Recent Global Warming: An Artifact of a Too-Short Temperature Record?

INTRODUCTION

Although the magnitude of the greenhouse effect has been of major concern during the last decades, the reality of the processes involved has hardly been discussed. It has become common to base planning on predictions that indicate a major warming. Assumptions concerning the future have been repeated at numerous occasions and are reflected in a number of statements in the recent report, “Impacts of a warming Arctic” (1). The warming of the Arctic has become an important issue, because the prediction is that changes will be strongest and first noticeable in the Arctic and because of the undesirable environmental impact that might accompany the elevated atmospheric CO2 (2).

The following discussion focuses on temperature observations from meteorological stations in the Arctic and surrounding areas. Is the temperature really rising at an alarming rate? Has the well documented and rapidly increasing concentration of greenhouse gases in the atmosphere really affected the temperatures at Arctic stations, where, according to the models, this effect will first be observed?

DATA

There are several data sets showing the temperature in the Arctic and its surrounding areas. One set of data, which has been made available on the Internet during the last few years, is the Nordklim database (3). This database includes temperature observations made between 1890 (or from the time when observations were initiated) and 1999, and has been obtained from meteorological stations in the Nordic countries (3). Information about changes in the Arctic climate is also reported in several papers (4, 5, 6) and data for many stations are available on the Internet (7).

For the purpose of this discussion, mean annual air temperature have been used. Svalbard Lufthavn, located on a group of islands at 78°N, is selected as representing climate in the Arctic. The first few years of observations from this station may have been affected by several shifts in the position, but this factor is not believed to have affected the record for the temperature maximum that was reached during the late 1930s (Fig. 1). The Svalbard temperature is compared with the annual mean temperature at Arctic stations. In addition, the temperatures of the Arctic are compared with data from Stockholm, because observations have been carried out there for 250 y, thus making it possible to place the short Arctic record in a longer perspective. The long record has been corrected for urban effect (8, 9). Corrections for urban effect are quite important, because it does influence climate even when the population is relatively small (10).

RESULTS

The Svalbard mean annual temperature increased rapidly from the 1910s to the late 1930s. The temperature thereafter became lower, and a minimum was reached around 1970. Svalbard thereafter became warmer, but the mean temperature in the late 1990s was still slightly cooler than it was in the late 1930s. Svalbard is, of course, only one point in the vast Arctic area. However, the observed warming during the 1930s is supported by data from several stations along the Arctic coasts and on islands in the Arctic, e.g. Nordklim data from Björnøya and Jan Mayen in the north Atlantic, Vardø and Tromsø in northern Norway, Sodankylä and Karasjok in northern Finland, and Stykkisholmur in Iceland (3). There is also data from other reports; e.g. Godthaab, Jakobshavn, and Egedesminde in Greenland, Ostrov Dikson on the north coast of Siberia, Salehard in inland Siberia, and Nome in western Alaska (7). All these stations indicate the same pattern of changes in annual mean temperature: a warm 1930s, a cooling until around 1970, and thereafter a warming, although the temperature remains slightly below the level of the late 1930s. Although details of the temperature fluctuations vary over time between the stations, the pattern of these fluctuations remains similar. Many stations with records starting later than the 1930s also indicate cooling, e.g. Vise in the Arctic Sea north of the Siberian coast and Frobisher Bay and Clyde on Baffin Island (7).

In Stockholm, where temperature observations have been made since 1756, it is apparent that the temperature has been affected by the growing city. This urban effect has been studied in detail, and a compensation has been made for this bias in the data used here (8, 9). The Stockholm temperature also increased.

Figure 1. Annual mean temperature and trends for Stockholm, Sweden and Svalbard Lufthavn, Svalbard.