Part 2

Exercise H – Material H3

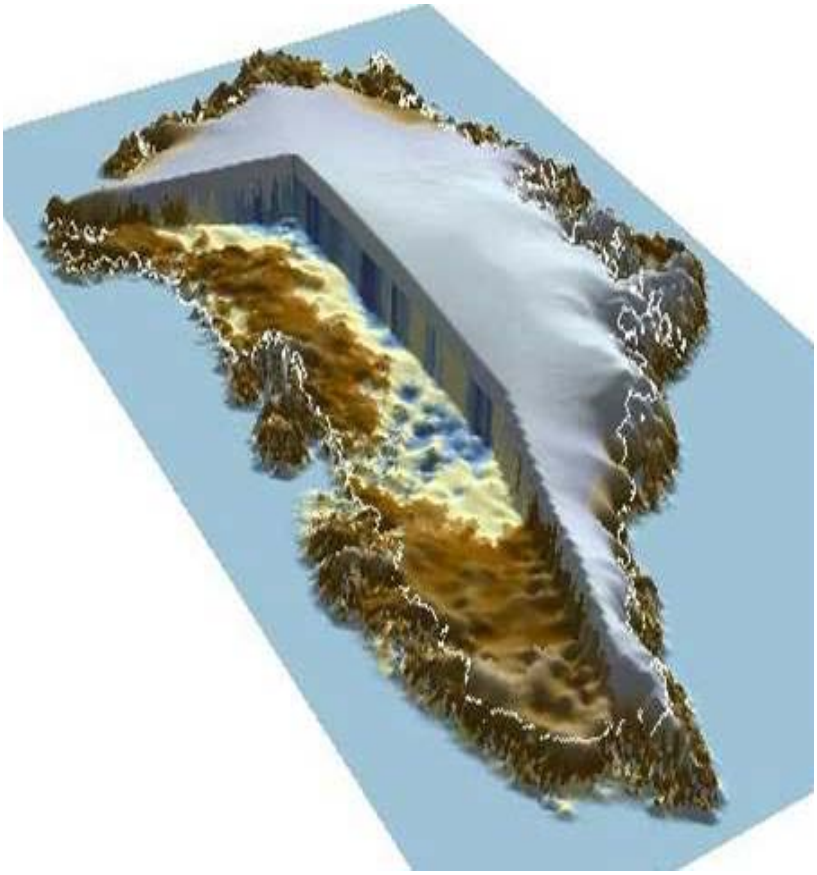
The melting ice cap of Greenland and global sea levels rising

Greenland is covered by an ice cap that contain almost 10% of the global fresh water resources. In itself this may not be very important as it does not supply a large population with water. However, the ice provides information layer by layer and is used to study how climate change has been part of the history of earth.

The important issue in this context is that the ice cap is melting. This is not just a result of changes between summer and winter and because of continued renewal of ice inland being pushed towards the lower oceans via glaciers either melting into rivers or directly calving ice bergs into fjords. The increased melting leads to a reduction of the masses of ice of the ice cap every year.

The figure to the right shows a model of the how the ice cap covering 85% of Greenland is surrounded by a ring of mountains. In some large areas the bottom of the ice cap is lower than the ocean surface.

When the ice cap melts it will result in a rise in sea level across most of the world as most of the ice is above sea level. If all the ice melts the sea level will rise by several metres. That is why so much focus has been on Greenland in relation to climate change as the rising air temperatures cause the ice cap to melt.



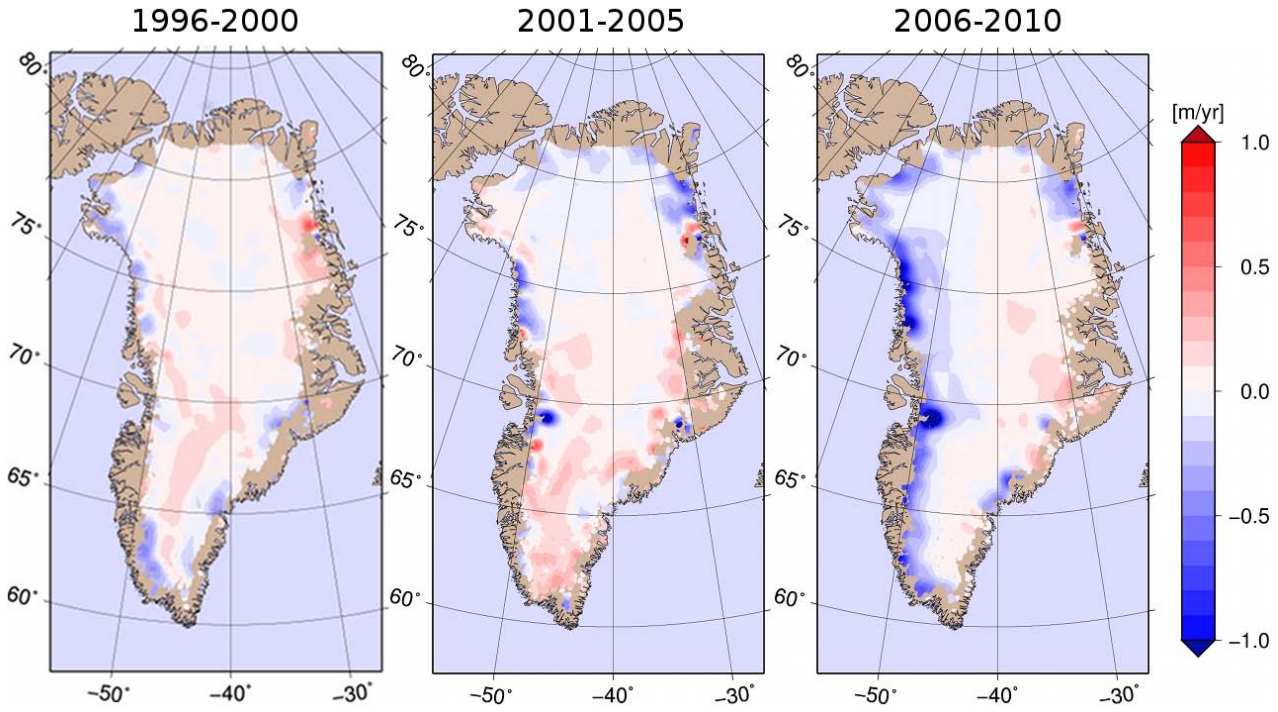
funded by the European Union programme Erasmus +

