5th Arctic Climate Forum (ACF-5)
Arctic Regional Climate Center – network (ArcRCC-N)

27-28 May, 2020

Videoconferences

Summary version May 27th

Helge Tangen, ArcRCC-N coordinator,
Norwegian Meteorological Institute

Vasily Smolyanitsky, ArcRCC – N Northern Eurasia node coordinator (host)
Arctic and Antarctic Research Institute (AARI)

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

WMO OMM
World Meteorological Organization
Organisation météorologique mondiale

ACF
Arctic Climate Forum

Key things on the forum

ACF is based on the Regional Climate Outlook Forum (RCOF) concept developed and supported by WMO in many regions around the world over the past two decades, as a key activity of WMO Regional Climate Centres (RCCs). WMO has established RCCs in many areas of the globe to fill geographical and service gaps in climate information, and to improve the collaboration and integration amongst National Meteorological and Hydrological Services (NMHS). The WMO, with active support from its Members in the Arctic region, has been making concerted efforts to implement an Arctic Regional Climate Centre Network (ArcRCC-N) to operationally provide climate scale (monthly and seasonal) circumpolar summary and outlook information for the key Arctic climate variables including temperature, precipitation and sea-ice for all of the Arctic. The ArcRCC-N includes 3 nodes (Nordic, North American, Northern Eurasia) supported by corresponding NMHS and has been in a demonstration phase since May, 2018

The **key objectives** of the current ACF-5 are to:

- ❑ **Develop** the **consensus statement** on the current status (winter 2019/2020 – spring 2020) and future outlook (summer 2020) of the Arctic climate on a seasonal scale;
- ❑ Raise awareness of end-users about **new climate products and services** for the Arctic, potential support to decision-making, and the current limitations;
- ❑ **Interact with end-users** and learn about the climate information they currently use for planning, and their needs for climate information.

5th Arctic Climate Forum (ACF-5) videoconference - format

- **Schedule**:
  - **May 27th 2020, Wednesday, Day 1, 1600-1740 UTC**, non-technical session, will present: key climate information from Winter/Spring 2019/20 and the Arctic Summer 2020 outlook for 8 regions in the Arctic (see ACF-5 draft as explanation); and the Consensus Statement (see ACF-5 draft as explanation) which provides an overall summary for the circumpolar Arctic;
  - **May 28th 2020, Thursday, Day 2, 1600-1810 UTC**, technical session, will provide greater detail on the Winter/Spring 2019/20 observations, and the modelled and consensus aspects of the temperature, precipitation and sea-ice information used to develop the ArcRCC products.
  - Following each session, the organizing committee will distribute summaries of key points
- **Recording** – sessions will be recorded and available later at **https://arctic-rcc.org/acf-spring-2020**
- **Connection and session rules (same for 2 days):**
  - 16:00 UTC: **https://bluejeans.com/431362831/9648?src=calendarLink**
  - BlueJeans video conferencing software is available for desktops and smartphones 5-15 and is installed automatically by clicking the above link (better install 5-15 minutes in advance)
  - 89 attendees registered – for stable and better performance, you are **very kindly asked to turn off your video** and **mute microphone** for most of the time of the sessions, unless you intend to speak – during the sessions only **moderators will be unmuted** by default
  - During the sessions use the BlueJeans **"CHAT function"** to **ask** the questions, **pass comments** to moderator, everyone or particular person or **rise your hand** for a question – all notes will be properly considered by the chair(s), moderator(s) or experts
- **Access to ArcRCC products and session ppts**
  - All ArcRCC information (including the ACFs) is available at **https://arctic-rcc.org/**
  - Fast access to ACF-5 information (ppts, pdf, docs) is organized at **http://wdc.aari.ru/acf5/**

ACF-5 Non-Technical Regional Briefing Agenda

Wednesday May 27, 2020, 16:00 – 17:40 UTC

To determine your local time go to: https://www.timeanddate.com/worldclock/timezone/utc

Intended Audience: Users interested in general climate conditions and forecasts for their region

TIME	ITEM	DETAILS
16:00 (10')	Welcome – Introduce the Arctic Climate Virtual Forum, – Agenda for next two days – Format, how to ask questions and make comments using the chat function. – Where to find the ArcRCC products and ppts	**Vasily Smolianitsky**, Arctic and Antarctic Research Institute (AARI), Russia
16:10 (10')	Background on the ArcRCC-Network (ppt, pdf)	**Helge Tangen**, ArcRCC Network Coordinator Norwegian Meteorological Institute (NMI)
16:20 (20')	ArcRCC Non-technical regional climate briefing: Temperature, precipitation and sea-ice conditions North America (Alaska, Canada), Europe and Eurasia and Central Arctic - Review of winter 2019/2020, spring 2020 and Outlook for Summer 2020 (ppt, pdf)	– **Rick Thoman** (Alaska), International Arctic Research Center (IARC), Alaska – **Gabrielle Gascon** (Canada), Environment and Climate Change Canada (ECCC) – **Halldór Björnsson** (Europe), Icelandic Meteorological Office (IMO) – **Valentina Khan** (Eurasia and Central Arctic), Hydrometcenter Moscow (HMC)
16:40 (15')	On-line discussion (with end-users): What impacts did your region face with changing climate conditions in winter 2019/20 and spring 2020?	**Rick Thoman** (moderator), IARC
16:55 (15')	On-line discussion (with end-users): Based on the summer 2020 outlook, what other potential risks were not highlighted that could affect your region?	**Bill Appleby** (moderator), ECCC
17:10 (10')	ArcRCC Consensus Statement for the Arctic: What it is and how it's created (ppt, pdf)	**Eivind Støylen**, NMI
17:20 (20')	Questions & Wrap-up	**Vasily Smolyanitsky**, AARI
17:40	End of the day	

ACF-5 Technical Regional Briefing Agenda

Thursday May 28, 2020, 16:00 – 18:10 UTC

To determine your local time go to: https://www.timeanddate.com/worldclock/timezone/utc

Intended Audience: Users interested in specifics of the climate observations and models

TIME	ITEM	DETAILS
16:00 (10’)	Welcome – Introduce the Arctic Climate Virtual Forum – Brief review of yesterday’s agenda – Format, how to ask questions and make comments – Where to find the ArcRCC products and presentations	**Vasily Smolianitsky,** AARI
16:10 (20’)	Arctic winter 19/20 and spring 2020 Seasonal Summary: – Temperature, precipitation, sea-ice , ocean, land hydrology – Review of observational and reanalysis data	**Vasily Smolyanitsky**, AARI **Gabrielle Gascon**, ECCC
16:30 (5’)	Using INTAROS project results for ArcRCC Northern Eurasia node: Access to seasonal summary data (ppt, pdf)	**Evgeny Vyazilov**, RIHMI-WDC, Obninsk
16:35 (15’)	On-line discussion (with end-users)	**Shanna Combley** (moderator) U.S. National Weather Service (NWS)
16:50 (20’)	Temperature and Precipitation – Introducing the multi-ensemble method – Validation of the outlook for winter 19/20 and spring 2020 – Review of model confidence for summer 2020 outlook	**Marko Markovic**, ECCC
17:10 (15’)	On-line discussion (with end-users)	**Valentina Khan** (moderator), HMC Moscow
17:25 (20’)	Sea-Ice Outlook for Summer 2020 – Introducing the models – Validation of outlook for winter 19/20 and spring 2020 – Review of model confidence for summer 2020 outlook	**Scott Weese**, ECCC
17:45 (15’)	On-line discussion (with end-users)	**Vasily Smolyanitsky** (moderator), AARI **Scott Weese** (moderator) ECCC
18:00 (5’)	Final thoughts & Wrap-up	Vasily Smolianitsky, AARI Helge Tangen, ArcRCC Network coordinator Anahit Hovsepyan, WMO
18:10	End of ACF-5	

Introducing the Arctic Regional Climate Centre Network (ArcRCC-N)

https://www.arctic-rcc.org/

Helge Tangen
Norwegian Meteorological Institute
ArcRCC Network Coordinator

Arctic Climate Forum-5, May 27-28, 2020

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

Weather · Climate · Water

Welcome to Arctic Climate Forum number 5 ACF-5

- A forum for Arctic Regional Climate Centre Network to meet stakeholders and users
- Usually: Every spring a face-to-face meeting, this spring converted to online meeting
- Every fall a virtual meeting - like this one

ACF
Arctic Climate Forum
Weather · Climate · Water

What's the difference?

Weather

- Conditions of the atmosphere over a short period of time
- Reported in terms of hours and days for a city, town, region

It answers these questions

- *What is the temperature right now?*
- *Will I need a coat this afternoon?*
- *Will it snow this weekend?*

Climate

- Average weather of a place over period of many years
- Tells us what's normal for an area.

It answers these questions

- *What is an average winter like in Ottawa?*
- *Was 2015 the warmest summer on record?*
- *Will Tromsø have above normal temperatures this summer?*

Climate is what you expect, weather is what you get

(sources: NOAA, NSIDC and WMO and websites)

Scale of Weather and Climate Information

Time Scale	Days	Weeks	Months (sub-seasonal)	Seasons (3 months)	Years	Decades	Centuries
Weather or Climate Information	Weather forecasting		Arctic Regional Climate Centre		Satellite and in-situ monitoring	Climate Change Models	
Geographic Scale	Local		← →			Global/Regional	
Sources of Information	National Meteorological Services		filling this gap		• National Meteorological Services • Arctic Report Card	• IPCC assessments • AC Working Group assessments	

ArcRCC products are filling the seasonal gap using

- State of the art modeling for **temperature, precipitation and sea-ice**
- Regional expertise at Meteorological organizations
- By providing operational products for decision-makers every
  - May for the Arctic summer season
  - October for the Arctic Winter season

The Arctic Regional Climate Centre

<table>
<tr><th colspan="2">NATIONAL</th><th colspan="2">REGIONAL</th><th>CIRCUMPOLAR</th></tr>
<tr><td>Countries</td><td>Meteorological Organizations</td><td colspan="2">Regional Climate Centres (RCCs)</td><td rowspan="9">Arctic
Regional Climate Centre</td></tr>
<tr><td>United States</td><td>NOAA</td><td rowspan="2">North American Node</td><td rowspan="2">Forecasting</td></tr>
<tr><td>Canada</td><td>ECCC</td></tr>
<tr><td>Denmark</td><td>DMI</td><td rowspan="5">Northern European / Greenland Node</td><td rowspan="5">Data Services</td></tr>
<tr><td>Iceland</td><td>IMO</td></tr>
<tr><td>Norway</td><td>NMI</td></tr>
<tr><td>Sweden</td><td>SMHI</td></tr>
<tr><td>Finland</td><td>FMI</td></tr>
<tr><td>Russia</td><td>AARI</td><td>Northern Eurasia Node</td><td>Monitoring</td></tr>
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Collaboration/Networking across Arctic regional nodes and Meteorological Organizations

ArcRCC Products
produced each May and October

1. Arctic Consensus Statement:

Text and graphics that summarize the temperature, precipitation and sea-ice climate trends for the past season and forecasts for the upcoming season. A collaborate effort by the network in reviewing:

- Trends in the historical monitoring data
- Forecasts from the models
- Using Met/Ice climate expertise, fill gaps in the data

https://arctic-rcc.org/consensus-statements

1. Regional Summaries

- The same information that is in the consensus statement but organized by Arctic region and added information about potential impacts to regional users.

