

## **Climate Change and the Oceans**

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In recent years we have become more and more aware of how vulnerable our oceans are to climate change. The Arctic Ocean is capped by frozen seawater, called sea ice. This melts during the Northern Hemisphere's spring and summer months. It normally reaches its minimum extent in mid-to-late September before refreezing again. Since 1978, satellites have monitored the melting and freezing of sea ice. They have detected an overall decline in Arctic sea ice coverage by almost 12 percent per decade. This means that Arctic sea will be ice free by in 16 years by 2030. The reason is that the temperature in the Arctic has increased at twice the rate of the rest of the world and could possible increase by another 8 degree Celsius by 2100. Many species, especially Polar bears, will be adversely affected by the dwindling ice cover. There is also the possibility that it will weaken or shut-down completely the global ocean circulation, because as ice forms it expels the salt which increases the density of the surrounding water and as consequence plays a crucial role in global ocean circulation. The shutting down of the Gulf Stream would have a huge impact on the climate of western and northern Europe, especially in Ireland and Britain.

### *Greenland*

The mass of the Greenland ice sheet has been rapidly declining in recent years due mainly to surface melting and iceberg calving. Research based on data from NASA's twin Gravity Recovery and Climate Experiment (GRACE) satellites indicates that between 2003 and 2013, Greenland shed approximately 280 gigatons of ice per year, causing global sea level to rise by 0.8 millimetres per year. In general, in the interior of Greenland there has not been much change, but in the southern coastal area up to three metres of ice mass has been

lost over a period of 10 years during which these observations took place. The largest loss of up to 30 centimetres per year occurred over southern Greenland.

### *Antarctic*

NASA's twin Gravity Recovery and Climate Experiment (GRACE) has also produced quite worrying data from the Antarctic. In the ten year period between 2003 and 2013 Antarctic lost 90 gigatons of ice per year. This caused global sea-levels to rise by 0.25 millimetres per year. Glaciers are also on the move in Antarctica. The highly dynamic Pine Island Glacier, which is located in the Western Antarctic, is, in fact, a large ice stream. In other words, it is moving faster than the surrounding ice. Satellite data shows that the speed of this glacier has increased dramatically from the late 1990s until the present. On October 26<sup>th</sup> 2011, NASA's Operation IceBridge campaign made the first detailed measurements of a major iceberg calving event which took place on the Pine Island Glacier. The depth of the canyon which was created was between 50 and 60 metres and an average of 73 metres wide which made it possible to fly through the ice canyon. If these changes continue or increase, the rise in sea-levels will exceed the projected one metre rise by the end of this century. This will have enormous consequences for all coast cities which will be very vulnerable to storm surge and serious flooding.

*(All the data used in this article is taken from the U.S. Center 2014 Hyperwall Science Stories which was distributed during a seminar at the U.S. Pavilion at Lima on December 3<sup>rd</sup> 2014).*