

Invited keynote address

The aim of the symposium

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The polar regions play a crucial role in global climate change. They are sensitive indicators of change and their snow and ice features are good integrators of change. They store long-term climatic records in their ice sheets, such as the Antarctic and Greenland ice sheets. They also affect the global climate directly through interactions between their atmospheres, ice cover, and oceans, and through feedback processes. Practically all climate models predict an amplification of the global greenhouse effect at high latitudes, but models as well as observations have produced results that are not easily interpreted.

There are large differences, for example, between the results of various GCM simulations, and uncertainties exist about the magnitude and timing of the expected changes. Also, the observed high latitude climate trends over the last few decades are much more regional and patchy than predicted by the models. Models are improving, however, with the introduction of sulphate aerosols and the elimination of flux adjustments and while considerable uncertainties remain in the long-term prediction of change there is some agreement between model results and observed trends by season on shorter time scales.

The warming observed over the landmasses of the Arctic and in the Arctic Ocean over the last few decades is matched by corresponding observed changes in the cryosphere, including decreases in snow cover and glacier mass balances, thawing of permafrost, and by reductions in sea ice extent and thickness. In Antarctica, warming in the Antarctic Peninsula and Ross Sea regions is associated with dramatic reductions in ice shelf areas and reduced ice thicknesses on the lakes in the McMurdo Dry Valleys.

A warmer climate in future will accelerate permafrost thawing on land and thus affect ecosystems and humans, it will change the productivity of marine ecosystems in the Arctic and Southern oceans, will have economic impacts on fisheries, petroleum production and other human activities, and will cause social consequences on northern indigenous populations. While uncertainties exist about the future, climate change in the polar regions during the past few decades can be shown to have already had major impacts which will become much more pronounced if present trends continue.

The key questions that need to be answered to remove some of the uncertainties include the following:

- Are we already seeing a climate change due to the greenhouse effect, as predicted by GCMs, and if not when are we likely to see it, and where?
- Are the changes in climate that we see in the polar regions due to natural or man-made causes, or both; and if both, what are their relative contributions to change?
- What parameters, processes and interactions – past, present and future – do we need to understand better in order to predict future climate change?
- What are the likely impacts of global change on the polar environment and people and of polar processes and feedbacks on the global climate and society?

The aim of this symposium is to begin to answer at least some of these questions.