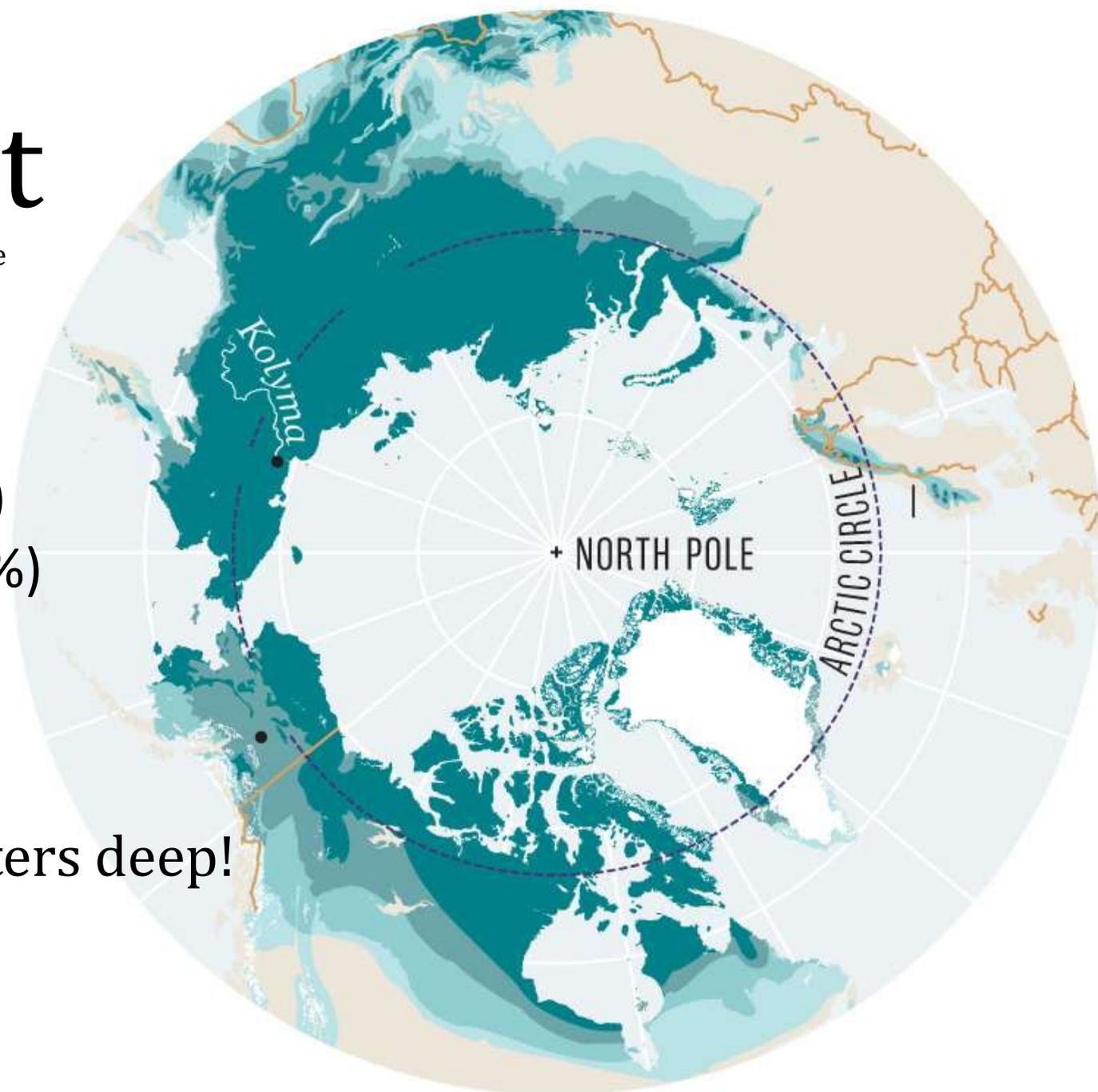
KATIE ORLINSKY, FOR NATIONAL GEOGRAPHIC

Permafrost

Figure source: *National Geographic* magazine

- Continuous (90-100%)
- Discontinuous (50-90%)
- Sporadic (10-50%)
- Isolated (0-10%)

Layers can be 10-80 meters deep!