How is this information different than?

The Arctic Council's Arctic Monitoring and Assessment Programme (AMAP)

- i.e. the Snow Water Ice and Permafrost Assessment (SWIPA) report discusses trends and future predictions, updated once every 5-6 years

National Snow and Ice Data Centre –Arctic Report Card

- Annual Summary of the Arctic climate over the past year

ArcRCC products are <u>ongoing</u> operational Arctic climate summary and forecast products that are updated every Winter and Summer

World Meteorological Organization

Weather · Climate · Water

Thank you!

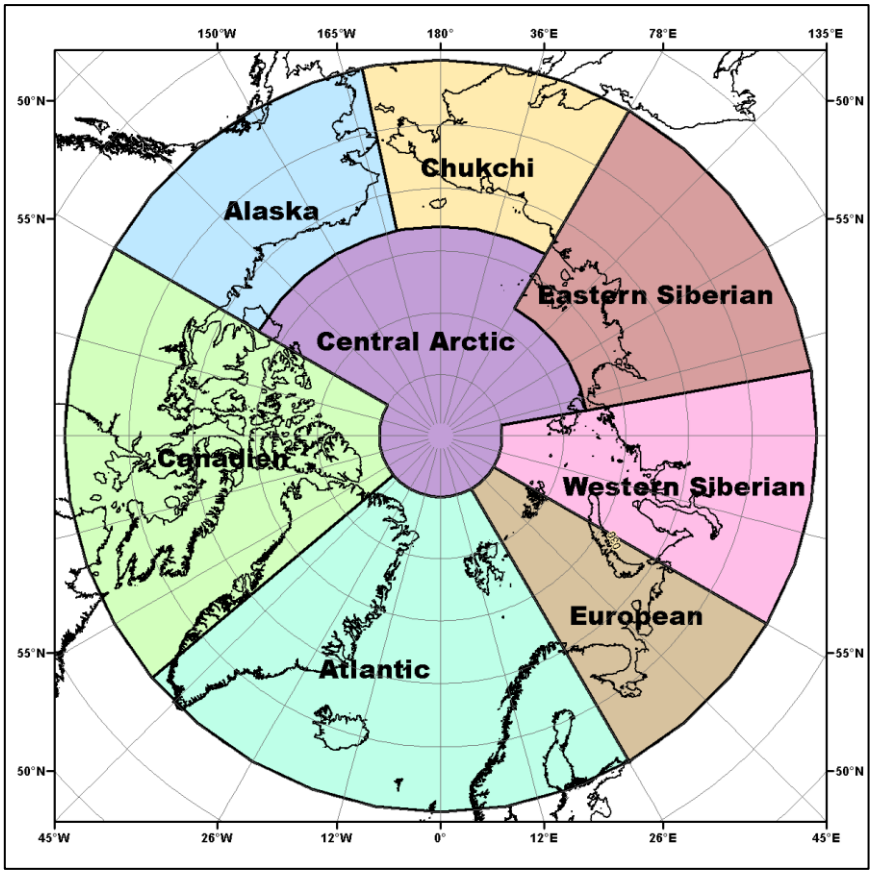
Arctic Climate Forum
May 2020

ACF
Arctic Climate Forum

Non-Technical Review: Summary of Winter 2020 and Outlook for Summer 2020

Arctic Regional Climate Center

Temperature and Precipitation Terrestrial Regions



North America Node

- **Alaska**: Includes the Yukon and the Northwest Territories
- **Canadian**: Central and Eastern Canada and Western Greenland

European Node

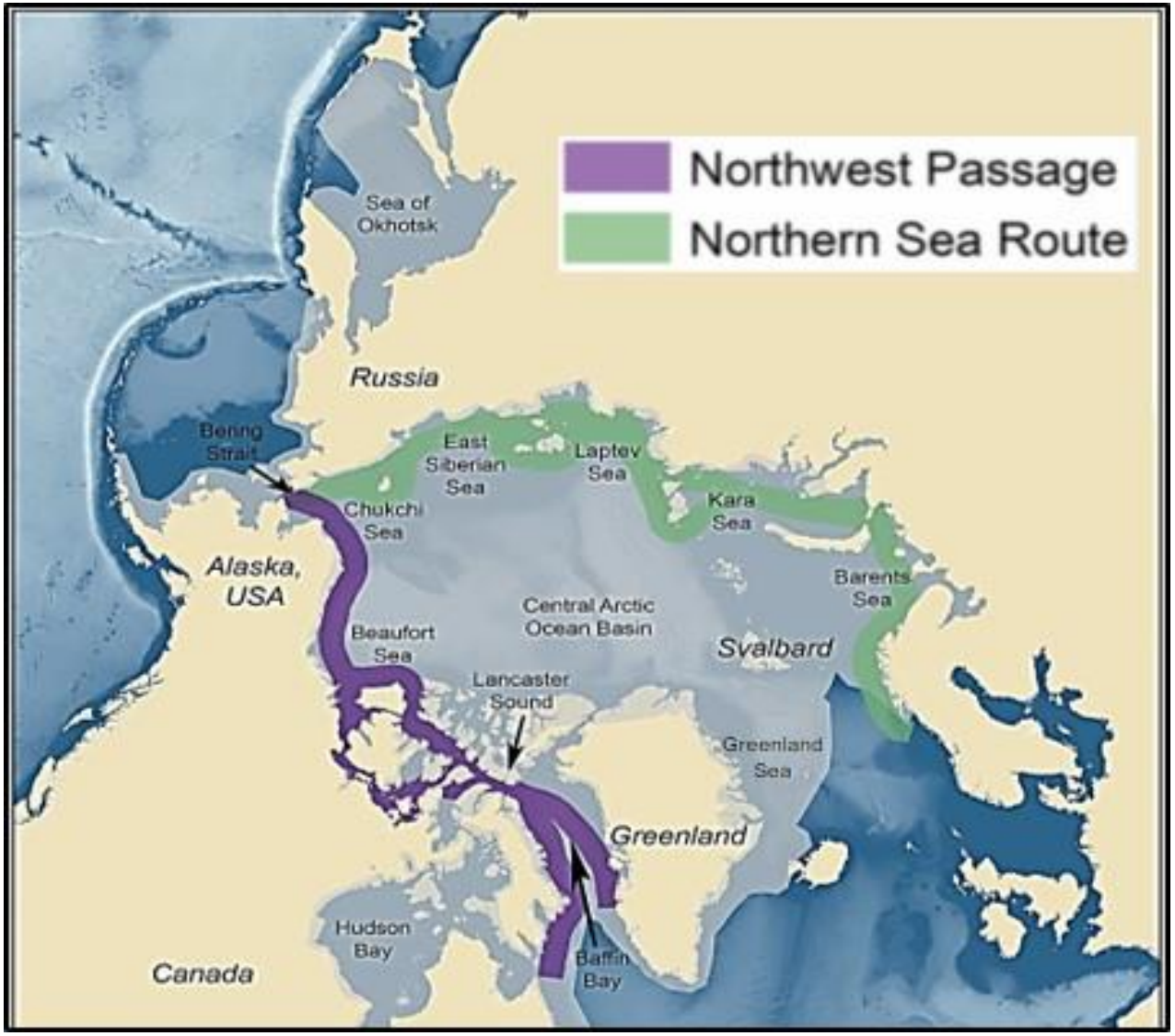
- **Atlantic**: Western Greenland, Iceland, Svalbard and Scandinavia
- **European**

Eurasian Node

- **Western Siberian**
- **Eastern Siberian**
- **Chukchi**

- **Central Arctic**

Sea-Ice Navigational Regions



Sea-Ice Regions. Map Source: Courtesy of the U.S. National Academy of Sciences.

How this summary was developed

1. Available observations +
2. State of the art modeling for temperature, precipitation and sea-ice +
3. Adjustments based on regional expertise at Arctic meteorological organizations =

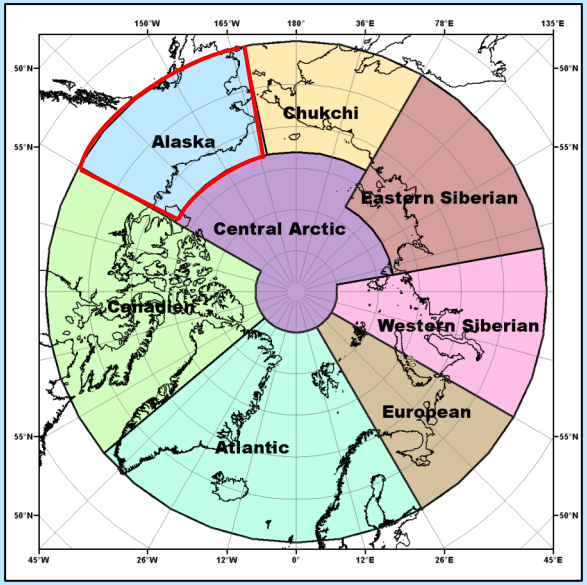
Information about potential impacts for regional users.

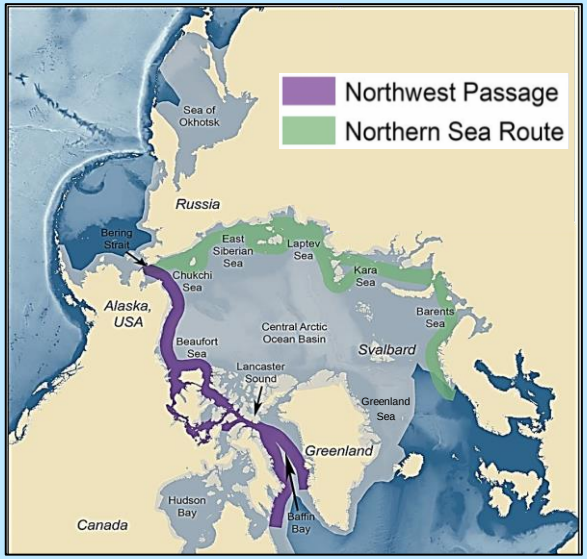
*As a result, the regional outlooks may not always match the model output

North American Node

Alaska

Includes the Yukon and the Northwest Territories





Seasonal Summary: Winter 2019 & Spring 2020

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	Near normal in Alaska, Yukon and the NWT	Warmest year was 2004 (+2.9˚C)	Coldest years were 1945 & 1955 (-1.3˚C)
Precipitation Normal 1961-1990	**Wetter** in Alaska, Yukon and the NWT	Wettest year was 1951 (+65 %)	Driest year was 1968 (-46 %)
Sea-Ice Since 1979	March maximum sea-ice extent: Normal for the Bering sea Chukchi and Beaufort seas were ice covered		

