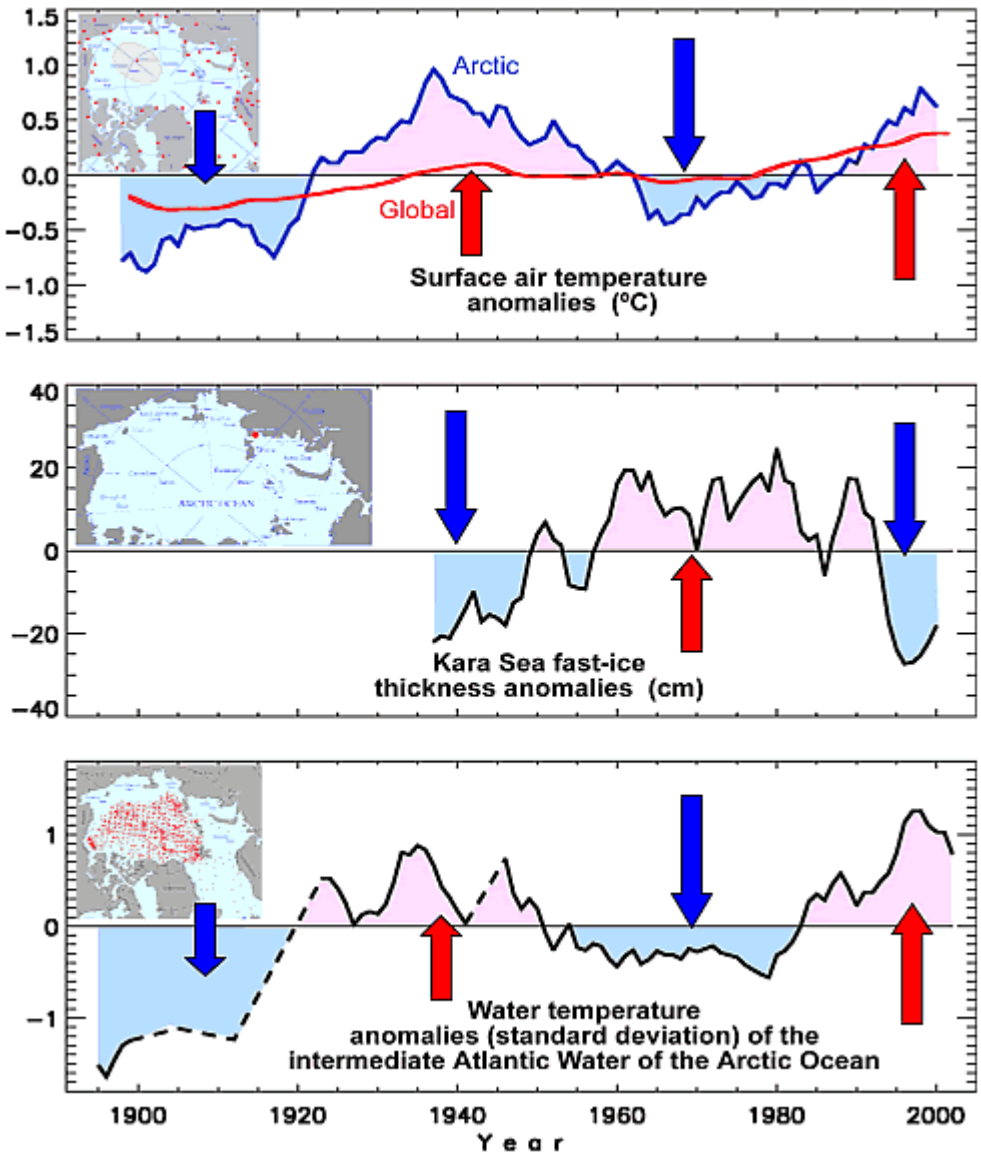
RECENT RESULTS

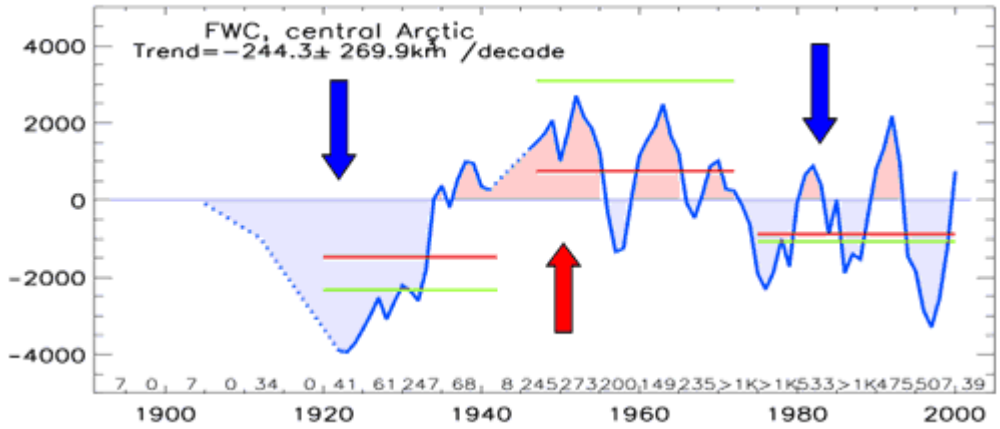
- ***The Arctic/North Atlantic climate system displays large-amplitude multidecadal variability***
- ***Understanding the key mechanisms influencing the Arctic/North Atlantic multidecadal variability is essential for developing robust climatic forecasts.***

