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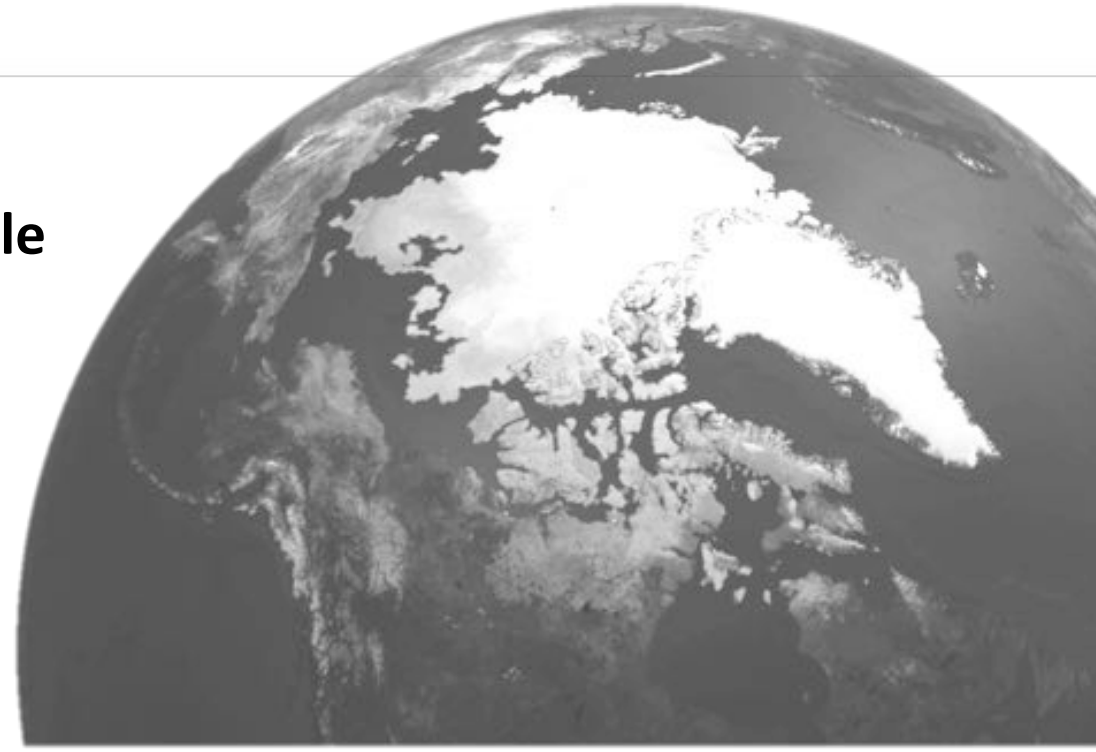
Arctic Alerts Media Roundtable

National Press Club

July 13, 2016



The Study of Environmental Arctic Change

Advancing and communicating scientific understanding to help society respond to a rapidly changing Arctic

Summary

Dr. Brendan P. Kelly

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Executive Director, Study of Environmental Arctic Change (SEARCH)

University of Alaska Fairbanks

Summary

- Record winter heat wave at the North Pole;
- Warming reflected in record low sea ice;
- Record surface temperature in Greenland;
- Sea level rise increased by Greenland melts;
- Diminishing snow cover amplifying warming;
- Permafrost thaw amplifying warming via CO_2;
- Warming Arctic increases extreme events.

Arctic Sea Ice

Dr. Walt Meier

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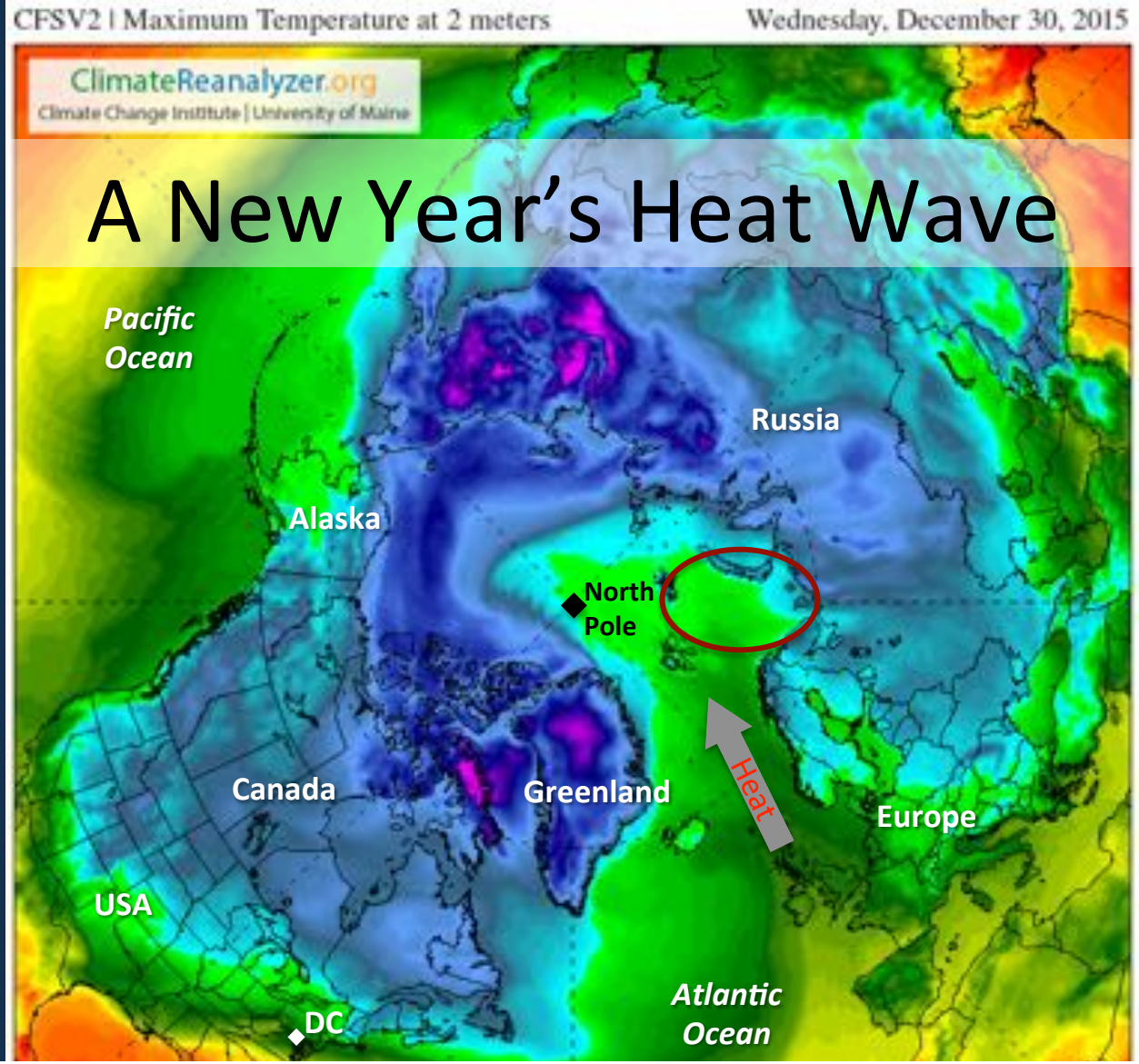
NASA Goddard Space Flight Center
Greenbelt, MD

2016 Arctic Alerts: Sea Ice

- Unusual weather over the ice so far in 2016
- Record low sea ice through June
- Response of sea ice to weather is changing because the ice is thinner



