



# The changing sea-ice conditions off Iceland

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# Recent changes in the Northern Hemisphere

Reduction in Arctic sea-ice extent in the satellite era, from 1979

Historical minimum occurred in 2012.

Loss of multi-year ice and thinning of the sea-ice cover.

Vicious cycle: Less radiation reflected; increased warming

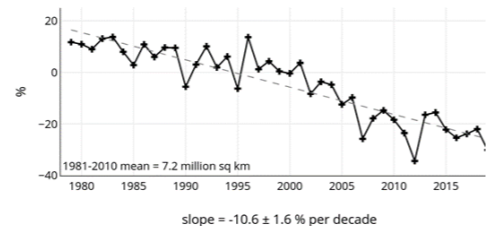
*“Extreme variability, both on a regional scale and from one year to the next, makes knowledge of local and regional ice conditions critically important for any maritime operations in the vicinity of sea ice or icebergs.*

*The International Ice Charting Working Group urges all vessel operators to include procedures to obtain up-to-date ice information in their operations manuals – whether navigating in the IMO Polar Code regions or not.” IICWG press release 2018*



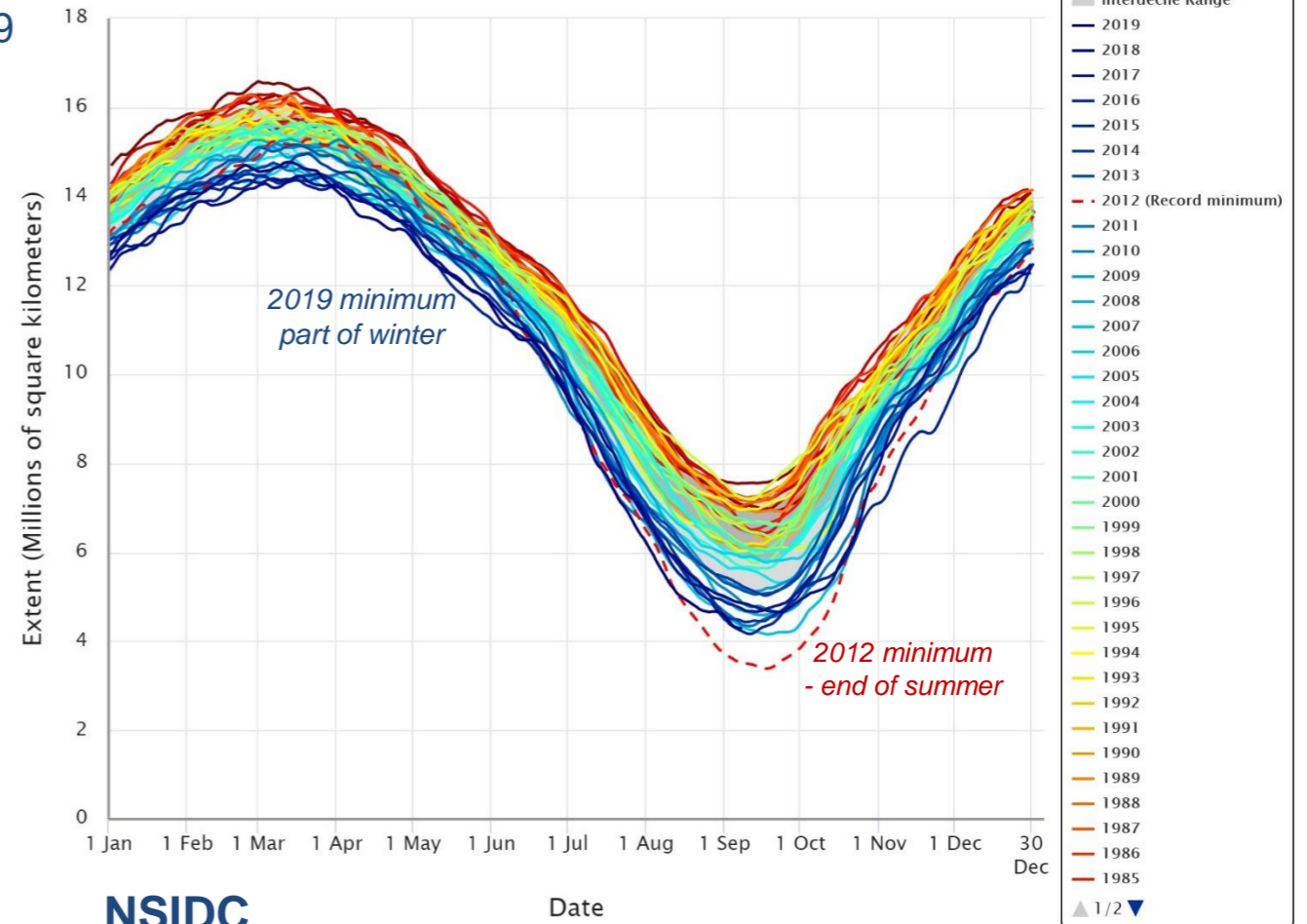
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Northern Hemisphere Extent Anomalies Aug 1979 - 2015



Arctic Sea Ice Extent

(Area of ocean with at least 15% sea ice)



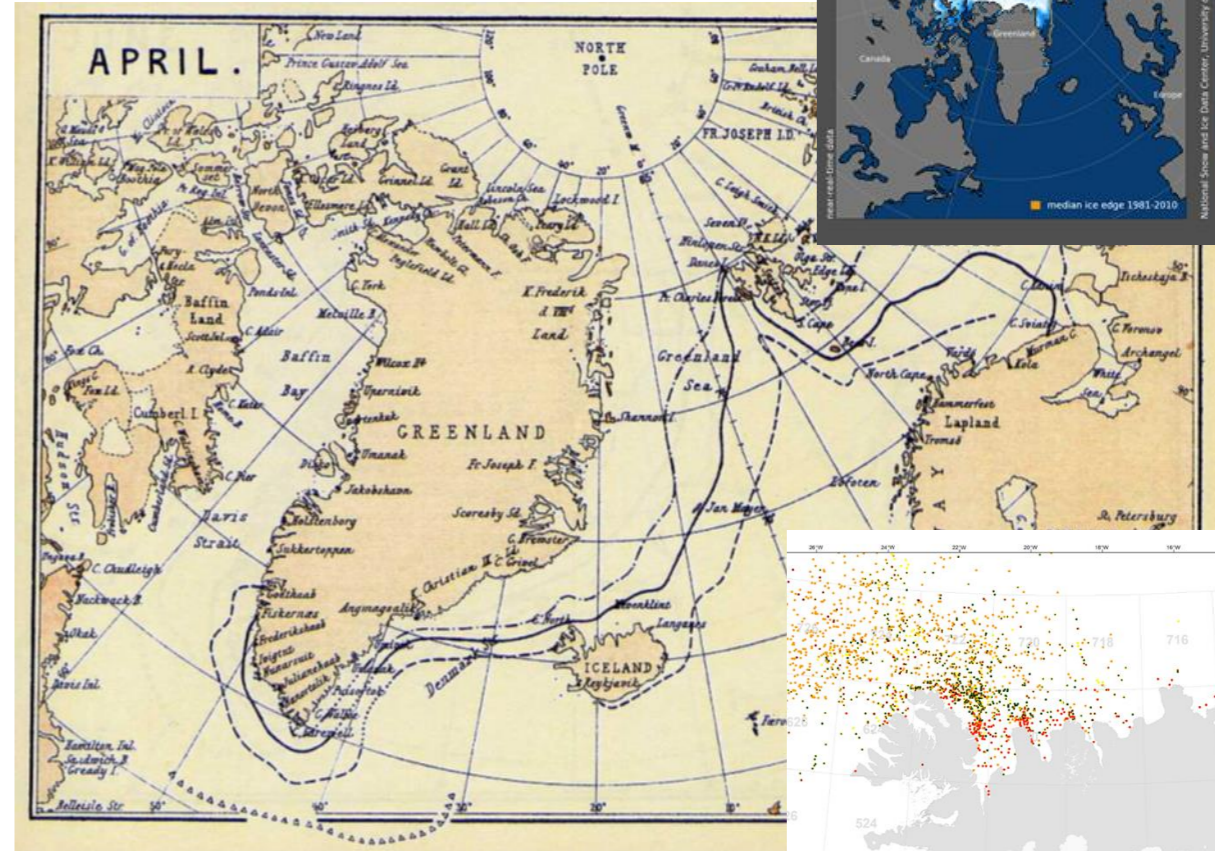
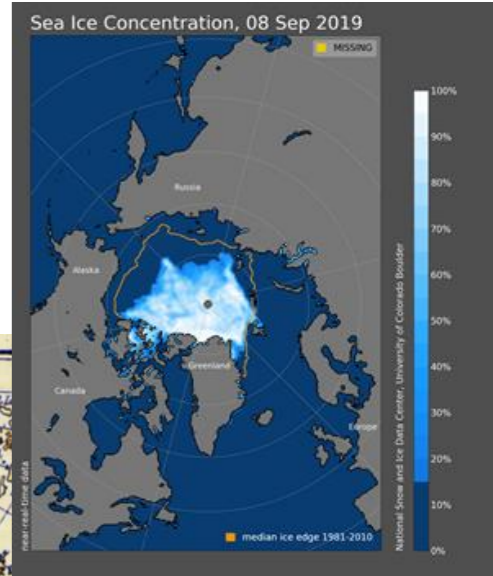
National Snow and Ice Data Center, Boulder, CO



# How unusual? Historical perspective

Important to have several independent data sources and overlap to ensure quality of the historical analysis  
DMI, NPI, IMO and various historical sources

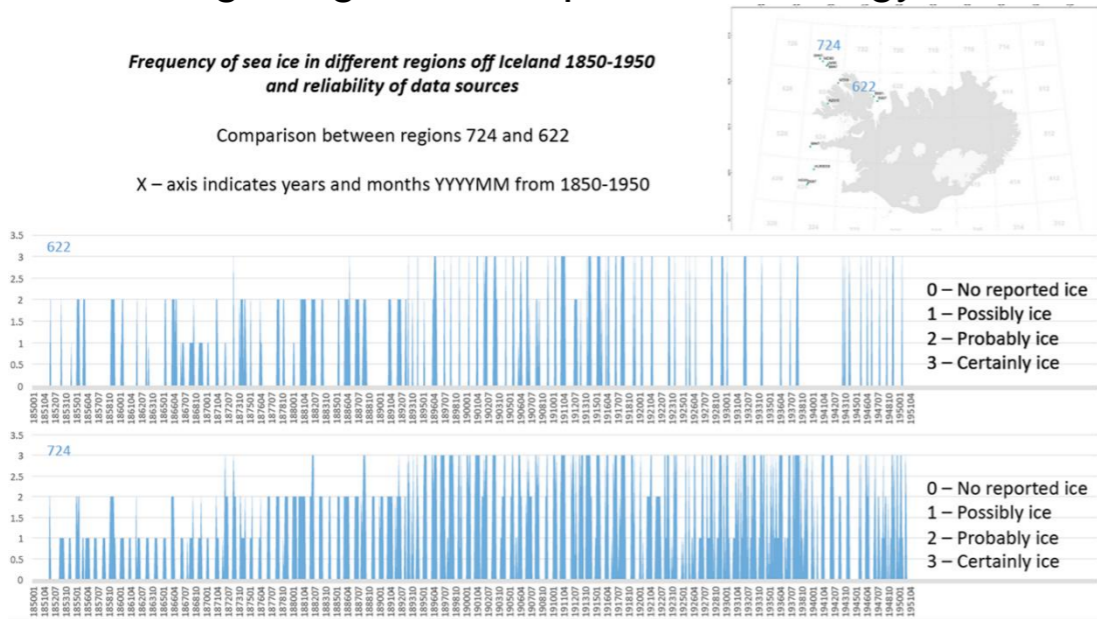
Also study variability on a longer time scale  
Link to geological data, paleoclimatology



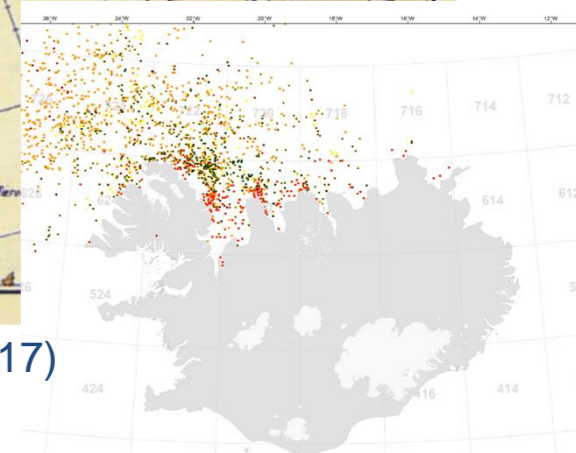
Frequency of sea ice in different regions off Iceland 1850-1950 and reliability of data sources

Comparison between regions 724 and 622

X-axis indicates years and months YYYYMM from 1850-1950



DMI 30 year average and extremes (1917)



IMO observations 1983-2011







# Sea ice off Iceland: Spring 2019

Satellite based observations for real-time monitoring are important

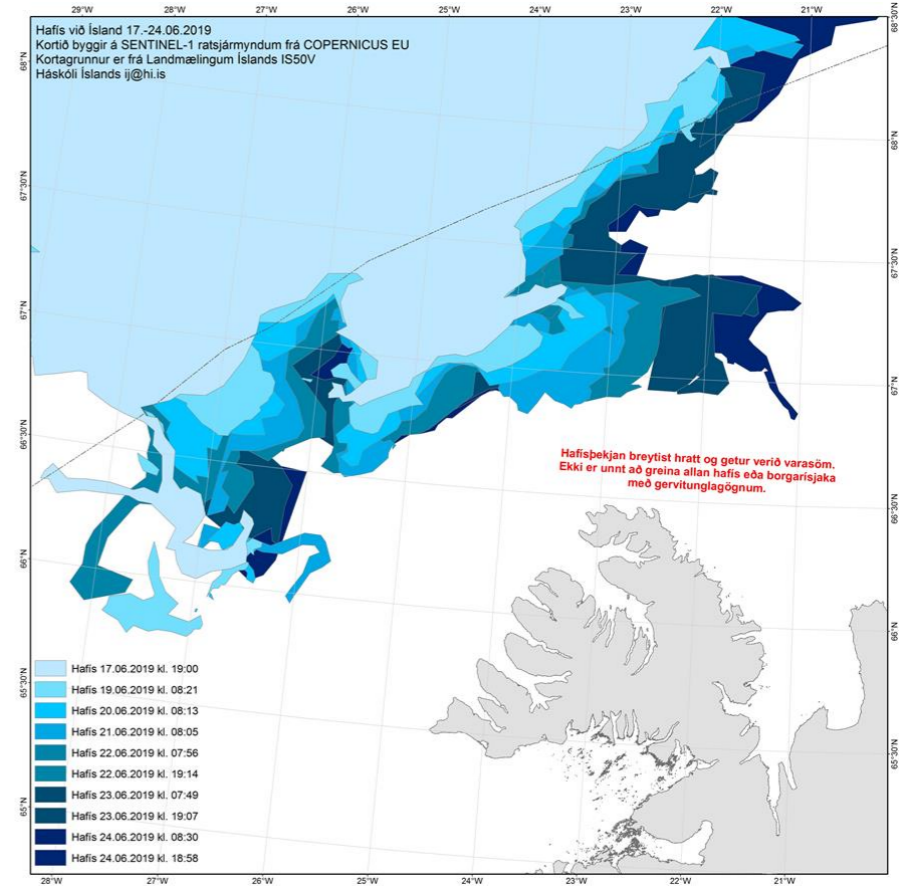
- GIS systems allow merging of several data sources/observations
- High temporal- and spatial resolution allow detailed studies on several sea-ice variables, supporting drift models and forecast.

Much less ice in the East Greenland Current

- Conditions that would have resulted in severe sea-ice years before

The ice breaks up easily, causing massive changes in the sea-ice field within few days.

Difficulties for animals that use the ice as platform  
 Chance of ice being left in „unexpected“ regions  
 hazardous for navigation



Ice chart: UI  
Based on information from the ICG and Copernicus EU





# Future implications

Clear trend toward less sea ice and weaker ice cover.

Influence from fresh water influx? *Arctic Ocean and the Greenland Ice Sheet*

Stratification, salinity, deep water formation

Change of currents? Influence on wildlife and fisheries

Wave action – influence on marine transport, also coastal erosion

Risk of navigation in areas previously covered by ice (*uncharted bathymetry*)

Increased number of icebergs?

Influence of increased dust, soot or other material on the ice.

SENTINEL-3 COPERNICUS EU 20.06.2018

