Proposal 12

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IPY research themes proposed by the Danish Meteorological Institute (DMI).
It is noted that all these themes comply with the main IPY themes including

- *Research (new knowledge)*
- *Polar change*
- *Improved understanding of polar processes*

The proposed research themes deal with geophysical research themes only, but it is important to note, that all the themes have a direct and strong impact – and interacts – with other areas of research, including biological/ecological, political and social sciences. It will therefore be easy to integrate the research into somewhat larger interdisciplinary research themes.
It is generally suggested that the Danish activities within the proposed areas focus to the largest possible extent on Greenland. Thus, atmospheric measurement components (including those in the upper atmosphere) should be performed at the existing Greenland stations (lidar, ozone, radar, etc).
For most of the suggested research the main focus is naturally on Greenland and the Arctic region, but some themes are also directly related to the Antarctic region.
It is noted that the list is in non-prioritised order.

Observations and data assimilation

It is common for essentially all geophysical research areas that improved understanding and forecasting require a better exploitation of existing data types and development of new observational techniques, in particular data which can be ingested into data assimilation schemes. This statement
is particularly valid in the polar regions where few conventional data are available. It is therefore suggested to:

- Develop a new system for sea-ice modelling and for assimilation of data into sea ice models. The system should be designed with high emphasis on arctic sea-ice thickness, melt water and type of sea ice. The system should be used for improved prediction of short term variations in sea ice properties (which is important for the ship traffic) as well as for a long term re-analysis of sea ice in the arctic (which is important for the understanding of climate variation).
- Perform observations of oceanic transports (import/export) over the ridge between Scotland and Greenland. Long term continuation of these measurements is highly important since they provide important information about the state of the general circulation including the thermohaline circulation in the North Atlantic.
- A new observational campaign of water mass transformations on the shelf to the north of Greenland.. The transformations on the shelf's in the arctic ocean are the main generators of arctic deep water which constitute an important part of the North Atlantic general circulation. The observed data should be used for theoretical and modelling studies (see Proposal 10).
- Perform a very high resolution atmospheric re-analysis for the entire arctic over the last 30-40 years using a new and advanced data assimilation system. Such a re-analysis is important to understand and analyse processes and feedbacks in the climate system and for long term studies of e.g. arctic societies and/or nature.
- Perform research on improved exploitation of new satellite based observations of the atmosphere. There should be special emphasis

on data assimilation of passive microwave observations (e.g. AMSU-A and AMSU-B) and on the problem of discrimination between atmospheric emissions and emissions from different types of sea ice.