Part 2

Exercise H – Material H3

The figures below illustrate that changes in the thickness of the ice is not happening in a uniform way across the ice cap. The colours indicate where the thickness of the ice has increased (red) and where glaciers and melting reduces the thickness (blue).

The colouring of the ice cap also demonstrates how the process of melting is increasing from period to period.



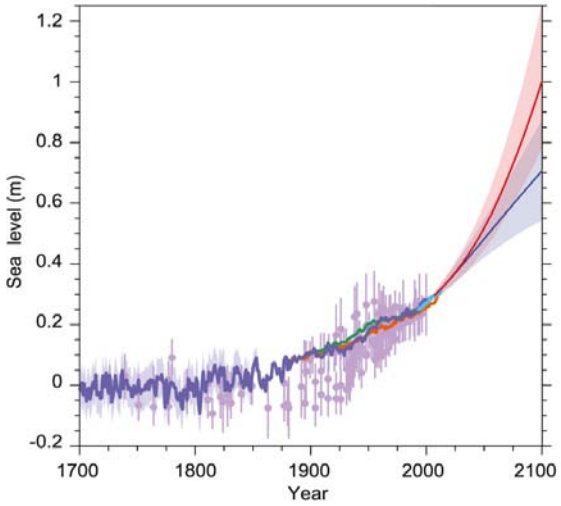
One of the globally most challenging and in places life threatening impacts of the melting ice cap of Greenland and the corresponding melting of the ice of the Antarctic is the rising level of the oceans. Rising sea levels impacts coastal areas all over the world and will potentially flood low lands. The risk of flooding is additionally impacted by more extreme and unpredictable weather resulting from climate change. Heavier rainfall becomes more likely and result in flooding from rivers. Protection against flooding is costly and lead to the building of higher dikes to protect the land both from the sea side and from rivers.

Another important impact of the fresh water melting from the ice cap is that it has an important impact on ocean currents which are partly driven by the different density between salt and fresh water.

funded by the European Union programme Erasmus +

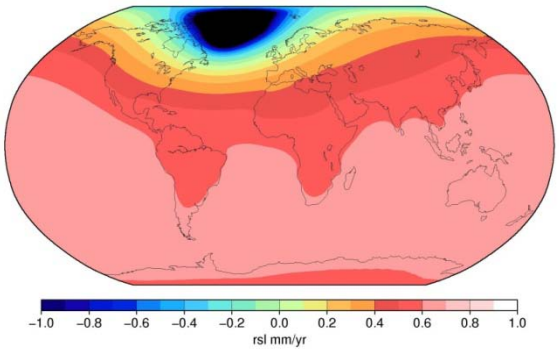
Part 2

Exercise H – Material H3



The figure to the right shows the rising sea levels in metres. From the end of the 19th century the rising sea levels are already visible from the curve. During the 20th century the sea level has on average been rising by 30 cm between 1900 and 2015. This may not sound as much of a rise, but has already resulted in areas land being flooded and the next 30 cm will have a devastating impact.

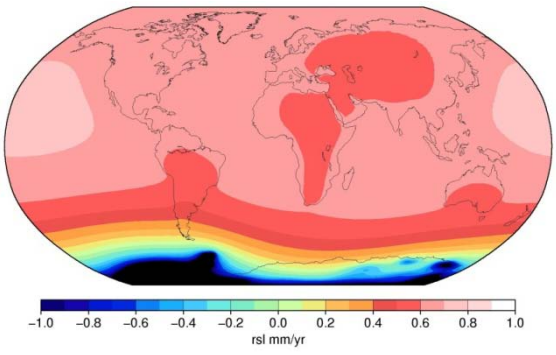
The figure also show estimates of how the sea level will rise after 2015 in the case where global temperatures pass the 4 degree threshold (the upper red line) and where climate mitigation measures reducing CO^2 and other climate gas emissions maintains a rise of temperatures around the 2 degree threshold (the lower blue line).



The two maps of the globe below illustrate the impact of the melting of the Greenland ice cap and the ice of the Antarctic. The first, upper one illustrate the calculated increase of sea water level resulting from the melting of the ice cap of Greenland measured in mm per year. The blue colours show the areas where the sea level relative to the land masses will be reduced. This result in the land masses to rise due to the reduced weight of the ice. The red colours show the areas where the average sea level is rising.

In fact the impact of the melting of the Greenland ice cap is rather small in northern America, Europe and Siberia. The reason for this 'strange' distribution of impacts is the due to gravitational changes related to the water and the changing weight loads of land masses that the earth responds to.

The second figure to the right complements the first, showing the calculated increase of sea water levels resulting from the melting of the ice of Antarctica measured by mm per year. Again figures are averaged to make this type of model based calculations possible. Here the severe impact of rising sea water level appear in most of the populated world making the impact of the melting of Antarctic more severe than the melting of Greenland's ice cap.



Graphs: Danish Meterological Insitute, Polar Portal, Danish Polar Research

funded by the European Union programme Erasmus +