Update on Canada’s Engagement in the Antarctic

**Update on Canada’s Engagement in the Antarctic**

**Information Paper submitted by Canada**

Summary

Canada has a long history of Antarctic research and engagement. On October 22, 2021, Canada submitted its application for Consultative Party status in the Antarctic Treaty System, highlighting its credentials. Since then, Canada has bolstered its application by becoming a full member of the Council of Managers of National Antarctic Programs (COMNAP) and advancing several important programmatic considerations, including potential knowledge mobilization and youth engagement opportunities; planning new Antarctic research activities led by Canadian researchers; and identifying potential international partners.

Canada’s Engagement in the Antarctic

For over 100 years, Canada has been involved in scientific research in the Antarctic. Canadian researchers have authored approximately 1500 science journals on Antarctic and Southern Ocean science. Additionally, domestic and international communities continue to benefit from Canadian experience, information, and technologies, including data and derived data products, to advance research, operational programs, environmental monitoring and intelligence, critical services and emergency response serving both polar regions.

Since ATCM-44, Canada has pursued its involvement in different areas of the Antarctic Treaty System. Canada was approved as a full member of COMNAP on July 27, 2022, after having been an observer since 2006. Canada has joined some COMNAP Expert Groups and anticipates playing a role in promoting and sharing our expertise of polar research infrastructure, technology, and practices. Canada is also an observer to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), attended the annual meeting in Hobart, and will participate to the special meeting on marine protected areas in June 2023. Conscious of the importance of sustainable tourism, Canada has also participated to the Antarctic Tourism Workshop that was held in March 2023.

Canada is committed to the advancement of scientific research in the Antarctic and is developing a Canadian Antarctic Research Program, including Space Science and Technology, to further support and expand ongoing Antarctic research undertaken by Canadian researchers. In November-December 2022, Canada hosted a Canadian Antarctic Research Program workshop at the Canadian High Arctic Research Station in Cambridge Bay, Nunavut. The workshop involved Canadian Antarctic scientists and researchers from academia and the Government of Canada, Canadian government officials, and representatives from the Scientific Committee on Arctic Research (SCAR) and COMNAP. Below we provide a summary of Canada’s current Antarctic research activities followed by Canada’s plan to advance a Canadian Antarctic Research Program. In addition, Canada’s Antarctic engagements are supported by a senior-level interdepartmental International Polar Committee.

Canadian Antarctic Research

Canada’s research contributions span the three Science Groups of SCAR, as described in *Canada and the Antarctic Treaty*, the application for Consultative Party status in the Antarctic Treaty System that Canada deposited in October of 2021. Some examples include:

**Canada’s research on ground ice (permafrost)** in the Antarctic and its role in shaping landscapes have contributed to the understanding of the distribution and origin of permafrost in Antarctica.

**Canada’s RADARSAT I and II:** Earth observation satellites supported mapping Antarctic ice and its surface motion, including ice streams, while Canada’s RADARSAT Constellation Mission (RCM) continues to provide Earth Observation coverage for sea ice and glacier monitoring. Canada is also presenting an information paper entitled *Advancing Canadian and International Antarctic Research through Space Science and Technology* under Agenda item 15.

**Monitoring and modelling ozone depletion from Canadian space assets in the Antarctic**: Canada’s atmospheric space missions are instrumental in informing evidence-based decision-making and contributing to global assessment reports.

**Antarctica in the global climate system:** Canada’s seasonal predictions of Antarctic sea ice are world-leading and Canada is co-leading a SCAR climate model intercomparison initiative to understand the profound impacts of Antarctic ice sheet melting on the Southern Ocean and Southern Hemisphere climate.

Several researchers based at Canadian universities were active in Antarctica in the last field season (2022/23), including the following:

* Four researchers joined a German cruise for biological sampling in the Atlantic sector of the Southern Ocean;
* Four researchers participated in investigations of perennially frozen Lake Untersee with researchers from several nations;
* One researcher undertook geomorphological field work to discern glacial retreat on Horseshoe Island with Turkey;
* Two researchers were involved in biological field work on microbial ecosystems on Livingstone Island with Spain; and,
* One researcher participated in climate variability investigations on a traverse to Dome C with Italy and France.

Looking forward to the 2023/24 field season, Canadian researchers will join the POLENET team in West Antarctica to promote seismological and geodetic network operations with the United States, participate in glaciological investigations in East Antarctica with Australia, and continue work in Lake Untersee.

