Summer Sea Ice is Leaving the Arctic within 30 Years

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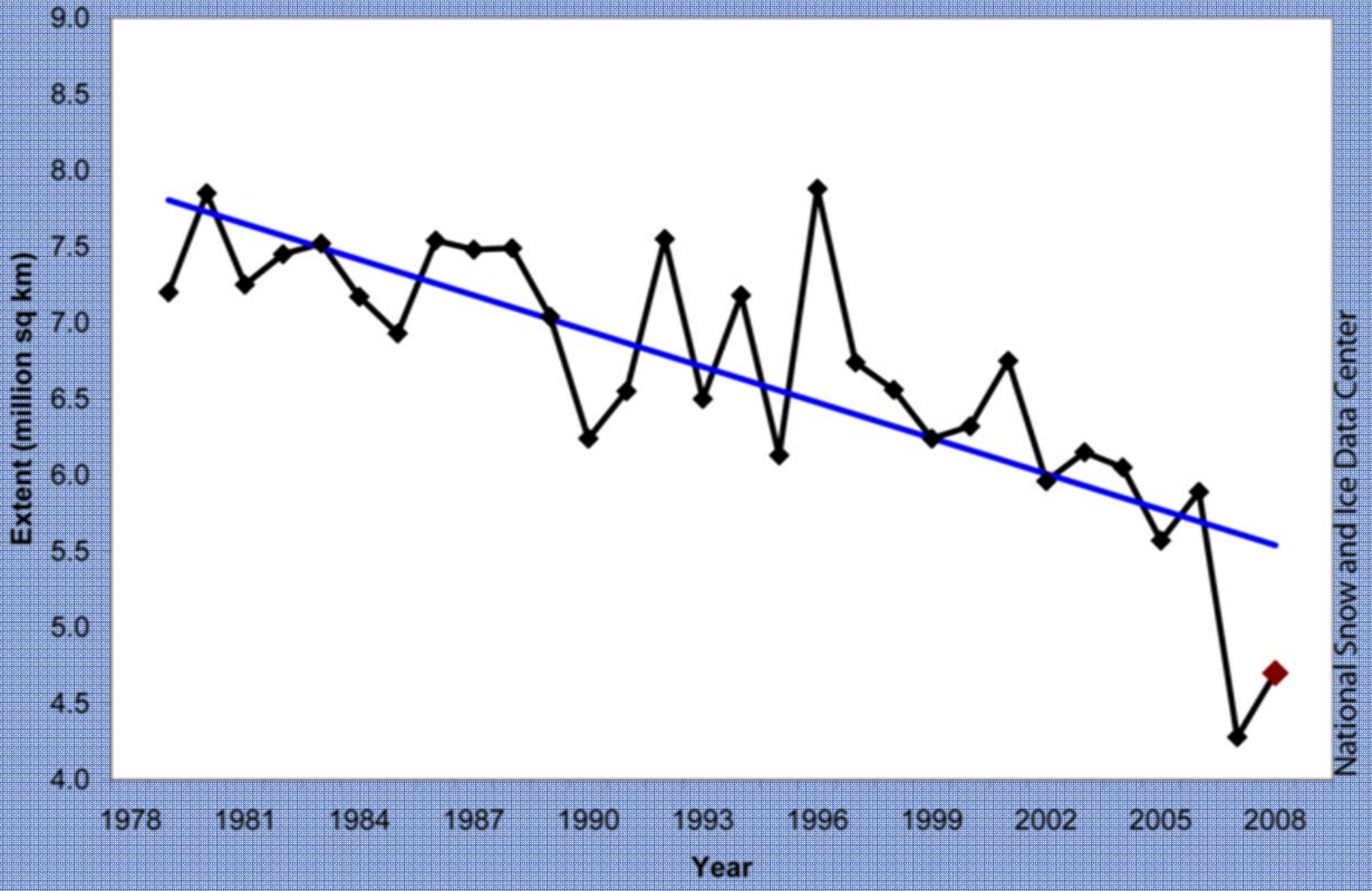
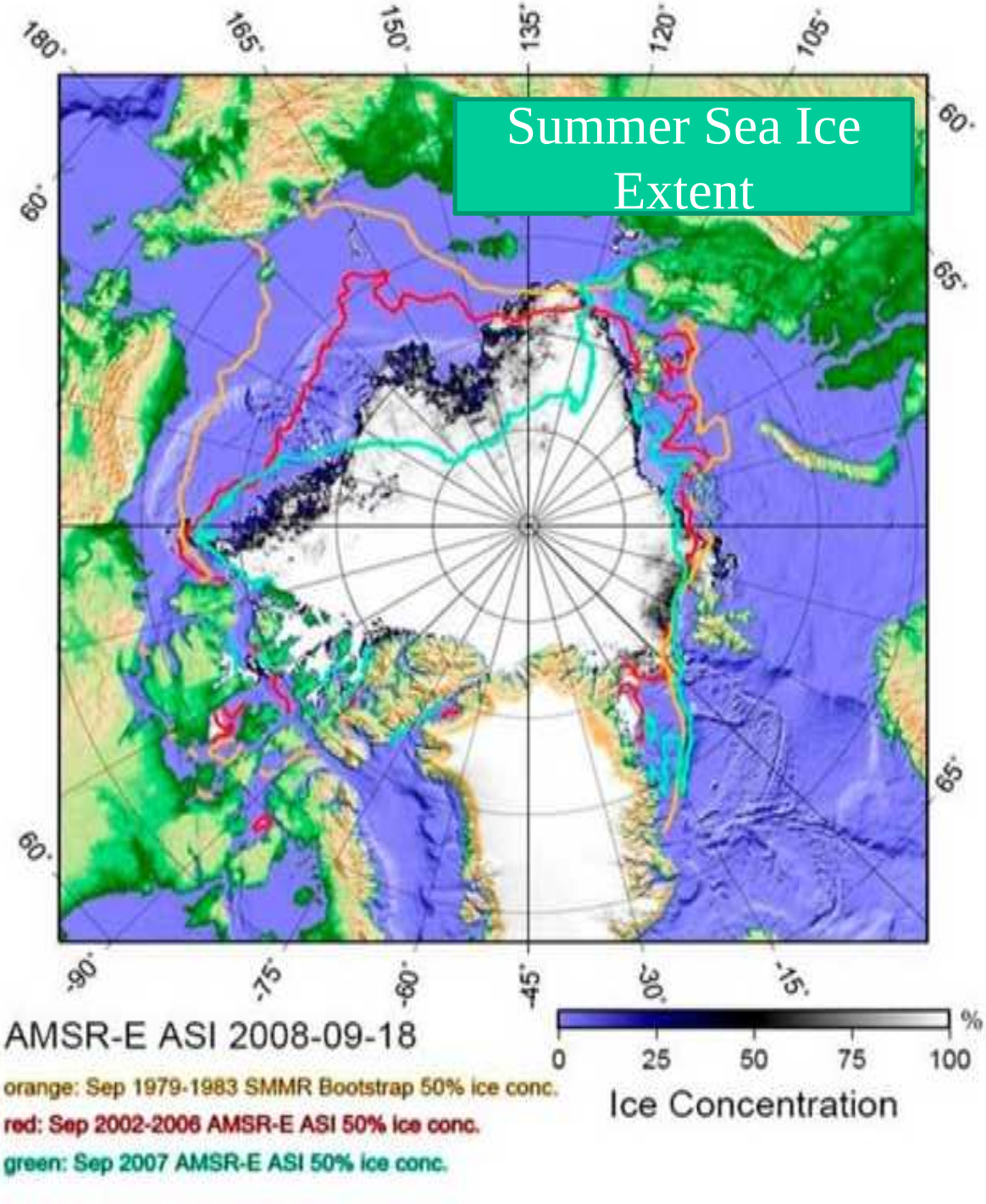
