The Barents Sea Climate and the Big Picture

A source of confusion in the climate debate is a lack of understanding of the difference between global and local climate. The global temperature is geographically averaged as a mean over the entire globe, and is often presented as a mean air surface temperature. Natural climate variations on short time-scales, such as interannual fluctuations and fluctuations from one decade to the next, usually disappear in the averaging process, leaving only the long-term climate variability (Figure 1, upper panel). In addition to a 60-70-year climate cycle caused by natural forcing, the figure shows an increasing temperature over the last 150 years. This trend is attributed to human-induced climate change caused by greenhouse gas emissions. Temperatures on a regional scale, for example in the Barents Sea or in the Arctic, show greater variability than the global temperature (Figure 1, lower panel), and has a strong climate period of about 10 years. The long-term climate signal is therefore harder to identify in the figure, but it is still present.

The summer temperature in the Barents Sea fluctuates on an even shorter time-scale (Figure 2). We do not know all the mechanisms that control these fluctuations, but one of the most important ones is changes in the transport of warm Atlantic
Arctic Ocean Climate and present situation in summer 2008

Water coming from south. Another important factor is the local heating/cooling from the air, but in summer this influence is limited to the upper 50 meters. In recent years the temperatures in this ocean region have been high, but although it is still warm, the summer of 2008 was colder than the summer of 2007 (Figure 2). Colder waters in both the upper and lower water layers indicate both a weaker and colder Atlantic current, and less heating from the air due to lower air temperatures in spring 2008 than in spring 2007.

The global air temperature can therefore not be used directly in our region because it does not capture the local conditions, as is illustrated by the difference between the upper and lower panel of Figure 1. For example, the warmest year globally, 1998, was a relatively cold year in the Barents Sea. Another issue is that the global surface temperature is just the temperature at the surface, and its interannual variations do not represent year-to-year variability in the deeper water layers. This is evident from the time series from the Barents Sea showing that the surface temperature has been experiencing a decreasing trend since 1998, while the temperature in the Atlantic inflow has increased (Figure 2). It is the temperature in the deeper water layers that has most impact on the marine ecosystem and fish stocks.

Another interesting point is that natural climate variations, for example large changes in the surface temperature in the Pacific Ocean (El Niño) one year, can be seen in the global surface temperature. Such conditions occurred in 1998, leading to a high global temperature that year (Figure 1). This means that we cannot expect a continuous temperature increase, but it does not mean that human-induced global warming is not occurring.

ICE CONDITIONS IN THE ARCTIC

The sea ice in the Arctic Ocean has been decreasing for as long as satellite measurements have been available, and in autumn 2007 the ice cover was at a record low (Figure 3). There was little ice in the Arctic Archipelago north of Canada, in the ocean regions north of Alaska and off eastern Siberia. This was caused by unusual

wind conditions and high air and ocean temperatures. Due to the situation last year, the ice in the Arctic Ocean now consists mostly of new ice (i.e. first-year ice). The new ice is thinner than multi-year ice and melts faster.

The late winter 2008 was very warm in the Barents Sea, and the ocean monitoring performed by Institute of Marine Research, Bergen, showed higher temperatures than ever. In warmer water less ice forms during winter, and the thin first-year old ice melts faster. In spring 2008 US scientists warned that the North Pole might already be ice-free this summer. However, as already mentioned, the spring and summer of 2008 were colder than in 2007, and this is reflected in both the ocean temperatures and ice cover. Currently (late summer 2008) there is less ice than normal in the Arctic, but more than in 2007 (Figure 4). In addition, the geographical distribution of the ice is different. The current situation (August 2008) is shown in Figure 5. There is more ice than normal to the east of Svalbard, while the rest of the Arctic has less ice