Outlook: June, July August (JJA) 2020

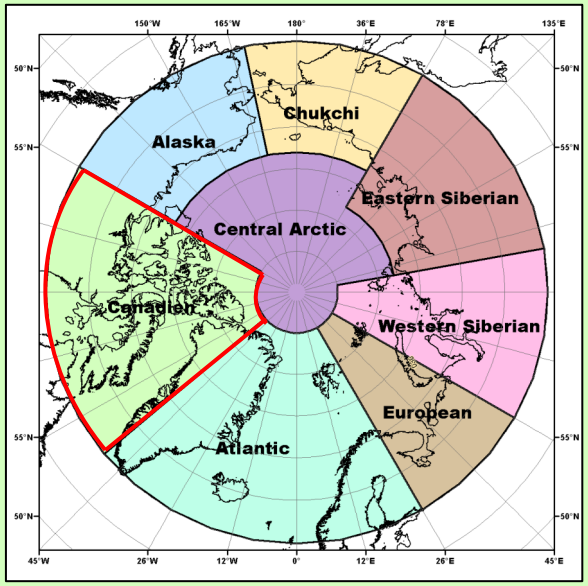
	Forecast			Multi Model Agreement		
				High	**Moderate**	**Low**
Temp*	Bering Sea, Northern Alaska		**Warmer**	✓		
	Western, coastal and continental Alaska, Yukon, Northwest Territories		**Warmer**		✓	
	Beaufort Sea		**No forecast**	No agreement		
Precip*	Chukchi and Beaufort seas		**No forecast**	No agreement		
	Northern Northwest Territories		**Drier**			✓
	Bering sea		**Wetter**			✓
	Yukon, Alaska		**Wetter**			✓
Sea-Ice	**Break-up**	Chukchi Sea	**Earlier**	✓		
		Western Beaufort Sea	**Earlier**	✓		
		Bering Sea	**Earlier**		✓	
	Min. Ice Extent Sept 2020	Chukchi Sea	**Below normal**	✓		
		Beaufort Sea	**Below normal**		✓	

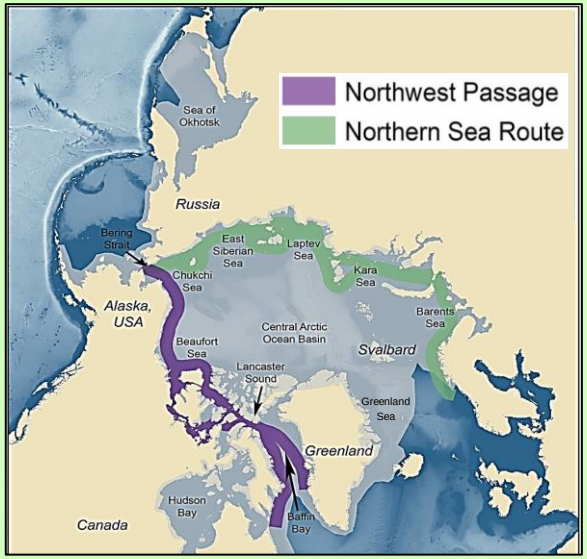
Alaska & Western Canada
Risks and Impacts

- Wildfires: Above normal temperatures may increase the threat of larger than typical wildfires.
- River Flooding: Above normal precipitation may increase the threat of river flooding in Alaska and the Yukon.
- Coastal Erosion and Flooding: Below normal sea ice extent in the Chukchi Sea may result in longer open water fetch and will greatly enhance erosion and the increase the risk of coastal flooding from late summer storms on unprotected west facing coasts of Alaska.
- Wildlife: Warmer summer temperatures increases the chances of negative impacts on fish, especially salmon that can not tolerate warm water once they enter fresh water rivers.
- Hunting: Early sea ice loss may result in an a shorter seasons for sea ice-based subsistence hunting activities.
- Shipping:
  - Early observations are already showing minimal sea-ice in the **Bering Sea** earlier than normal shipping activities are expected.
  - Early sea-ice break-up in the **Beaufort Sea** region may result in areas of old ice becoming become mobile earlier in the season increasing shipping hazards.

Canada

Includes central and eastern Canada and Western Greenland





Seasonal Summary: Winter 2019 & Spring 2020

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	Near to below normal	Warmest year was 2012 (+2.3˚C)	Coldest year was 1972(-1.6˚C)
Precipitation Normal 1961-1990	• Near normal in Nunavut's Qikiqtaaluk region • **Drier** in Nunavut's Kitikmeot and Kivalliq regions, Nunavik and Nunatsiavut	Wettest year was 2005 (+23.5 %)	Driest year was 1977 (-25 %)
Sea-Ice Since 1979	March maximum sea-ice extent: Below to near normal in the Gulf of St. Lawrence and Labrador sea. All other areas ice covered		

Outlook: June, July August (JJA) 2020

	Forecast			Multi Model Agreement		
				High	Moderate	Low
Temp	Western Greenland		Warmer	✓		
	Nunatsiavut, Nunavik, Nunavut				✓	
	Baffin Bay, Davis Strait, Hudson Strait, Labrador Sea				✓	
	Western Hudson Bay, Eastern Hudson Bay		Colder to Normal		✓	
Precip	Nunavut Qikiqtaaluk region, northern Hudson Bay, Foxe Basin, Western Greenland		Wetter			✓
	Northeast Nunavik and Nunatsiavut (Torngat Mountains region), Labrador		Drier			✓
	Nunavut Kitikmeot and Kivalliq regions, Baffin Bay, southern Hudson Bay, Labrador Sea		No Forecast	No Agreement		
Sea-Ice	Break-up	Baffin Bay, Davis Strait, Labrador Sea	Earlier	✓		
		Western Hudson Bay	Near normal		✓	
		Eastern Hudson Bay	Later		✓	
	Min Ice Extent Sept 2020	Canadian Arctic Archipelago	Below normal		✓	

Central and Eastern Canada, Western Greenland
Risks and Impacts

- Wildfires: Above-normal temperatures and drier than normal conditions forecasted for Labrador may lead to an increased threat of wildfires

- River flooding:
  - Wetter conditions forecasted may increase the threat of river flooding in Nunavut's Qikiqtaaluk region.
  - Below-normal snowfall throughout the winter and spring should reduce the risk of flooding this year in Labrador.

- Wildlife: Wetter conditions forecasted may lead to increased freezing rain in the early summer affecting wildlife foraging in Nunavut's Qikiqtaaluk region.

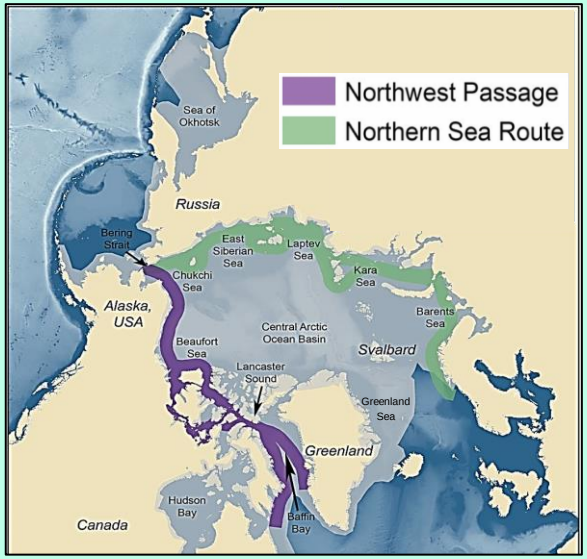
- Hunting: Early sea-ice loss may result in a shorter season for sea ice-based subsistence hunting activities.

Shipping

- **Northwest Passage**: light ice conditions may be experienced in the southern route of the Northwest Passage in August and in the northern route by early September. However, light ice conditions may allow old ice from the Canadian Arctic Archipelago to become mobile earlier in the season increasing navigation risks.
- **Hudson Bay:**
  - Faster than normal sea ice break-up is currently underway in Hudson Strait with significant areas of open water expanding in the northern portion of the strait.
  - Near normal break-up is expected for western Hudson Bay.
  - Later than normal break-up is expected for eastern Hudson Bay. Thicker ice coverage along with colder temperatures forecasted could lead to a more challenging navigation season in the eastern half of Hudson Bay.
- **Baffin Bay:** light ice conditions may be experienced in Baffin Bay and no specific hazards are anticipated. The presence of an ice bridge in Nares Strait well into the spring normally cuts off the inflow of old ice from the Arctic Ocean into northern Baffin Bay, limiting the import of old ice into the region.
- **Labrador Coast**: ice coverage along the Labrador coast has been normal throughout the winter and spring showing near normal ice extent but lower concentrations. Break-up in Lake Melville is expected to be normal.

Nordic Node

Atlantic



Seasonal Summary: Winter 2019 & Spring 2020

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	• **Warmer** in Scandinavia • All other regions normal	Warmest year was 2003 (+1.9˚C)	Coldest year was 1965 (-0.7˚C)
Precipitation Normal 1961-1990	• **Wetter** in Iceland and Norway • **Drier** eastern Greenland and Svalbard • All other regions normal	Wettest year was 1964 (+20.5%)	Driest year was 1968 (-24.9%)
Sea-Ice Since 1979	March maximum sea-ice extent: Greenland sea - Below to near normal		

Outlook: June, July August (JJA) 2020

	Forecast			Multi Model Agreement		
				High	**Moderate**	**Low**
Temp	Southern Greenland		**Warmer**	✓		
	Svalbard, northern and continental Greenland and Baltic sea				✓	
	Iceland, Scandinavia					✓
	North Atlantic		**Colder**	✓		
	Greenland and Norwegian seas		No Forecast	No Agreement		
Precip	North Atlantic, North sea and southern Baltic sea		**Drier**			✓
	Norwegian and southern Baltic seas, continental Greenland, Iceland, and Scandinavia		No Forecast	No Agreement		
Sea-Ice	**Break-up**	Greenland Sea	**Later**		✓	
	Min Ice Extent Sept 2020		**Above Normal**	✓		

Atlantic
Risks and Impacts

- Wildfires:
  - Warmer temperatures and drier than normal conditions forecasted for Scandinavia indicates a potential for Wildfires, although the forecast agreement is low.
  - Trends in land cover in Iceland resulting from long term warming are increasing the risk of wildfires associated with droughts, with one large event so far this spring.

- Flooding:
  - Late warming and large amounts of snow accumulation indicates a high risk of floods for inland Norway.
  - A combination of above normal snow accumulation and a late melt season in the highlands of northern Iceland may result in a greater risk for flooding in the coming weeks.