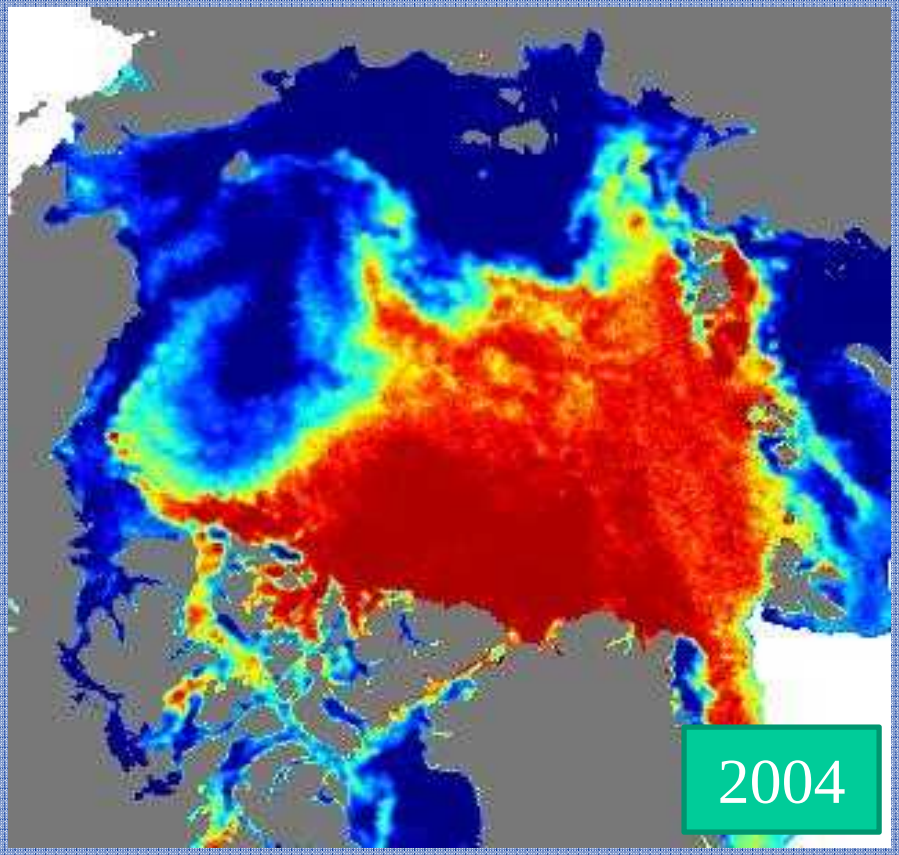
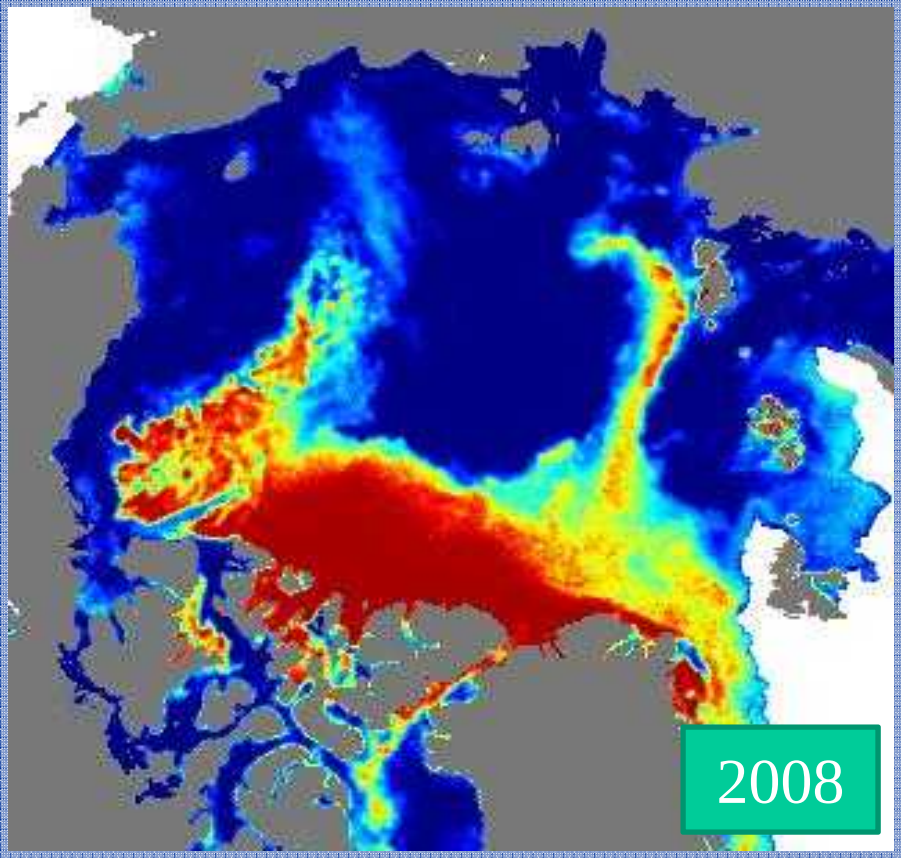
ARCTIC SEA ICE SUMMER MINIMA




