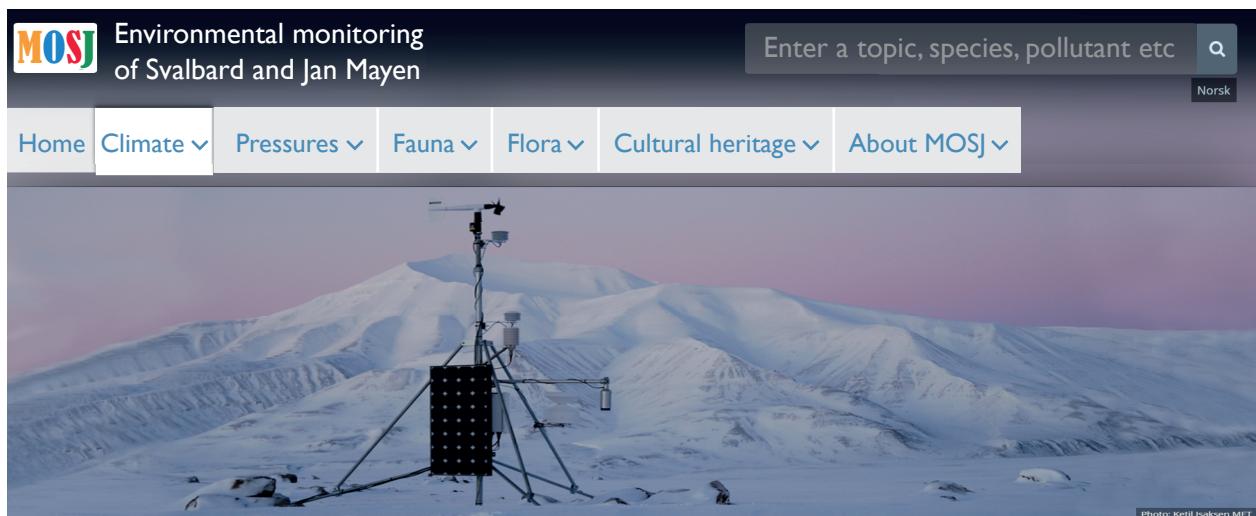


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Permafrost

⌚ Last updated 16 March 2018

An important aspect of climate change in the Arctic is the melting of the permafrost (a thick subsurface layer of soil that remains frozen throughout the year). In Svalbard, monitoring of permafrost is ongoing in several boreholes, including at Janssonhaugen, 20 km from Longyearbyen. Heating and thawing of permafrost may result in greater instability in hillsides, increasing the probability of landslides and avalanches. Thawing permafrost can damage buildings and infrastructure and cultural heritage sites in coastal areas are exposed to increased erosion.

