

Arctic Sea Ice History

Ronan and Michael Connolly

with Willie Soon¹

Three Independent Scientists

March 23, 2017

Heartland Institute ICC12

Washington, DC

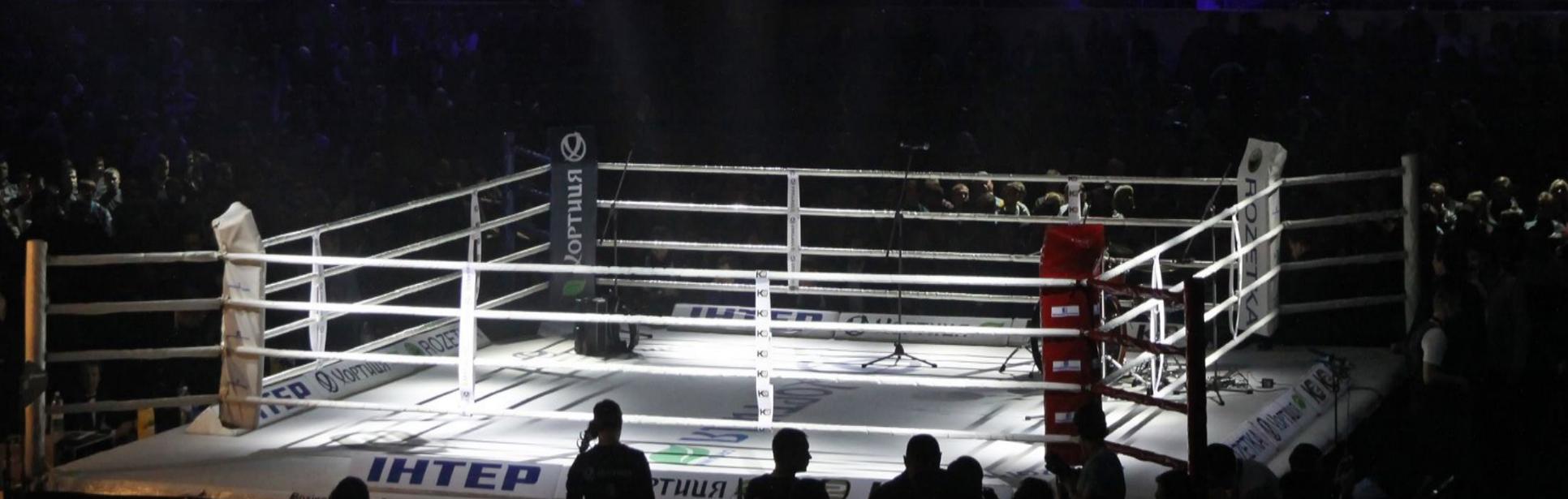
¹All Views Expressed Are Strictly Our Own

Is the UN right about the Arctic?

UN's Intergovernmental Panel on Climate Change (IPCC)

vs.

The Inconvenient Truth of reality



The UN's IPCC report

Climate Change 2013: The Physical Science Basis
Working Group I contribution to the IPCC Fifth Assessment Report

IPCC AR5 WGI : Polar Regions Polar Amplification , Permafrost, Sea ice changes

Paul J Hezel

Contributing Author: Ch 12, Tech Summary, SPM

Folgefonna glacier on the high plateaus of SØrfjorden, Norway (60°14' N, 6°44' E).

©Yann Arthus-Bergaud / Alamy

IPCC on Snow and Ice

Summary for Policymakers (SPM):

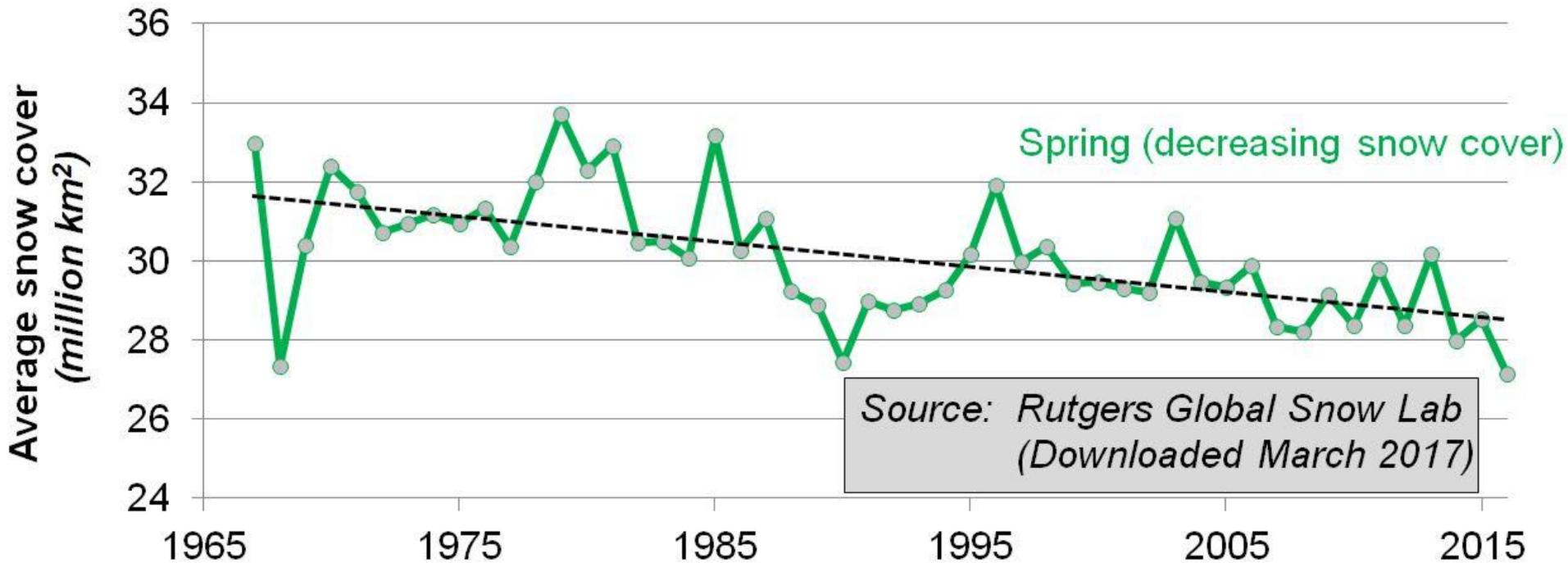
All Figures © IPCC 2013

Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have **continued to decrease** in extent (*high confidence*).