Arctic air temperature, fastice thickness, and intermediate Arctic Ocean layer temperature exhibit strong coherent multidecadal variations



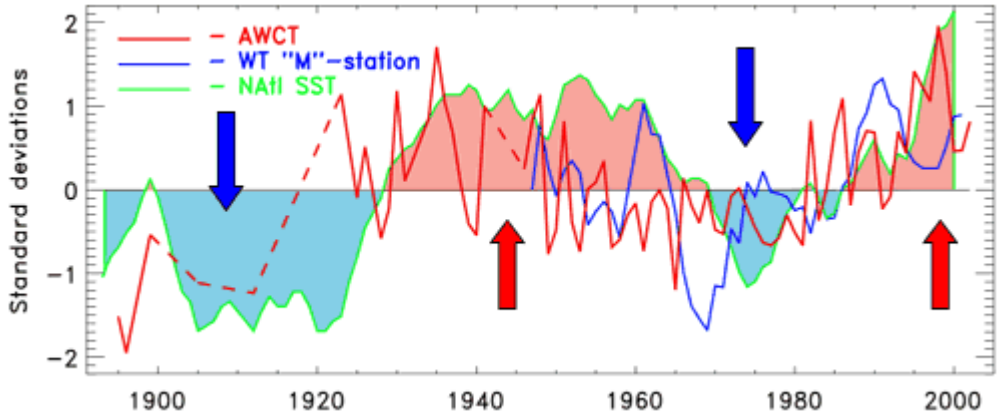
Arctic (blue) and global (red) surface air temperature anomalies (top), fastice thickness (middle), and intermediate Arctic Ocean water temperature (AWCT, bottom) are show.

Arctic Ocean freshwater content exhibits strong multidecedal signal



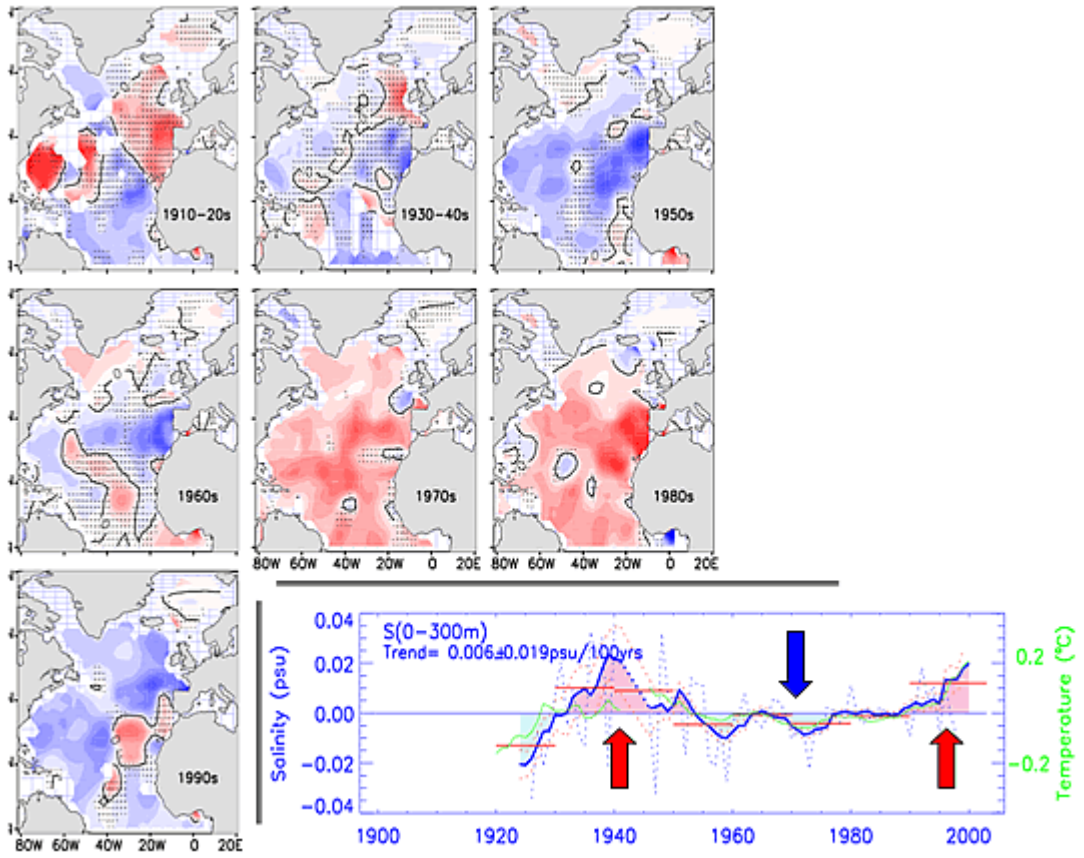
6-yr running mean Arctic Ocean freshwater content (FWC, blue line with shades) anomalies (km3).

Low-frequency variability in the Arctic and North Atlantic is linked



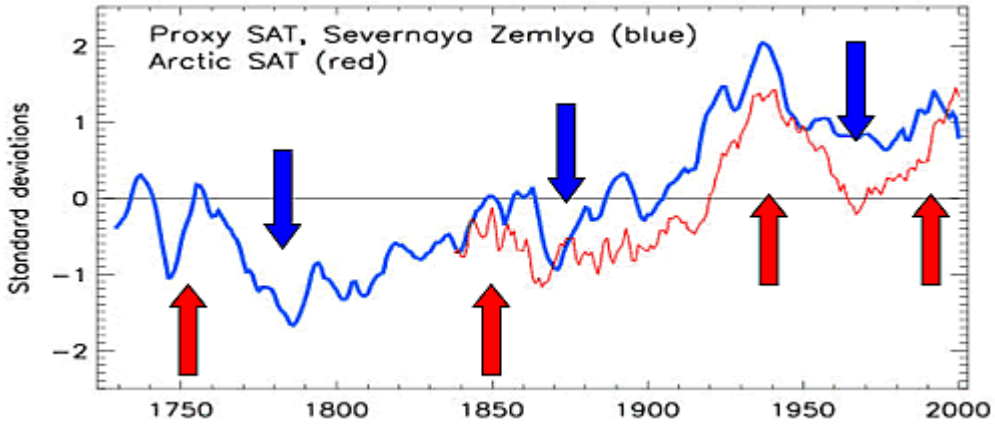
Normalized North Atlantic sea surface temperature (SST) anomalies (0-90oN, 290-30oE, green with red and blue shades), intermediate Arctic Ocean water temperature (AWCT, red), and normalized 6-yr running mean 10m water temperature (WT) anomalies from ocean weather station ``Mike'' at 66oN, 2oE (Norwegian Sea, blue), are show.

North Atlantic temperature and salinity show strong multidecadal variability



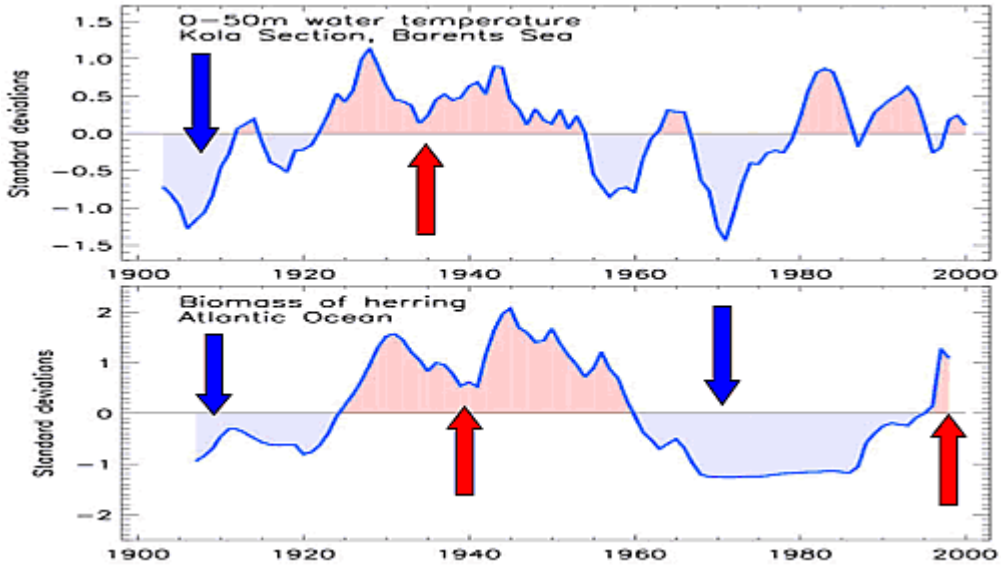
(Left) Maps of North Atlantic water temperature anomalies (C, 1000-3000m layer). Blue/red color shows cold/warm anomalies. (Bottom) 6-yr running mean time series of North Atlantic (0-300m layer) water salinity (blue with shades) and temperature (green) anomalies.

Paleoclimate records support multidecadal variability



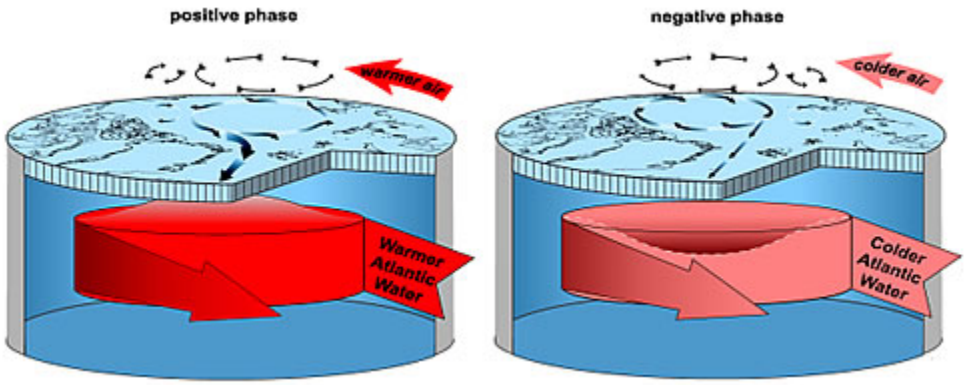
Comparison of instrumental composite record of the Arctic maritime surface air temperature (SAT, red, Polyakov et al. [2003]) and proxy SAT derived from the ice core (blue, Fritzsche et al. [2005]).

Biological records also show multidecadal fluctuations



Normalized water temperature from the Barents Sea and North Atlantic herring biomass.

Positive and negative phases of arctic multi-decadal variability



During the positive phase, there is an increase of transport of warmer air and water from the North Atlantic into the Arctic. The anticyclonic Beaufort Gyre is weakened/ strengthened, and cyclonic circulation in the eastern Arctic is intensified/suppressed during positive/negative phases of multi-decadal variability. Increased cyclonicity under the positive phase of multi-decadal variability causes divergence of ice drift and surface circulation, leading to doming of the Atlantic Water. The well-developed Arctic High, evident during negative phases, results in intensified anticyclonic ice drift and surface circulation, convergence of surface currents and a depression in the Atlantic Water.

Summary

Multidecadal fluctuations in the Arctic/North Atlantic climate system should be taken into account when assessing long-term climate change and variability. Understanding the key mechanisms influencing the Arctic/North Atlantic multidecadal variability is essential for developing robust climatic forecasts.

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