The impact of Greenland on the predictability of European weather systems

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The high topography and mid-to-high latitude of Greenland means it has a major influence on the atmospheric circulation of the North Atlantic-Western Europe region. One can think of this sizeable 3000-m high barrier deflecting flow both over and around itself, i.e. distorting the atmospheric flow. The primary North Atlantic storm track is influenced by the presence of Greenland as is the atmosphere well downstream, for example over the British Isles and Scandinavia. In principle Greenlands flow distortion can trigger a downstream 'Rossby wave-train' that influences the flow and the predictability of weather systems thousands of kilometres, and several days, from Greenland

This PhD project will investigate the role of Greenland in determining the predictability of downstream weather systems over Europe. It is part of the Greenland Flow Distortion Experiment (GFDex) which will investigate the role of Greenland in defining the structure and the predictability of both local and downstream weather systems, through a programme of aircraft-based observation and numerical modelling. The Greenland Flow Distortion Experiment (GFDex) will provide some of the first detailed in-situ observations of the intense small-scale weather features thought to be important in modifying the ocean in this area as well as investigating Greenlands role in atmospheric flow predictability. Targeted observations (additional to the normal network of observations) will be made as part of the aircraft-based field programme flying over Greenland and vicinity in March 2007. By running model hindcasts (model forecasts of past events) with and without the targeted observations the student will be able to assess their value for different weather regimes and determine the regions where additional observations can lead to the greatest improvement in model forecasts.

The student will need to become familiar with the UK Met Offices operational forecast model, the Unified Model, so a willingness to learn computing skills is important. There will be the opportunity to collaborate with research groups in the UK, Canada, USA and Europe during what will be a very exciting project taking place at the start of the International Polar Year.



Map of forecast sensitivity (shaded areas) from an ECMWF forecast during the Atlantic Regional THORPEX Campaign in December 2003. Targeted observations in the sensitive areas should improve the forecast over northern Europe (the boxed area) 42 h after the targeting time. The background contours show mean-sea-level pressure.

Student profile:

This project would be suitable for students with a degree in mathematics, physics or a closely related physical or environmental science.

Funding particulars:

NERC funded tied studentship. Part of the Greenland Flow Distortion project which also funds another tied studentship at the UEA (started October 2005), a postdoctoral researcher at the UEA (to start Spring 2006) and involves international project partners.