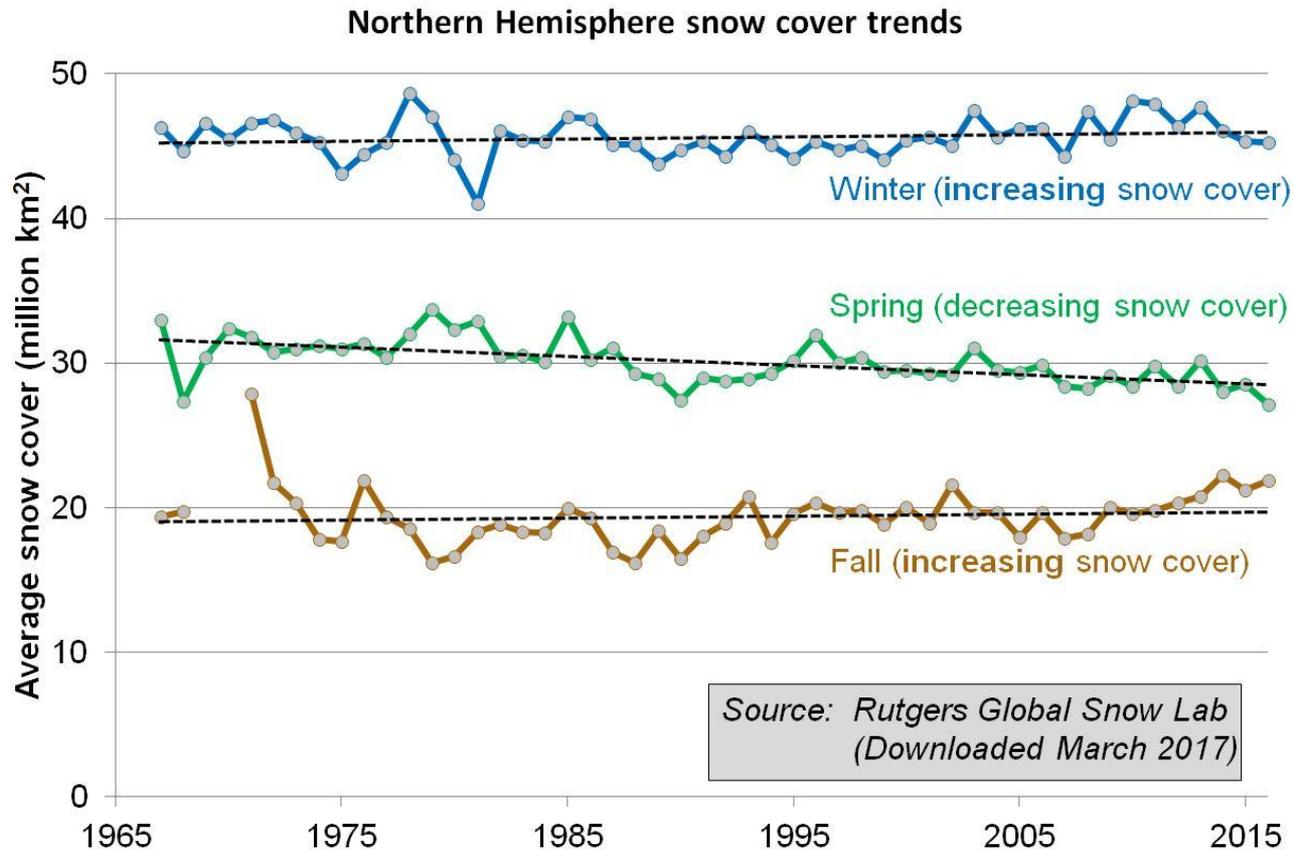
It is *very likely* that the **Arctic sea ice cover** will **continue to shrink and thin** and that Northern Hemisphere spring snow cover will decrease during the 21st century as global mean surface temperature rises. Global glacier volume will further decrease.

(Spring) Snow
disappearing from Northern
Hemisphere according to
IPCC AR5?

Northern Hemisphere snow cover trends (Spring only)



Q. Why did they only mention spring?



A. Because winter & fall have been increasing?

Why did they only mention
the Arctic?

Sea ice trends (satellite era)

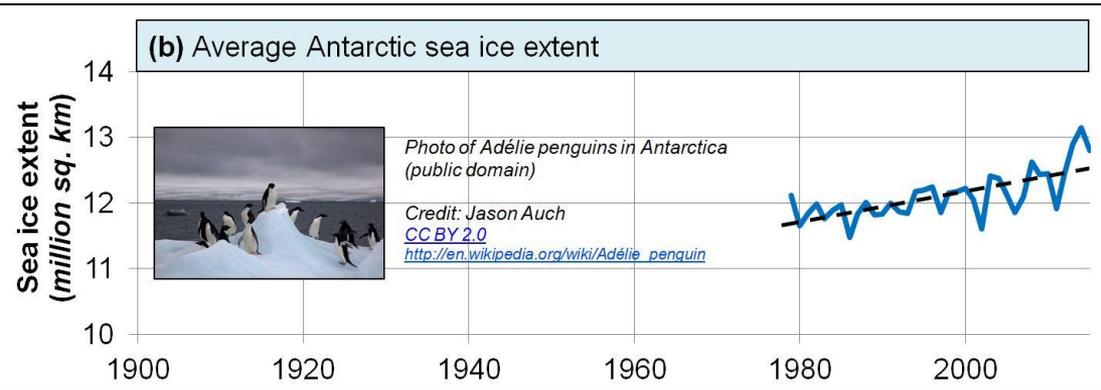


Arctic Sea Ice

- Northern Hemisphere
- Polar bears live here
- Decreasing since satellite era

Data source:

National Snow & Ice Data Center



Antarctic Sea Ice

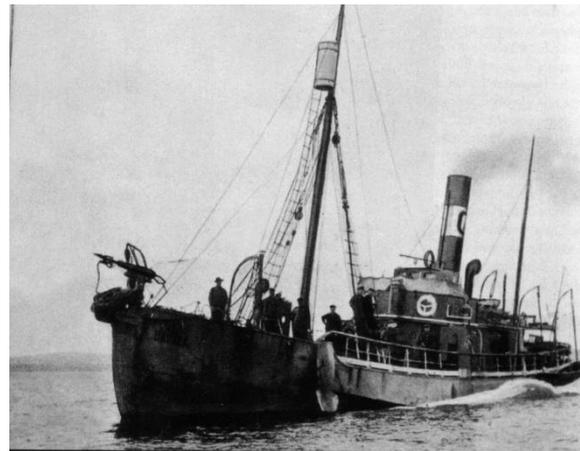
- Southern Hemisphere
- Penguins live here
- **Increasing** since satellite era!