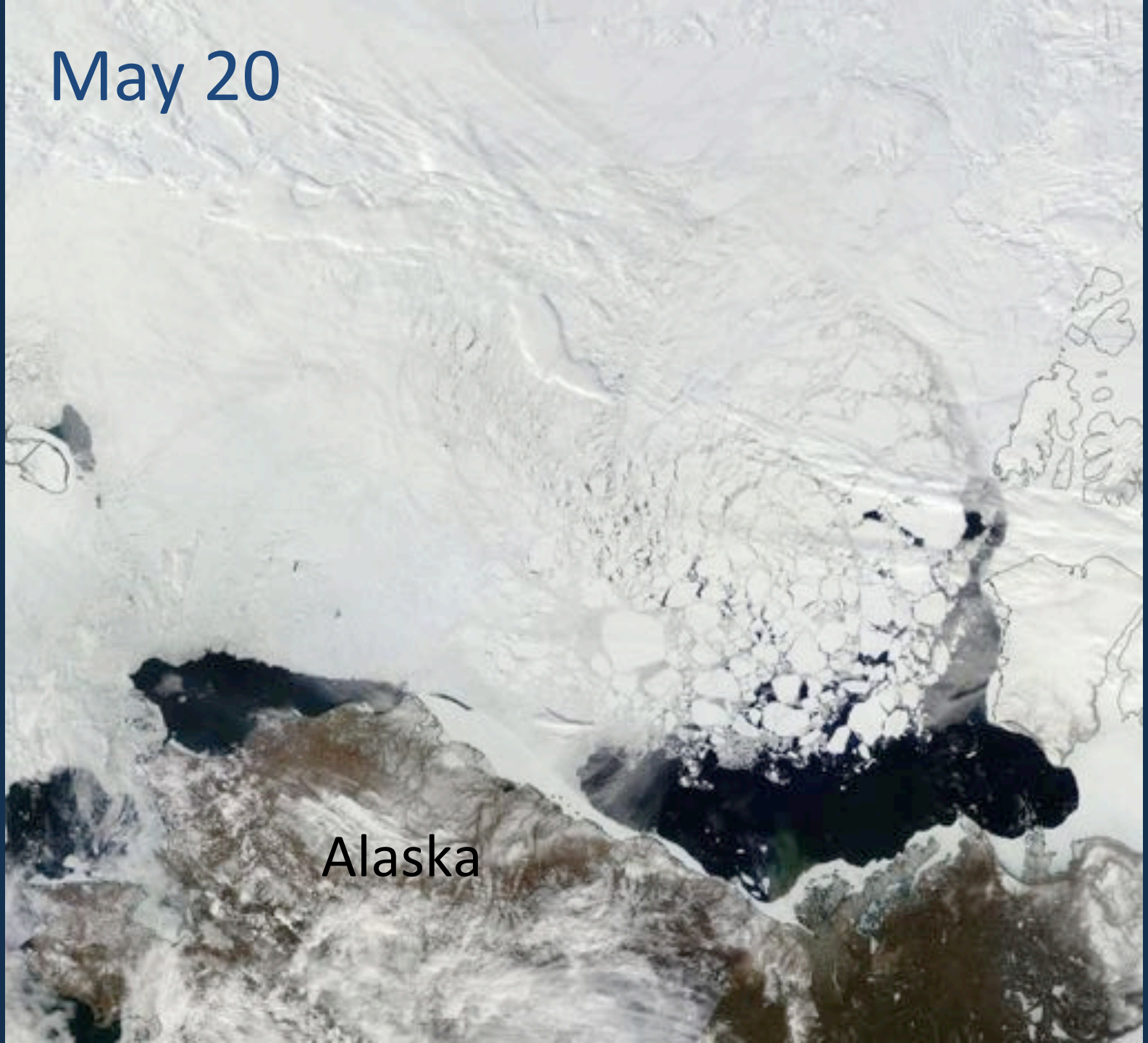
Below freezing ← → Above freezing

Cold — Warm

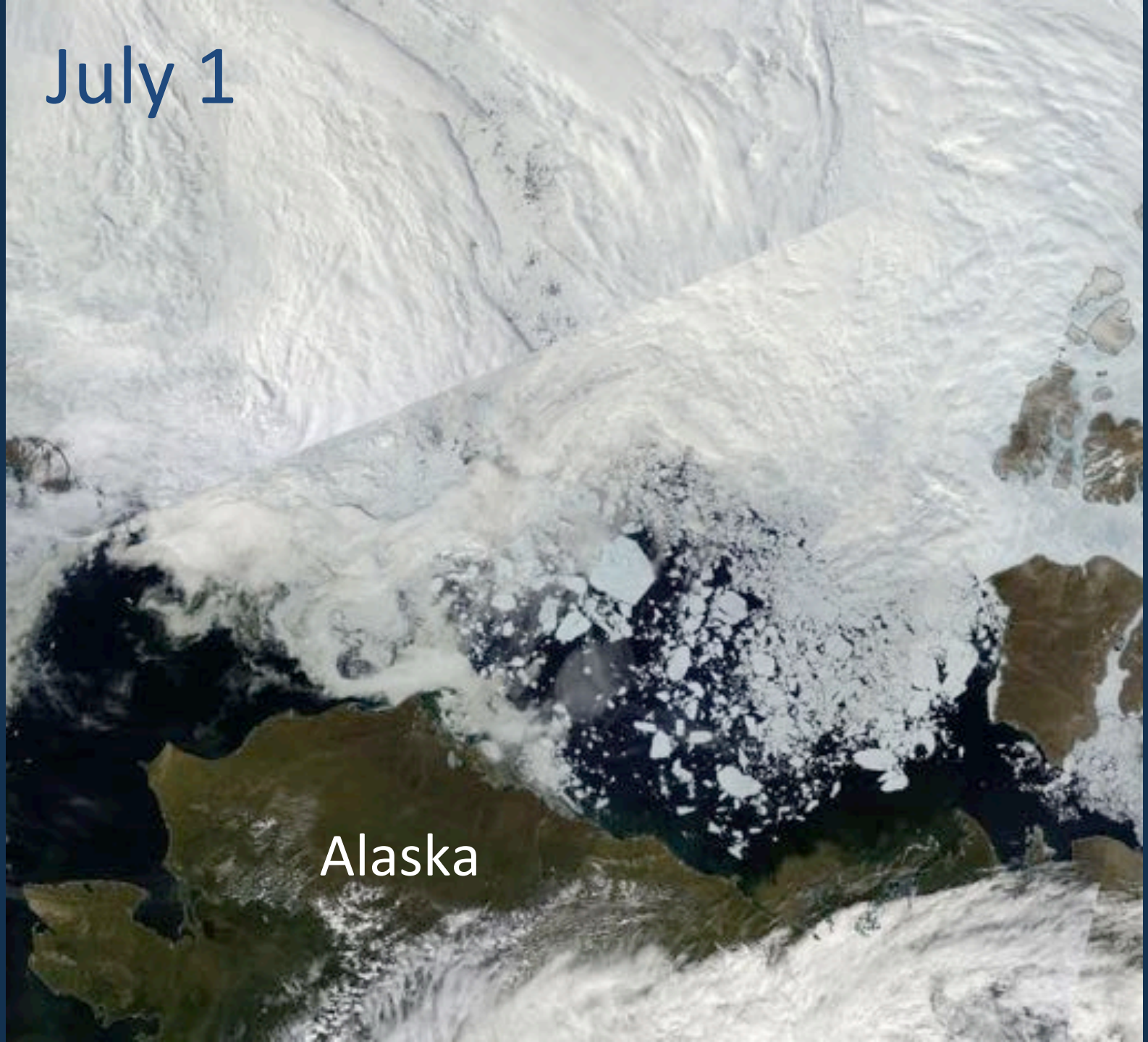
Data from NOAA NCEP Climate Forecast System (CFS) Version 2

April 23

May 20

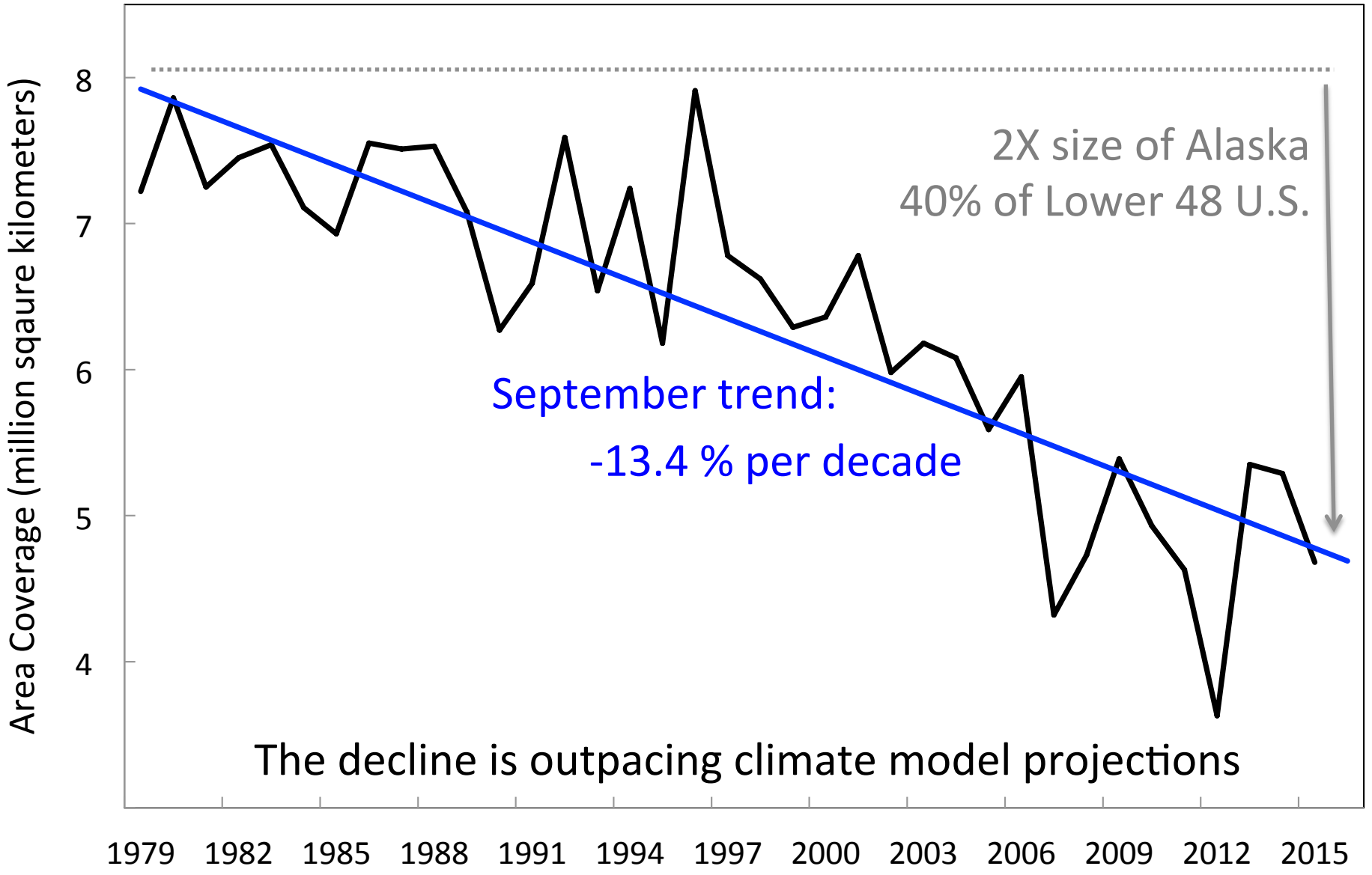


July 1



Arctic Ocean area covered by sea ice in September

1979 - 2015



ARCTIC ALERTS 2016

Melting Ice Sheets and Sea Level Rise

Dr. Marco Tedesco

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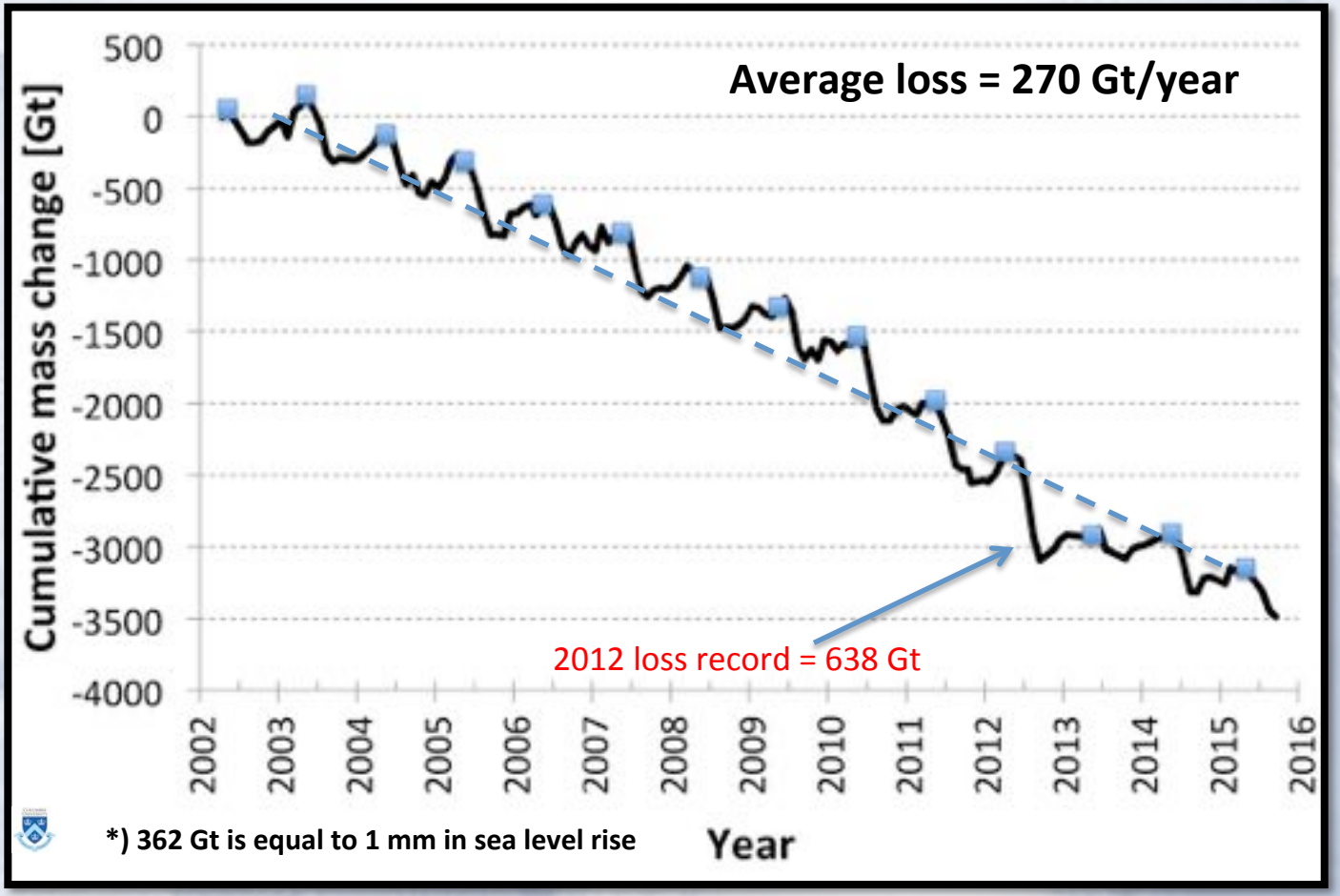
Lamont-Doherty Earth Observatory
of Columbia University

