UNDERSTANDING THE CREATION AND USE OF POLAR WEATHER AND CLIMATE INFORMATION

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A primary goal of the World Meteorological Organization's Polar Prediction Project (PPP) is to advance numerical modeling, data acquisition and assimilation, ensemble forecast methods, verification, and the development of prediction products for the polar regions. However, as aptly expressed more than two decades ago, "it should be understood that forecasts have no intrinsic value. They acquire value through their ability to influence the decisions made by users of the forecasts" (Murphy 1993, p. 286). Improved modeling and more technology are sometimes assumed to be inherently "better," but if end users do not use, or cannot access, the information, they are not better in a societal sense. The work of the PPP's Societal and Economic Research and Applications (SERA) subcommittee is focused on understanding how weather and climate information and forecasts are accessed, understood, and utilized in, for, and to learn about the polar regions. This work has the potential to enable weather and climate information providers and users to obtain greater value from advances in polar prediction that result from the Polar Prediction Project.

The aim of the second PPP-SERA meeting was to identify some of the foundational socioeconomic questions, gaps, and research needs for improving the interface between weather and climate data production, forecast services and modeling, and addressing diverse end-user needs. The meeting was held in

SECOND POLAR PREDICTION PROJECT (PPP) SOCIETAL AND ECONOMIC RESEARCH AND APPLICATIONS (SERA) SUBCOMMITTEE MEETING

What: Eight participants from Europe, Oceania, and North America gathered for the second meeting of the Societal and Economic Research and Applications (SERA) subcommittee, part of the World Meteorological Organization's World Weather Research Program (WWRP) Polar Prediction Project (PPP).
When: 18–22 April 2016
Where: Gateway Antarctica, University of Canterbury, Christchurch, New Zealand

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Christchurch, New Zealand, one of the world's primary gateways to Antarctica, so naturally Southern Hemisphere interests were highlighted. This included visits to key Antarctic-focused locations around Christchurch, including the Antarctic exhibition at the Canterbury Museum, which holds many artifacts from the early twentieth-century exploration era; the Antarctic Heritage Trust and International Antarctic Centre; the Antarctic campus, which is home to four different National Antarctic programs; and Lyttelton, the historic port for many early Antarctic expedition.

An important component of the meeting was a series of discussions with representatives of five key Antarctic stakeholder groups, which—together with the site visits—provided valuable context and ground truthing of the key conclusions developed during the meeting. The informal discussions involved nine stakeholders and experts with a variety of connections to the Antarctic, including users of weather data (i.e., tourism and fishing operators, Antarctic logistics providers and planners, deep field researchers, indigenous scholars) and producers/interpreters of weather data (i.e., researchers and meteorological forecasters). The focus of the exchanges was on sources of weather and climate (including sea ice) information, how forecast information is communicated, and how it is used both by weather/ice service providers on the one hand and by those who must consider diverse weather and ice information sources at various temporal and spatial scales to make decisions in dynamic, remote, and challenging conditions.

The meeting generated a number of important insights, including four key concepts that warrant further exploration. First was the recognition that almost all providers of weather and climate information for the polar regions are also users of the same information. The dualistic nature of providers and end users results in a value chain or network that includes (or excludes) numerous people that all provide and use similar information in different ways and for diverse purposes. For example, information initiatives for understanding sea ice dynamics occur both bottom up by communities and other sectors, as well as top down by satellite-based information services. Similarly, operational forecasters are users of postprocessed numerical model output, which in turn is provided in some further processed format to other users, whose needs may or may not be well known or even formulated. Thus, the value chain of data producers and data users is inherently complex and nonlinear.

Second, and related, there has been an important, and not fully appreciated, evolution of the information age whereby the nation states (and, by implication, national weather and hydrometeorological services) are no longer the only holders of key geophysical information. Rather, information is often provided by nongovernmental organizations, or even groups of individuals, and shared to varying degrees among the public who in turn create their own information. The forecasting and data systems need to adapt to this new era and new modes of engaging with environmental information.

Third, the needs and requirements of different marine-based users for climate services in the polar regions are currently ill understood. Large public and private sector investments are currently made in the development of climate services in the polar regions to improve access to, and quality of, climate-relevant information to actors and sectors operating in remote, dynamic, and resource-rich polar environments. However, it remains largely unclear how different types of Arctic marine end users interact with climate services, including their different interests, abilities, routines, and decision-making contexts, as well as how the saliency, credibility, and legitimacy of climate services can be enhanced. This information gap has led to a culture of blind investments into the development of newer or higher-resolution weather and climate data development that, while offered with the best of intentions, is often, and perhaps unknowingly, disconnected from actual end-user needs. Discussions with diverse end users also identified a clear call for new technology and information services development to be more often driven by societal needs, instead of narrowly focused on what may be scientifically possible or interesting.

Fourth, it became apparent during the meeting that difficulties in communicating and accessing weather and climate information is related to technological infrastructures in polar regions that lag far behind many areas at lower latitudes, such as basic Internet accessibility or bandwidth. The problem is regionally acute in the Arctic, but is in general more problematic in the Antarctic. Shipboard Internet bandwidth in the Southern Ocean may be limited to a few megabits per day, and land-based field research camps often have the same access to forecast information as 50 years ago—for example, shortwave radio communications with larger base camps. In other words, for climate services to become more salient they will have to be tailored more precisely to decision contexts of different users, not only in terms of content, but also in terms of format.

The discussions between the PPP-SERA committee members, and with the stakeholders, greatly

contributed to the primary purpose of the meeting, which was to advance and begin implementing the PPP-SERA Action Plan, including defining contributions to the Year of Polar Prediction (YOPP). This being the second PPP-SERA subcommittee meeting, considerable time was spent providing updates on relevant and related projects, WMO activities, events, and opportunities, as well as sharing current and planned research activities related to PPP-SERA interests.

The group also set aside a relatively large amount of time to work on a draft outline and initial text for the PPP-SERA scoping document, a strategic document for communicating the "big picture," including challenges, opportunities, and needs with respect to weather data, services, and stakeholders in the polar regions, and for defining a "research response plan" to address gaps and pursue future research directions identified by the PPP-SERA subcommittee (and those stakeholders consulted). The scoping document will include a review of the current state of knowledge concerning the weather-sensitive actors in the polar regions and their (data/research) requirements, review of the available data sources and an inventory of data providers, discussion on the current weather and data challenges for stakeholders, and a tiered SERA research agenda addressing, among other things, long-term data gaps and needs as well as including shorter-term proposals, especially those that leverage ongoing or planned projects.

The meeting concluded with commitments to finalize the scoping document prior to the 2017 PPP-YOPP launch and continued work on the action plan.

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