Summer Sea Ice Extent
180°
165°
150°
135°
120°
105°
60°
65°
-90°
-75°
-60°
-45°
-30°
-15°
AMSR-E ASI 2008-09-18
orange: Sep 1979-1983 SMMR Bootstrap 50% ice conc.
red: Sep 2002-2006 AMSR-E ASI 50% ice conc.
green: Sep 2007 AMSR-E ASI 50% ice conc.
0
25
50
75
100
%
Ice Concentration

42 % Loss of Multi-year (thick) Sea Ice between January 2004 and 2008





Satellite Data (QuickScat) From Ron Kwok (JPL)

Lessons Learned from 2008

*Summer 2008 was a second sequential summer of extreme minimum arctic sea ice extent.

*Given typical future atmospheric conditions, it will be difficult for summer sea ice to return to its previous state of the 1980s.

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*Not all of the first-year sea ice which formed in winter 2008 melted out in summer 2008.

*Rather than being at a tipping point, it may take until the 2030s for a sea ice free summer Arctic.

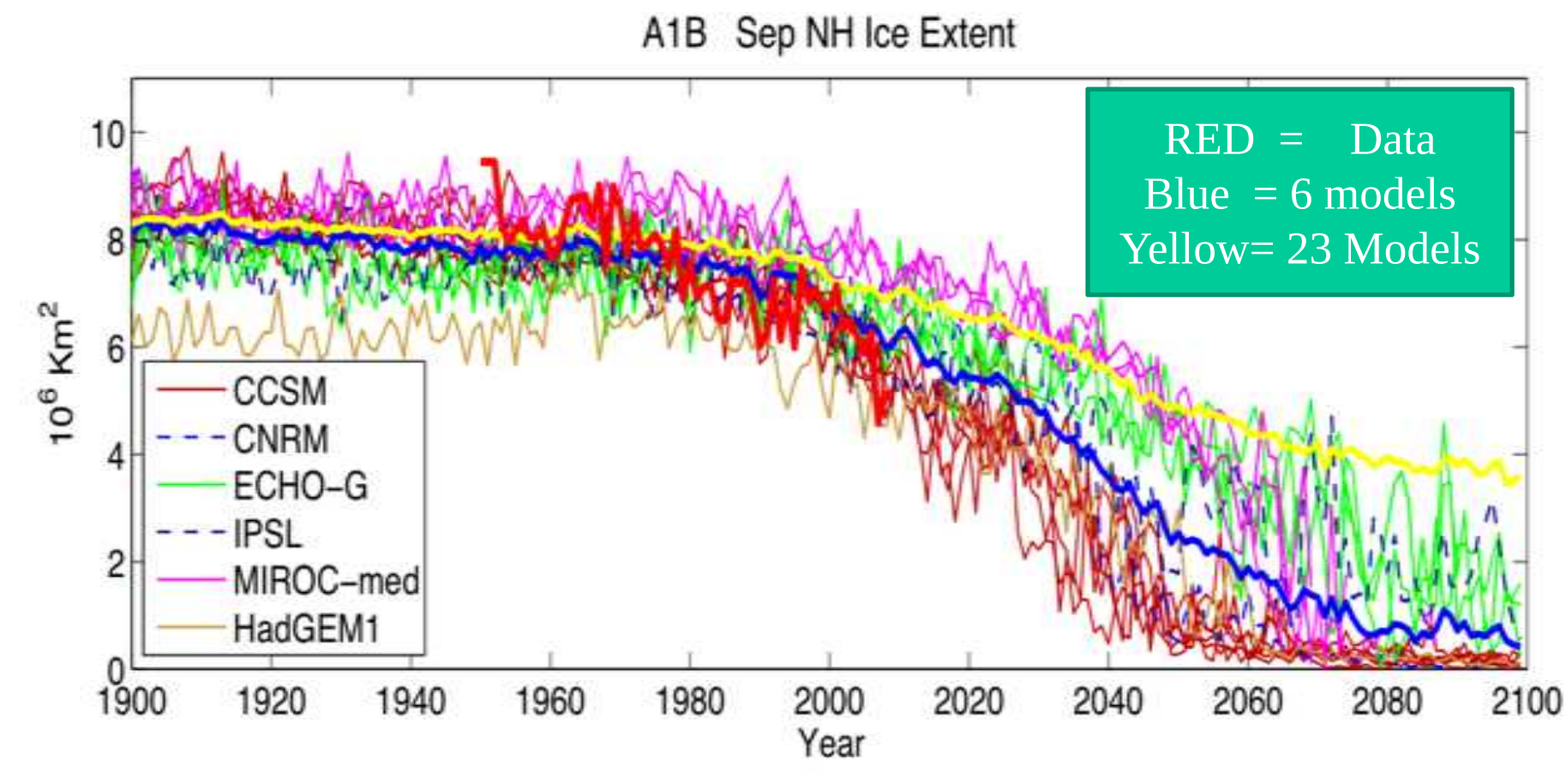
*This is still 30 years earlier than anticipated.

THE SUMMER ARCTIC ICE PACK IS MELTING AT A RATE THAT EXCEEDS MOST EXPECTATIONS

WHY SO FAST?

Anthropogenic (CO_2) + Unusual (Natural Variability)
Warm Climate Pattern the last 10 Years
+ Ice/ocean Feedbacks = NEW CLIMATE STATE
(ONE WAY TRIP)

IPCC Sea Ice Projections from the 6 “better” Models



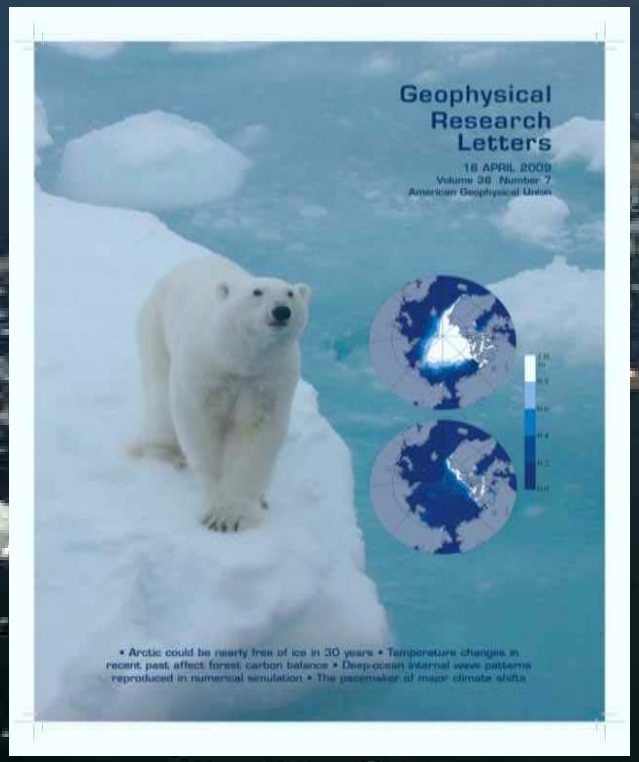
THE ARCTIC IS WARMING FASTER THAN ANYWHERE ELSE