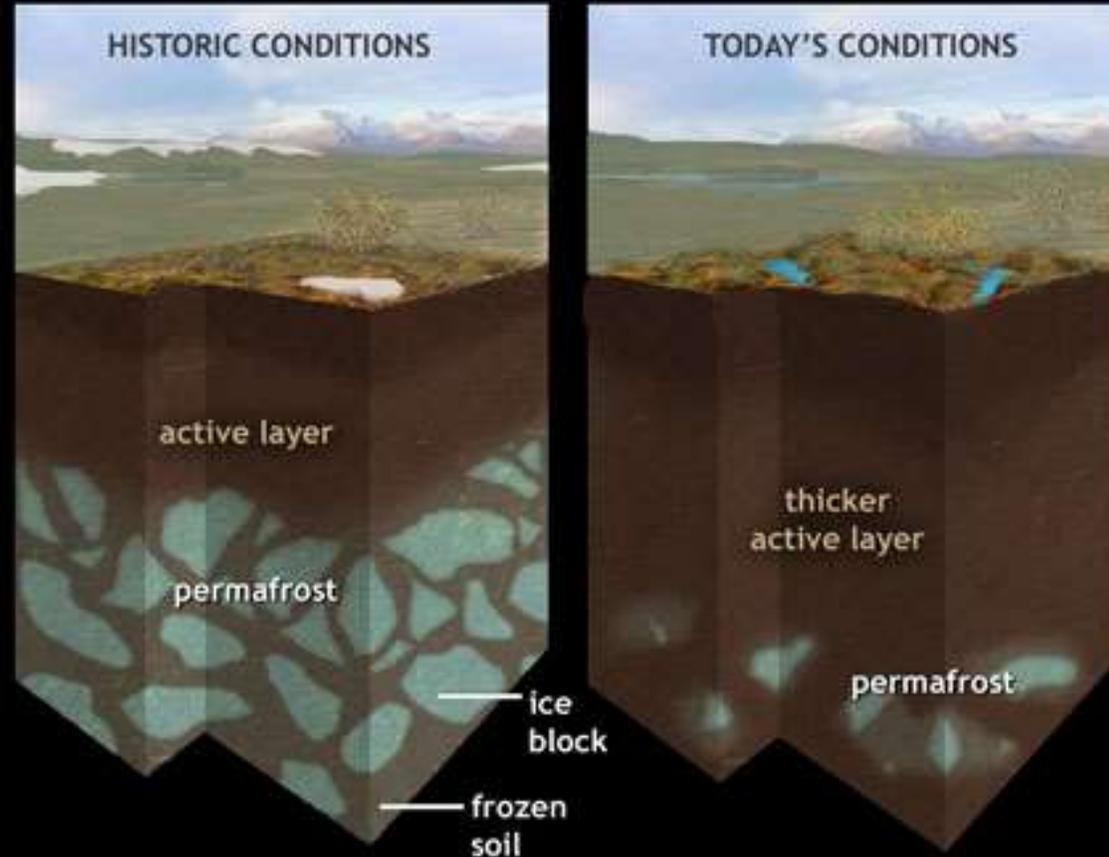
THE ARCTIC'S FROZEN GROUND

Rising temperatures **are thawing** the Arctic's deep layer of frozen soil.



