First Session of the Pan-Arctic Regional Climate Outlook Forum (PARCOF-1)
Ottawa, Canada, May 2018

Consensus Statement for the Arctic Summer 2018 Season Outlook

Climate change in the Arctic is affecting the entire Earth system. Indigenous Peoples and communities, Northerners, industry and wildlife are experiencing significant and direct impacts. For example, temperature increases have led to significant reductions of sea ice, thawing permafrost and coastal erosion. To meet the Arctic adaptation and decision-making needs, substantial progress has been made towards the establishment of an Arctic Regional Climate Centre Network (ArcRCC-Network). ArcRCC-Network is based on the World Meteorological Organization (WMO) RCC concept with active contributions from all the Arctic Council member countries. The Pan-Arctic Regional Climate Outlook Forum (PARCOF) is a flagship activity of the ArcRCC-Network, following the well-known Regional Climate Outlook Forum (RCOF) concept supported by WMO and its partners around the world.

The inaugural PARCOF meeting was held in Ottawa, Canada May 15–16, 2018 with representatives and scientists from most of the Arctic Council Member States. Invited participants representing several Arctic Indigenous groups, Permanent Participants of the Arctic Council and shipping concerns also attended to provide their perspectives on Arctic climate information needs and to help the ArcRCC-Network refine product delivery during the demonstration phase of the network. This consensus statement for the 2018 summer season was adopted by the participants at the end of the PARCOF meeting.

Summary

For this outlook, strong warm oceanic temperatures, predominant atmospheric circulation, and the distribution of sea ice are the main contributors of predictability over Arctic regions such as the Bering and Greenland seas and adjacent coastal areas.

Temperature: The November 2017 to April 2018 average surface temperature in the Arctic domain north of 65°N was the third highest since 1949. Surface temperatures over the same region are expected to continue to be above average for June, July and August (summer) 2018, with probabilities ranging between 40 and 70%.

Precipitation: Precipitation between October 2017 and Mach 2018 was slightly above average over the Arctic region. For the upcoming summer, Alaska, western Canada, the Canadian Arctic Archipelago, and the easternmost parts of Russia have a slight chance of above normal precipitation, while the Gulf of Bothnia has a slight chance of drier than normal conditions.

Sea ice: The Northern Hemisphere March 2018 maximum sea ice extent was the second lowest on record, driven by record low sea ice extent in the Bering Sea. The previous winter's record low sea ice extent, combined with observed and predicted above normal temperatures for the Arctic region, will contribute to below normal sea ice conditions for the majority of the Arctic.

Temperature

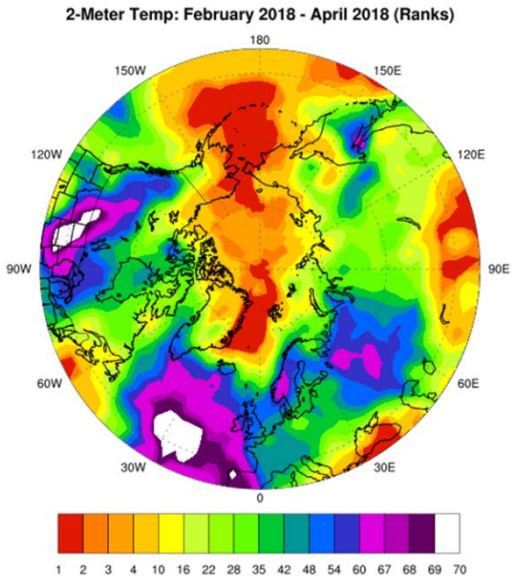

Figure 1: Rank of the 2-m surface temperate between February and April 2018 since 1949. Ranks are from 1 (high, warm) to 70 (low, cold). Credit: University of Alaska Fairbanks (B. Brettschneider).

Last season: The November 2017 to April 2018 average surface temperature in the Arctic domain north of 65°N was the third highest since 1949. Surface temperatures over the Arctic Ocean, Alaska, Greenland, eastern Eurasia and most of the Canadian Arctic were above average for the entire period; surface temperatures at the North Pole climbed above freezing point during February 2018. Surface temperatures over central Eurasia between November 2017 and January 2018, and over Scandinavia between February and April 2018 were below average.

