

Rapid declines in Arctic sea ice: *what does this mean for Alaska?*



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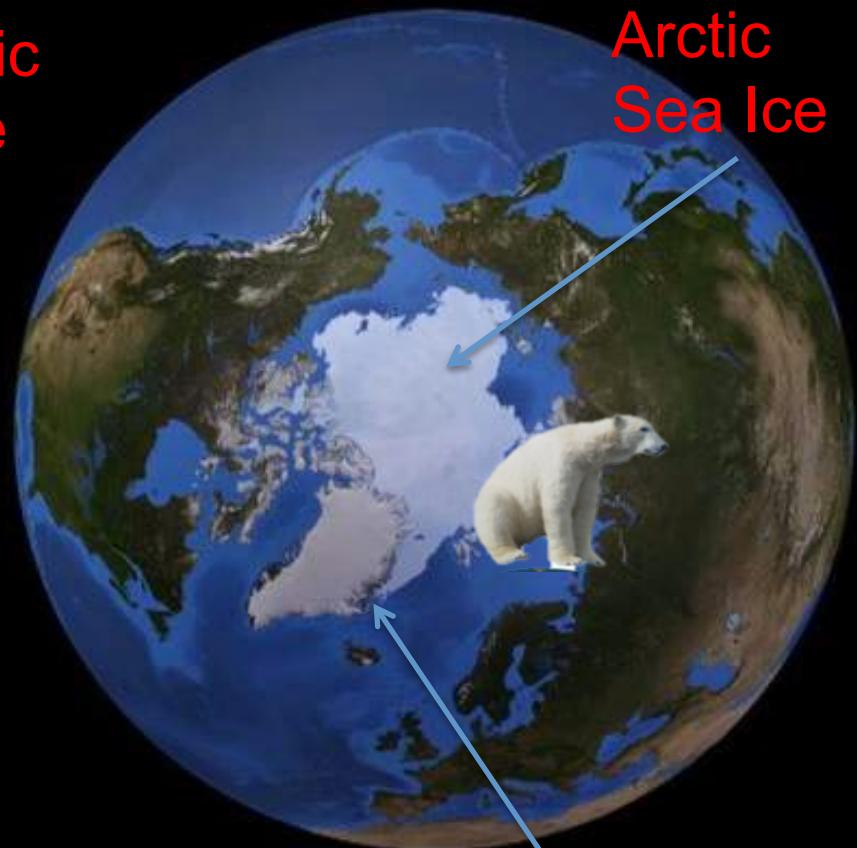
ANTARCTIC