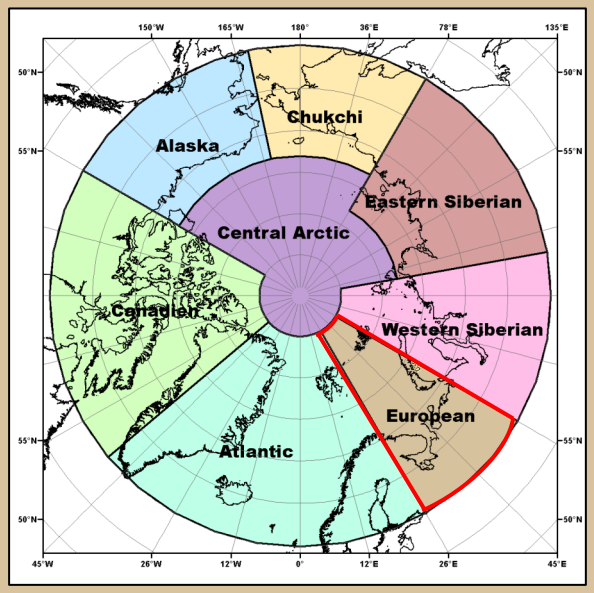
- Permafrost: The continued trend of warmer temperatures in Svalbard leads to the thawing of the permafrost, resulting in a greater risk of landslides which may impact stability of some structures. In general this risk is also increasing in Iceland and Scandinavia due to recent warming trends

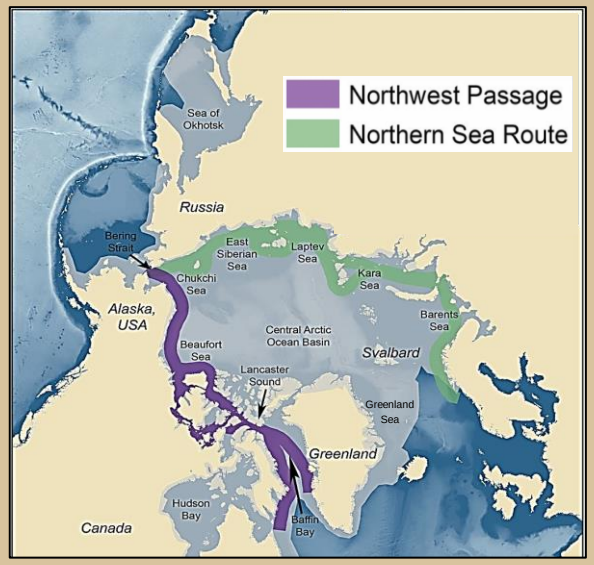
Atlantic
RISKS AND IMPACTS CONTINUED…

- Wildlife / Hunting: Prolonged thick snow cover in Northern Scandinavia / Lapland may impact Reindeer not reaching the lichen that is under the snow cover.

- Shipping:
  - Svalbard: Warmer conditions and generally near normal sea-ice around the Svalbard region may indicate normal shipping activities in this region.
  - Iceland: Sea-ice concentrations are unusually low in the Denmark Strait even though the marginal ice zone (MIZ) extent is near normal. The extent of the MIZ extent may pose a risk to shipping.

European



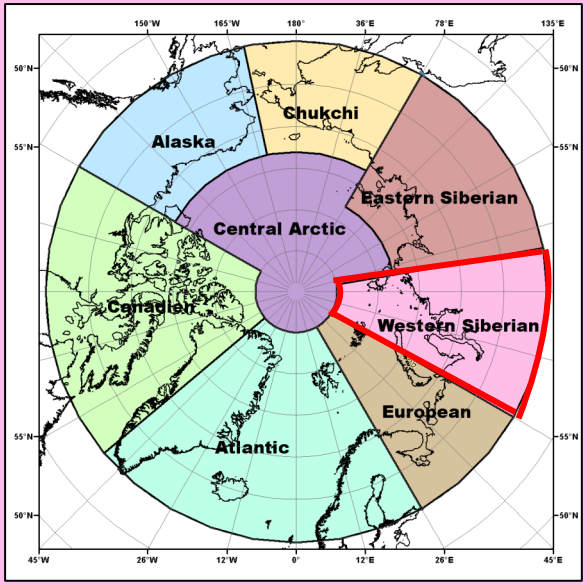


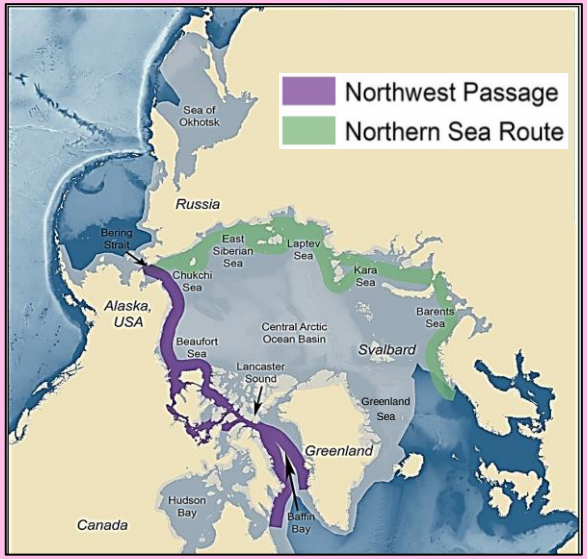
Seasonal Summary: Winter 2019 & Spring 2020			
Observations above (+) and below (-) normal			
Temperature Normal 1961-1990	**Warmer** for the entire region	Warmest year was 2013 (+2.8˚C)	Coldest year was 1969 (-1.6˚C)
Precipitation Normal 1961-1990	**Wetter** for the entire region	Wettest year was 1981 (+28 %)	Driest year was 1980 (-32 %)
Sea-Ice Since 1979	March maximum sea-ice extent: Barents sea below normal		

Outlook: June, July August (JJA) 2020				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Southern Barents Sea		**Warmer**	✓		
	Murmansk/White Sea/Continent					✓
	Northern Barents Sea		**No forecast**	No agreement		
Precip	Entire Region		**No forecast**	No agreement		
Sea-Ice	**Break-up**	Northern Barents sea	**Later**	✓		
	Min Ice Extent Sept 2020		**Above Normal**			✓

Eurasian Node

Western Siberia





Seasonal Summary: Winter 2019 & Spring 2020

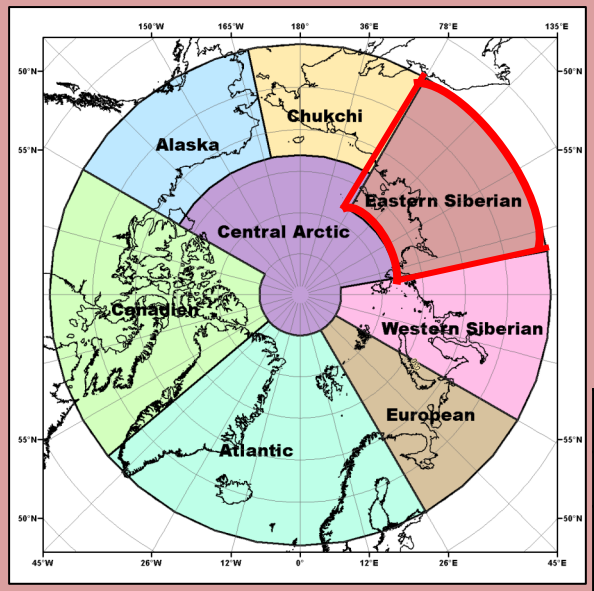
Observations above (+) and below (-) normal			
Temperature Normal 1961-1990	**Warmer** for the entire region	Warmest year was 2016 (+3.6˚C)	Coldest year was 1968 (-1.6˚C)
Precipitation Normal 1961-1990	**Wetter** for the entire region	Wettest year was 2002 (+ 22.6 %)	Driest year was 1946 (- 27.6 %)
Sea-Ice Since 1979	March maximum sea-ice extent: Kara Sea, ice covered		

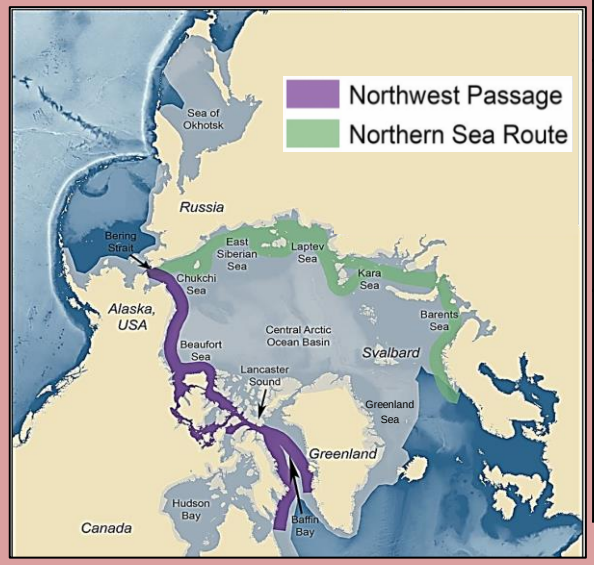
Outlook: June, July August (JJA) 2020				Multi Model Agreement		
Forecast				High	Moderate	Low
Temp	Western Kara Sea		Warmer	✓		
	Continent				✓	
	Eastern Kara Sea					✓
Precip	Continent		Wetter			✓
	Barents sea, Murmansk coast		No forecast	No agreement		
Sea-Ice	Break-up	Kara Sea West	Early	✓		
		Kara Sea East	Near normal		✓	
	Min Ice Extent Sept 2020	Kara Sea	Below Normal	✓		

Western Siberia
Risks and Impacts

- Wildfires: A risk of forest fires is possible in the State reserve "Verkhne-Tazovsky" region at the beginning of the summer due to above normal temperatures and below normal precipitation forecasted in the north of West Siberia.
- Flooding: The threat of river flooding in Ob' and Yenisei is uncertain.
- Coastal Erosion: Forecasted high temperatures may lead to continued permafrost degradation and coastal erosion.
- Wildlife/Hunting: The reduction in the sea-ice extent and permafrost degradation in tundra may create difficulties for "keystone" species, e.g. polar bears, caribou, whales etc.
- Shipping: Shipping in the Northwest Passage from west to east is expected to start earlier than normal with safe and easy ice conditions for independent navigation of large-capacity tankers, gas carriers and bulk vessels. However, above normal temperatures may increase the number of icebergs due to glacier calving in the Islands Novaya Zemlya and Severnaya Zemlya, creating navigation hazards.