GREENLAND: ARCTIC IMPACT AND BEYOND

Impact and feedback

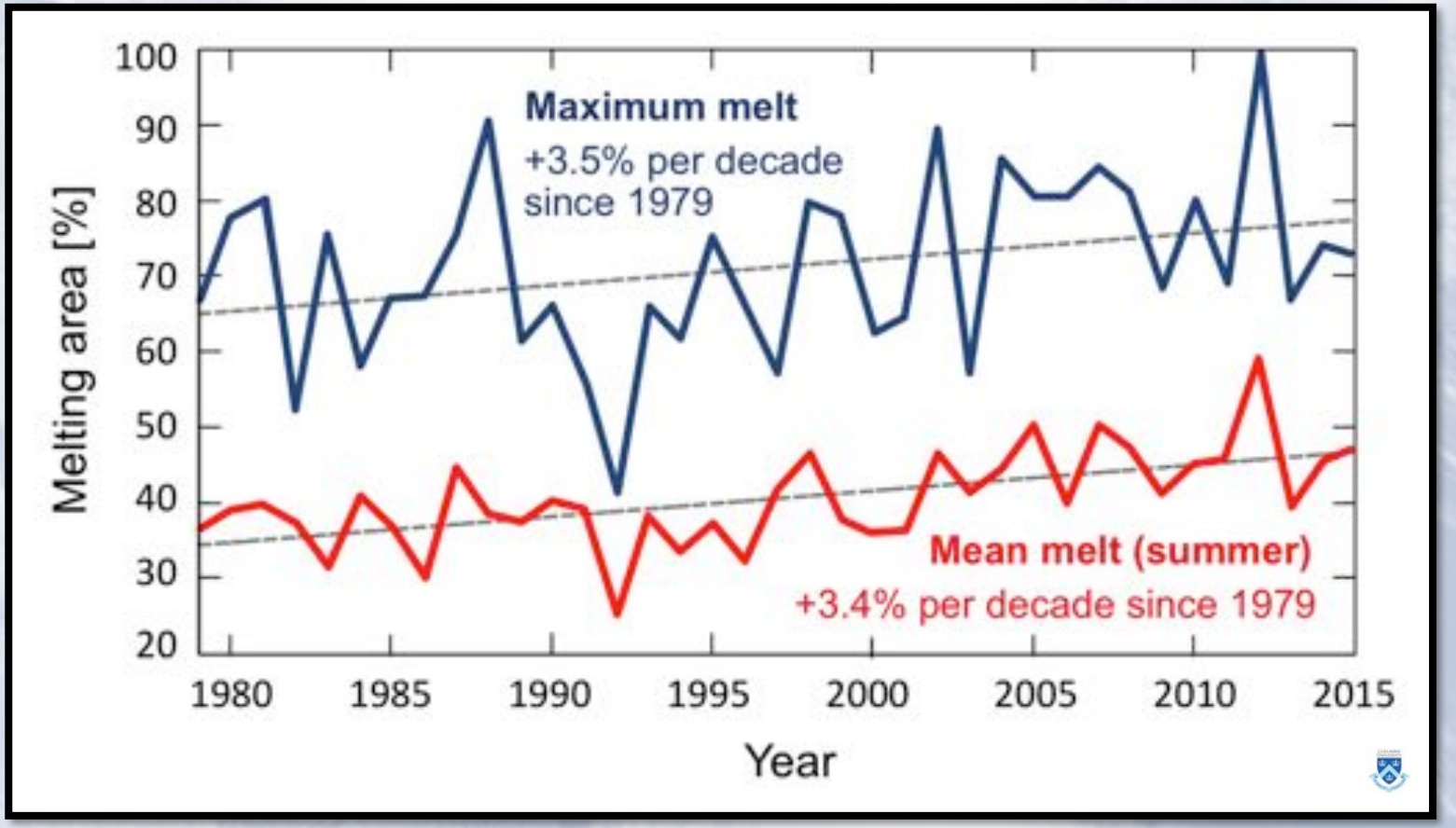
- Global sea level rise
- Ocean circulation
- Ecosystems
- Earth's climate (albedo)
- Atmospheric patterns
- Sea ice

SURFACE MELTING AND SEA LEVEL RISE



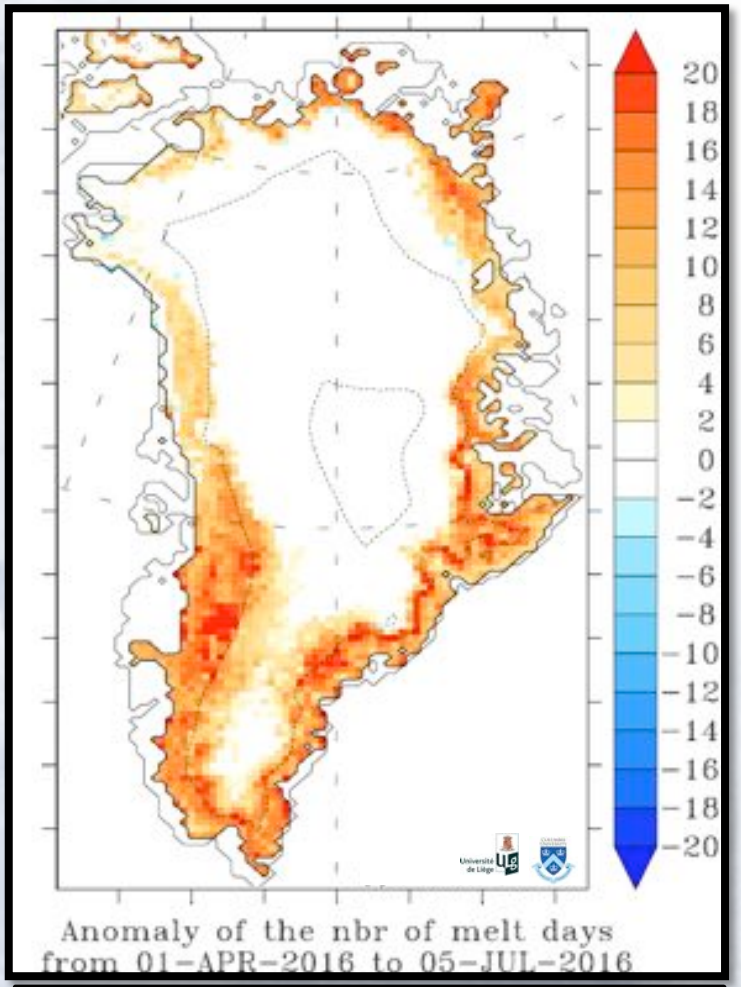
Surface melting is becoming the major contribution to mass loss in Greenland

MELT EXTENT IN GREENLAND HAS BEEN INCREASING

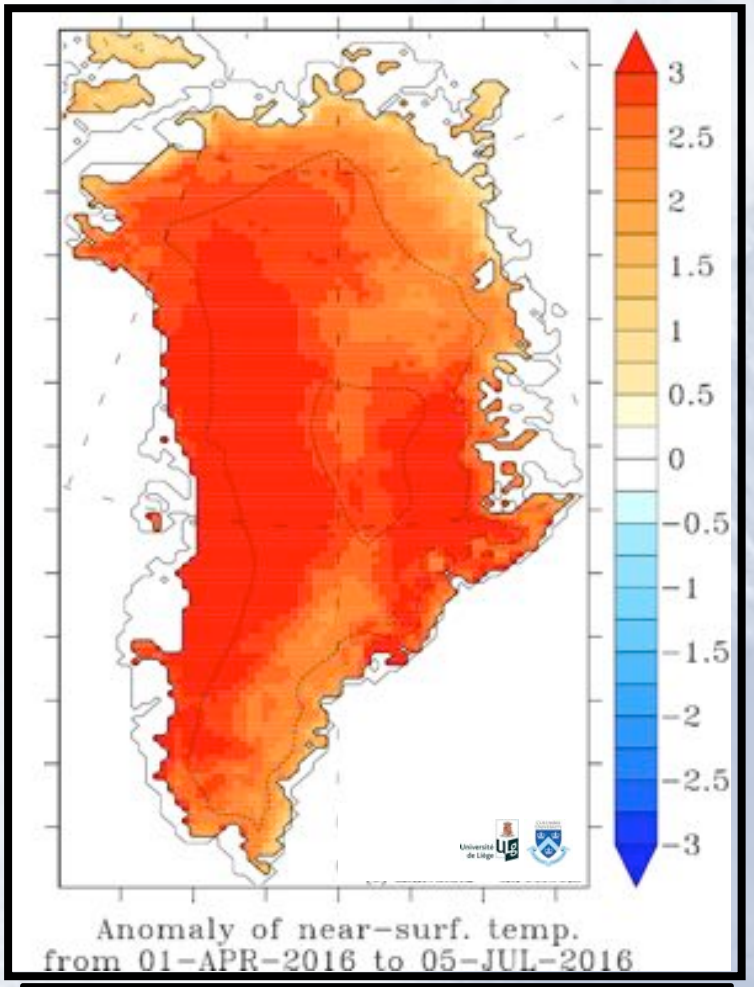


12 % of Greenland is melting more on average today than in 1979 (~ extent of Kansas)