Antarctic
Sea Ice

Antarctic
Ice Sheet

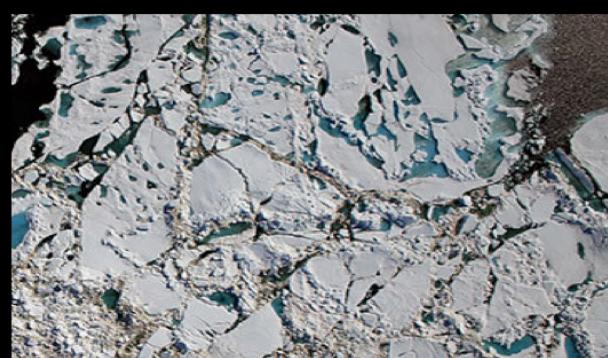
ARCTIC



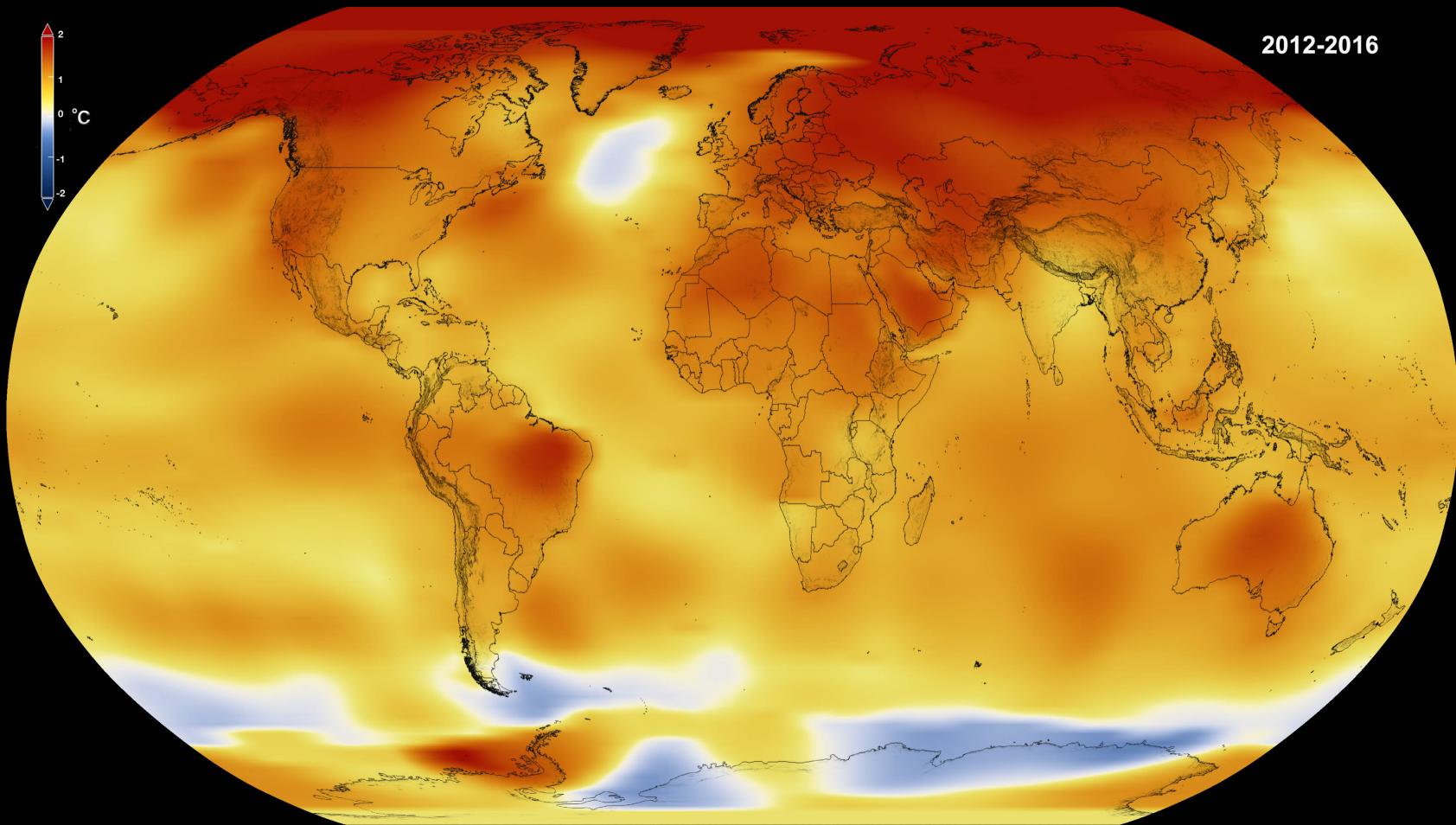