Projected Year for a Sea Ice Free Summer Arctic*

From Combined Effects ~ 2035

From CO_2 Influences Alone ~ 2065

10 Year Standard Deviation

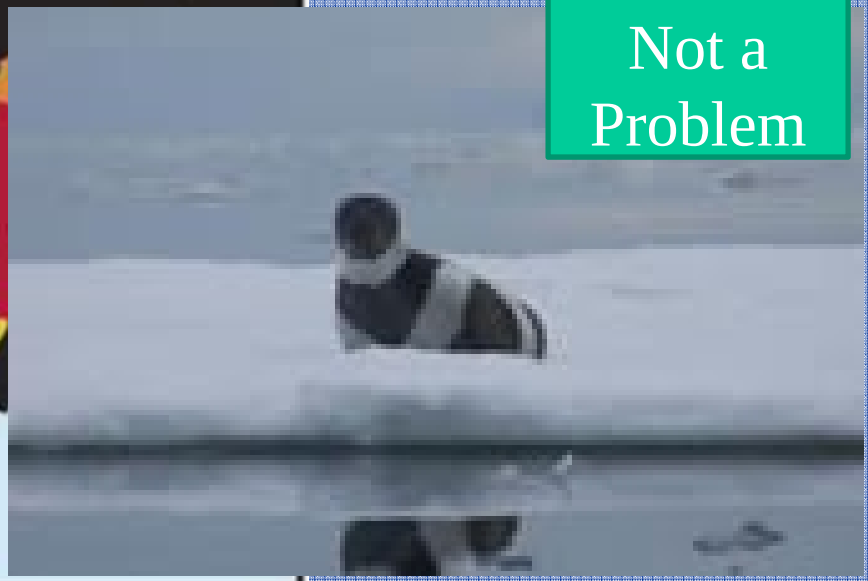


Wang and Overland GRL 2009

*IPCC AR4 models that have good annual cycle of sea ice extents

BUT

Bering Sea in winter does not show same early sea ice loss as the Summer Central Arctic



Ribbon Seals Not a Problem

STUDY OF ENVIRONMENTAL ARCTIC CHANGE

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Sea Ice Outlook | Overview

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What's New?

2009 Arctic Sea Ice Preconditions
Fairly warm winter temperatures paired with a cooling trend in April has resulted in a near-normal spring ice extent; ice thickness, however, is quite thin, and consists mostly of vulnerable, first-year ice. For further information on 2009 preconditions, please go to the National Snow and Ice Data Center (NSIDC) website.

2009 Sea Ice Outlook
The Sea Ice Outlook organizers are now launching activities and soliciting contributions for the first 2009 Sea Ice Outlook monthly report. (more)

March 2009 Sea Ice Outlook Workshop
A small Sea Ice Outlook workshop was held 10 March 2009 in Boulder, Colorado. *Presentations now available.* (more)

About
The SEARCH Sea Ice Outlook is an international effort to provide a community-wide summary of the state of arctic sea ice over the summer season. Monthly reports synthesize the community estimates of the current state and expected minimum of the sea ice - at both a pan-arctic and regional scale.