Data from NCEP/NCAR reanalysis was used to rank the 2-m surface temperatures since 1949 (Figure 1). Most of the Bering Sea, the southern part of the Chukchi Sea, and the Greenland Sea off the coast of Greenland saw their warmest year since 1949 (rank 1, red areas). Cooler than normal temperatures were recorded in northwestern Canada, Scandinavia and Eastern Europe.

Outlook: Summer surface temperatures in the Arctic are expected to be above average over most of the Arctic region (Figure 2).

Most of the Pan-Arctic region has at least a 40% probability of having above normal temperatures during June, July and August (summer) 2018. The exceptions are the southern Beaufort Sea, Hudson Bay, Labrador Sea and Baffin Bay regions where below normal temperature is predicted with a probability in the range of 40–60%. The regions with the highest probability (greater than 60%) of above normal temperature are the Bering Sea region and its adjacent coastal areas, and the Greenland Sea region.

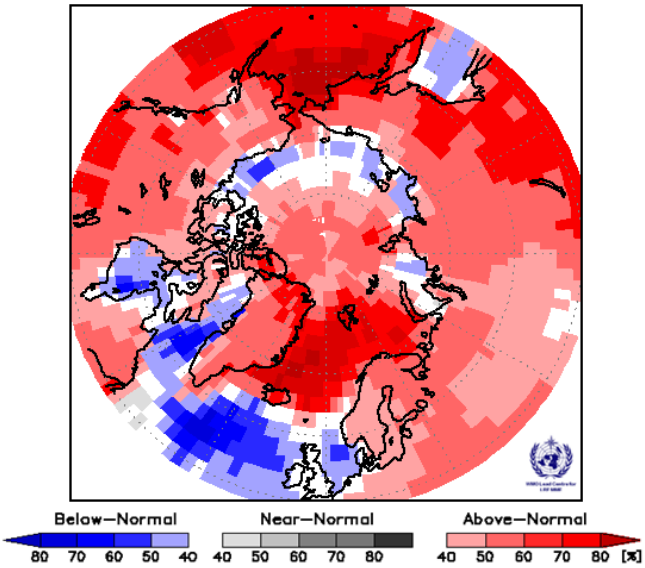

Figure 2: Multi-model ensemble probability forecast of three categories (below normal, near normal, above normal) for surface temperature for summer 2018 (www.wmolc.org).

Precipitation

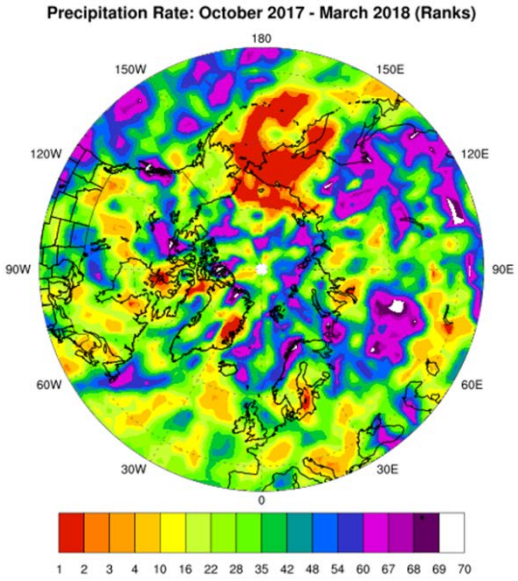

Figure 3: Rank of the precipitation between October 2017 and March 2018 since 1949. Ranks are from 1 (high, wet) to 70 (low, dry). Credit: University of Alaska Fairbanks (B. Brettschneider).

Last season: Precipitation between October 2017 and March 2018 was slightly above average over the Arctic region. Over that time period, eastern Eurasia, the southern part of the Chukchi Sea, the Bering Sea, and the central portion of Greenland's east coast received above average precipitation. Norway, the Barents Sea, and a portion of the Norwegian Sea experienced drier than average conditions.