Eastern Siberia





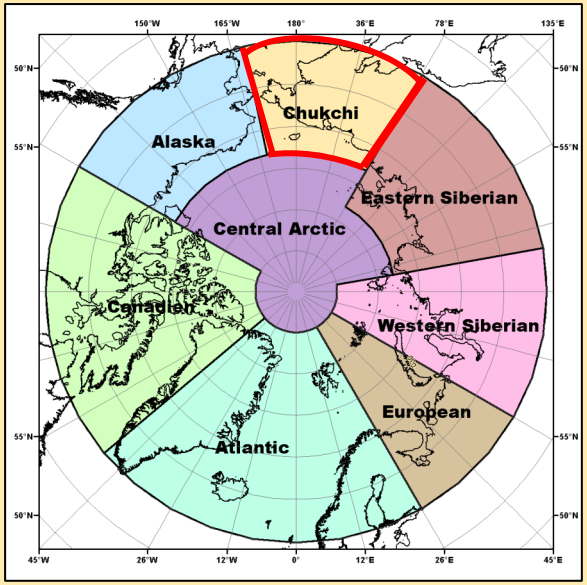
Seasonal Summary: Winter 2019 & Spring 2020			
Observations above (+) and below (-) normal			
Temperature Normal 1961-1990	**Warmer** for the entire region	Warmest year was 2019 (+2.9˚C)	Coldest year was 1989 (-1.2˚C)
Precipitation Normal 1961-1990	**Wetter** for the entire region	Wettest year was 1988 (+25.2%)	Driest year as 1967 (-21.6%)
Sea-Ice Since 1979	March maximum sea-ice extent: Laptev sea, ice covered		

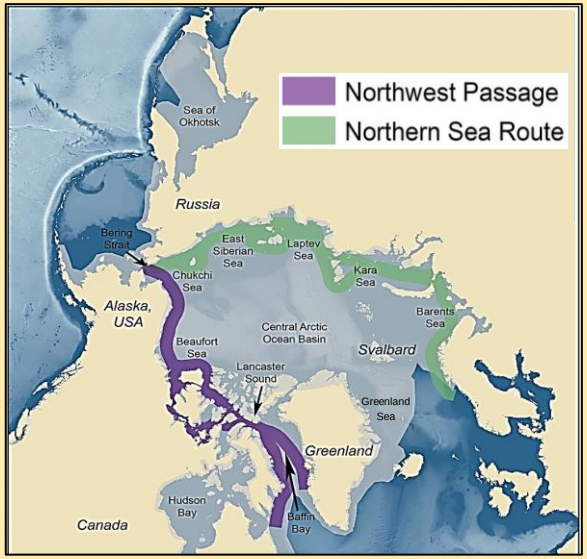
Outlook: June, July August (JJA) 2020				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Laptev sea and continental regions		Warmer		✓	
Precip	Laptev Sea and Continent		Wetter			✓
Sea-Ice	**Break-up**	Laptev Sea	Early			✓
	Min Ice Extent Sept 2020		Below Normal	✓		

Eastern Siberia
Risks and Impacts

- Wildfires: A risk of forest fires is possible for the northwest of Yakutiya region at the beginning of the summer due above normal temperatures and below normal precipitation forecasted.
- Flooding: The threat of flooding of main Arctic rivers (Lena, Yana, Indigirka, Kolyma) is uncertain.
- Coastal Erosion: Forecasted high temperatures may lead to continued permafrost degradation and coastal erosion.
- Wildlife/Hunting: The reduction in the sea-ice extent and permafrost degradation in tundra may create difficulties for "keystone" species, e.g. polar bears, caribou, whales etc.
- Shipping: Shipping across the Northern Sea Route is expected to be start earlier than normal with safe and easy ice conditions for the independent navigation of large-capacity tankers, gas carriers and bulk vessels. The navigation season on estuaries of main Arctic rivers (Lena, Yana, Indigirka, Kolyma) for cargo delivery by vessels type "river-sea" will start earlier.

Chukchi





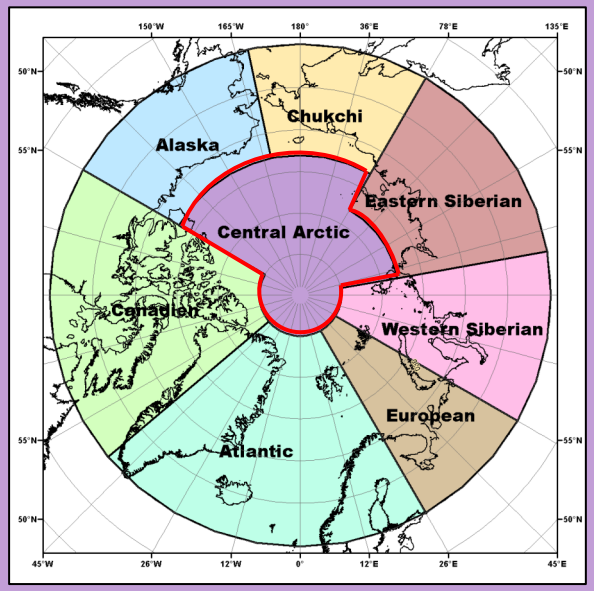
Seasonal Summary: Winter 2019 & Spring 2020			
Observations above (+) and below (-) normal			
Temperature Normal 1961-1990	**Warmer** to near normal	Warmest year was 2007 (+2.9˚C)	Coldest year was 1949 (-1.3˚C)
Precipitation Normal 1961-1990	normal	Wettest year was 1954 (+39.6 %)	Driest year was 1982 (-39.8%)
Sea-Ice Since 1979	March maximum sea-ice extent: Sea of Okhotsk – Below to near normal Chukchi sea, ice covered		

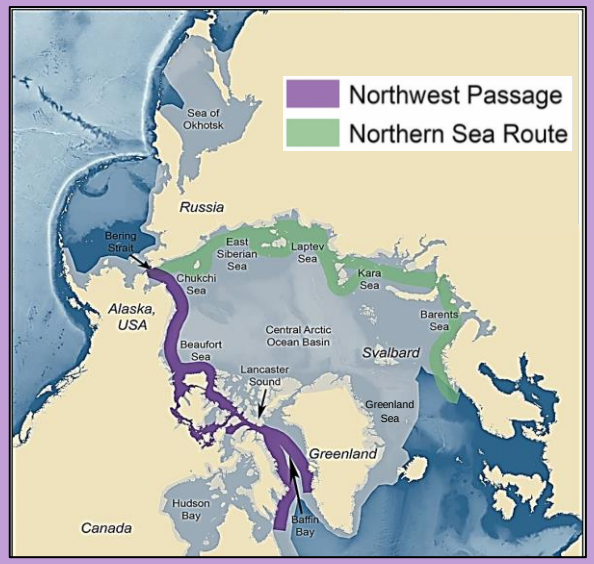
Outlook: June, July August (JJA) 2020				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Bering sea		Warmer	✓		
	Eastern and Southern continental regions				✓	
	Eastern Siberian Sea, Chukchi sea, Northern continental regions					✓
Precip	Bering Sea and continental regions		Wetter			✓
	Eastern Siberian Sea, Chukchi sea		No forecast	No agreement		
Sea-Ice	Break-up	Chukchi Sea	Early	✓		
		East Siberian				✓
	Min Ice Extent Sept 2020	Chukchi Sea	Below Normal	✓		
		East Siberian			✓	

Chukchi
Risks and Impacts

- Wildfires: Due to above normal precipitation forecasted wildfires are not expected
- Flooding: Above normal precipitation may increase the threat of river flooding in Indigirka and the Kolyma.
- Coastal Erosion: A possible increase of storm activity may negatively impact coastal erosion. Forecasted high temperatures may lead to continued permafrost degradation and coastal erosion.
- Wildlife: Possible increase of storm activity at the end of summer may impact migratory birds and fish passages.
- Hunting: Possible increase of storm activity may negatively impact hunting and fishing.
- Shipping: Shipping across the Northern Sea Route is expected to be start earlier than normal with safe and easy ice conditions for the independent navigation of large-capacity tankers, gas carriers and bulk vessels. Cargo navigation for all vessel classes to the Chukchi sea from the Pacific Ocean will start earlier.

Central Arctic





Seasonal Summary: Winter 2019 & Spring 2020			
Observations above (+) and below (-) normal			
Temperature Normal 1961-1990	Warmer	Warmest year was 2012 (+2.0˚C)	Coldest year was 1963 (-0.7˚C)
Precipitation Normal 1961-1990	n/a	Wettest year was 1989 (+27%)	Driest year was 1998 (-16%)
Sea-Ice Since 1979	March maximum sea-ice extent: Region is covered in sea-ice		

Outlook: June, July August (JJA) 2020			Multi Model Agreement		
	Forecast		High	Moderate	Low
Temp	Near the Alaskan, Chukchi, Eastern and Western Siberian regions	Warmer		✓	
	North pole, European and Atlantic regions				✓
Precip	All regions	No forecast	No agreement		
Sea-Ice	**Break-up**	No Forecast			

ACF
Arctic Climate Forum

Discussion on regional impacts

Arctic Regional Climate Center

Arctic Climate Forum
May 2020

Arctic Consensus Statement: Summary of Winter 2020 and Outlook for Summer 2020

Arctic Regional Climate Center

What is ArcRCC Consensus Statement?

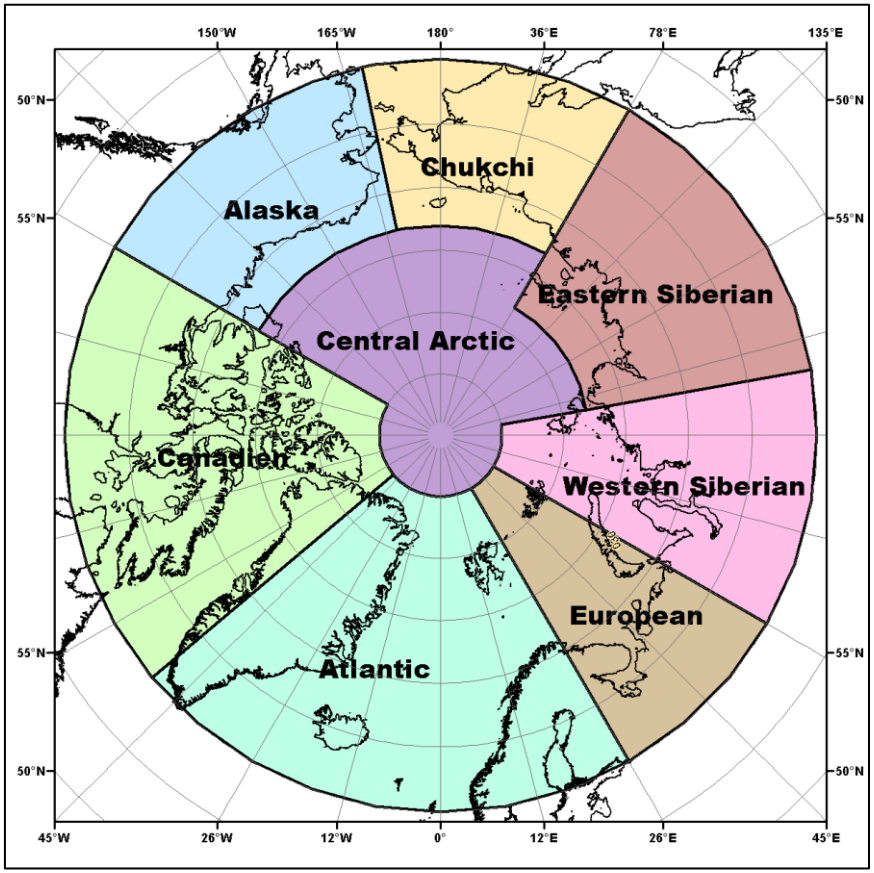
A collaborative product developed amongst Arctic meteorological and ice services to synthesize observations, historical trends, forecast models and fill gaps with regional expertise.

The consensus statement provides:

- a review of the major Arctic climate trends of the previous season,
- verification of the previous seasons outlooks and
- outlooks for the upcoming season for temperature, precipitation and sea-ice.