Canadian Antarctic Research Program Framework

Canada’s Antarctic Research Program Framework is focusing on high level themes/scientific areas of focus. Canada has extensive polar research experience and expertise which can inform on Antarctic issues, such as ice sheet stability and sea-level rise, and circumpolar issues, such as high-latitude landscape evolution, sea-ice dynamics, and space weather.

Four high-level themes and sub-themes, as applicable, are described below:

1. **State and fate of the Antarctic Ice Sheet and global sea-level rise**

*Ice-sheet/ocean interactions*: Parts of the Antarctic ice sheet may be subject to a marine ice sheet instability. Understanding the processes acting at the ice/ocean interface, and upstream, contribute to robust projections of global sea-level rise.

*Ice-sheet/solid-Earth interactions*: Ice sheet evolution depends on the nature and response of the underlying solid Earth. Geological and geophysical investigations are required to understand conditions beneath the ice sheet, to contribute to robust projections of global sea-level rise.

1. **Antarctica in the global climate system**

*Atmosphere:* Atmospheric composition and processes over Antarctica and the Southern Ocean, such as feedbacks in atmospheric chemistry (e.g., ozone), aerosols, and cloud formation, and evolution of the Southern Annular Mode, affect the global climate system.

*Oceans and ecosystems*: The Southern Ocean is a key sink for atmospheric carbon and is a key player in the global climate system, while Southern Ocean biology is strongly affected by climate change.

*Landscapes and ecosystems*: The Antarctic landscape, and the ecosystems it hosts, are experiencing rapid change due to climate change, similar to Arctic Canada. The extreme environment of Antarctica gives rise to organisms adapted to these environments (extremophiles) and give insights to the potential for life on other planets (exobiology).

1. **Antarctica as a platform for observing space weather and the universe**

Space weather affects airplane and satellite communications and electrical transmission lines in high-latitude regions. Antarctic observations and modelling contribute to improved monitoring and understanding of this global phenomenon. Antarctica, owing to its southern polar location, and dry atmosphere, hosts unique astronomical and astrophysical investigations.

1. **Cross-cutting theme:  Anthropogenic effects on the Antarctic environment and mitigation by conservation, cold-regions technology, and green infrastructure solutions**

Local and long-range anthropogenic influences on the environment, such as pollution, micro-plastics, and climate change, affect Antarctic and Southern Ocean biology, including fisheries. Conservation efforts, combined with cold-regions technology and green infrastructure solutions, have the potential to mitigate these influences.

Canadian Antarctic researchers affiliated with each high-level theme (and sub-theme where appropriate) were identified. Discussions of the activities of SCAR, the Committee on Environmental Protection (CEP), and the COMNAP took place during and after the workshop to consider the priorities and foci of these different elements of the Antarctic Treaty System.

***Ongoing Program Development***

Canada is committed to increasing funding dedicated to Antarctic research scholarships and awards through a competitive process in future years. For example, Canada is supporting students to attend a 2023 SCAR training school on glacial isostatic adjustment, training a new generation of circumpolar scientists which is a core element of the Canada’s Antarctic Research Program.

In December 2022, Canada provided support to the Students on Ice Foundation for a youth delegation to the Antarctic. A federal government representative joined as a resource for the youth to discuss the current and potential roles of Canada in the Antarctic. An important component of Canada’s involvement in the Antarctic is and will continue to be to foster and encourage activities and events that promote greater awareness of, and opportunities for knowledge sharing on polar regions.

***Next Steps***

Canada recognizes the need to increase scientific collaboration to address shared challenges in the Antarctic and will continue to increase its engagement with international partners and stakeholders.

With the strong linkage between North and South Polar regions, Canadian researchers have the necessary knowledge and tools to continue to make substantial contributions to polar science in both the Arctic and Antarctic. Canada will share the Canadian High Arctic Research Station with partners in its continued development of Antarctic partnerships and collaborations. Indigenous rights, values, and knowledge of cold-climate environments, Antarctic gateway nations, and Arctic-Antarctic exchanges are other elements that will be considered throughout Canada’s engagement in the Antarctic.

Building on its strength as an Arctic nation, the advancement of the Canadian Antarctic Research Program will provide strategic direction and new funding for collaborativeresearch activities of Canadian university researchers with international partners and complement the Antarctic research activities and technological developments of the Government of Canada.