A. Because Antarctic has been increasing?

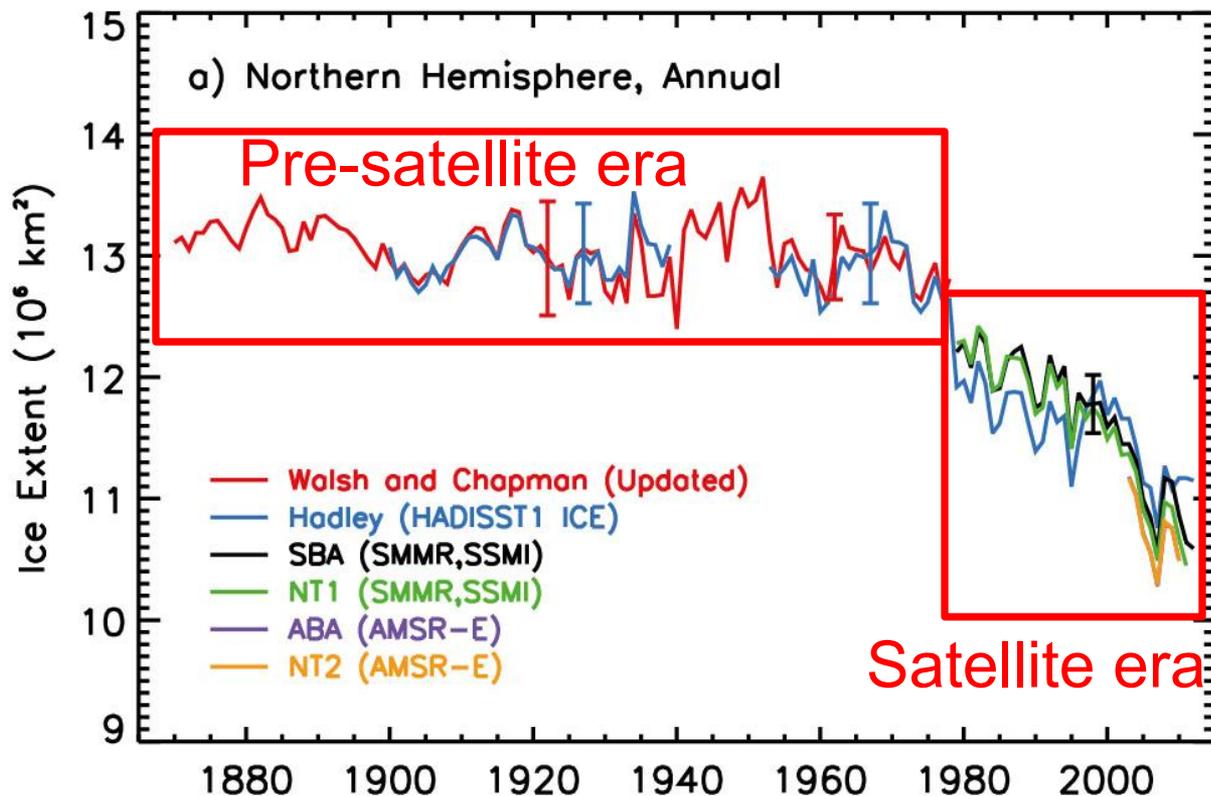
What happened before satellite era?

Pre-satellite observations

- Whaling logs
- Aerial reconnaissance
- Ice breaker records
- Drifting buoys
- Sea ice charts
- etc.

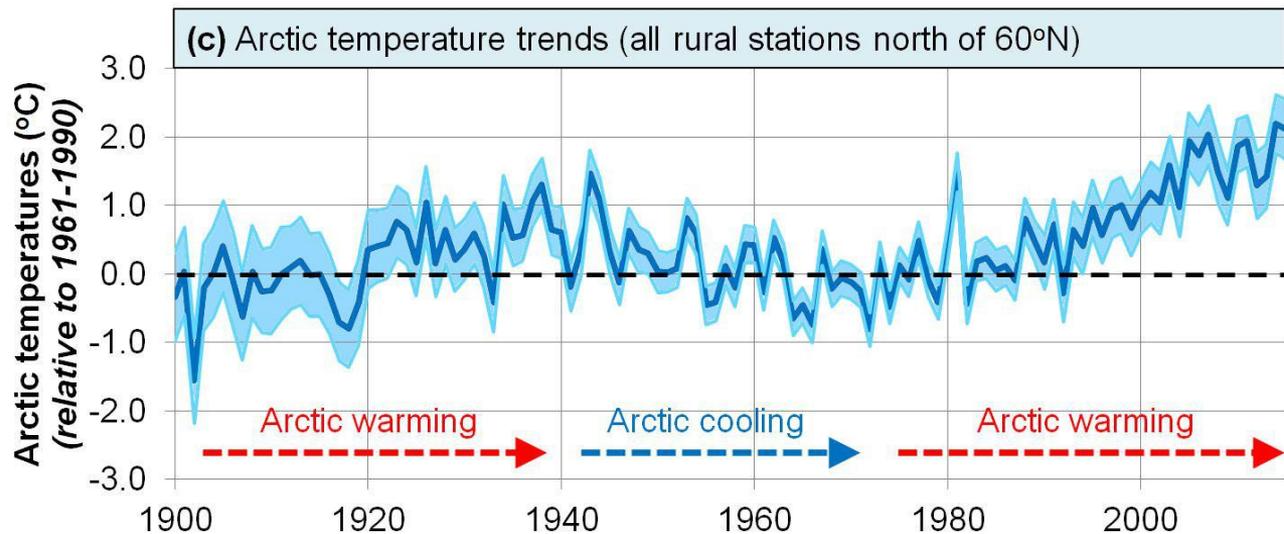


The IPCC's pre-satellite era estimates



But what about Arctic temperatures?

- Arctic warming since the 1970s... but followed Arctic cooling since 1940s!
- So, why was the IPCC pre-satellite era data so flat?



Data source: Arctic temperature trends calculated using NOAA's GHCN ver 3 dataset

Problems with pre-satellite data

Pre-satellite data is quite limited

Data sources for each region changed over time

e.g., 1920s-30s = mostly ship observations

1950s-70s include drifting buoys, etc

Regions covered changed over time

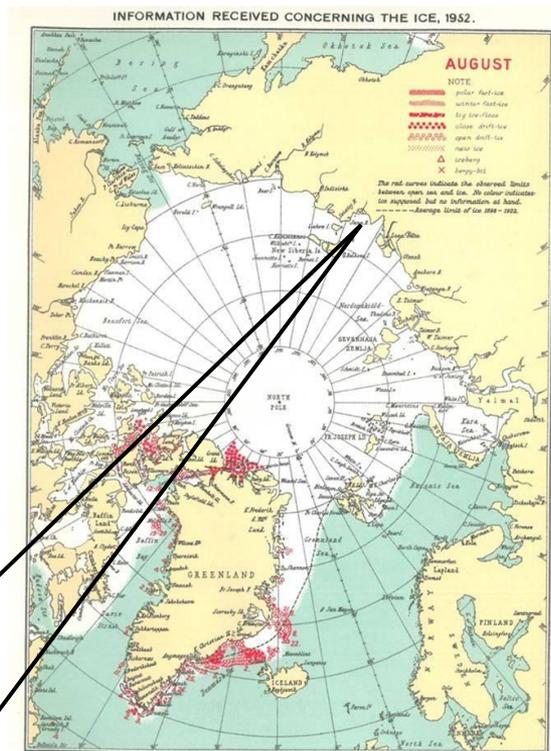
Much of Arctic was not monitored for most of the time

E.G., Russians didn't share sea ice data during Cold War

- IPCC's pre-satellite estimates used Danish sea ice charts for Russian Arctic.
- But, Danish had almost no Russian data during Cold War
- Instead Danish **guessed** there **might** be ice there!
- In late 2000s, the Russians digitized their observations for the region – very different story!