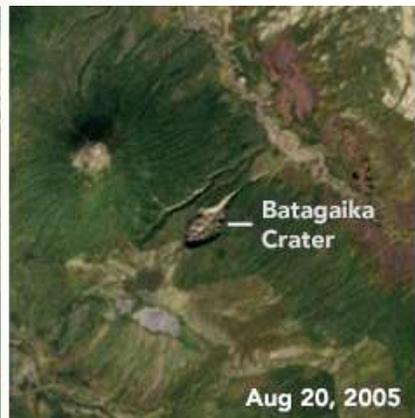
PERMAFROST

- continuous
- discontinuous
- sporadic
- isolated





Aug 27, 1999



Aug 20, 2005

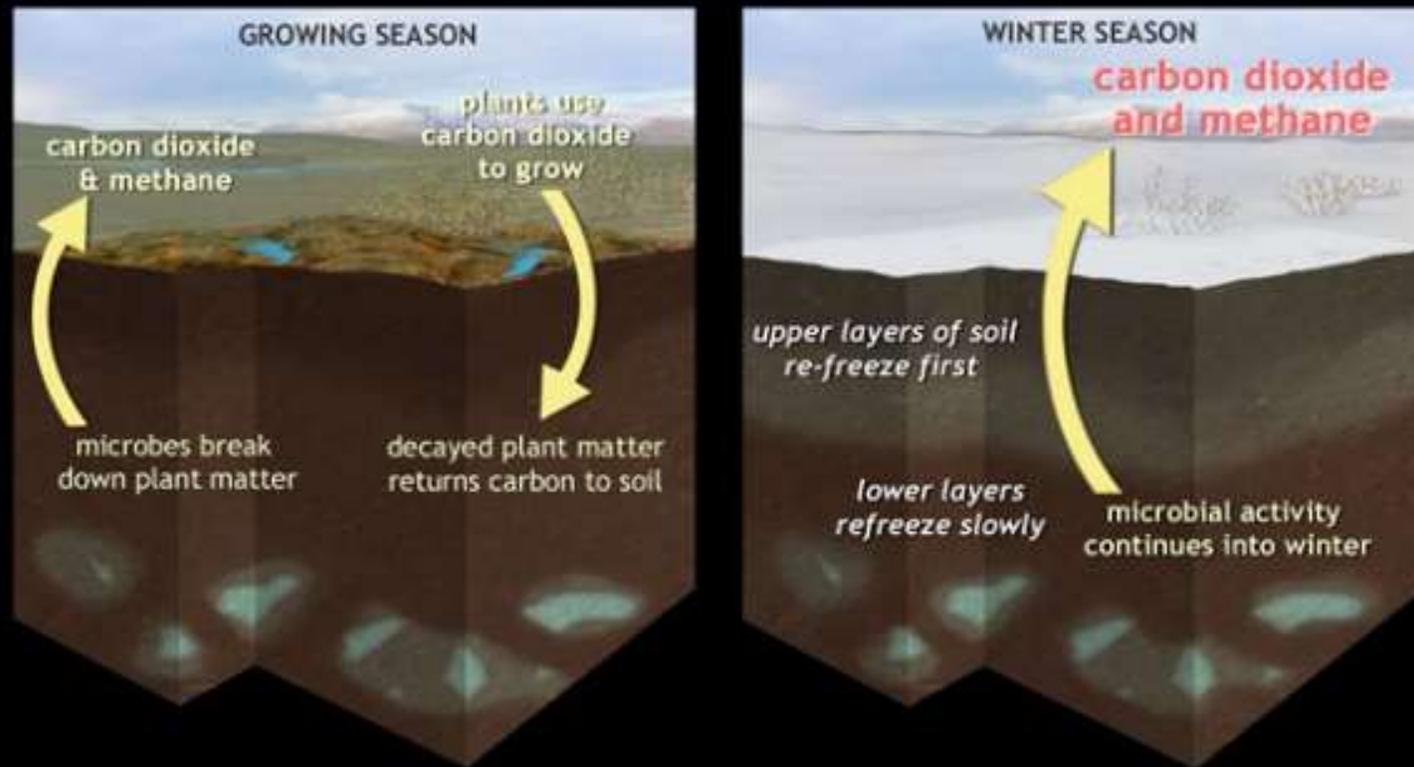


Jul 23, 2013





On the tundra, soil microbes are **adding carbon** to the air faster than plants can absorb it.