Data from NCEP/NCAR reanalysis was used to rank the precipitation rate since 1949 (Figure 3). A significant area around eastern Eurasia, the southern part of the Chukchi Sea, and a large fraction of the Bering Sea saw their wettest winter since 1949 (rank 1, red areas).

Outlook: Summer precipitation (including rain and snow) in the Arctic will be spatially variable with higher uncertainty, with different regions expected to be drier, wetter or near normal compared to average (Figure 4).

There is a probability of at least 40% for above average precipitation over Alaska, western Canada and the easternmost parts of Russia. There is also a 40% chance for above normal precipitation over the Canadian Arctic Archipelago, and northern Scandinavia. Below normal precipitation is expected over the Gulf of Bothnia, with a probability of at least 40%. Otherwise, there is an equal chance for above, below or near normal precipitation over much of the Arctic (i.e. white area on Figure 4).

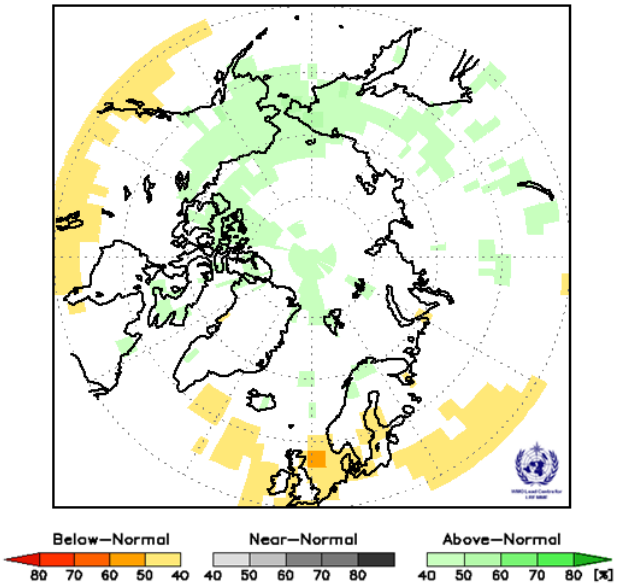

Figure 4: Multi-model ensemble probability forecast of three categories (below normal, near normal, above normal) for precipitation for summer 2018 (www.wmolc.org).

Sea Ice

Last season*:* The Northern Hemisphere 2018 winter maximum sea ice extent was the second lowest on record since 1979. The October 2017 to January 2018 sea ice extent was lowest on record. The latest freeze-up on record over the southern Chukchi Sea in fall 2017, and the early start of the melt-out in 2018 both contributed to the observed low sea ice extent in 2018 (Figure 5). By the end of winter 2018, growth of first-year ice observed at the coastal stations in the Eurasian Arctic and coastal Labrador was in general 20–50 cm lower than normal. However, thick first-year ice observed at the North Pole in April 2018 was still close to normal.