Arctic
Sea Ice

Greenland
Ice Sheet

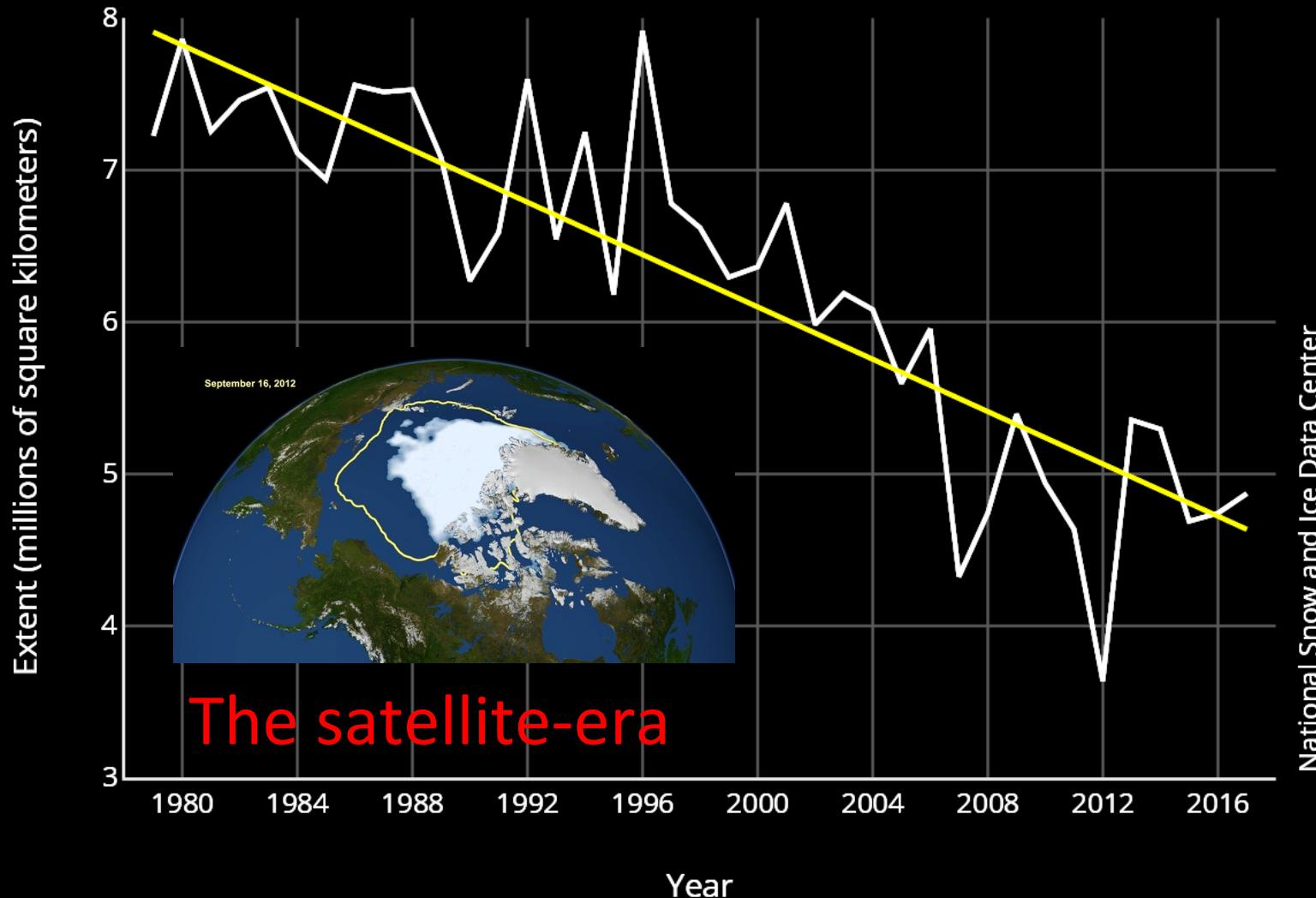
Sea ice: it comes in all shapes and sizes