MELTING AND SURFACE TEMPERATURE IN 2016



Number of melting days (Apr 1 – July 5th, 2016)



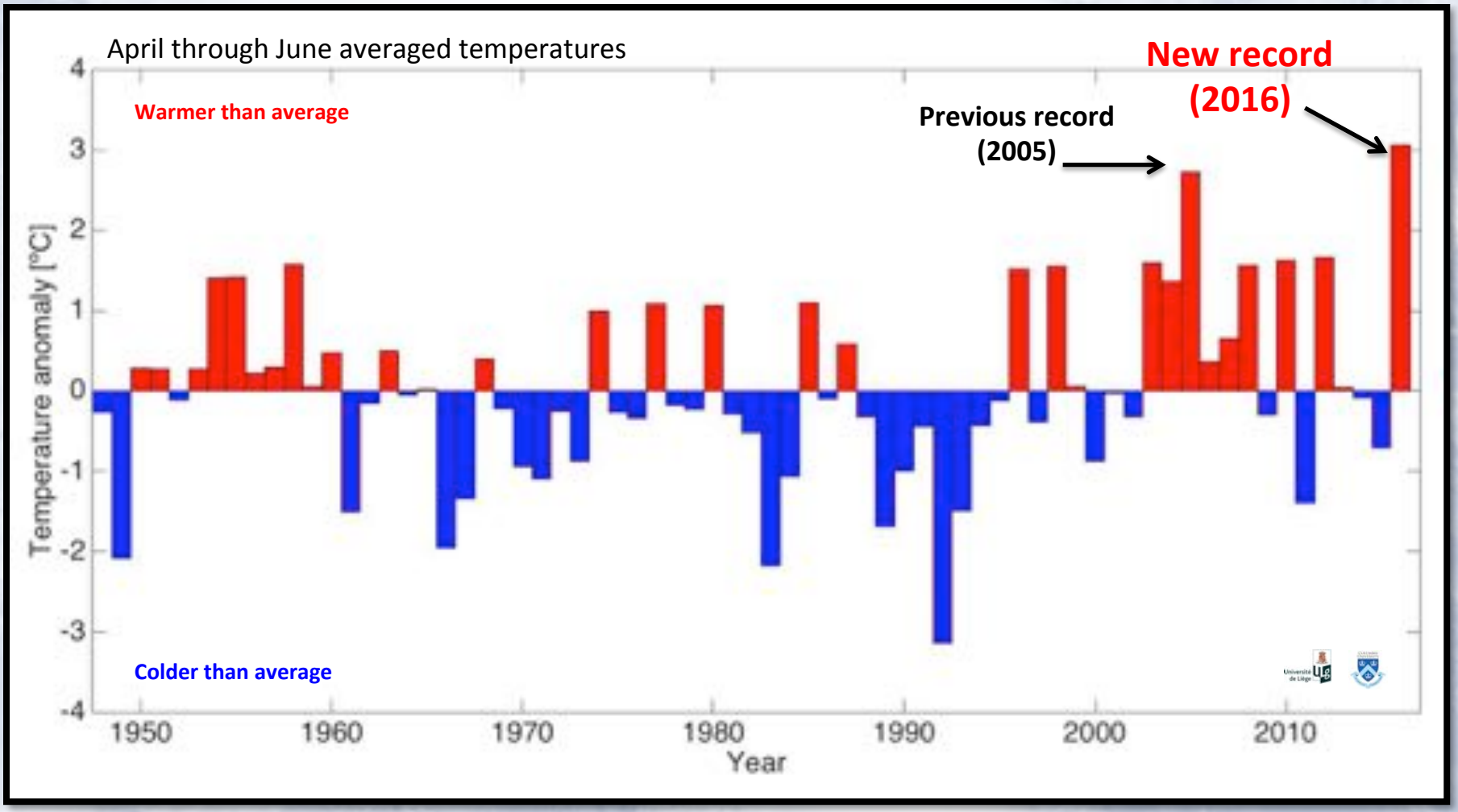
[°C]

Surface temperature deviation from the mean

Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE

www.cryocity.org

SURFACE TEMPERATURE RECORD



2016 Arctic Alerts:

MELTING ICE SHEETS AND SEA LEVEL RISE

1) Surface melting has been the major contribution to sea level rise from Greenland over the past years

2) Over the past 30 years melt extent has been increasing, covering ~ 12 % more of the Greenland ice sheet than 37 years ago

3) In 2016 , melting in Greenland started early and is above the average through July 5th

4) Surface temperature in Greenland set new records for the period April – June 2016

ARCTIC ALERTS 2016

Declining Spring Snow Cover Extent Over Northern Hemisphere Lands

Dr. David A. Robinson

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Rutgers University,
Piscataway, NJ

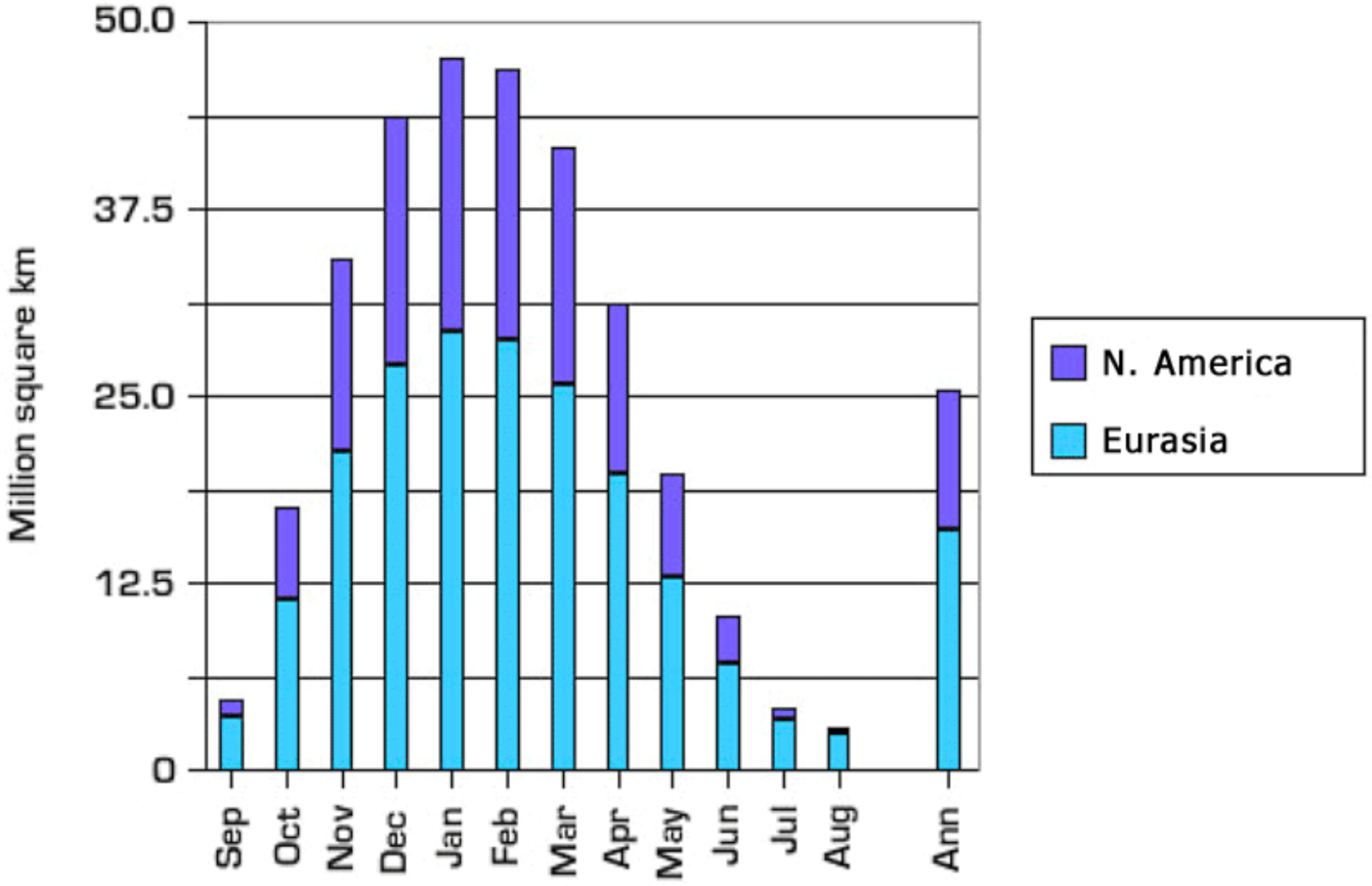
Research supported by
Global Science and Technology, Inc.
at NOAA NCEI