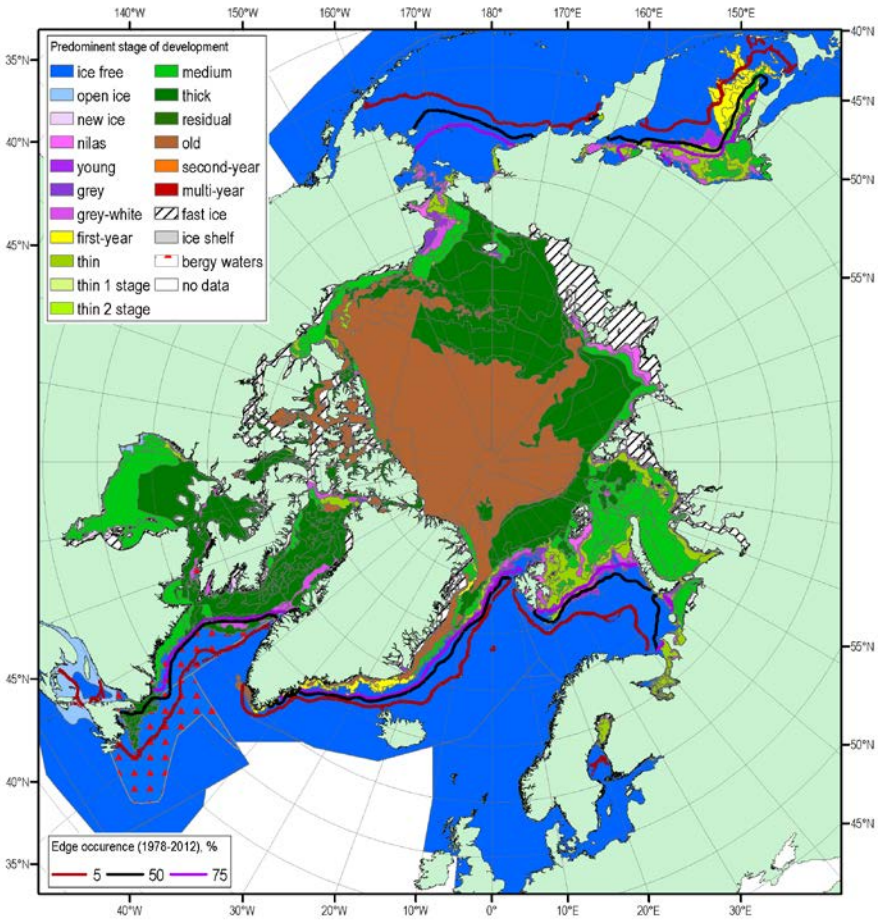

Figure 5: Blended Arctic ice chart (AARI, CIS, NIC) for 23—26 April 2018 and ice edge occurrences for 21—25 April for 1979—2012.

Outlook, 2018 September Sea Ice Extent and Area: The outlook is expressed as below normal, near normal and above normal ice extent/area based on the last 10 years with 3-agreement classifications: 'high agreement' where there is good agreement between model forecasts; 'medium agreement' where there is some agreement between models; and 'low agreement' where there is little agreement between models. Figure 6 is the probabilistic forecast for September 2018 from Environment and Climate Change Canada (ECCC) and a multi-model ensemble of two climate models.

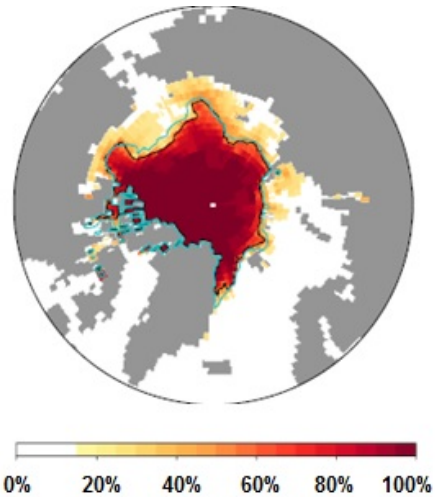

Figure 6: September 2018 probability of sea ice at concentrations greater than 15% from CanSIPS (ECCC). Ensemble mean ice extent (black); observed ice extent 2008—2017 (blue).

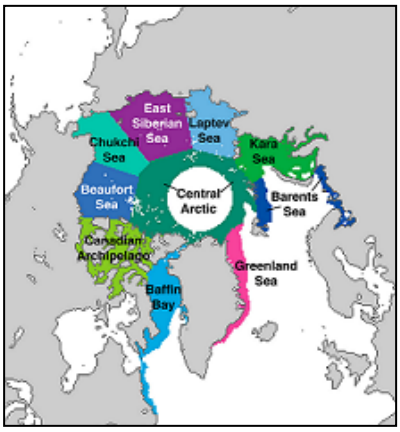

Figure 7: Arctic sea ice sub-regions.

Arctic sea ice sub regions' (Figure 7) outlook for September 2018:
Chukchi Sea: **below normal** [high agreement]
East Siberian Sea: **below normal to near normal** [high agreement]
Laptev Sea: **near normal** [high agreement]
Kara Sea: **below normal** [medium agreement]
Barents Sea: **below normal** [medium agreement]
Greenland Sea: **below normal** [high agreement]
Baffin Bay: **near normal** [high agreement]
Canadian Arctic Archipelago: **near normal** [medium agreement]
Beaufort Sea: **near normal** [high agreement]

Forecast discussion

Beaufort Sea: Significant amounts of multi-year ice moved from the western Canadian High Arctic into the eastern Beaufort Sea during the late winter. As a result, ice offshore of the western Canadian Arctic and northeast Alaska is likely to persist longer during the upcoming summer than in 2017, and could pose a risk to navigation through much of the summer.

Northwest Passage (NWP): Warmer temperatures over the Canadian Arctic Archipelago (CAA) were observed this winter and are expected to continue through the summer. This could lengthen the summer shipping season in general, however, the presence of multi-year ice throughout the CAA at present could be a hazard to summer navigation in the southern route of the Northwest Passage and will likely keep the northern route of the NWP closed.

The Northern Sea Route (NSR): Ice conditions along the NSR are expected to be below normal with the exception of near normal ice conditions in the Laptev Sea. Diminished areas of close and very close ice (ice massifs) along the NSR will facilitate summer navigation, however, ice at lower concentrations is more mobile and could still cause difficult ice conditions in some areas. Old ice presence is likely in the northern parts of the Laptev, Eastern-Siberian and Chukchi Seas.

Background and Contributors

This Arctic seasonal climate outlook was prepared at the first session of the Pan-Arctic Regional Climate Outlook Forum (PARCOF-1), as part of the launching of the demonstration phase of the Arctic Regional Climate Centre Network (ArcRCC-Network). Contents and graphics were prepared in partnership with the Russian, United States, Canadian, Norwegian, Danish, Finnish, Swedish, and Icelandic meteorological agencies and

contributions of the Expert Team on Sea Ice, an expert team of the Joint WMO/IOC Technical Commission on Oceanography and Marine Meteorology.

The sea ice consensus statement is based on results from the consensus forecast exercise that took place at the 5th Polar Prediction Workshop, [Montreal May 7–9, 2018], experimental forecasts from five WMO Global Producing Centers of Long-Range Forecasts (GPC-LRFs), and statistical forecasts from the Arctic and Antarctic Research Institute and the Canadian Ice Service. A multi-model ensemble for sea ice from the GPC-LRFs centres that will form the basis for future ArcRCC Outlooks and Consensus Statements is under development.

The temperature and precipitation forecasts are based on a multi-model ensemble approach using computer-generated climate predictions from a number of WMO designated GPC-LRFs. The multi-model ensemble approach is a methodology reputed as providing the most reliable objective forecasts on average. The factors that contribute to predictability at the seasonal time scale in the Arctic are: the ocean (e.g. sea ice and temperature anomalies), the atmospheric internal modes of variability (e.g.: Arctic Oscillation in winter), and interaction between the ocean and the atmosphere.

The ArcRCC is in demonstration phase to seek designation as a WMO RCC-Network, and products are in development and are experimental. For more information, please visit www.arctic-rcc.org.

Acronyms:

ArcRCC: Arctic Regional Climate Centre
AARI: Arctic and Antarctic Research Institute
CAA: Canadian Arctic Archipelago
CanSIPS: Canadian Seasonal to Interannual Predition System
CIS: Canadian Ice Service
ECCC: Environment and Climate Change Canada
GPC-LRF: Global Producing Centres Long-Range Forecasts
IOC: Intergovernmental Oceanographic Commission
NIC: National Ice Center (United States)
NCEP/NCAR: National Centers for Environmental Prediction/National Center for Atmospheric Research
NSR: Northern Sea Route
NWP: Northwest Passage
PARCOF: Pan-Arctic Regional Climate Outlook Forum
RCC: Regional Climate Centre
RCOF: Regional Climate Outlook Forum
WMO: World Meteorological Organization