Will be published on https://arctic-rcc.org/acf

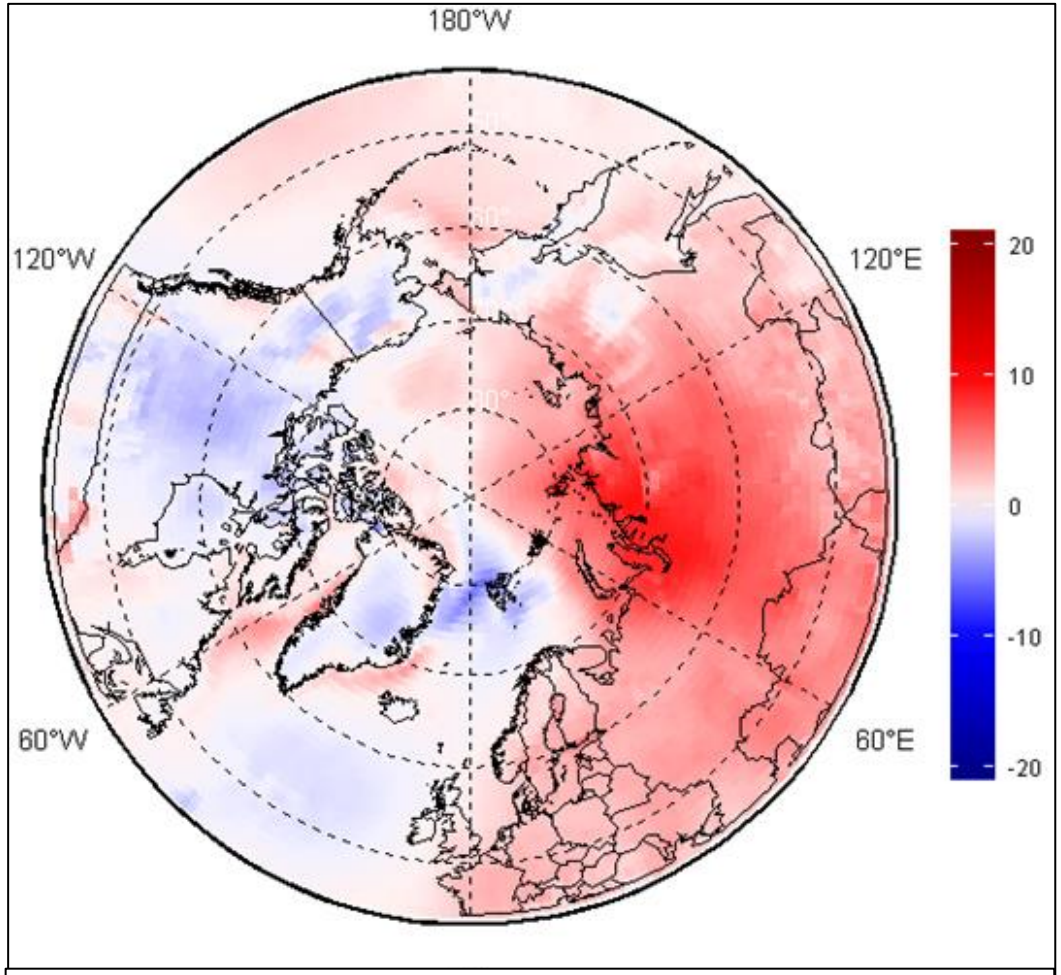
Circumpolar Arctic Perspective Temperature & Precipitation



- Outlooks are based on **eight** WMO Long-Range Forecasts models.
- All the model forecasts are compared and areas where all eight models
  - agree = high forecast confidence
  - disagree = low forecast confidence

- Called a multi-model ensemble (MME) approach
- A methodology reputed as providing the most reliable objective forecasts.

TEMPERATURE: Observations from Winter 2020



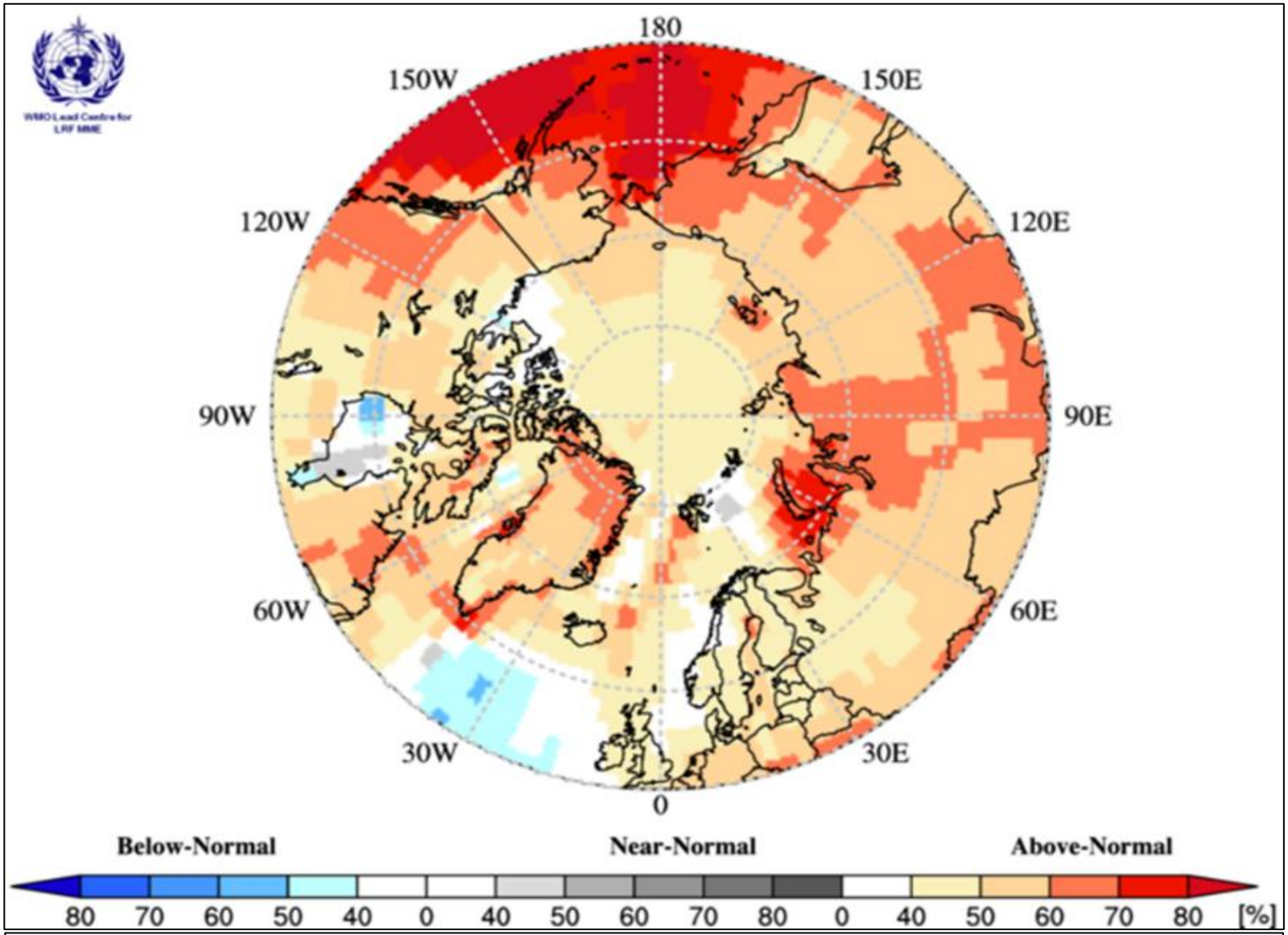
February, March, and April (FMA) 2020 surface air temperature anomaly based on the 1981-2010 reference period. Red indicates warner than normal temperature, and blue indicates cooler than normal temperatures. Map produced by the Hydrometcenter of Russia https://meteoinfo.ru/ Data source: ERA-5.

- Higher than normal in the eastern hemisphere
- Lower than normal in the western hemisphere
- Scandinavia and the majority of the Eastern and Western Scandinavia regions experienced warmer than normal conditions (red areas)
- Parts of Eastern and Western Siberia saw their fifth warmest FMA since the start of the record in 1949.
- Canada, Alaska, Greenland, and the North Atlantic Ocean experienced near normal (white areas) or slightly below normal (light blue) conditions.

TEMPERATURE: Winter 2020
How did the forecasts perform ?

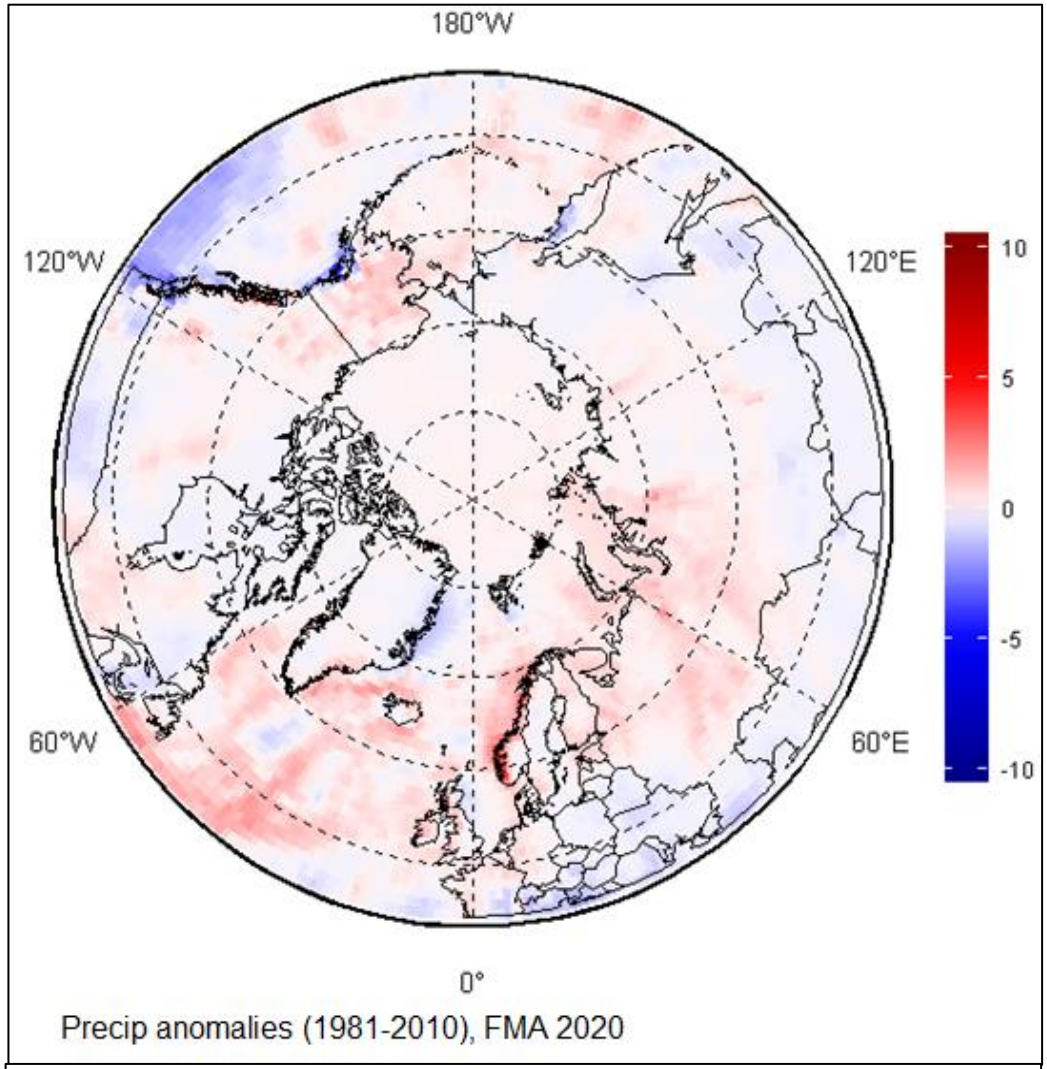
Regions	MME Temperature Forecast Agreement	MME Temperature Forecast	Observations NCAR CFSR Reanalysis	MME Temperature Forecast Accuracy
Alaska	Low	Above normal	Near normal	**Low**
Chukchi	High	Above normal	Above to near normal	**Moderate**
Eastern Siberia	High	Above normal	Above normal	**High**
Western Siberia	High	Above normal	Above normal	**High**
European	Moderate	Above normal	Above normal	**High**
Atlantic	Moderate	Mostly near normal	Above normal (Scandinavia only)	**Moderate**
Canada	Low	Above normal	Near to below normal	**Low**
Central Arctic	High	Above normal	Above normal	**High**

TEMPERATURE: Outlook Summer 2020



Multi model ensemble probability forecast for surface temperature for June, July, and August 2020. Three categories: below normal (blue), near normal (grey), above normal (red) and no agreement amongst the models (white). Source: www.wmolc.org.