Unusually early 2016 snow melt: Alaska & eastern Siberia

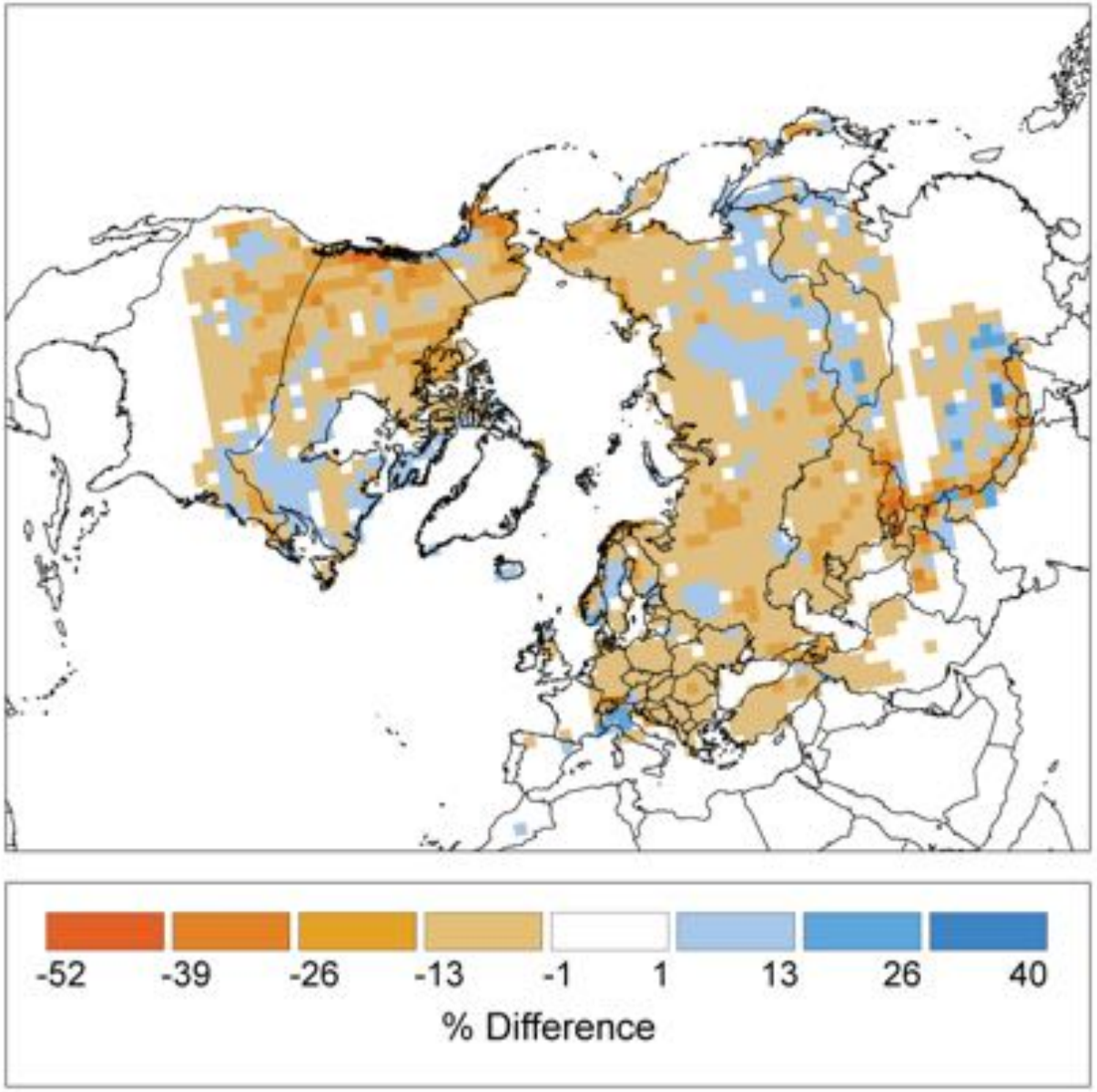
April 21, 2016: MODIS

May 29, 2016: MODIS

Average Northern Hemisphere continental snow cover extent

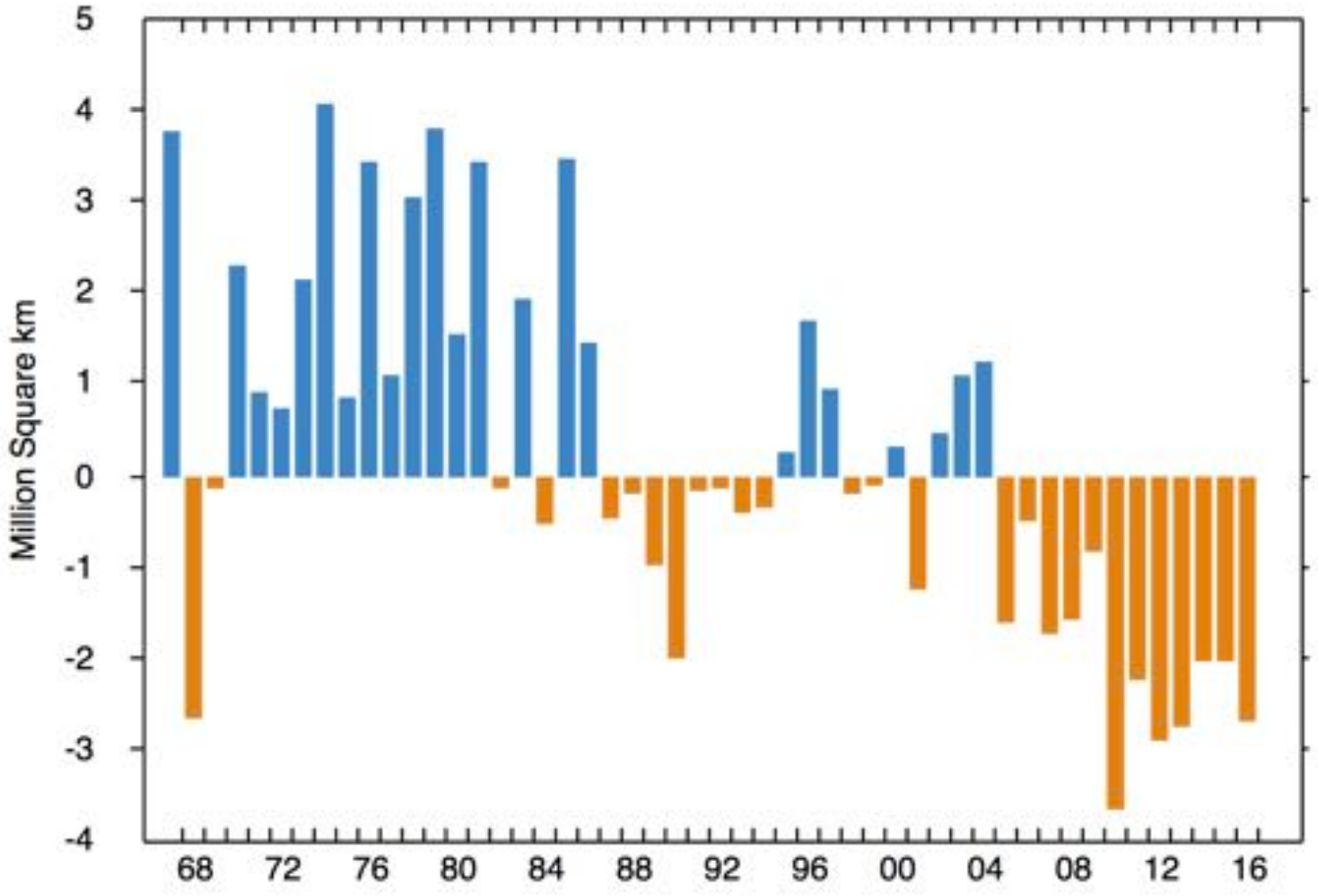


NH Spring (March-June) snow extent anomalies



Anomalies derived from 1981-2010 mean

May continental snow cover extent anomalies: deviations from normal 1967-2016

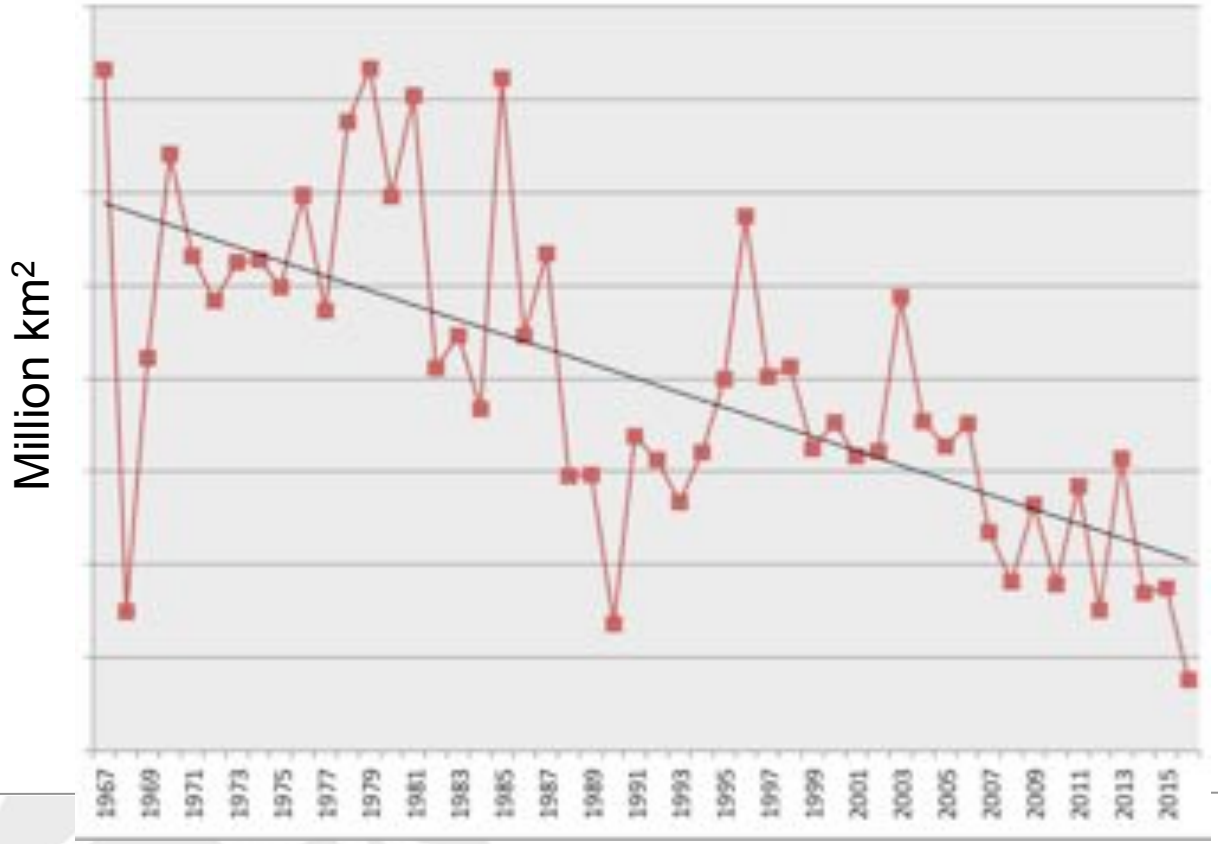


Summing up

Spring decline in snow extent

- Occurring from the middle latitudes to the Arctic
- Shows significant Arctic decline during the past 10 years in May and June
- The loss of spring continental snow extent is similar to the loss of late summer Arctic sea ice extent

Spring (March-June) Northern Hemisphere continental snow cover extent:1967-2016



Source: www.snowcover.org

Changing Permafrost

Dr. Ted Schuur

ted.schuur@nau.edu

Permafrost Action Team Lead,
Study for Environmental Arctic Change Program (SEARCH)

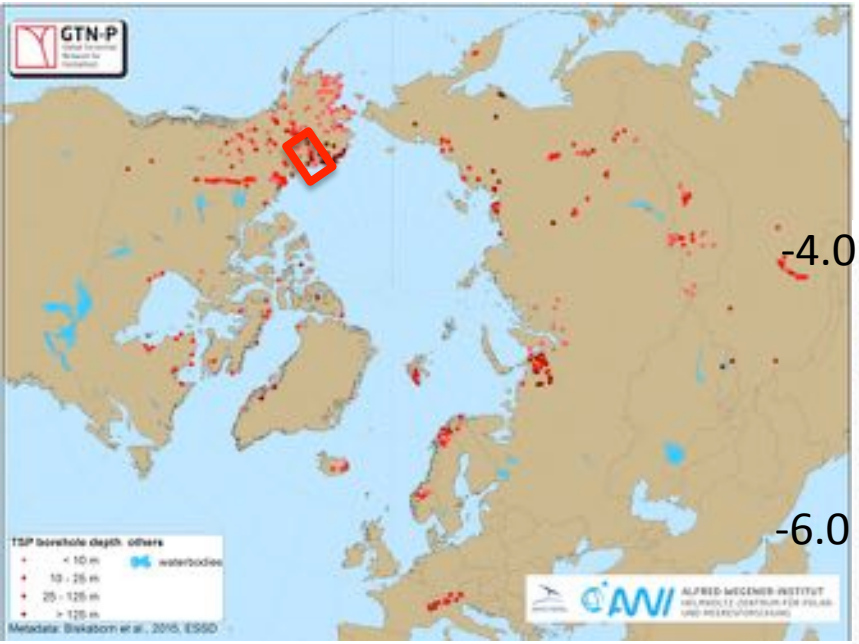
Center for Ecosystem Science and Society,
Northern Arizona University

Permafrost is Perennially Frozen Ground

Permafrost Distribution

Brown 1998

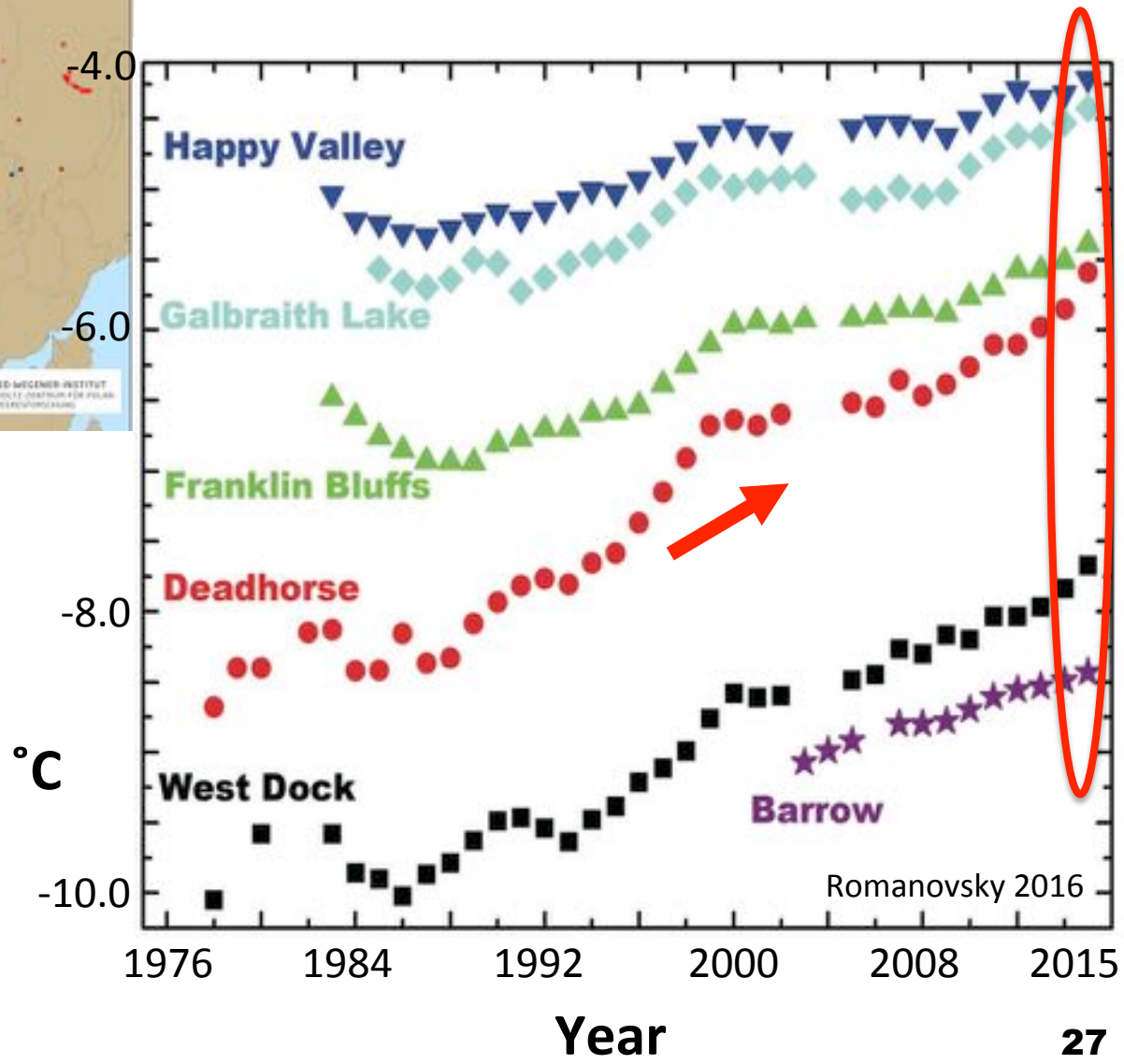
Permafrost Temperatures Are Increasing



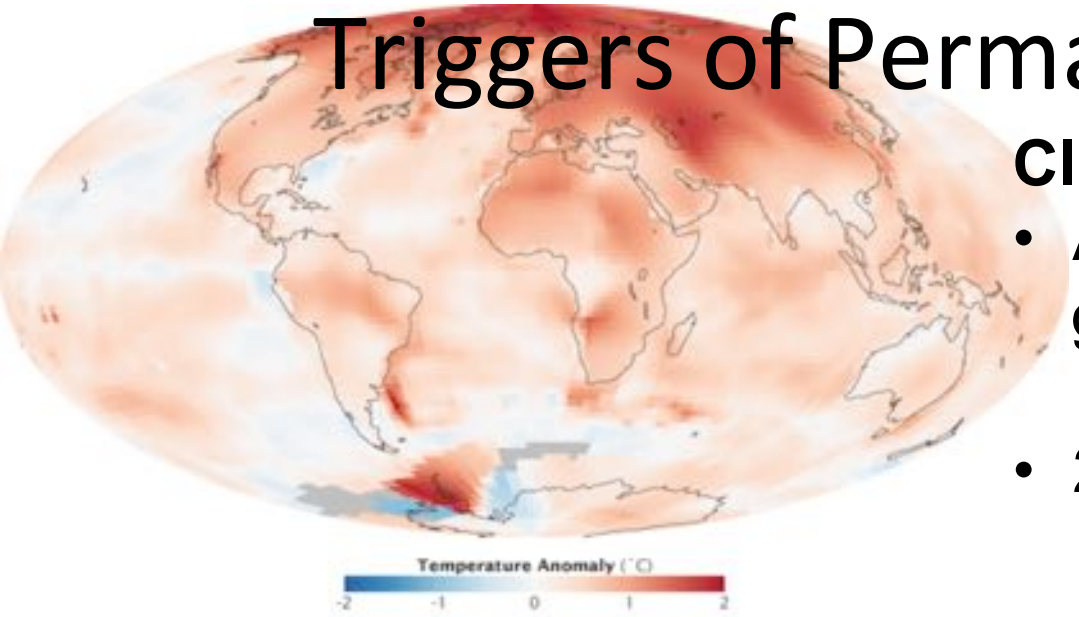
Increasing temperatures over decades

Record high levels at many sites in **2015**

Conditions point towards record temperatures in **2016**



Triggers of Permafrost Thaw



Climate:

- Arctic warming 2x faster than globe
- 2016 record warm conditions

Ecosystem Disturbance:

- Fires burn soil organic layer, which insulates permafrost
- Increased frequency of large fire years + extreme fire events
- **2015** Alaska fire season, 2nd largest area burned

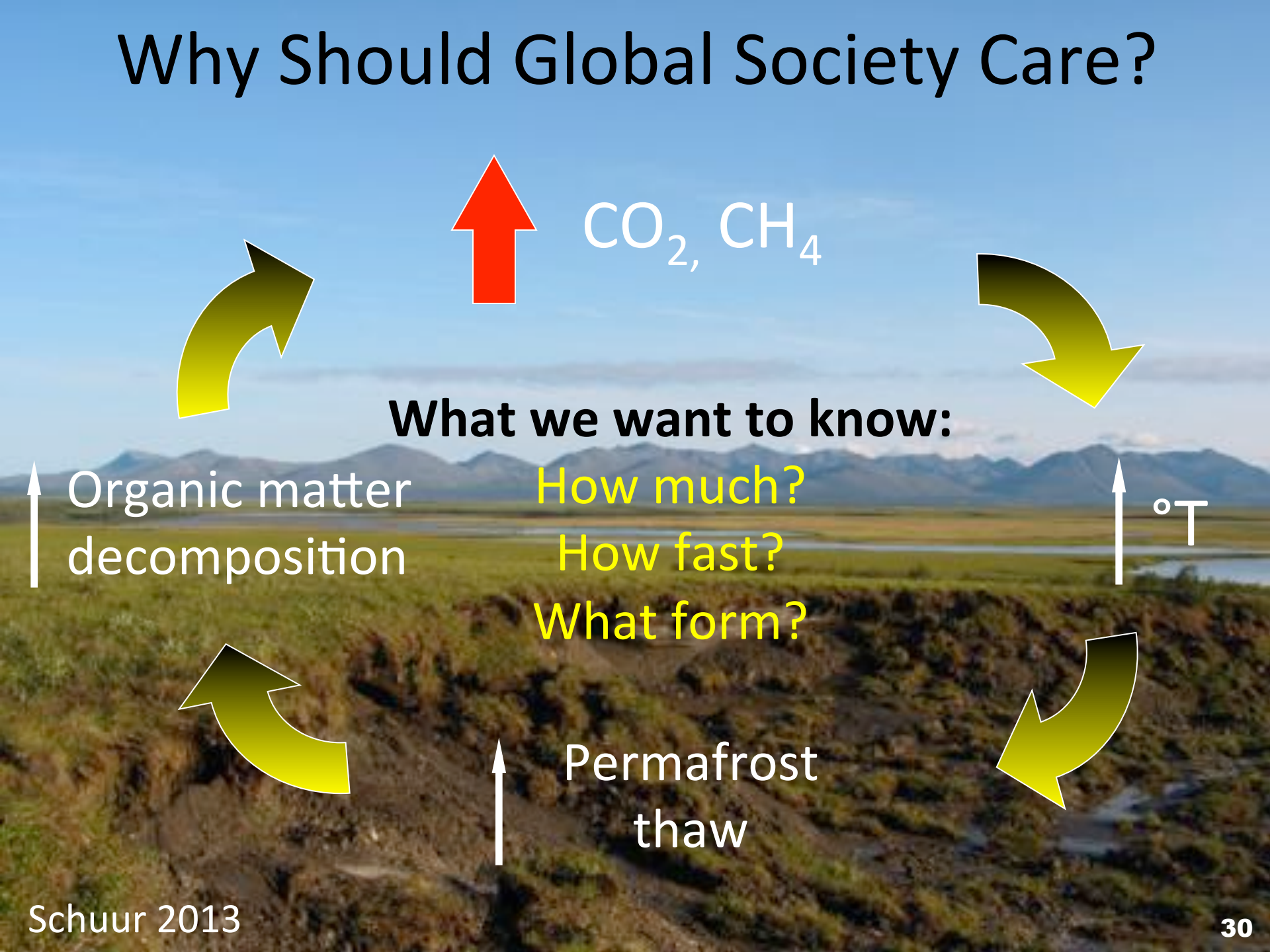
Why Should Arctic Residents Care?