The Arctic is warming fast



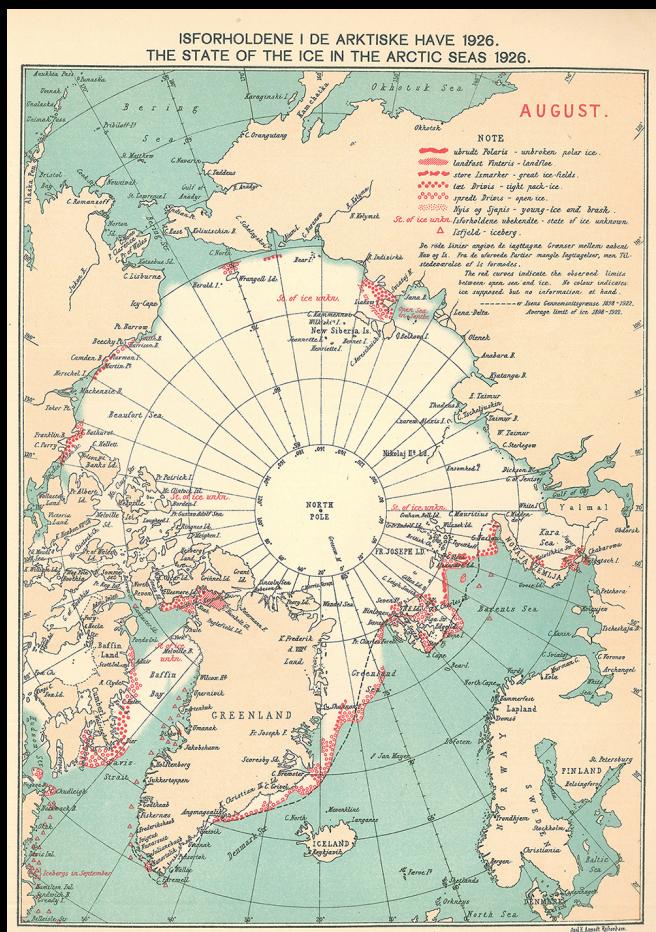
Average Monthly Arctic Sea Ice Extent September 1979 - 2017