PRECIPITATION: Observations from Winter 2020



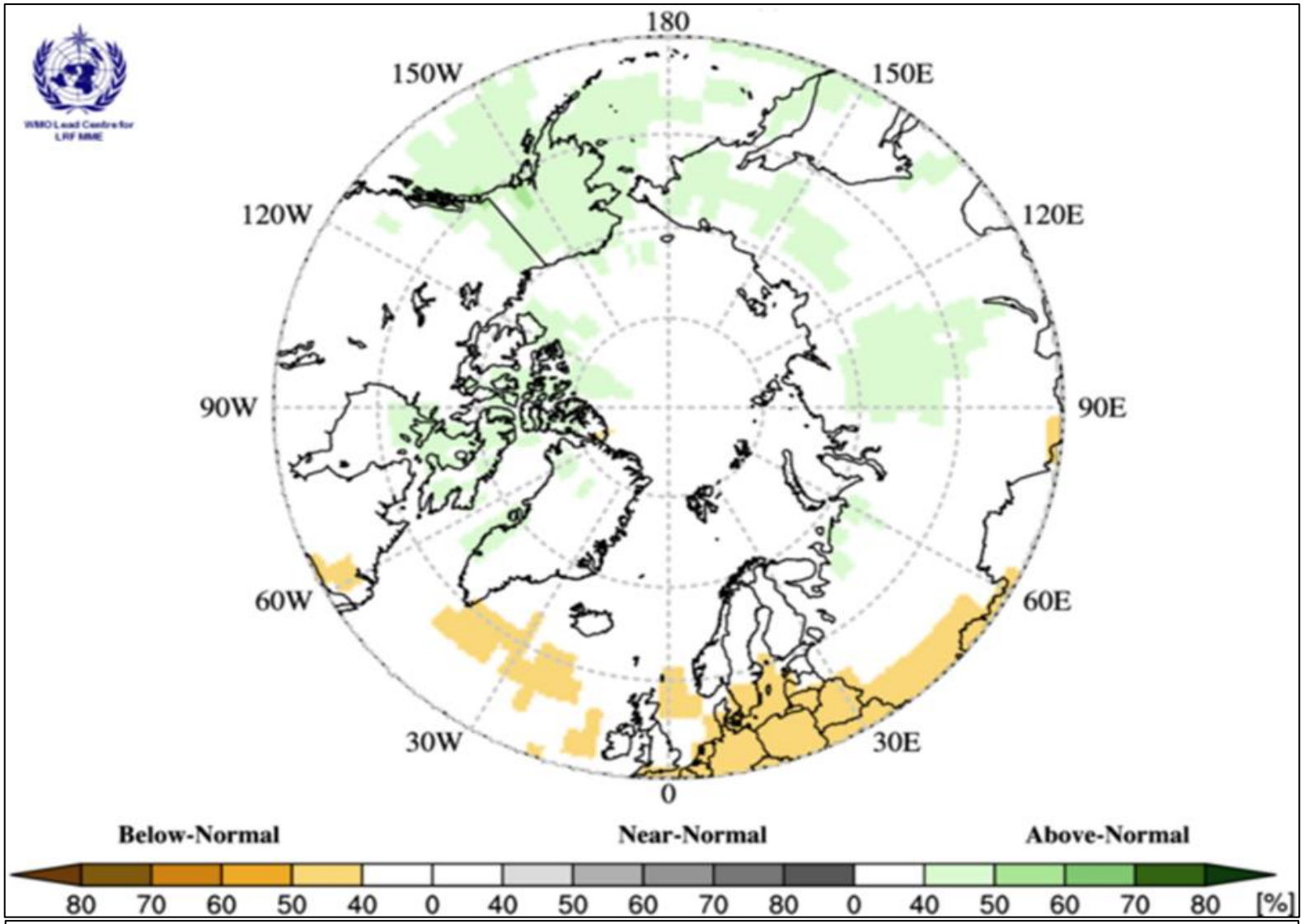
February, March, and April (FMA) 2020 precipitation based on the 1981-2010 reference period. Red indicates wetter than normal conditions, and blue indicates drier than normal conditions. Map produced by the Hydrometcenter of Russia https://meteoinfo.ru/ Data source: ERA-5.

- Wetter than average conditions were observed across a majority of Arctic region (red areas).
- Only a few isolated areas, including the northeastern coast of Greenland, northern Canada, and a small swath over southern Alaska, experienced drier than average conditions (blue areas)

PRECIPITATION: Winter 2020
How did the forecasts perform ?

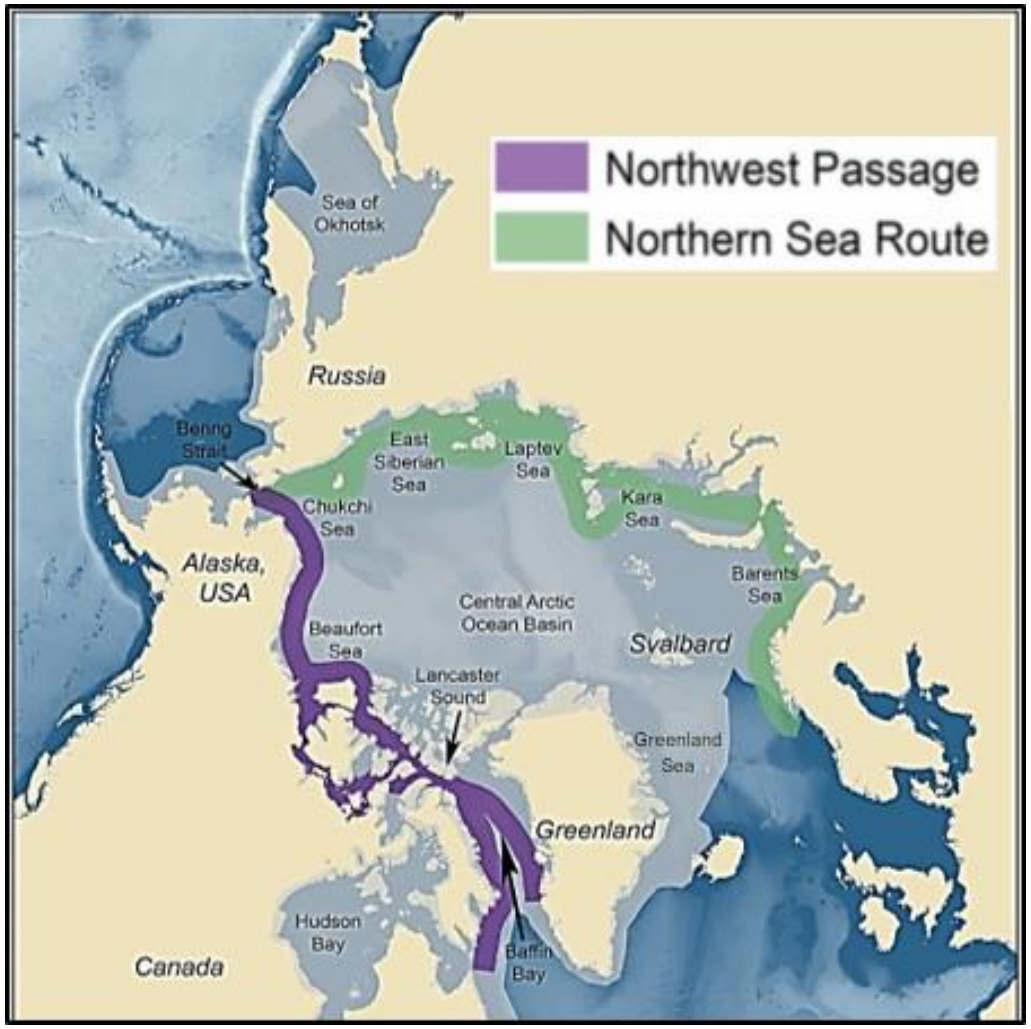
Regions	MME Precipitation Forecast Agreement	MME Precipitation Forecast	Observations NCAR CFSR Reanalysis	MME Precipitation Forecast Accuracy
Alaska	Moderate	Above normal	Above normal	**High**
Chukchi	Moderate	Above normal	Near normal	**Low**
Eastern Siberia	Moderate	Above normal	Above normal	**High**
Western Siberia	Moderate	Above normal	Above normal	**High**
European	Moderate	Above normal	Above normal	**High**
Atlantic	Moderate	Above normal (continental regions only)	Above normal (continental regions only)	**High**
Canada	No agreement	No forecast	Near normal in the south and west, below in the center	**N/A**
Central Arctic	No agreement	No forecast	N/A	**N/A**

PRECIPITATION: Outlook Summer 2020



Multi model ensemble probability forecast for precipitation for JJA 2020. Green indicates wetter conditions, orange drier conditions and white, no agreement amongst the models. Source: www.wmolc.org.