What we want to know:

Where's the ground ice?

How to anticipate abrupt thaw?

Why Should Global Society Care?



Schuur 2013

Permafrost Carbon Emissions

Permafrost Zone
Soil Carbon
Vulnerable Fraction
5-15% by 2100

Equivalent to
~75 ppm atm CO_2

Similar in amount
to biospheric sources
(deforestation)
Less than human sources
(fossil fuels)

Schuur 2015 Nature

ARCTIC ALERTS 2016

Atmospheric Response to a Warming Arctic

Dr. Jennifer Francis

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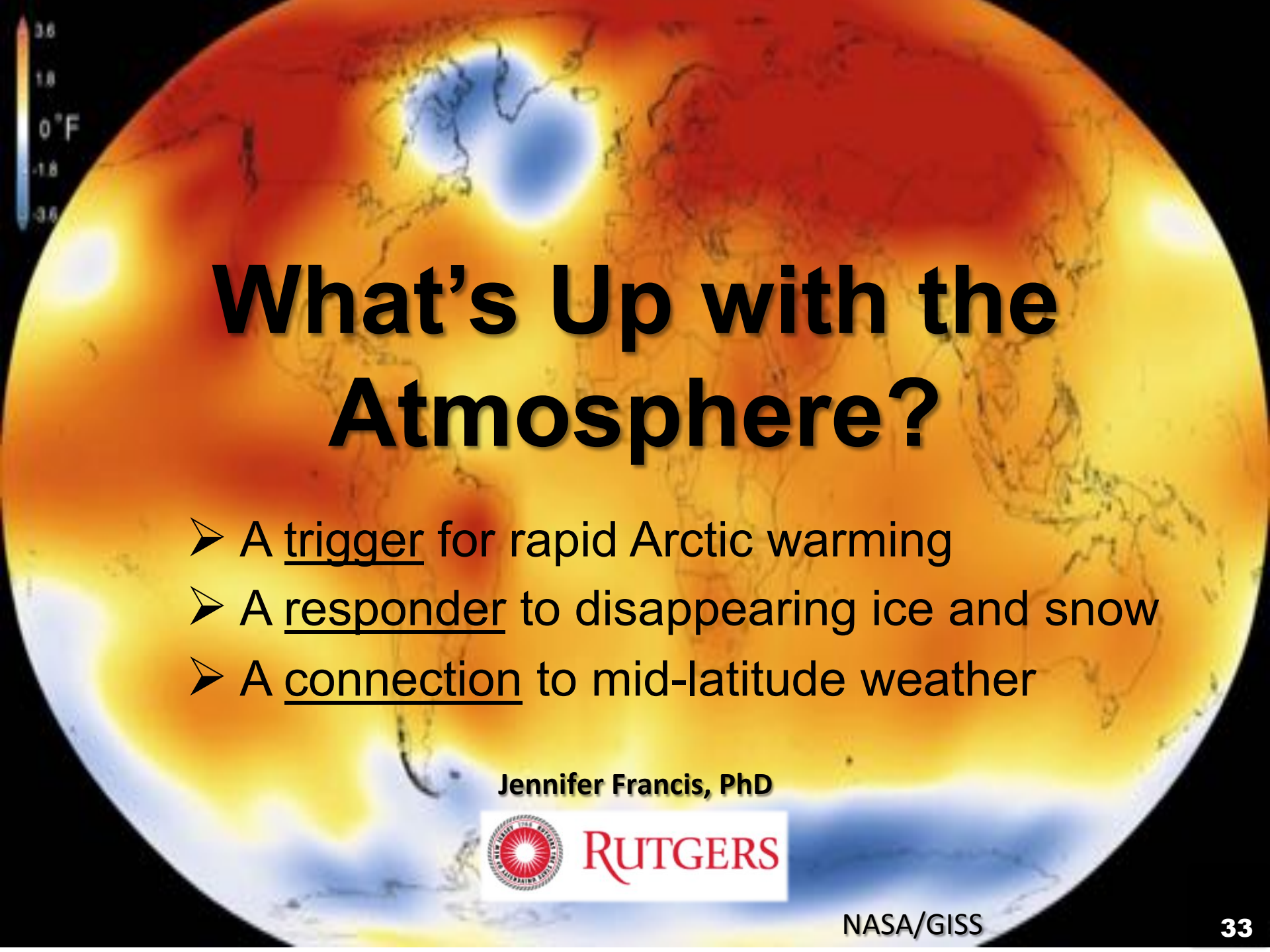
Sea Ice Action Team Lead,
Study for Environmental Arctic Change Program (SEARCH)

Rutgers University



What's Up with the Atmosphere?

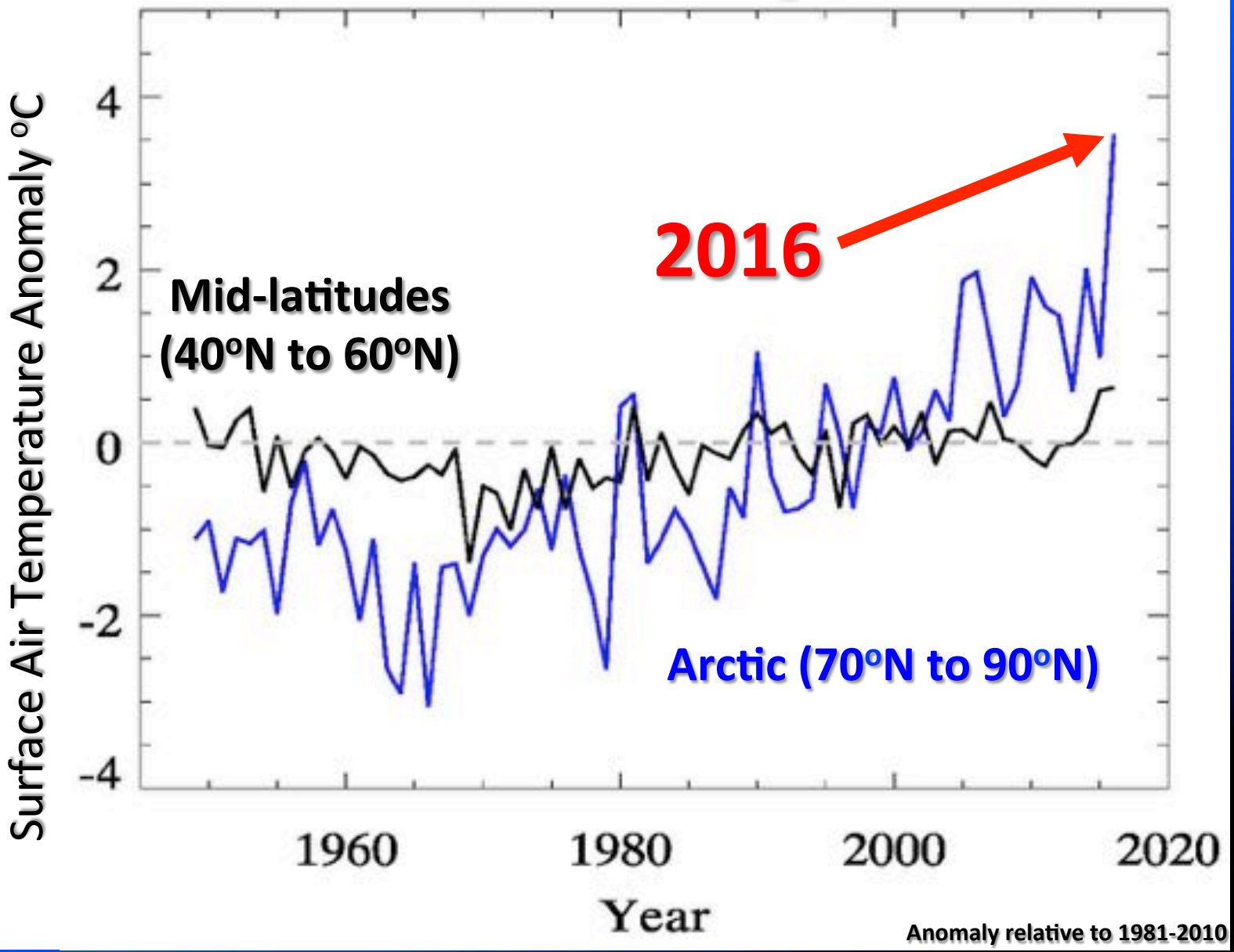
- A trigger for rapid Arctic warming
- A responder to disappearing ice and snow
- A connection to mid-latitude weather