The red curves indicate the observed limits between open sea and ice. No colour indicates ice supposed but no information at hand.

-----Average limit of ice 1898-1922.



(a) August 1952 sea ice estimates according to Danish Meteorological Institute (DMI) charts

Siberian Arctic, August 1952



(b) August 1952 Siberian sea ice estimates according to the Russian-based Arctic and Antarctic Research Institute's (AARI's) data



New and exciting results from Ronan and Michael Connolly

[Connolly, Connolly, Soon 2017, Hydrol. Sci. J.]

Re-calibration of Arctic sea ice extent datasets using Arctic surface air temperature records

Ronan Connolly^{1,*}, Michael Connolly¹ and Willie Soon²

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Abstract A new seasonal and annual dataset describing Arctic sea ice extents for 1901-2015 was constructed by individually re-calibrating sea ice data sources from the three Arctic regions (North American, Nordic and Siberian) using the corresponding surface air temperature trends for the pre-satellite era (1901-1978), so that the strong relationship between seasonal sea ice extent and surface air temperature which has been observed for the satellite era (1979-present) also applies to the pre-satellite era.

According to this new dataset, the recent period of Arctic sea ice retreat since the 1970s followed a period of sea ice growth since the mid-1940s, which in turn followed a period of sea ice retreat since the 1910s.

Arctic sea ice is a key component of the Arctic hydrological cycle both through its freshwater storage role, and its influence on oceanic and atmospheric circulation. Therefore, these new insights have significance for our understanding of Arctic hydrology.

Keywords: Arctic sea ice; climate change; Arctic hydrological system; Early Twentieth Century Warm Period

Re-calibration of Arctic sea ice extent datasets using Arctic surface air temperature records

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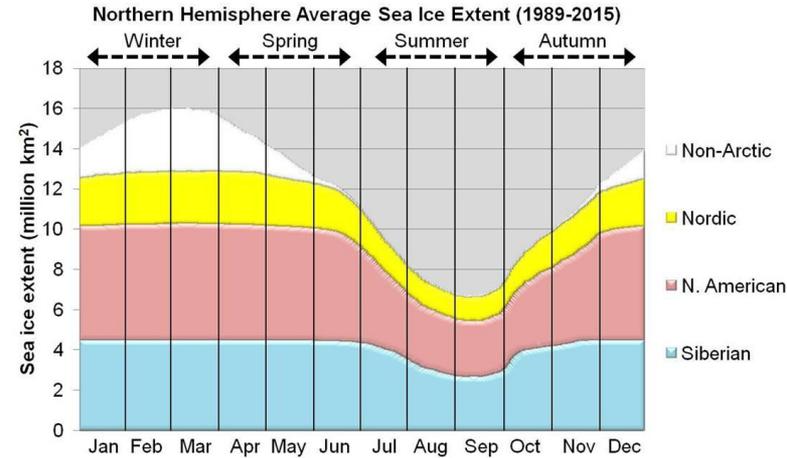
Acknowledgements We thank Prof. Genrikh Alekseev of the Arctic and Antarctic Research Institute for providing the Alekseev et al., 2016 September sea ice extent estimates used in Figure 11. We would also like to thank the editor and reviewers for their constructive comments.

All of the research in this collaborative paper was carried out during the authors' free time and at their own expense. None of the authors received any funding for this research.

Re-calibration process

1. Divide up data into three regions and four seasons
2. Calculate temperature trends
3. Calculate sea ice trends for satellite era
4. Work out sea ice to temperature relationship for each region

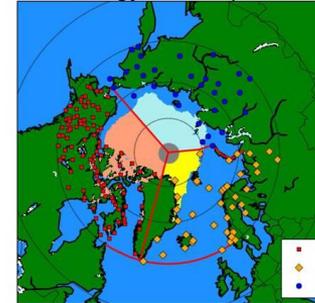
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Climatology for 2 March

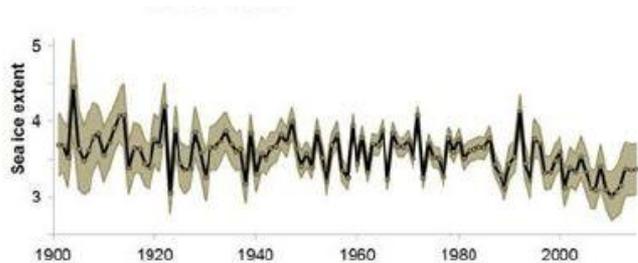


Climatology for 8 September

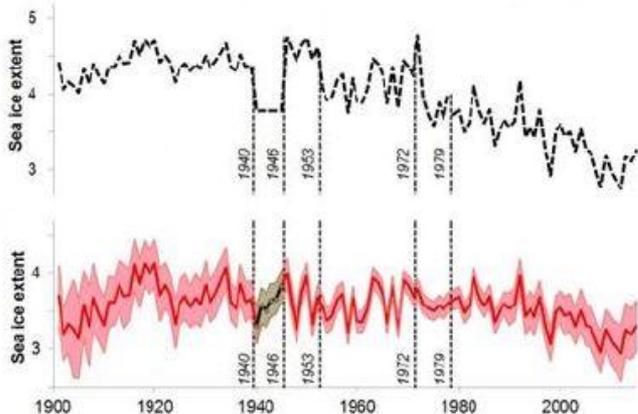


Legend: N. American, Nordic, Siberian

Re-calibration process



Step 5. Apply the above linear relationship to the surface air temperature reconstruction from step 2 to generate a temperature-derived sea ice extent proxy for 1901 – present. This step is applied separately to the mean, upper bound and lower bound to generate equivalent confidence intervals for the proxy dataset.