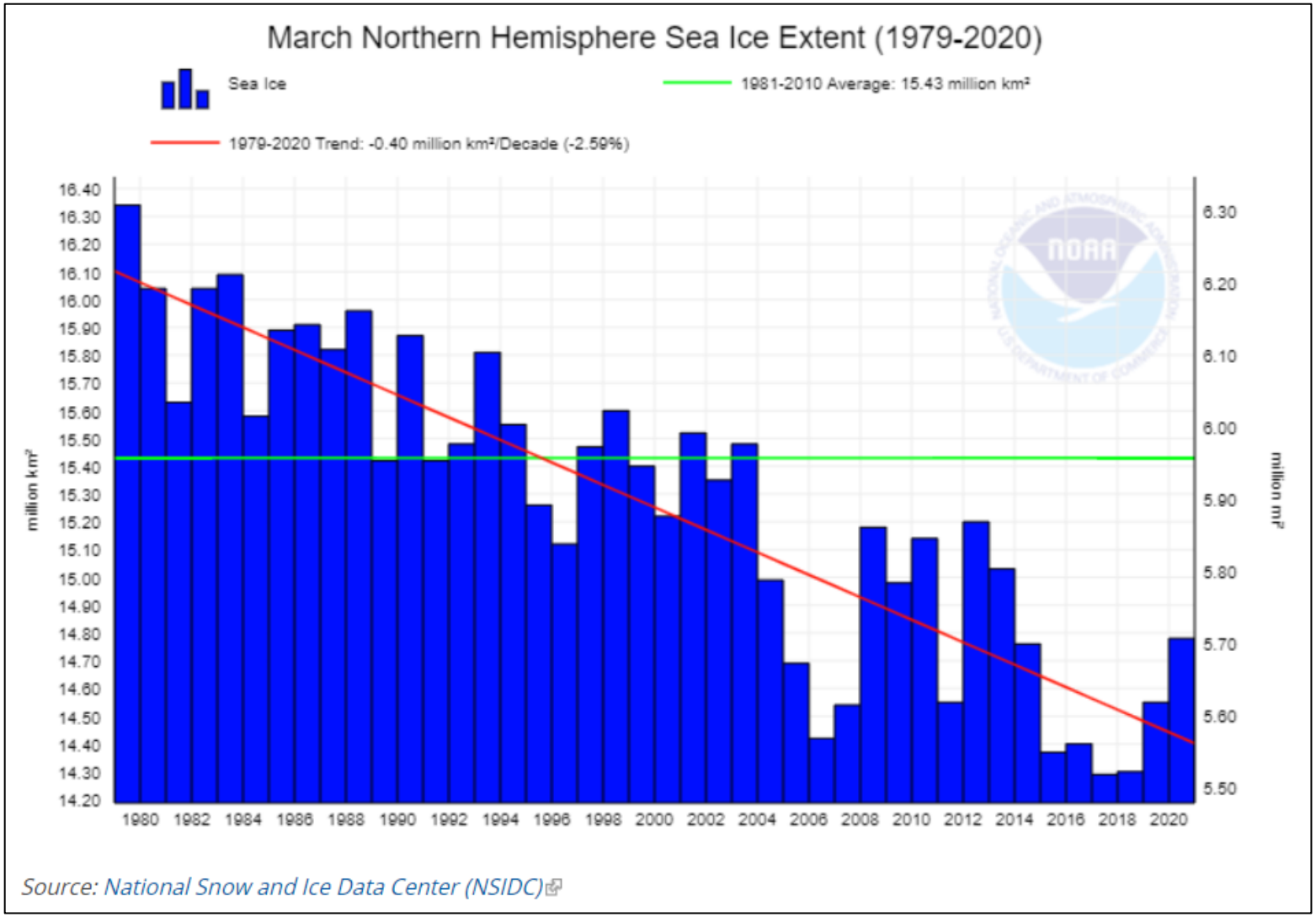
Sea-Ice: From a Circumpolar Perspective



Maximum sea-ice extent, volume and thickness is normally reached each year in the Arctic during the month of March.

The forecast for March 2020 sea ice extent was based on output from CanSIPSv2, an MME of two climate models

SEA-ICE Extent: Observations from Winter 2020

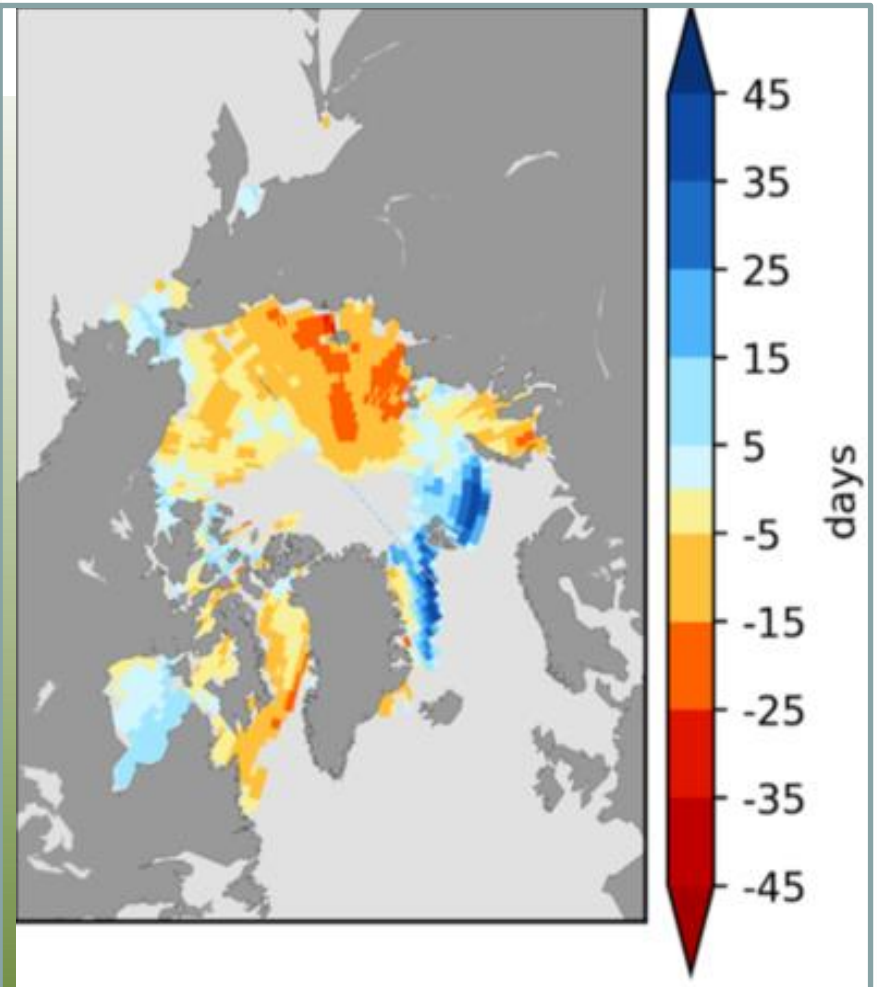


Source: National Snow and Ice Data Center (NSIDC)

SEA-ICE: Winter 2020
How did the forecasts perform ?

Regions	CanSIPS Sea-Ice Forecast Confidence	CanSIPS Sea-Ice Forecast	Observed Ice Extent	CanSIPS Sea-Ice Forecast Accuracy
Bering Sea	Low	Below normal	Normal	**Low**
Sea of Okhotsk	Low	Below to near normal	Below to near normal	**High**
Barents Sea	Low	Near normal	Below normal	**Low**
Greenland Sea	High	Near normal	Below to near normal	**Moderate**
Gulf of St. Lawrence	Low	Below normal	Below to near normal	**High**
Labrador Sea	Moderate	Below normal	Below to near normal	**Moderate**

SEA-ICE: Break-up Outlook 2020



Forecast for the 2020 spring/summer break-up expressed as an anomaly (difference from normal) Source: CanSIPS (ECCC)

What is Normal break-up?

- The first day in a 10 day period when the ice concentration goes below 50%
- based on climatological period (2009-2017)

Break-Up Categories:

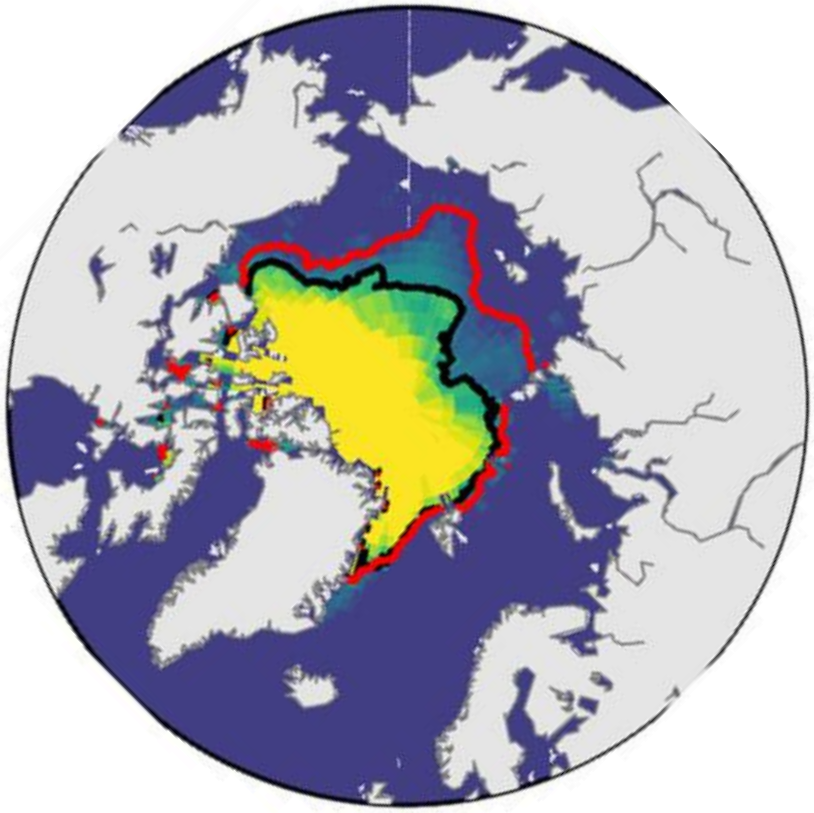
- Late break-up
- Near normal break-up
- Early break-up

Regions	CanSIPS Sea-Ice Forecast Confidence	CanSIPS Sea-Ice Break-up Forecast
Baffin Bay	**High**	**Early**
Barents Sea	High	Late in northern section
Beaufort Sea	High	Early
Bering Sea*	Moderate	Near normal to late
Chukchi Sea	High	Early
East Siberian	Low	Early southern section, near normal northern section
Greenland Sea	High	Late
Hudson Bay	Moderate	Late eastern half, near normal western half
Kara Sea	Moderate	Early in the west, near normal in the east
Labrador Sea	High	Early
Laptev Sea	Low	Early

Minimum SEA-ICE Extent: Outlook September 2020

observed mean ice edge (2011-2019)

forecast median ice edge



Regions	CanSIPS Sea-Ice Forecast Confidence	CanSIPS Sea-Ice Forecast
Barents Sea	Low	Above normal (northern section)
Beaufort Sea	Moderate	Below normal
Canadian Arctic Archipelago	Moderate	Below normal
Chukchi Sea	High	Below normal
Eastern Siberian Sea	Moderate	Below normal
Greenland Sea	High	Above normal
Kara Sea	High	Below normal
Laptev Sea	High	Below normal

September 2020 probability of sea ice at concentrations greater than 15% from CanSIPSv2 (ECCC). Forecast median ice extent from CanSIPSv2 (black) and observed mean ice edge 2011-2019 (red).

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Questions & Wrap Up

Arctic Regional Climate Center

Thank you! Merci! Takk! Спасибо!
Tak! Tack! Kiitos! þakka þér fyrir!
Naqurmiik ! Qaĝaasakuq !
Grazie! Giitu! Vielen Dank!
Dhanyavaad !

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale