

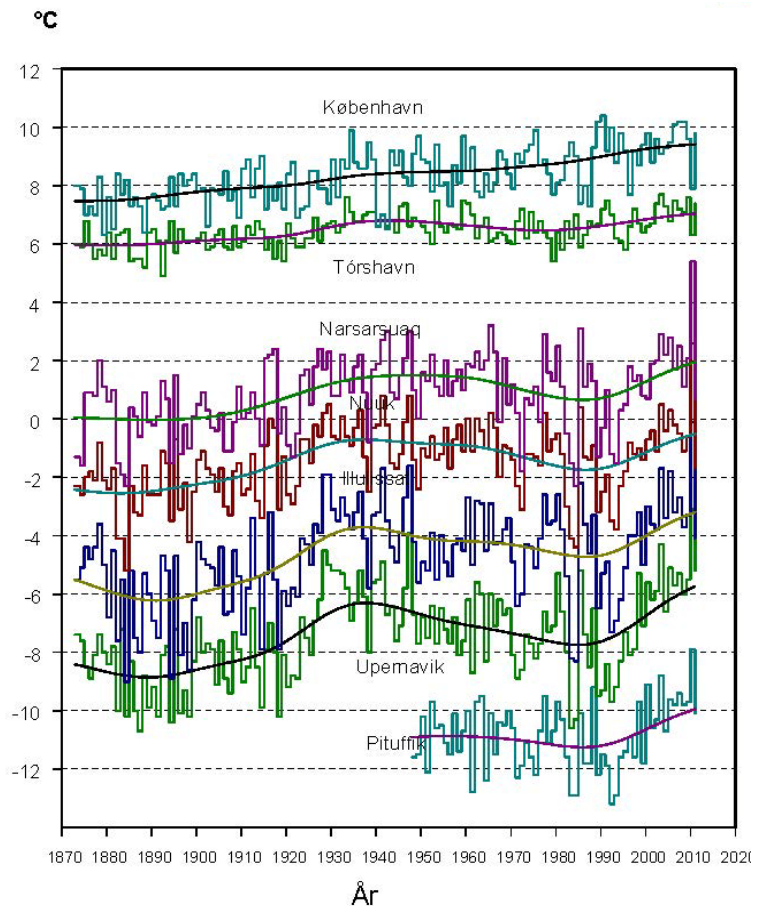
## Exercise H – Material H2

### Rising temperatures and diminishing sea-ice in the Arctic

Rising average temperatures have been observed for many decades, but since the 1960s the rising temperatures have gained increasing attention across the world. The rising temperatures are recognised as a potential threat to the global climate which has resulted in a global controversy over the urgency of climate changes, what impacts these may have and which precautionary measures should be taken.

The Intergovernmental Panel on Climate Change (IPPC) has argued that dramatic changes on earth would occur if the temperature rise passes beyond certain average levels of respectively 2 and 4 degrees. Beyond these thresholds climate change will be difficult to counter and adaptation strategies complicated if not impossible.

The graphs to the right show the annual, average temperatures in the period from 1873 until 2011 in Copenhagen, Denmark, in Thorshavn, Faroe Islands and in different cities in West Greenland: Narsarsuaq, Nuuk, Ilulissat, Upernavik and Pitufik (Thule) ordered according to how far north these places are located. The graphs show that the temperatures have been going up and down, but also that the average temperatures have been rising over time. The mentioned cities in Greenland can be found on Map H1.