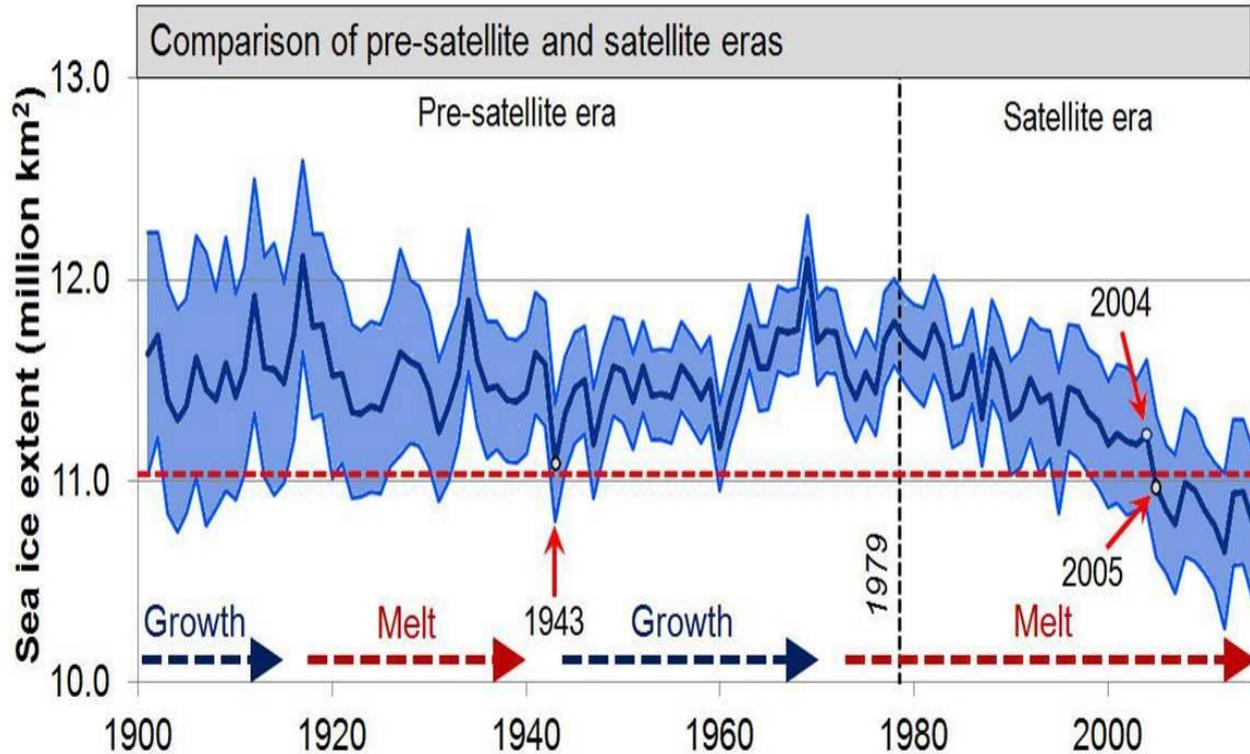


Step 6. Calculate the mean sea ice extents estimated from the available pre-satellite dataset for that season and region. Group the estimates into separate periods according to the underlying data sources used. Note for our analysis, we use the satellite-derived estimates for the post-1979 satellite era.

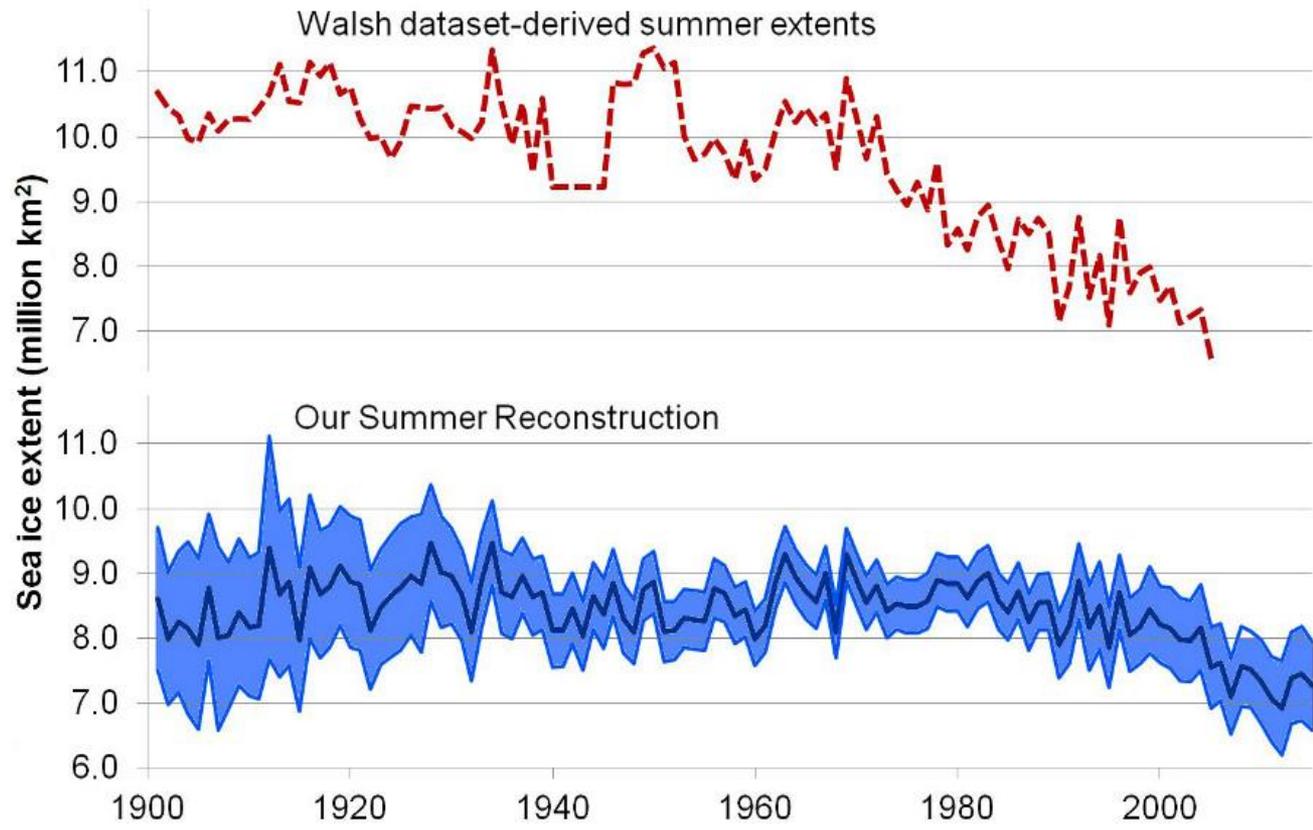
Step 7. Separately rescale the estimates for each of the periods so that their means and standard deviations are the same as for the temperature-derived proxies. The confidence intervals of the temperature-derived proxies are used as an estimate of the associated uncertainty of the final reconstruction. For periods when the pre-satellite estimates are missing data (or are just climatology estimates), the temperature-derived proxies are used directly.

Final result

All Arctic Oceans and Seas
(using unadjusted temperature dataset)



IPCC's Walsh dataset shows no large variability/change pre-1970s



Let's go back to the IPCC report

Summary for Policymakers (SPM):

All Figures © IPCC 2013

Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and **Arctic sea ice** and Northern Hemisphere spring snow cover have **continued to decrease** in extent (*high confidence*).

It is *very likely* that the **Arctic sea ice cover** will **continue to shrink and thin** and that Northern Hemisphere spring snow cover will decrease during the 21st century as global mean surface temperature rises. Global glacier volume will further decrease.

People keep making prophecies about how the Arctic sea ice will “soon” disappear, but are they right?



Arctic sea ice gone by 1988?

The New York Times

THURSDAY, FEBRUARY 20, 1969

Expert Says Arctic Ocean Will Soon Be an Open Sea

Catastrophic Shifts in Climate Feared if Change Occurs

By WALTER SULLIVAN

Col. Bernt Balchen, polar explorer and flier, is circulating a paper among polar specialists proposing that the Arctic pack ice is thinning and that the ocean at the North Pole may become an open sea within a decade or two.

IPCC predictions are based on Computer Models

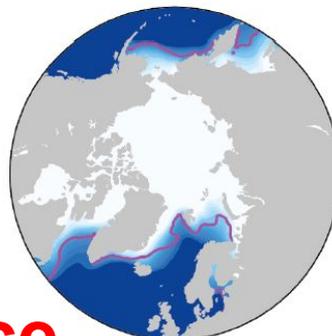
Figure 12.29a,c

All Figures © IPCC 2013

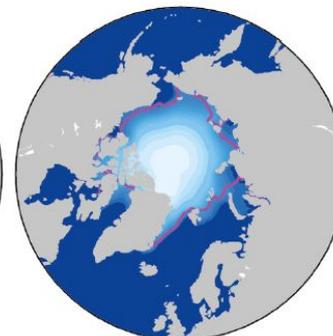
Maps of multimodel mean Arctic sea ice concentration

1986-2005
(39 models)

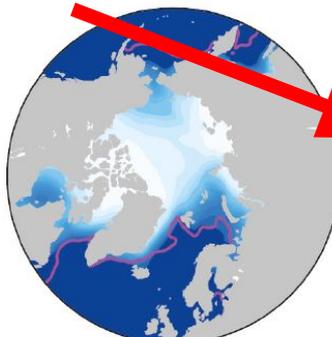
February



September



February



September



Bye-bye Arctic Sea Ice

RCP 8.5, 2081-2100

(37 models)



ipcc

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

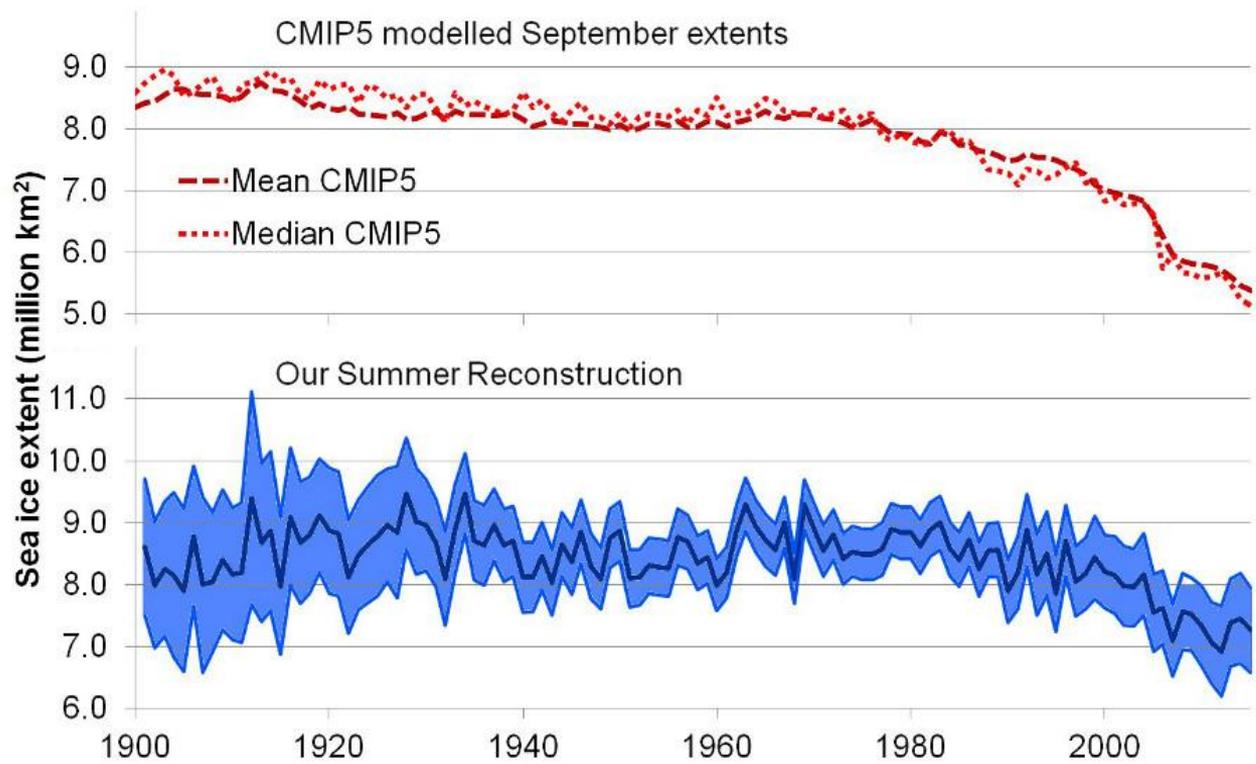




If you put garbage into a computer, nothing comes out of it but garbage. But this garbage, having passed through a very expensive machine, is somehow ennobled and no-one dares criticize it.

Adapted/Paraphrased from an observation by the French brigadier general and geopolitician, Pierre Gallois (1911-2010)