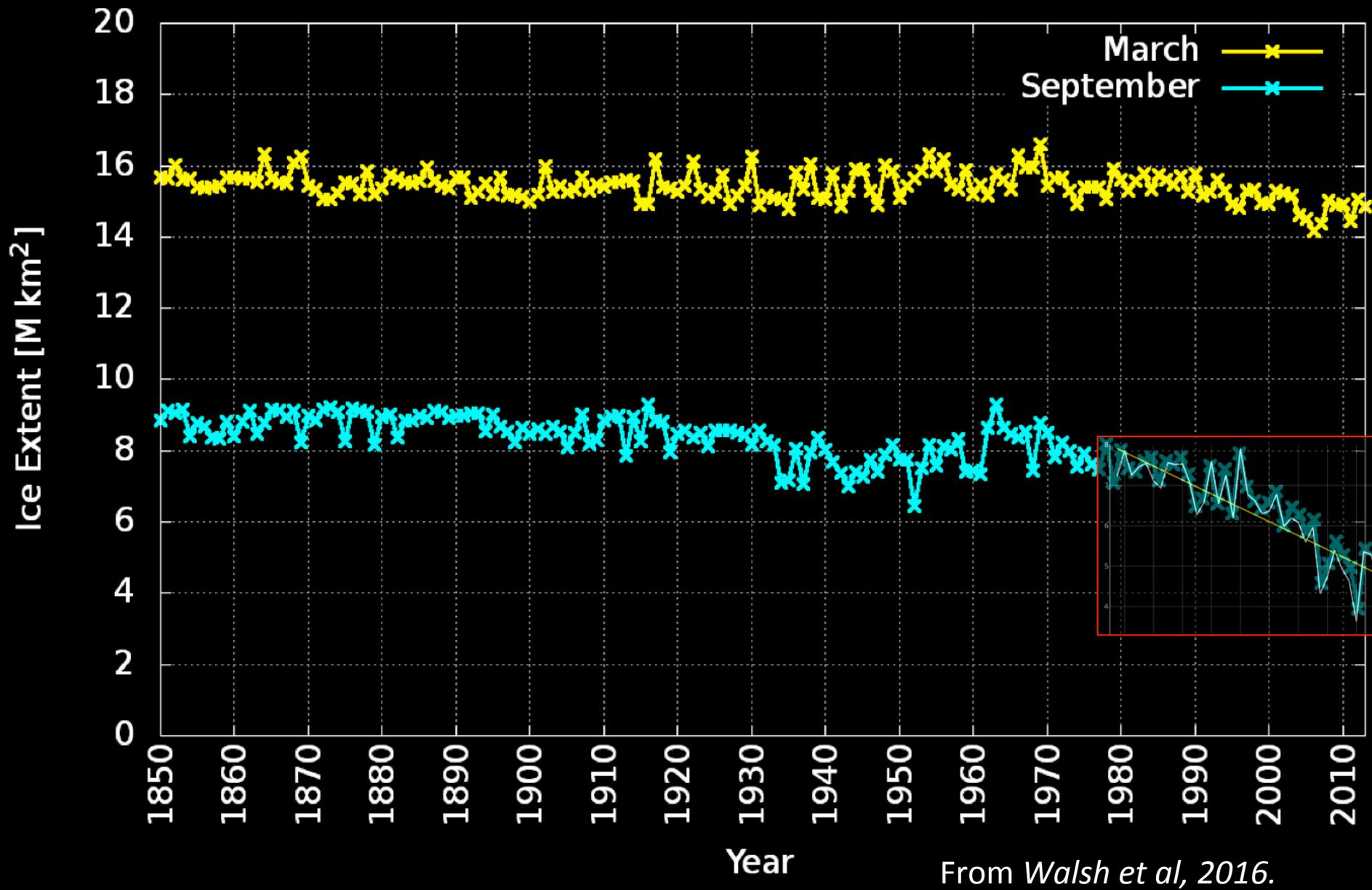
Pre-satellite observations of sea ice?

Danish Meteorological Institute
ice chart for August, 1926

Whaling ships kept logs of sea ice conditions



SIBT1850 Pan-Arctic Ice Extent



The Arctic will very likely become ice-free in summer.