Infographic by NOAA Climate.gov, permafrost map by NSIDC



Photograph by Katie Orlinsky

Arctic warming, Arctic greening

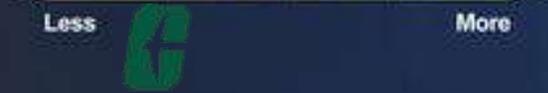
Figure source: NASA



Arctic Greening Trend

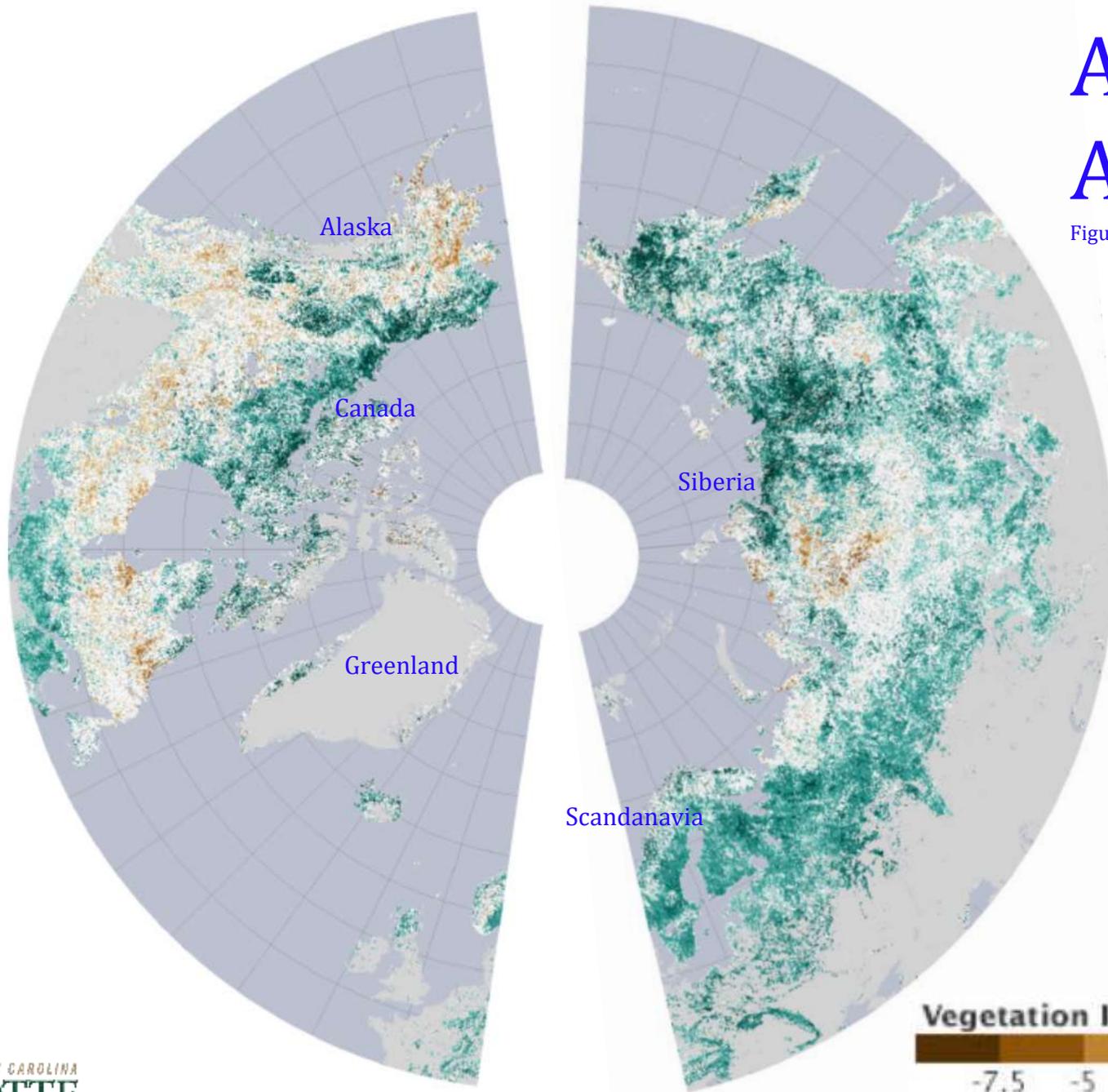