Jennifer Francis, PhD

RUTGERS

NASA/GISS

Jan. – June Air Temperatures



Anomaly relative to 1981-2010

Data from NOAA/NCEP/ESRL

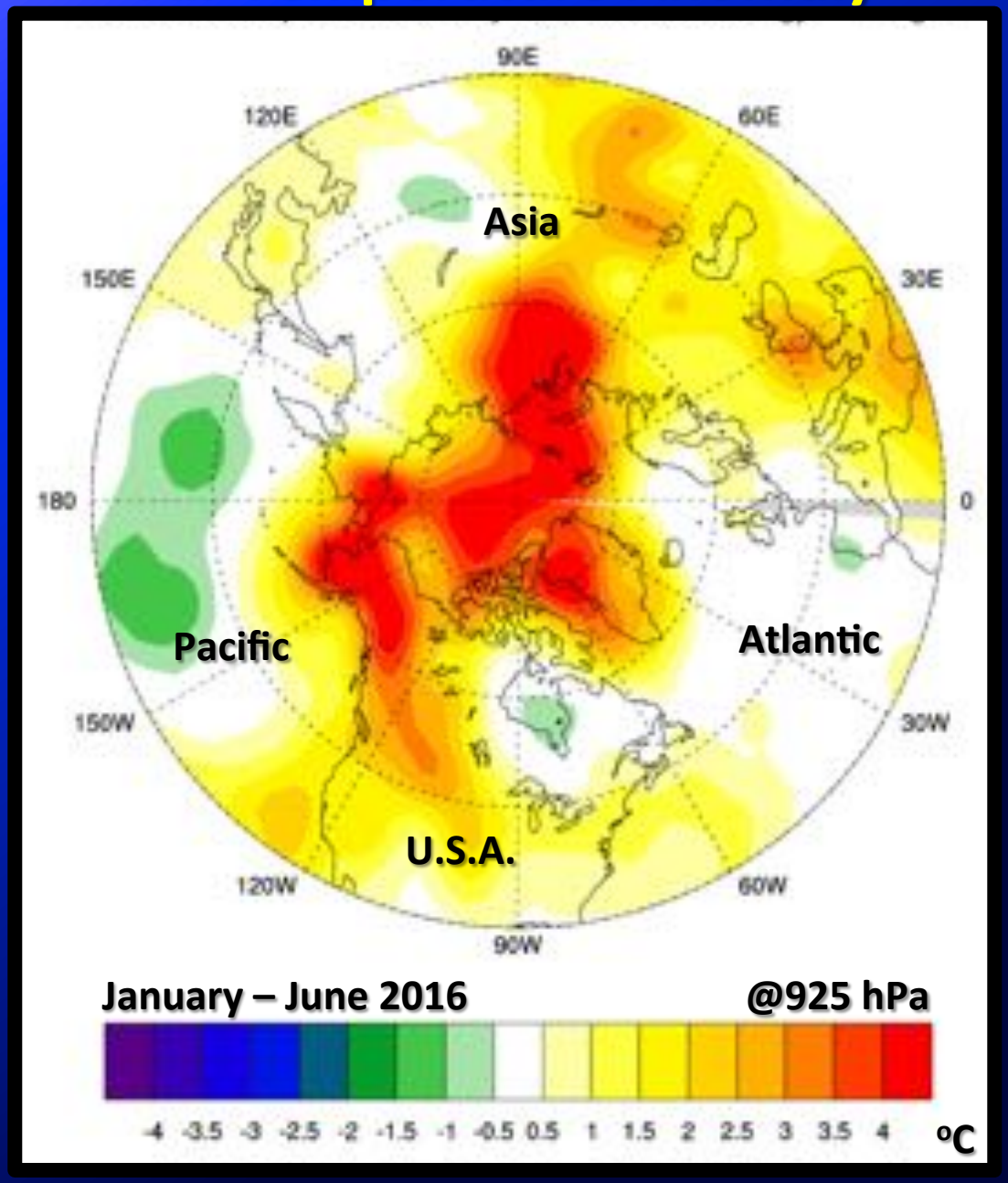
J. Francis: *francis@imcs.Rutgers.edu*

A Warm Arctic:

=> smaller N-S temperature difference

=> disrupted jet stream

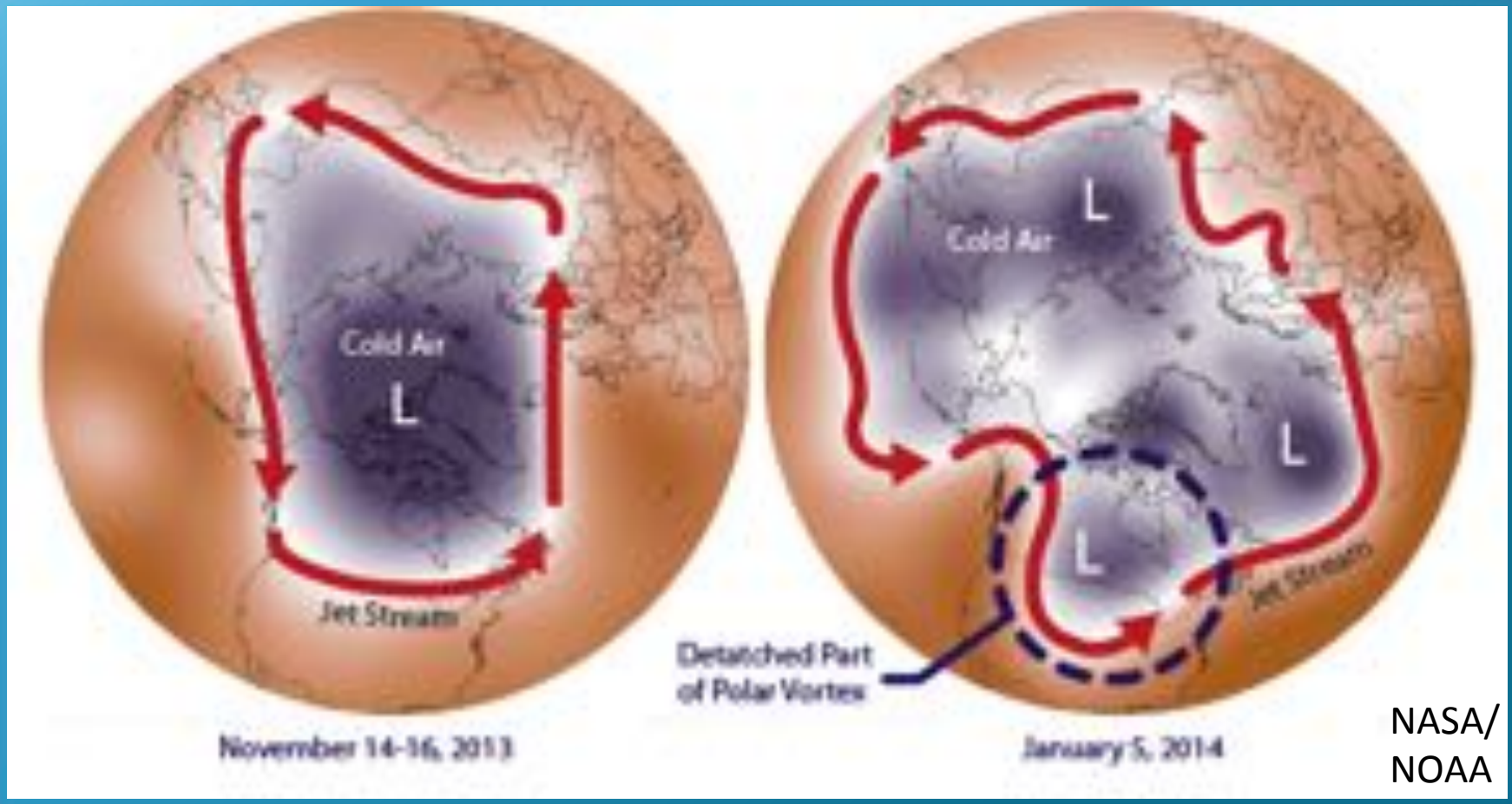
Air Temperature Anomaly



J. Francis: *francis@imcs.Rutgers.edu*

Why care about a weak jet stream?

Strong **Weak**



NASA/
NOAA

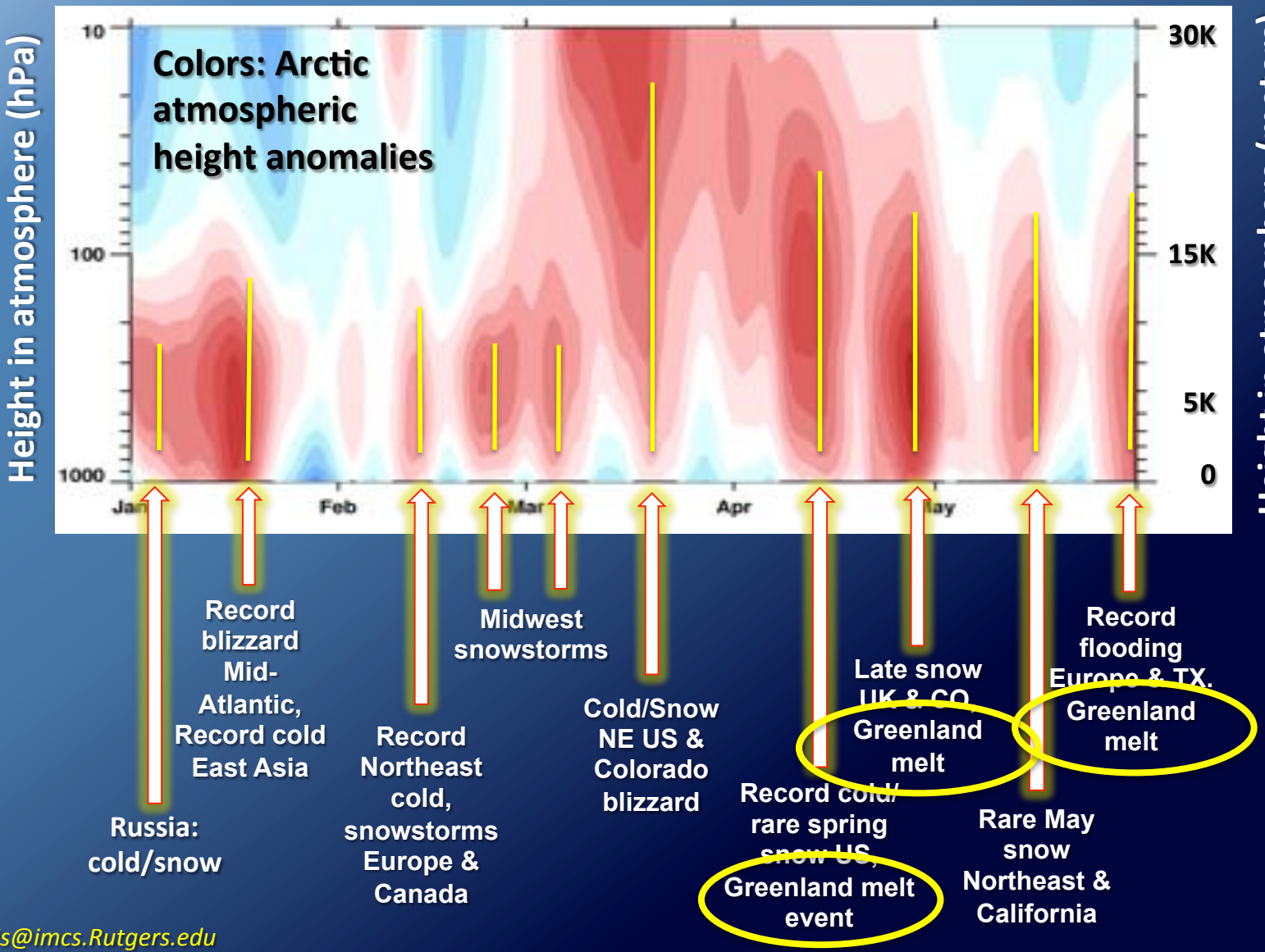
Warm Arctic => Extreme Events More Likely

J. Francis: *francis@imcs.Rutgers.edu*

Extreme events in 2016

from Judah Cohen:

aer Atmospheric and Environmental Research



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