Probability of summer ice-free Arctic



Global
warming
of 1.5°C



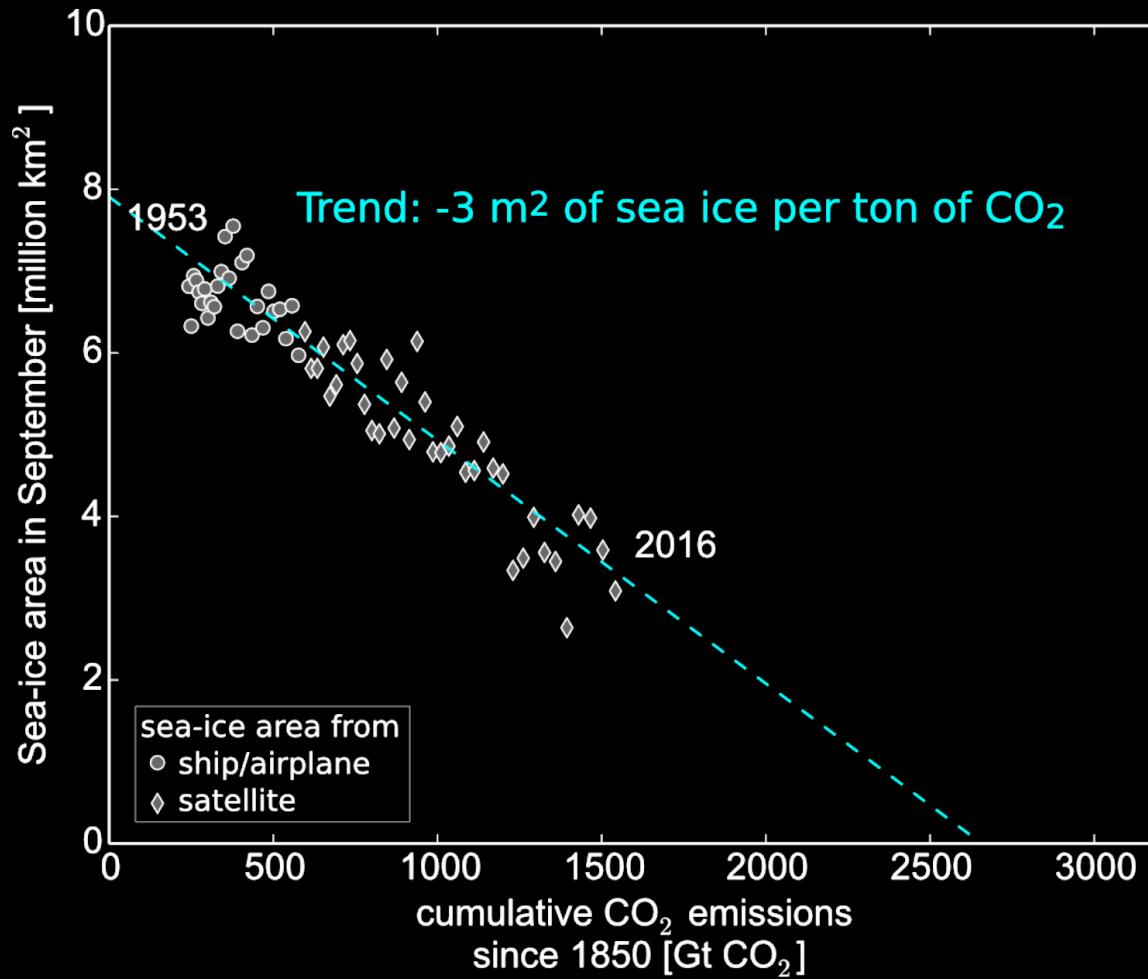
Global
warming
of 2°C



Global
warming
of 3°C

From Screen and Williamson, 2017, *Nature Climate Change*.