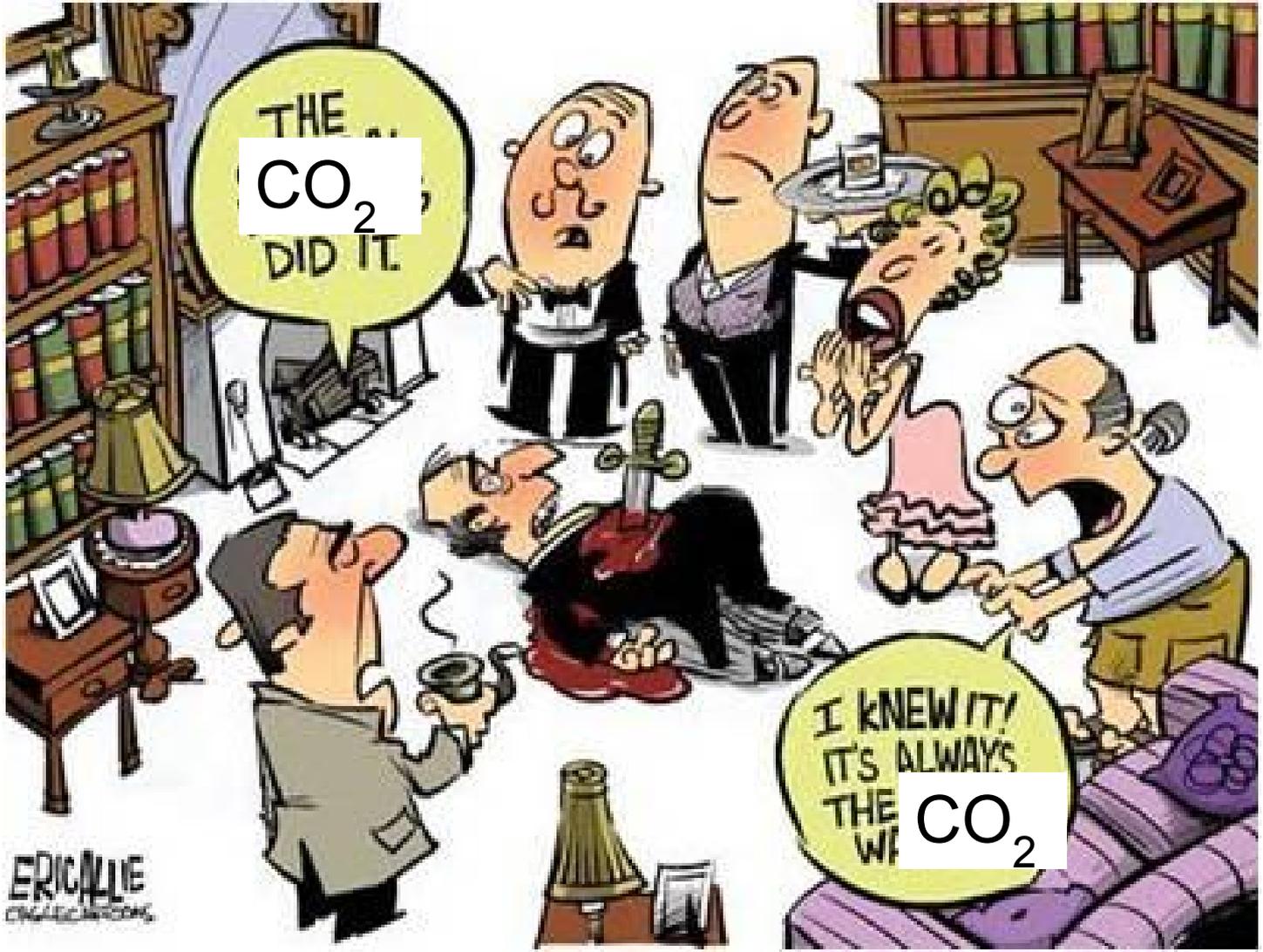
Comparison of IPCC's computer models with reality!



IPCC's "CMIP5"
computer models

Our new
reconstruction

The IPCC's models can't even model the past!



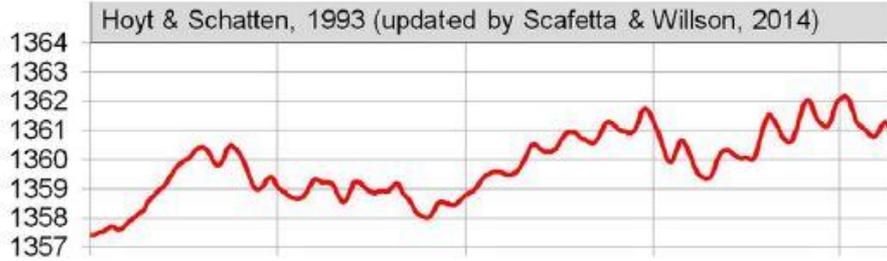
THE
CO₂
DID IT.

I KNEW IT!
IT'S ALWAYS
THE WIFE
CO₂

ERIC ALLIE
CINAGCARTOONS.COM

IPCC models blame CO2, but could it be the Sun?

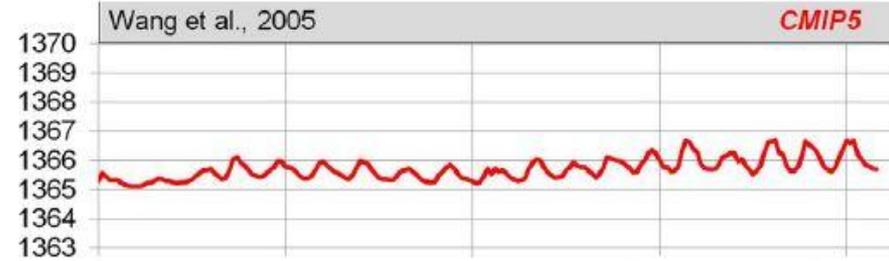
High solar variability



Solar trend estimate ignored by IPCC

Developed by researchers in charge of NASA's sun-monitoring satellites

Low solar variability

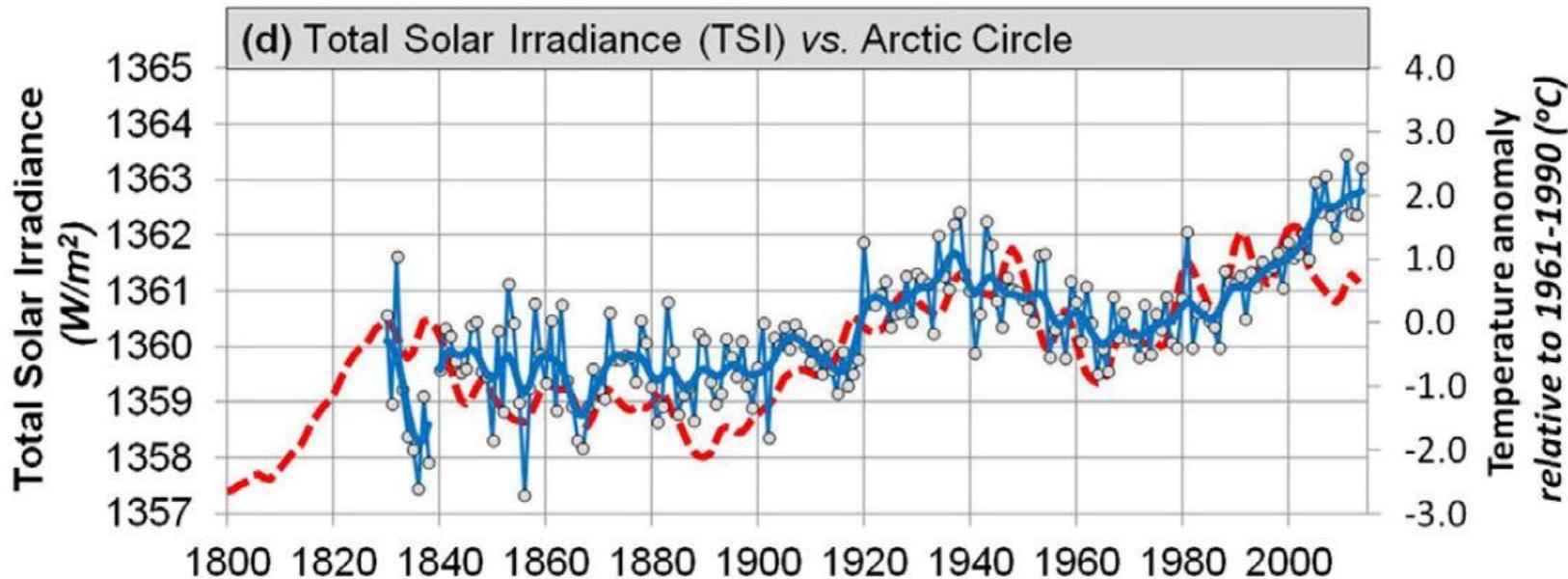


Solar trend estimate IPCC models used

Developed by Judith Lean (IPCC author) and her colleagues



Arctic warming & cooling = driven by Sun?