Less

More



Arctic warming, Arctic greening

Figure source: NASA Earth Observatory



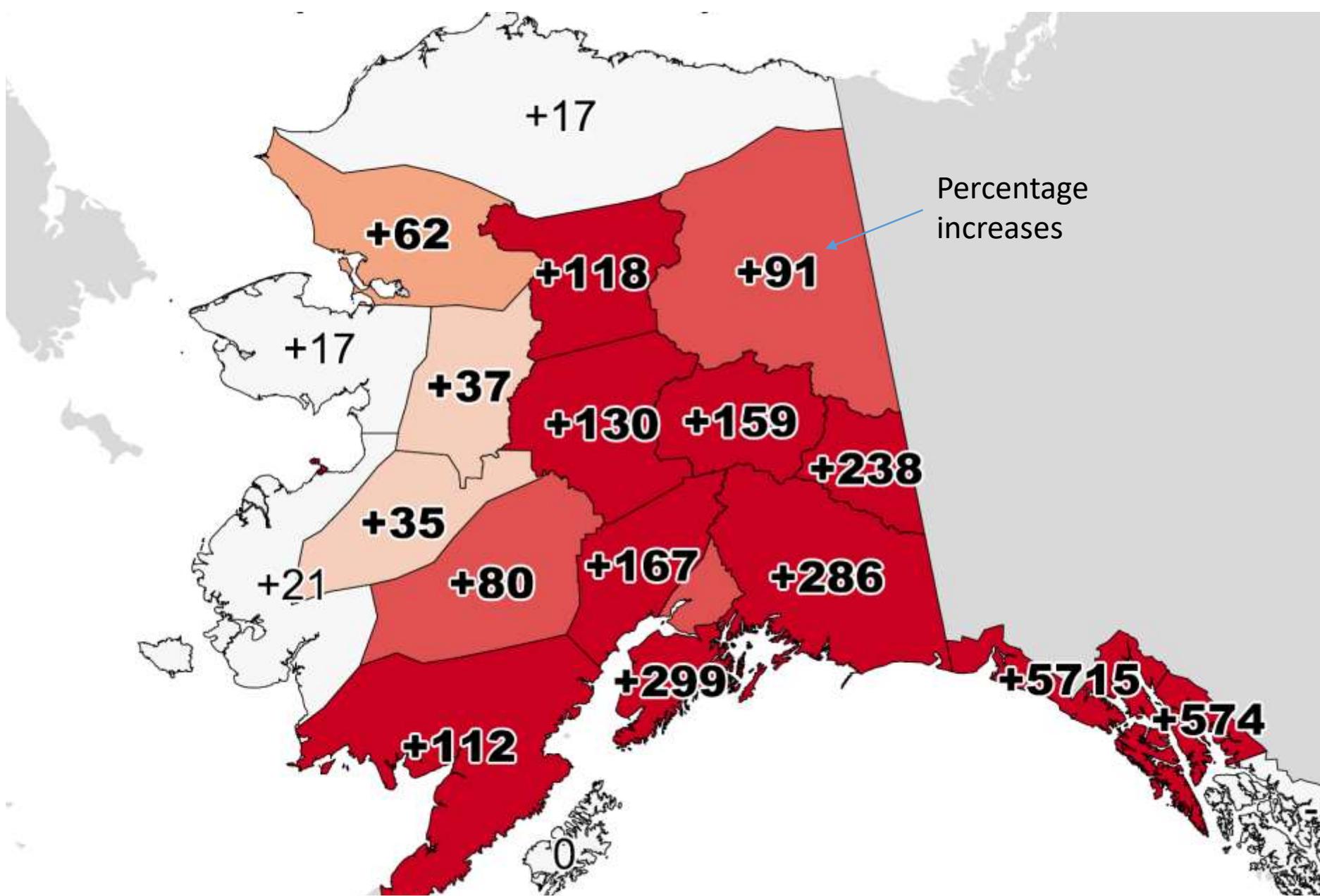


Forest fire in Interior Alaska
Photo by Scott Rupp
Alaska Climate Adaptation Science Center (CASC)

