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Dear Sir/Madame

**House of Lords Select Committee on the Arctic:
Evidence on behalf of the WMO's Polar Prediction Project**

1. Improved weather and environmental prediction is urgently required to safely and responsibly exploit the resources and opportunities that the Arctic can offer society. The Arctic is host to a variety of weather and weather-related hazards, including: severe wind storms, blizzards, poor visibility due to fog and low cloud, severe ocean waves and sea-ice.
2. Short-term weather and sub-seasonal climate forecasting is less skilful for the Arctic than elsewhere on the planet. There are numerous reasons for this situation, including: relatively few in situ observations with which to initialise Numerical Weather Prediction (NWP) models; the difficulty in accurate retrievals of observations from satellites; a sub-optimal observing network (for historical and geopolitical reasons); a historic lack-of-attention in NWP model development for processes that are unique or more prominent in the polar regions; and the importance of coupled atmosphere-ocean-sea ice processes for day-to-day forecasts (in contrast to mid-latitudes), which implies coupled models need to be employed (most current forecast models are atmosphere only) . At present it is not known which of these deficiencies are the greatest blockages improving the skill of environmental prediction.
3. Recognising this relative lack of skill for a region of growing significance, the *World Meteorological Organisation's World Weather Research Programme* initiated a decade-long **Polar Prediction Project (PPP)**, starting in 2011, with its mission being to "*Promote cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hours to seasonal.*" The PPP has an International Coordination Office in Germany and a Steering Group of about 15 international experts, drawn from academia and national meteorological services, covering all aspects of polar prediction. The PPP has received modest operational funding from around a dozen national meteorological services, many of whom are committed to fulfilling the mission and aims of the project. Further details on the PPP can be found in a Science Plan (2013) and an Implementation Plan (2013), both available on the project website <http://www.polarprediction.net/>
4. A **Year of Polar Prediction (YOPP)** is planned to provide a focus for observational campaigns and a test ground for enhanced operational and experimental NWP from national meteorological services such as the UK's Met Office and the European Centre for Medium-range Weather Forecasts. The YOPP is planned for mid-2017 to mid-2019 and, it is hoped, will include a major international effort to run a Multi-disciplinary drifting Observatory in the Arctic for at least a year. (The last time this occurred was twenty years ago in a region that no longer has summer sea ice!). The Polar Prediction Project are leading development of the YOPP, but other Arctic science committees, international science organisations and international & national funding agencies are starting to commit energy and resources to this initiative.

5. UK scientists have played key roles in developing the Polar Prediction Project and are well-placed to undertake world-leading research during the YOPP. The Met Office currently runs one of the foremost global operational weather forecasting systems, however this system (in common with all NWP systems) has known problems in the Arctic, which will require new research to fix or ameliorate. The YOPP will present an outstanding opportunity to undertake such new research.
6. The current status of weather and environmental prediction for the Arctic is relevant to a number of the **Questions** posed in the Select Committee's *Call for Evidence*. In particular:
 - a. **Q1:** recent changes have made polar prediction on daily to subseasonal time scales even more challenging, as previous observational data sets are becoming redundant (as the sea-ice has changed), and the coupling between the atmosphere/ocean/sea-ice system becomes more important.
 - b. **Q2:** many new opportunities in the Arctic (e.g. shipping, natural resources, etc) will rely on skilful weather and environmental prediction for safe and responsible operation. Thus there will be opportunities for both national meteorological agencies and commercial environmental prediction services in this supporting domain, e.g. new services provided by ship-routing companies, new weather and hazard alert services, etc.
 - c. **Q3:** improved environmental prediction, on a variety of time scales, has the potential to improve environmental protection and stewardship in the Arctic region. The UK could and should be involved in improved prediction services.
 - d. **Q5:** There are currently insufficient data sets for the Arctic to allow the significant improvements in operational weather and environmental prediction models that are required. The Year of Polar Prediction presents an outstanding opportunity to obtain new high-quality data sets specifically tailored to improving pre-identified model deficiencies.

The above evidence is based on the Polar Prediction Project's Science and Implementations Plans, which are available here: <http://www.polarprediction.net/en/documents.html>

Yours faithfully

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