We are directly responsible for this ice loss



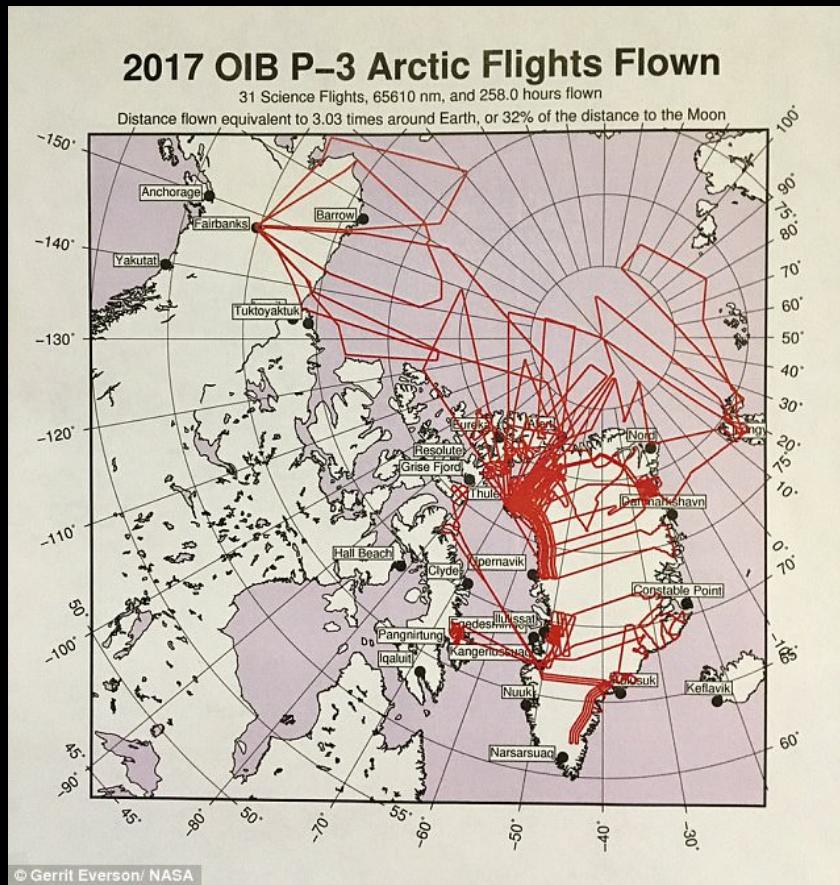
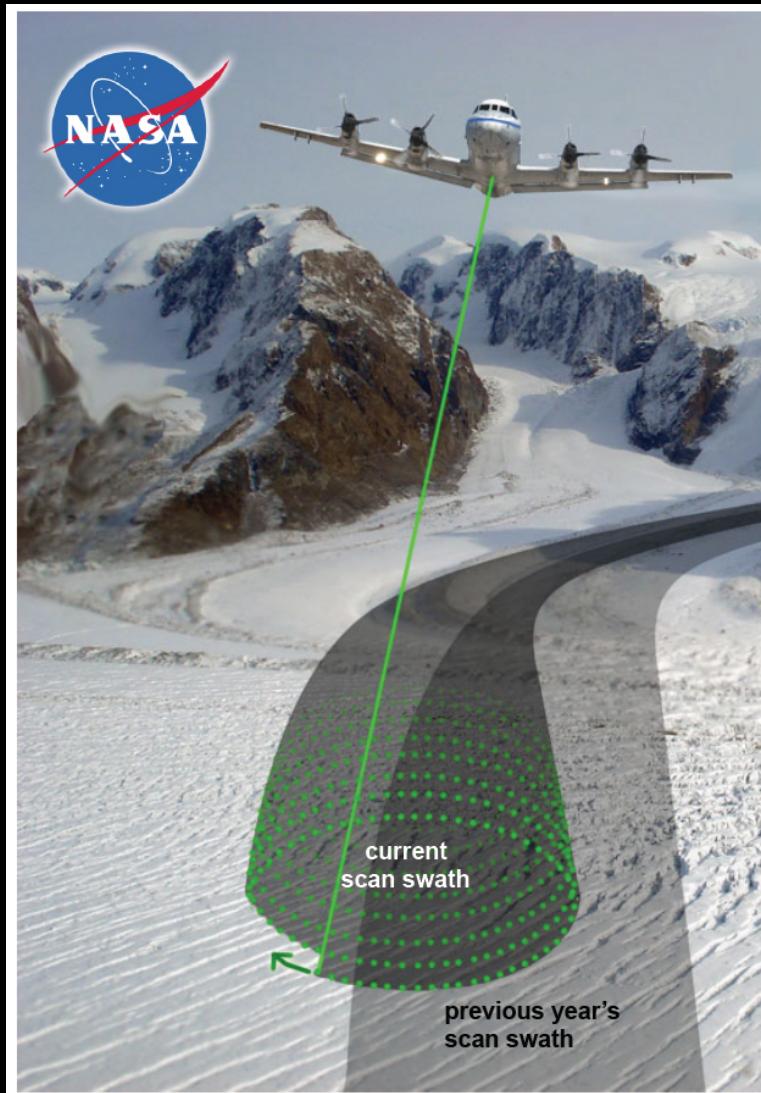
From Notz and Stroeve , 2017, Science.

Coverage isn't everything. We also need to also know the sea ice thickness, *aka the sea ice quality*

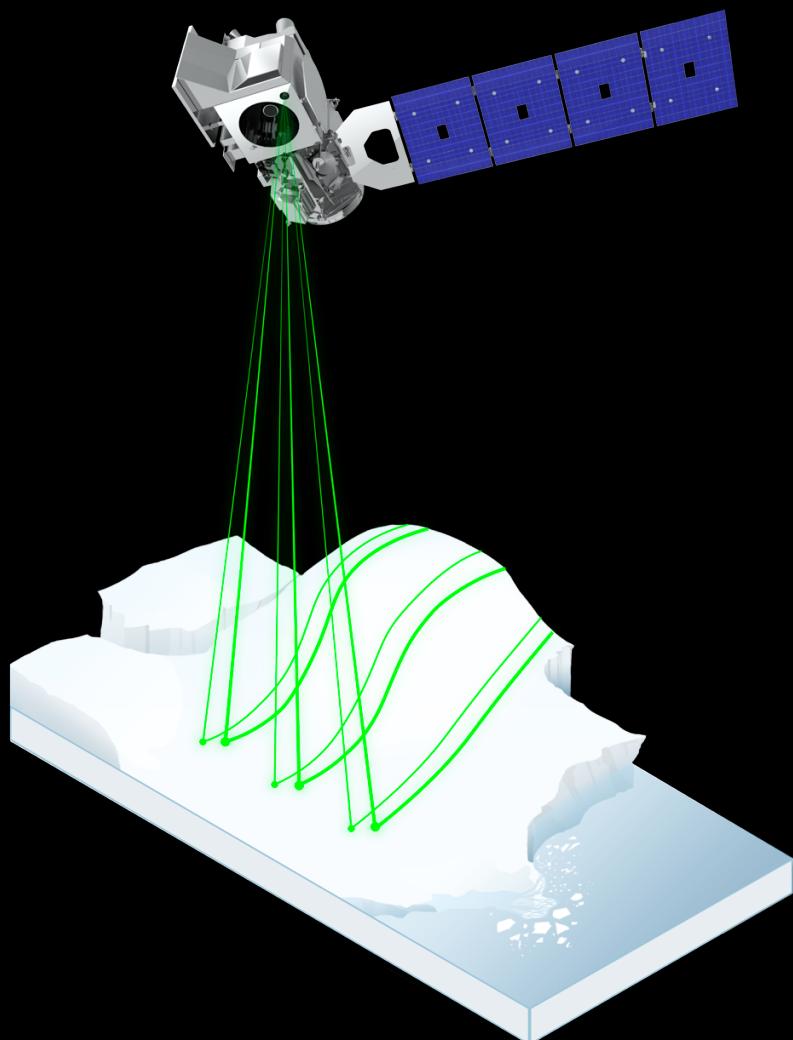
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Use:
Planes
Satellites
Ships
Sticks!
Local knowledge