Tundra fire in Alaska
Photo by Dr. Philip Higuera







Lightning at northern latitudes is expected to increase by the year 2100

Research by International Arctic Research Center, University of Alaska Fairbanks



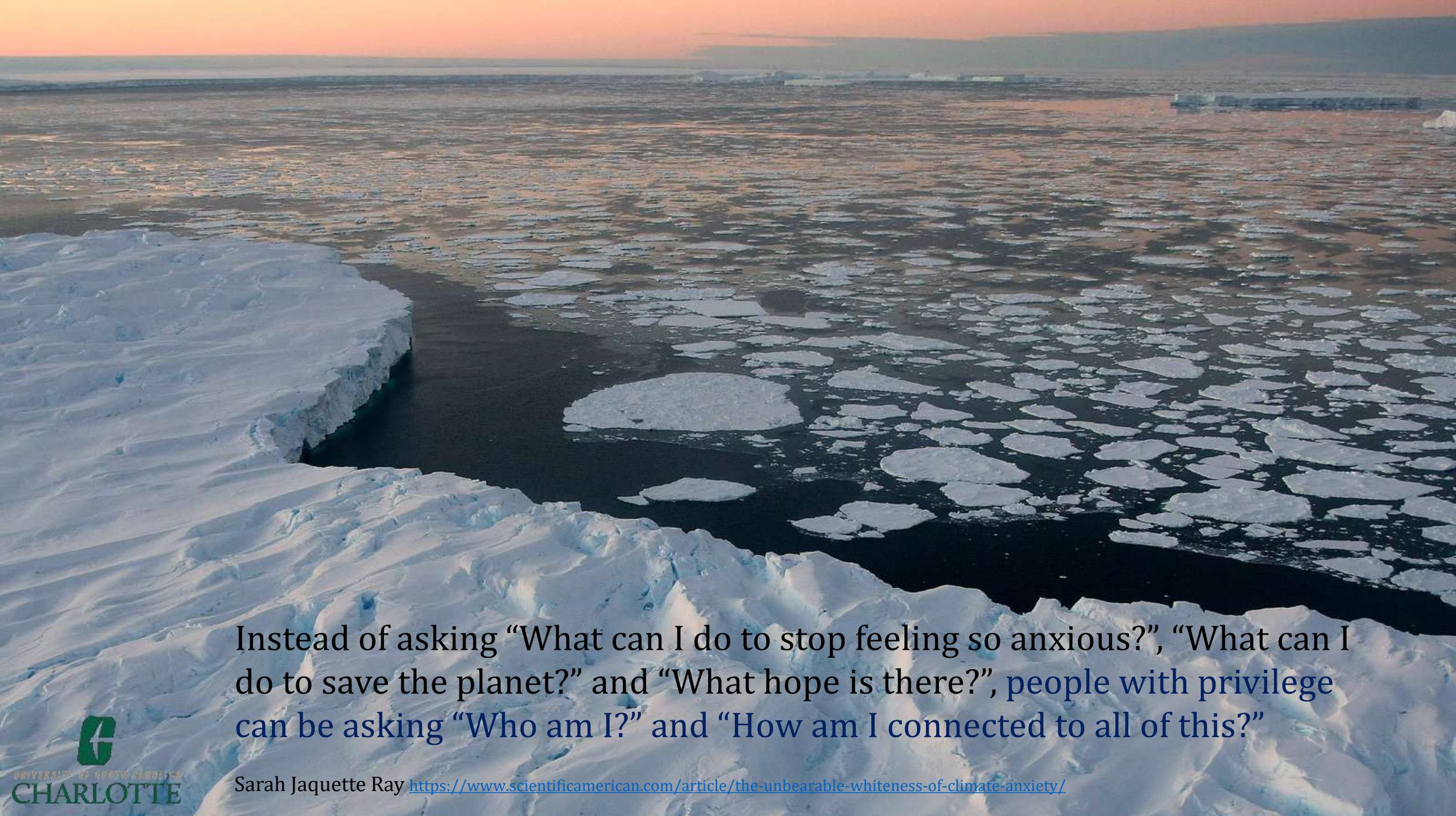
The lasting pleasures of contact with the natural world are not reserved for scientists but are available to anyone who will place himself under the influence of earth, sea, and sky and their amazing life.

Rachel Carson, *The Sense of Wonder*

If we want our future generation to become empowered citizens, then “let us allow them to love the Earth before we ask them to save it.”

David Sobel, *Beyond Ecophobia*





Instead of asking “What can I do to stop feeling so anxious?”, “What can I do to save the planet?” and “What hope is there?”, **people with privilege can be asking “Who am I?” and “How am I connected to all of this?”**



Artist Zaria Forman
soft pastel on paper





Artist Zaria Forman



Stills from a video montage called *Like Shishmarif* by artist Marek Ranis, UNC Charlotte



Artist Justin Brice Guariglia





Judy Twedt, music composition with notes set to the data showing Arctic sea ice decline



Jill Pelto, combining data and imagery to juxtapose sea ice decline with habitat loss for the Arctic fox

NORTHWEST PASSAGE (ARCTIC OCEAN)
37.75" X 53.75" BATIK ON SILK
Mary Edna Fraser