--- Hoyt & Schatten solar estimate

— Arctic temperature trends

See Soon, Connolly & Connolly, 2015 for more details

Earth-Science Reviews 150 (2015) 409–452



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Earth-Science Reviews

journal homepage: www.elsevier.com/locate/earscirev



Re-evaluating the role of solar variability on Northern Hemisphere temperature trends since the 19th century

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Are these Arctic sea ice
changes new?

JQS

Journal of Quaternary Science

QRA
Quaternary Research Association

Holocene variability in sea ice cover, primary production, and Pacific-Water inflow and climate change in the Chukchi and East Siberian Seas (Arctic Ocean)

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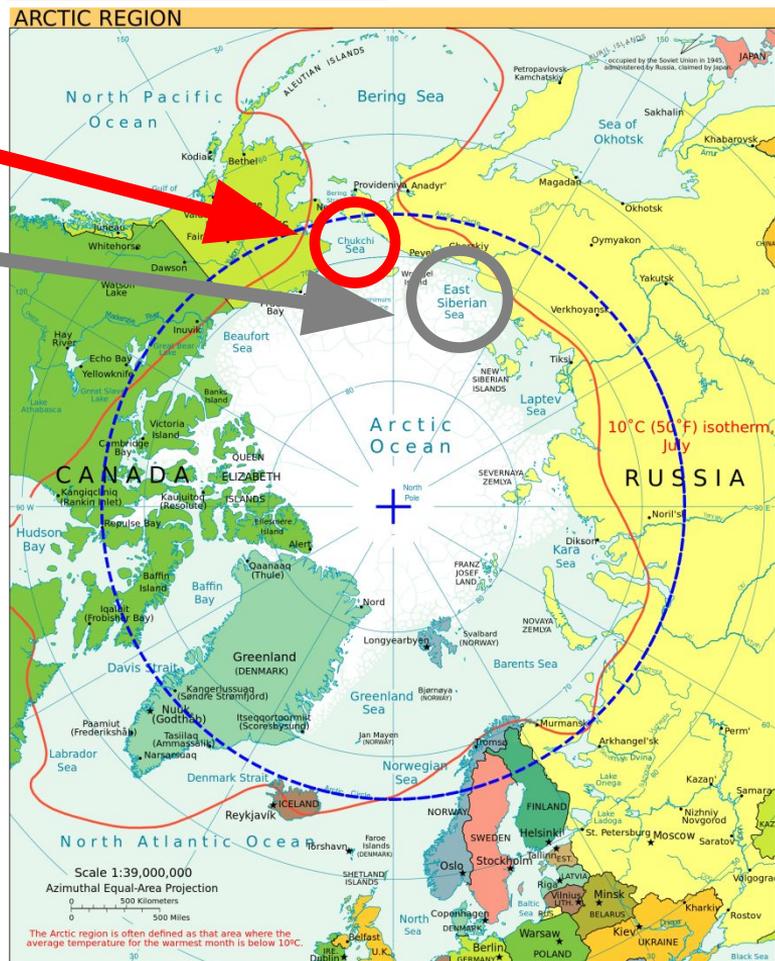
Received 15 July 2016; Revised 23 November 2016; Accepted 24 November 2016

New results from ocean sediment cores by
Prof. Ruediger Stein & his colleagues
(online: Feb. 27, 2017)

Arctic: Chukchi & East Siberian Seas

Chukchi Sea

East Siberian Sea

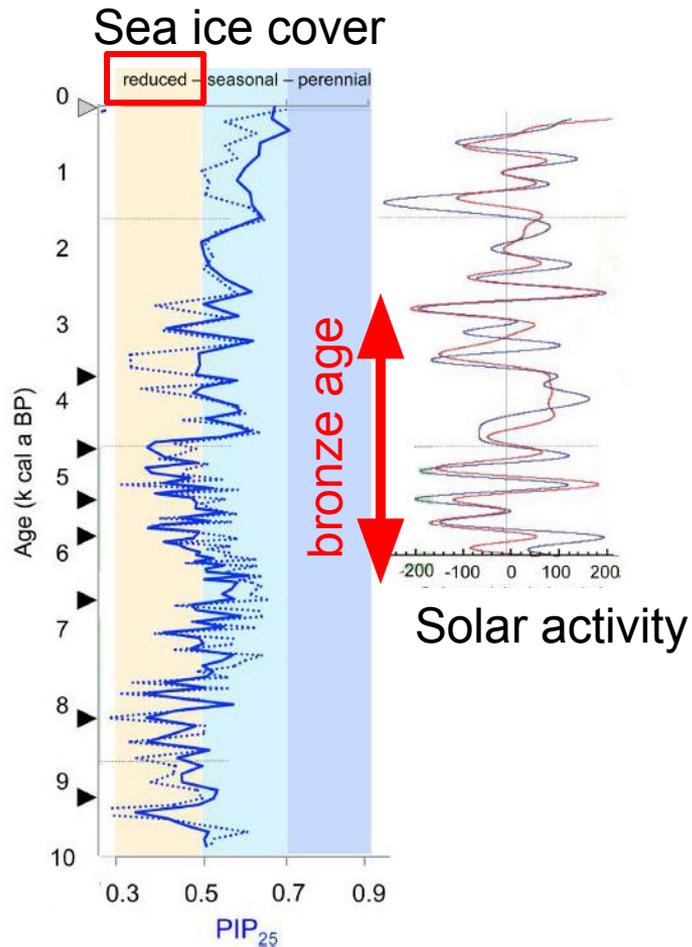


• Stein et al., 2017 analyzed “PIP₂₅” measurements from ocean cores in Chukchi & East Siberian Seas

• Currently these seas have “seasonal sea ice”, i.e., sea ice in winter, but in summer can be “ice-free”

• But is this unusual?

Chukchi Sea core results



Sea ice cover terminology

“Perennial” = ice-filled all year round

“Seasonal” = sometimes “ice-free” in summer

“Reduced” = often “ice-free”

Chukchi Sea

- Currently “seasonal”
- Hasn’t been “perennial” in last 10,000 years
- Was often “reduced” during bronze age and earlier
- Sea ice coverage changes over the centuries
- Seems to be related to solar activity

Adapted from Figure 6 of Stein et al., 2017

Conclusions

- Arctic sea ice has decreased since 1970s (but not Antarctic)
- But, it was increasing from the 1940s to 1970s!
- IPCC based their conclusions on poor data and computer models that didn't work
- Arctic sea ice has been repeatedly advancing and retreating since long before the Bronze Age!
- It seems to be due to the Sun, not CO₂

Should we be taxing the Sun instead???

Any questions?

