Predictability of weather in polar regions and impact of atmospheric observations in the polar regions for mid-latitude weather forecasting

Background and motivation:
In spite of great advances in weather forecasting in recent decades, severe weather events such as windstorms and extreme precipitation are often poorly represented in the medium-range (214 days) and even short range (1-2 days) forecasts. Such events do often have high negative impact on society and this impact can be reduced by more reliable weather forecasts. Failures in forecasting high-impact weather events can often be traced to wrong analysis of the state of the atmosphere, leading to wrong initial conditions for the numerical calculations on which the weather forecasting is based. The erroneous analysis is in general associated with wrong or inadequate observations. The latter is particularly true for the polar regions. Substantial global increase in observations is however very expensive. Therefore, methods are being developed to identify regions where increased observations lead to large improvements in the forecasts. Such targeted observations in sensitive regions are expected to be the most fruitful way to go to improve the weather forecasts.

Proposed Research:
There will be focus on both development of high-impact weather systems in the polar regions as well as development within the polar regions that leads to high-impact weather at midlatitudes. The research will be carried out with numerical modeling of the development of the atmosphere in the short and medium range (1-14 days) from different initial conditions. There will be numerical calculations to identify areas where observations are likely to have high-impact on the development of the weather systems. Some emphasis will be on the impact of the sea ice and fluxes from the ocean as well as on orographic effects and the necessary conditions for extreme response of the atmosphere to orography. Targeted observations will also be made. This project is closely linked with the international research programme THORPEX (THe Observing-system Research and predictability experiment).

Haraldur Ólafsson, haraldur@vedur.is
Department of Pysics, Faculty of Science, University of Iceland, Icelandic Meteorological Office, Bústaðavegi 9, IS-107, Reykjavík, Iceland.