The intent of the SEARCH Sea Ice Outlook effort is not to issue predictions, but rather to summarize all available data and observations to provide the scientific community, stakeholders, and the public the best available information on the evolution of arctic sea ice.

Sea Ice Outlook activities are supported in part through the National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA).

Submitting an Outlook
Outlooks will include a September sea ice minimum extent projection, methods and techniques, and the rationale for the estimate. (more)

Sea Ice Outlook Background
For information about the history and development of the SEARCH Sea Ice Outlook, visit the Background page.

Arctic Research Consortium of the United States (ARCUS)
Last Update: 6/1/09

http://www.arcus.org/search/seaiceoutlook/index.php

Arctic Report Card 2008

Tracking recent environmental changes

• Home • Atmosphere • Sea Ice • Ocean • Land • Greenland • Biology

Atmosphere
Sea Ice
Biology
Ocean
Greenland
Land

Warming (red) and mixed (yellow) signals

There continues to be widespread and, in some cases, dramatic evidence of an overall warming of the Arctic system.

Atmosphere
5° C temperature increases were recorded in autumn

Sea Ice
Near-record minimum summer sea ice extent

Biology
Fisheries and marine mammals impacted by loss of sea ice

Ocean
Observed increase in temperature of surface and deep ocean layers

Greenland
Records set in both the duration and extent of summer surface melt

Land
Permafrost temperatures tend to increase, while snow extent tends to decrease

About the Report Card

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http://www.arctic.noaa.gov/reportcard/

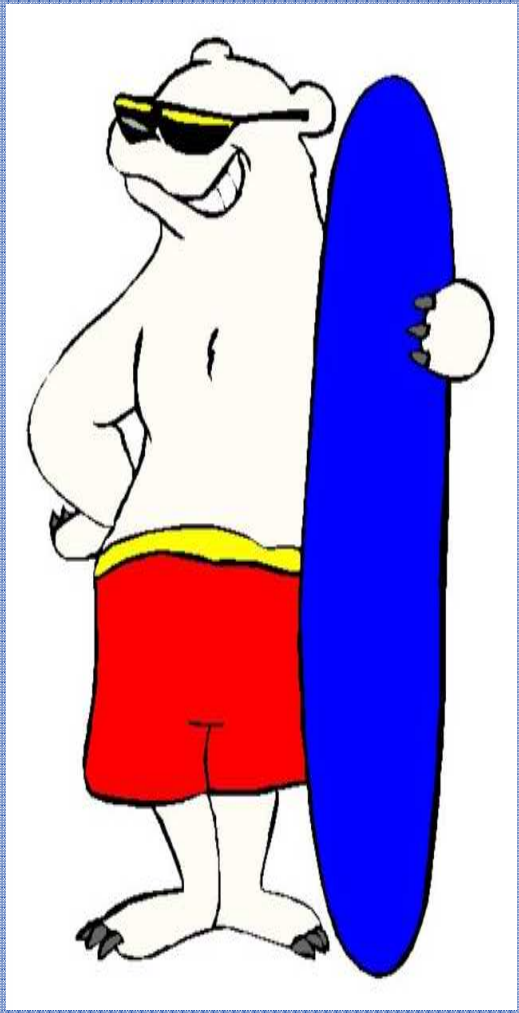
Lessons from 2008

- It will be difficult for the arctic sea ice/climate system to return to its previous state. A continued rapid decline is also unlikely. We project a nearly sea-ice free September Arctic in the 2030s.

- Major Arctic sea ice loss is in late SUMMER and fall. Not SPRING. This is Occurring NOW in Alaska.

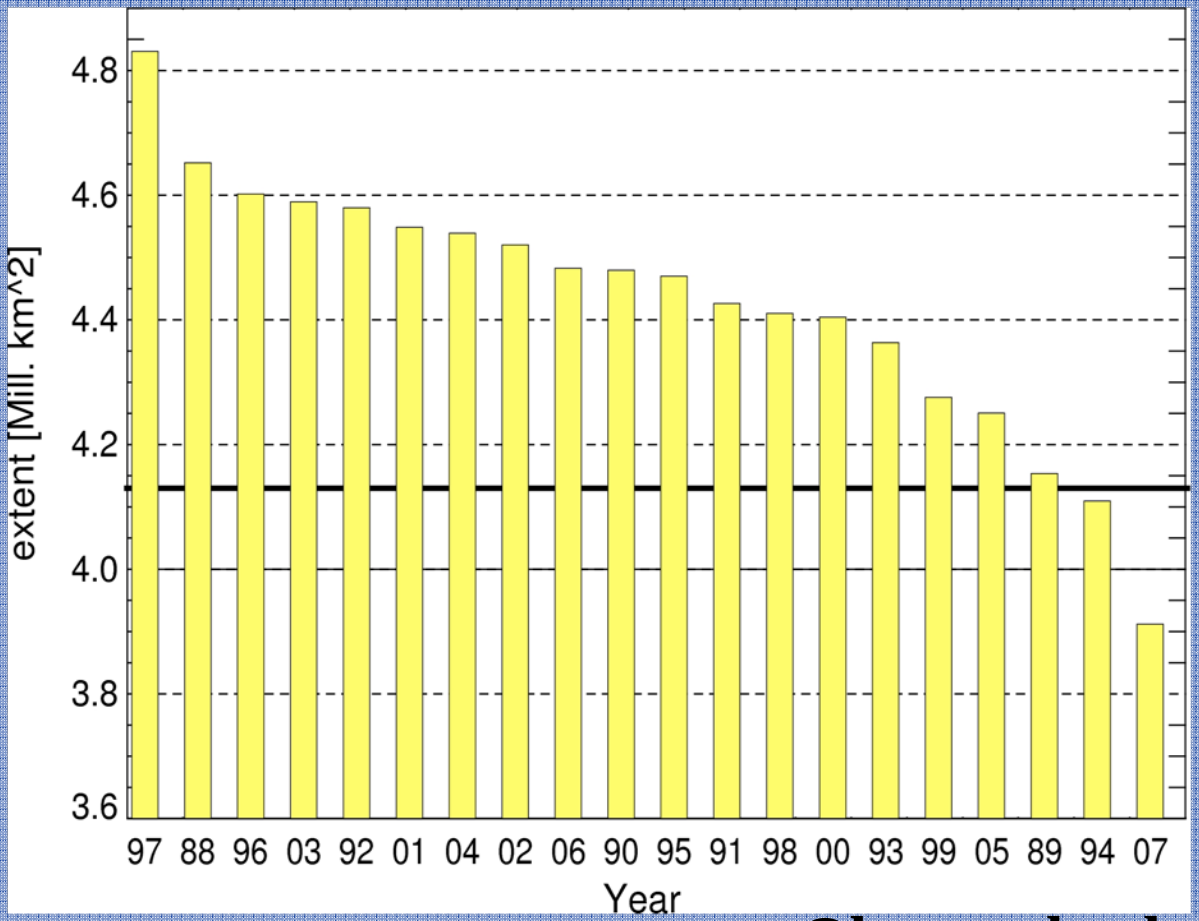
- Extends shipping and oil explorations season into November. Impacts summer biology of fisheries and certain marine mammals (Salmon, Polar Bears, Walrus)

- Seasonal Sea Ice OUTLOOK for 2008 was successful – Repeat in 2009



Sea Ice Outlook 2008

http://www.arcus.org/search/seaiceoutlook/



Ensemble forecast:

initialized at 26th June

20 years of summer forcing 1988-2007

Probabilistic statements:

lower than 2005 : 100%
lower than 2007 : 8%
between 4.2-4.6km2: 80%

Observed value Sept 2008 4.5 M km2

AWI

O.A.Sys Ocean Atmosphere Systems