NASA's Operation IceBridge



NASA's upcoming ICESat-2



Set for launch in
summer of 2018 (next
year!)

Highly accurate
photon-counting laser.

Will provide
unprecedented detail
about ice surface
topography (sea ice,
glaciers, ice sheets).

Beaufort Gyre research expedition





Many different ways of showing how
the ice is declining across the Arctic!

Many different ways of showing how
the ice is declining across the Arctic!

But what does less Arctic sea ice mean
for Alaska?

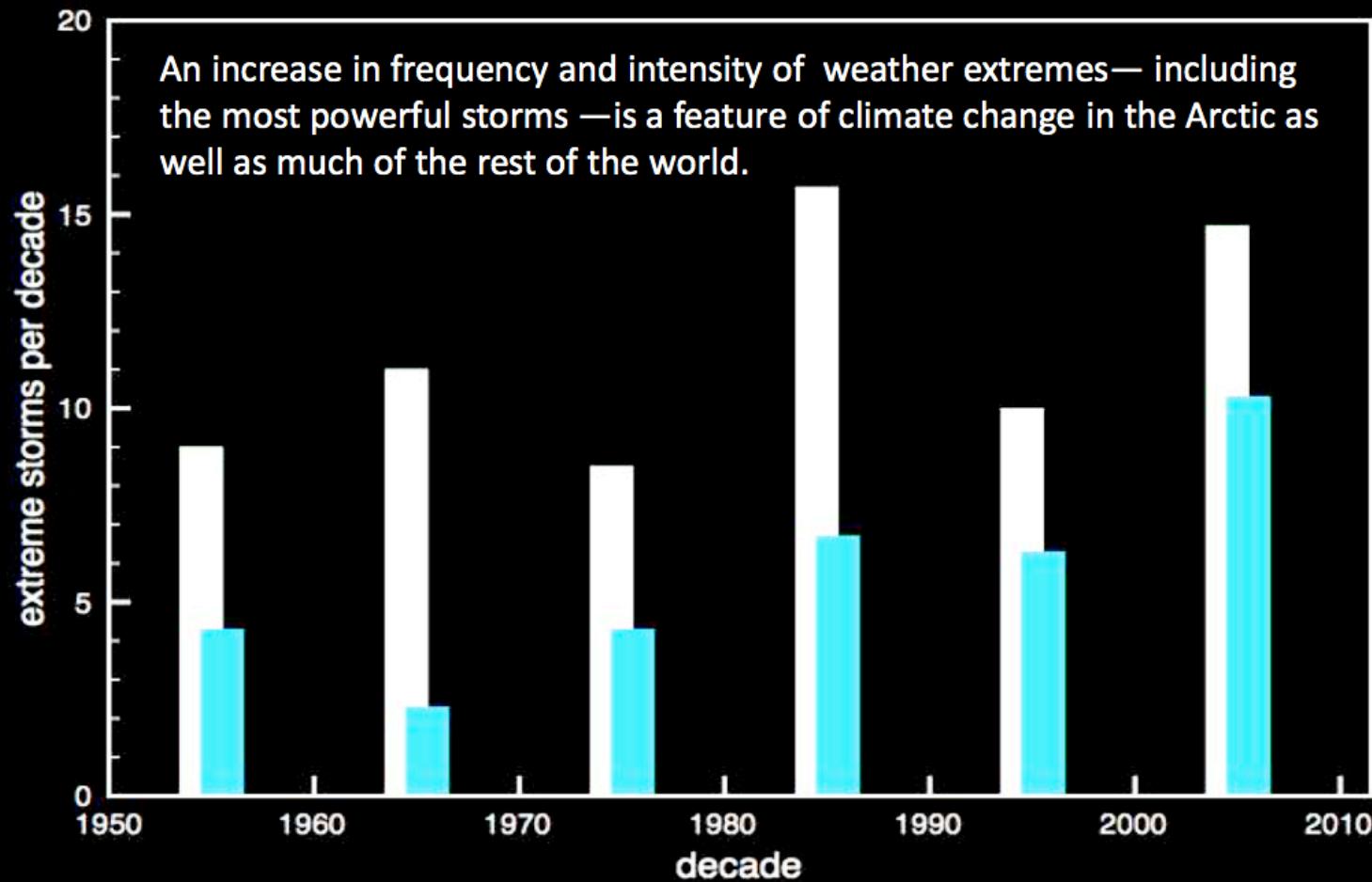
Temperature feedbacks



Increased evaporation/precipitation



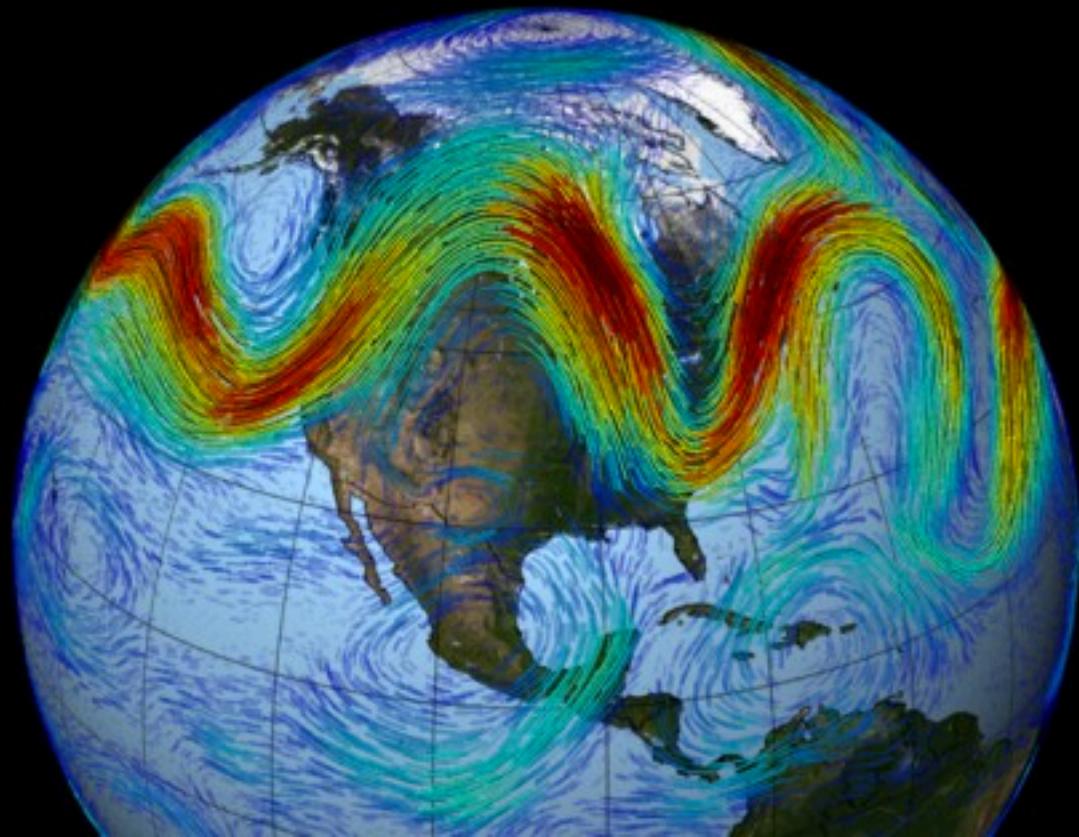
Storms/coastal impacts



(Black = total # of extreme storms; red = those with open water)

From Walsh & Chapman, UAF

Weather patterns – a wavier jet stream?



Navigability/globalization of Northern Alaska



Crystal serenity cruise ship being escorted through the Northwest Passage by the British icebreaker RRS Shackleton

Alaskan fisheries

Example:

Low sea ice years in
the Bering Sea:

Increased
prevalence of small
body plankton

Decreased young
pollock survivability



Mammals/hunting/subsistence



The Sea Ice for Walrus Outlook (SIWO): A partnership between the National Weather Service, Eskimo Walrus Commission, and others, combines local observations with data collected by satellites to issue a weekly springtime weather and ice forecast for villages in northwestern Alaska

Sea ice is **declining** and this is linked to increased levels of greenhouse gases and global warming.

A summer **ice-free Arctic is very likely** (but not guaranteed) sometime mid-century

Where do we go from here as sea ice scientists?

What does sea ice science need to do next?

Understand future projections of the Arctic climate system.

Assess complex feedbacks/impacts.

Improve information for decision making (at the local scale)

Questions?