

In Whose Service?

Meteorological and Climate Research for Antarctic Environmental Predictions

Daniela Liggett (University of Canterbury, Christchurch, New Zealand;
daniela.liggett@canterbury.ac.nz)

The WMO Polar Prediction Project's (PPP) Societal and Economic Research and Applications (SERA) Task Team concerns itself with the social-science aspects of PPP. PPP-SERA, which includes social scientists as well as experienced forecasters, was formed to provide advice on how to ensure that scientific advances in weather, water, ice and climate (WWIC) predictions yield benefits for society. One of PPP-SERA's major efforts during the Consolidation Phase of PPP will be the organisation of a series of regional weather and society workshops. These workshops aim at stimulating dialogue between environmental forecasters, researchers and end-users, understanding the role and relevance of WWIC services in decision-making by diverse end-user groups operating in the Polar Regions; and engaging users and providers regarding on how best to tailor and co-produce WWIC services.

PPP-SERA carried out a focus-group discussion during the 14th Workshop on Antarctic Meteorology and Climate (WAMC), 25-27 June 2019, in Charleston, South Carolina. This focus-group discussion aimed at beta-testing the envisioned series of PPP-SERA Weather and Society Workshops to be held in 2020. After briefly introducing the work of the PPP-SERA task team to the participants of the focus-group discussion, a world-café approach was employed to facilitate targeted smaller-group conversations in four different round tables.

The round tables focussed on the following questions:

- **Table 1:** What are the biggest inadequacies of WWIC services for the Antarctic community?
- **Table 2:** What can enhance the transition of PPP outcomes into better WWIC user experiences?
- **Table 3:** What Antarctic WWIC information is important in your work, and why?
- **Table 4:** What will be the most meaningful contributions from the PPP for individual WWIC user groups and society more largely?

32 individuals, most of them researchers and meteorologists/forecasters but also including one US Air Force aviator and a group of participants from the Naval Information for Warfare Center (NIWC) in Charleston, participated in the focus-group discussion. One hour was set aside for it, which meant that the goals and process of the focus-group work were introduced relatively briefly at the start, followed by roundtable work of ten minutes per table per group, after which the groups rotated to the next table to ensure that each of the participants was able to contribute input to each of the questions to be addressed. Groups added to a running catalogue of thoughts and responses to each of the questions that were recorded on flip charts (see Figure 1). At the very end, the groups presented the overall results of the last question they addressed. The responses to each of the questions were then hung up in the meeting room for participants to add any thoughts that might come up for the remainder of the WAMC.



Figure 1: Group work during the focus-group discussions at the WAMC.

In the following, the results obtained during the focus-group discussions are being discussed by question below.

Question 1: What are the biggest inadequacies of WWIC services for the Antarctic community?

Here, the participants agreed that the biggest inadequacies of Antarctic WWIC services largely fall into two categories:

- (a) Causal elements or enablers, including *communications and observation technologies and capacities* (e.g. bandwidth; cost; archival capabilities; technological robustness in terms of power, durability and transportability of technology; the age and conditions of equipment; satellite availability; and logistical infrastructure), *the quality and character of observations* (e.g. Observation density – surface, upper air), *administration and management* (e.g. data and knowledge sharing arrangements and data management), and *reputation and recognition of these services* (e.g. focus/attention, or lack thereof, from the global community, the perceived low importance of services generally when compared to the Arctic; and narrow focus by different organizations or countries).
- (b) Underdeveloped or insufficient services, including with respect to sea-ice forecasts, long-term forecasts, space weather and geomagnetic forecasts, long-term climate variability, near-real-time availability of data and services

Question 2: What can enhance the transition of PPP outcomes into better WWIC user experiences?

Preparatory research to identify users and user needs was seen as very important, not just in the transition to better services but also in the production of outcomes, was considered to be paramount. Similarly, communication with users should be carefully planned and thought-through. It should be an interactive and bi-directional process based on a well-defined communications plan. Questions such as how to sustain interest after the PPP has formally ended were also raised. It was suggested that PPP outcomes could be better advertised and that a WMO-level PPP representative should be appointed to advocate for the use of the PPP outcomes and to act as a point of contact. Finally, meta-services were advertised as being essential in ensuring a better connection between users and providers, and international collaboration efforts should be at a broader (continental) scale and involve a larger community of researchers and data users.

Question 3: What Antarctic WWIC information is important in your work, and why?

The question prompted a wish list to be drawn up that covered all imaginable WWIC information, including surface observations (visibility, pressure, precipitation, wind, sea ice concentration, sea ice surface temperature, sea ice stability, air temperature, surface fluxes), upper-air observations, oceanographic observations and satellite observations, UAV observations, glaciological data (ice analysis, snow profiles, sea ice data, ice-mass balance data), and air chemistry observations. These datasets should include metadata, historical information, model re-analysis, forecasts (manual and model with uncertainty information and different scenarios) and re-forecasts based on models. Access to data and effective data curation and management were considered as important.

This information was considered important for a wide range of user requirements and purposes, including for research for a range of disciplines (including biology, glaciology) and to understand Antarctic environmental processes and interactions, for forecasting and climate monitoring as well as to initiate models and feed the data into machine learning/AI algorithms, for education and training purposes, to ensure the safety of operations (from both a human-safety as well as environmental-safety perspective; to inform go/no-go decisions and operational decision-making both for National Antarctic Programs as well as for recreational visits). Finally, collecting this information was seen as being an important global responsibility, especially in an age of climate change, as well as an (Antarctic) Treaty obligation.

Question 4: What will be the most meaningful contributions from the PPP for individual WWIC user groups and society more largely?

Improved forecasting with better data sets and better information about sea-ice cover and extreme weather events were seen as very meaningful contributions by PPP that would allow a better understanding of climate change in the polar regions. PPP was also thought to contribute to a shared understanding of weather processes, the development of cross-agency communication and datasets that would be freely and easily available. In terms of the latter, distribution of these datasets was thought to become more innovative, with the use of mobile apps and social media services such as Facebook. PPP should stimulate further research and more opportunities for scientists to become involved in Antarctic meteorological and atmospheric research, at the same time making future work in these fields more cost-effective. PPP could enable links between providers and users, such as tourists, with data transfer in both directions, becoming established. Overall, PPP was seen as a valuable learning experience in terms of international polar program coordination and execution.

We thank all the WAMC organisers for giving us time to run this session and the focus-group participants for their enthusiastic contributions.