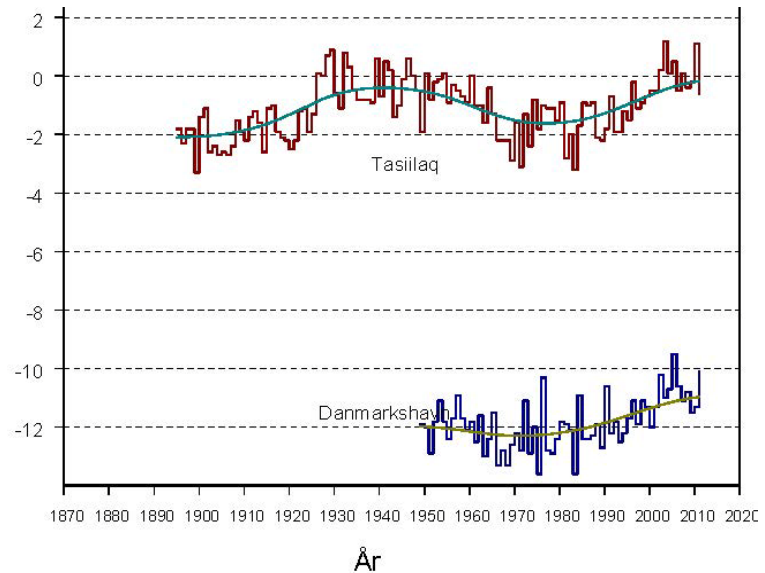


## Part 2

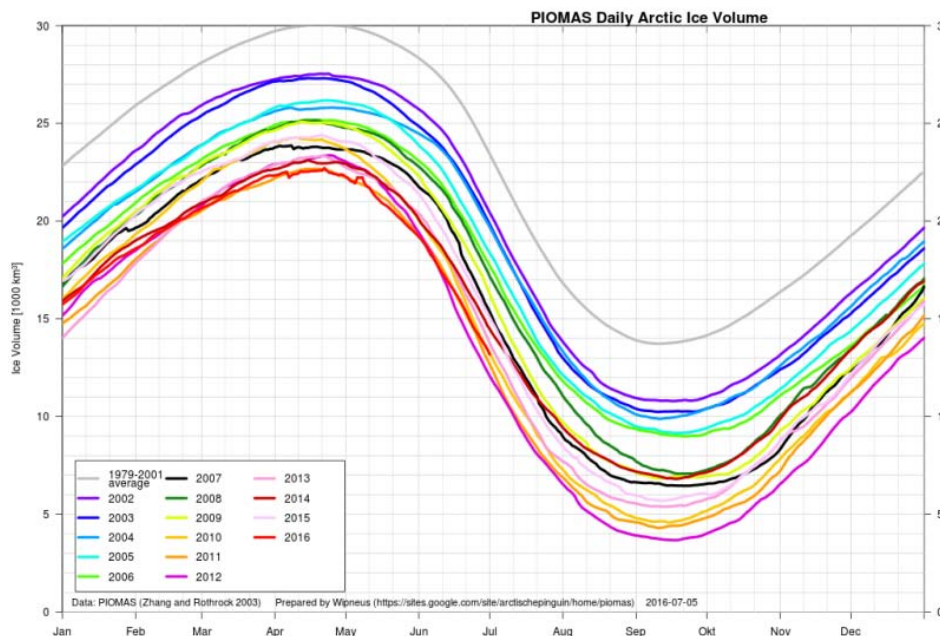
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The same average temperature graphs are shown to the right for the places Tasilaq and Danmarkshavn in East Greenland. These graphs and figures demonstrate a quite similar pattern of rising temperatures.

While a few years ago there still was an idea in the IPCC and in the EU about the possibility of not passing the 2 degree rise in average temperatures keeping temperatures below this threshold has now been recognised as not being realistic.



Another of the visible impacts of rising temperatures can be observed around the North and the South Pole that is covered with sea ice. The rising temperatures in the atmosphere also impact the temperatures of the oceans which consequently impact the areas covered with sea ice.



The extent to which the oceans of the Arctic around the North Pole is covered with ice varies – as do the air temperatures – from winter to summer which can be seen in the graphs showing the area (in 1000 km<sup>2</sup>) covered by sea ice shown to the left.

## Part 2

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Most important in relation to climate change is how the sea ice from year to year has been diminishing as shown in the period from 1979 to 2016 by the coloured graphs. The period shows a decrease in the largest extent of the sea ice in late winter of almost 50%.

One result is that the accessibility of the Arctic oceans by ship has been increasing which has led to a global interest in utilizing the options for new and eventually shorter sailing routes north of Siberia, Alaska and Canada. China and Korea who earlier did not show interest now have delegations and policies focusing on the Arctic.

The map to the right shows the area covered by sea ice in September 2016, which is the time of the year when sea ice covers the least area.

Though the melting sea ice does not directly matter much for the sea level of the world, the white ice cover has returned sun light and prevented the darker water in the ocean from warming. With less ice, ocean temperatures will rise faster and affect the huge currents particularly in Atlantic Ocean. Ocean currents also have profound impact on the temperatures of coastal zones as with the Gulf Stream which results in higher temperatures in Scandinavia and Northern Europe compared to areas in the eastern USA and Canada lying at the same northern altitude.



Graphs: Danish Meteorological Institute, Polar Portal, Danish Polar Research