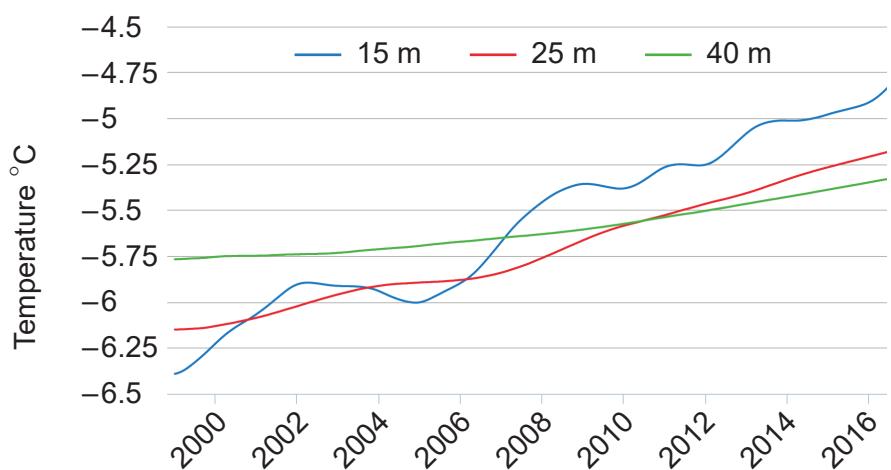
Casual factors

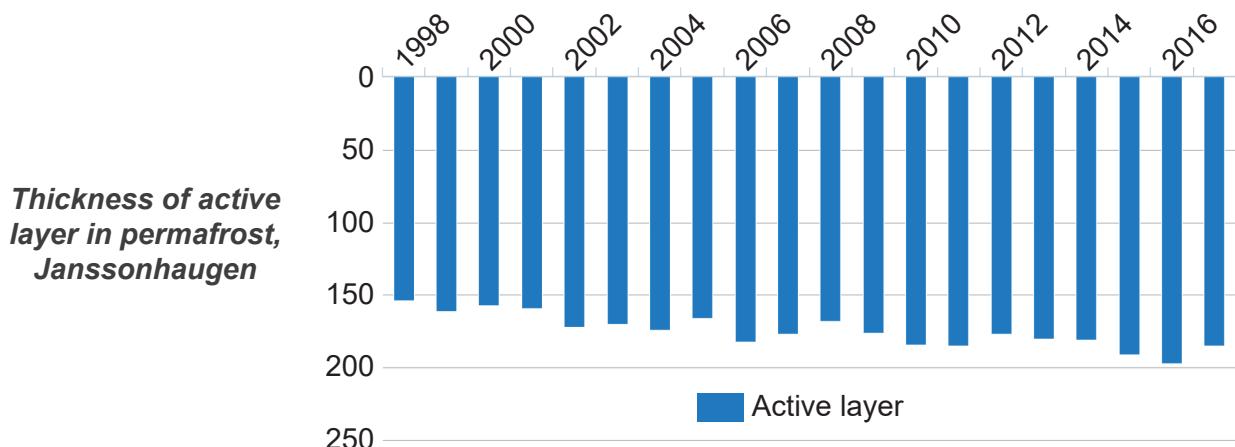
10 The warming of the permafrost at Janssonhaugen is first and foremost a response to the rise in the air temperature in recent decades.

Studies so far show that any changes in the snow cover have had no effect on the permafrost at Janssonhaugen. This is because the locality is extremely exposed to wind, and the ground around the borehole is blown free of snow for large parts of the winter.

What is being monitored

Ground temperature in permafrost, Janssonhaugen





15 Status and trend

Permafrost monitoring began in 1998. Analyses show that the temperature in the upper part of the permafrost is rising on average 0.8 °C per decade and that this rise has been accelerating during the past decade.

20 Rising temperatures in the permafrost have been recorded right down to a depth of 80 metres during the time the monitoring has been taking place. The active layer (the uppermost soil layer of the permafrost that thaws in the summer) has become 25–30 cm thicker since 1998.

Consequences

25 All buildings in the Svalbard settlements are built on piles driven into the permafrost, and roads, bridges, airports and other infrastructure are also constructed on permafrost. When warming and thawing of the permafrost occurs, the infrastructure may be affected in the longer term. In addition, the permafrost is essential for stabilizing steep mountainsides, which may become more unstable when warming takes place. This will have consequences for travelling, and also potentially for animal life if, for example, areas with arctic fox dens become unstable and collapse. Many cultural heritage remains in Svalbard are situated in the shore zone, where they 30 may be vulnerable to increasing erosion in the future.

35 On a circumpolar¹ level, the most important consequence of the warming and thawing of the permafrost is, nevertheless, that large volumes of greenhouse gases, like CO₂ (carbon dioxide) and CH₄ (methane), may be released if ever deeper layers of the permafrost thaw. These gases have been kept out of the atmosphere because the organic carbon has been frozen in the ground. The release of such greenhouse gases may lead to a further rise in the temperature and thawing of the permafrost. This is one of the many feedback mechanisms in the Arctic, and attempts are continually being made to improve the estimates of the emissions from thawing permafrost.

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¹ circumpolar: situated around one of the earth's polar regions

² MOSJ: "Environmental monitoring of Svalbard and Jan Mayen (Norwegian islands)," an environmental monitoring system under the direction of the Norwegian Polar Institute