# *Climate change in the Polar Regions*

***Both Antarctica and the Arctic have a decisive impact on the Earth's climate development. Because of their role in the global climate system, a close watch needs to be kept on the Polar Regions to be able to give an adequate response to the challenge of climate change at a global level.***

For climate change, the Arctic can be seen as the "canary in the coalmine". Over the past few decades the annual average arctic temperature has increased at almost twice the rate of the rest of the world. Without changes in global emission patterns climate change is expected to accelerate in the Arctic in this century, contributing to major physical, ecological, social and economic changes, many of which have already begun.
Over the last decades we have seen an extensive retreat in sea ice cover, multi-year sea ice has been significantly reduced and the ice has become thinner. The observed minimum sea ice cover in the Arctic in the last few years corresponds to a warming that was not expected to occur until 20-30 years into the future.

Climate change is also observed in the Antarctica. In the last 50 years, the air temperatures of the Antarctic Peninsula have increased by 2.5 degrees Celsius. The temperature of the ocean has increased by 1-2 degrees Celsius. Some of the ice shelves surrounding the Peninsula have disappeared and the ice masses onshore are increasing their speed on the way to the ocean.

## Feedback processes in the Arctic can accelerate climate change

The melting of sea ice is one of the key feedback processes that threaten to accelerate climate change. The reduction in ice and snow cover will increase the absorption of incoming radiation because a reflective white surface – snow and ice – is replaced by a dark surface; open sea and a bare earth surface. This will absorb more heat, which will lead to increased warming. Increased terrestrial temperatures may lead to thawing of permafrost and subsequent releases of large quantities of methane to the atmosphere. This is another crucial feedback mechanism that may lead to increased warming and make efforts to combat climate change all the more difficult.

## Effects on sea level rise

The Polar Regions store large freshwater reservoirs in the form of ice. The ice cap at the South Pole continent makes up 90% of the fresh water ice of the world. An accelerated melting process is observed for the Greenland Ice Sheet and several Arctic glaciers. There are also signs of increased warming in the Antarctic. Melting of these ice caps will result in major rises in sea level. Melting of the Greenland Ice Sheet, if only a long-term threat, would increase the sea level by about 6-7 meters. If only 1 percent of the Antarctica melts, it will increase the sea level by 65 cm. The Greenland ice sheet is already diminishing. Melting of ice in the Antarctica is the most unpredictable variable in the prognoses of future sea levels, according to the IPCC. Sea level rise will have devastating consequences for livelihoods in coastal areas.

## Understanding more

Polar climate research is a priority issue for the Norwegian government. We must understand the polar processes better to get more precise climate predictions, and thus a better foundation for understanding the consequences of climate change. A better understanding of these climate processes will also help us identify the emission cuts necessary to avoid triggering irreversible physical processes that may threaten our ability to control the future climate development.