Icelandic
Met Office

ACF
Arctic Climate Forum

WORLD
METEOROLOGICAL
ORGANIZATION

ARCTIC REGIONAL CLIMATE CENTRE (ArcRCC) Network

13th Arctic Climate Forum (ACF-13)

22 – 23 May 2024, from 16:00 to 19:00 UTC

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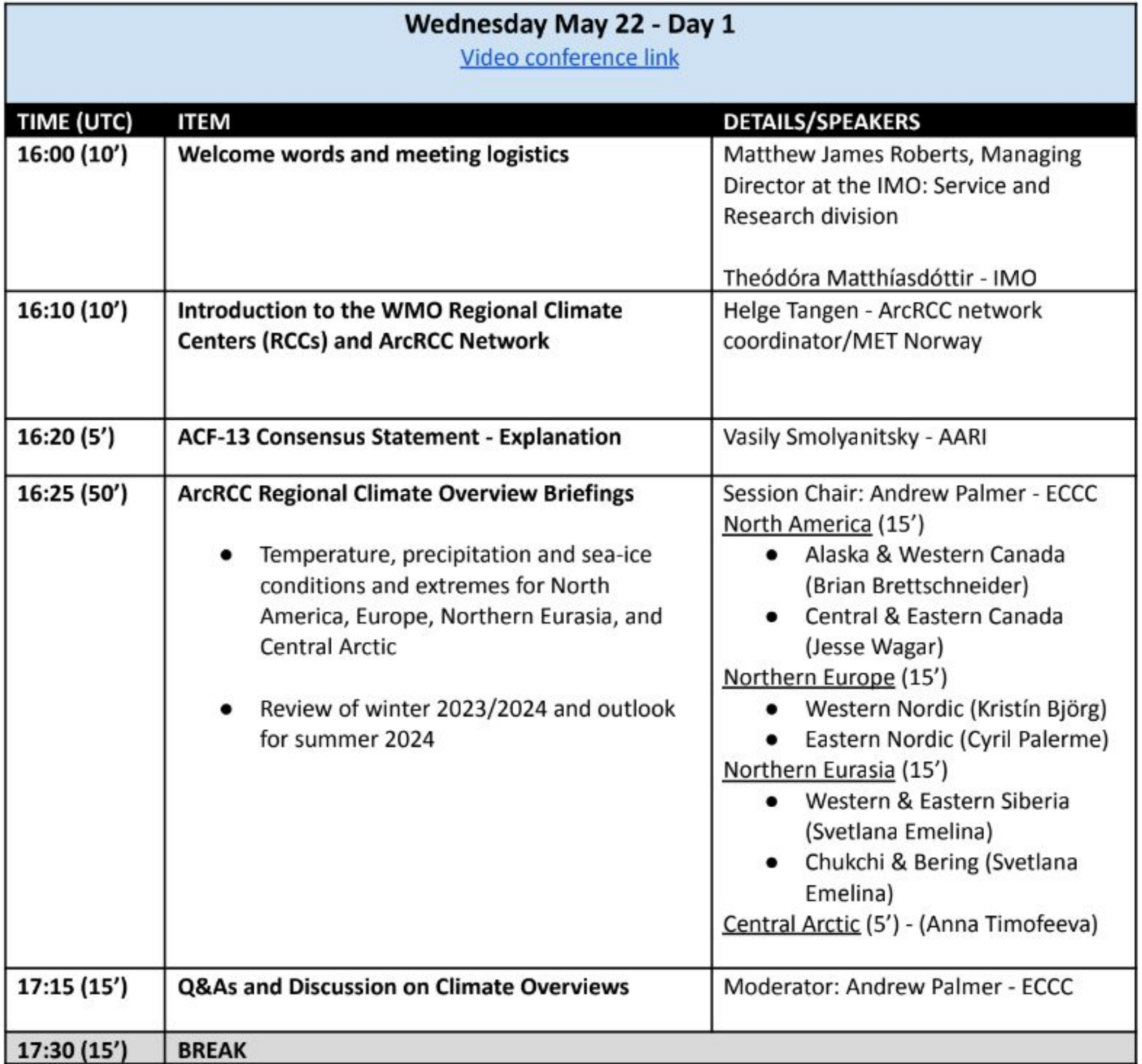
Meeting Logistics

ACF
Arctic Climate Forum

Agenda
DAY 1

WORLD METEOROLOGICAL ORGANIZATION

Icelandic Met Office



Wednesday May 22 - Day 1

Video conference link

TIME (UTC)	ITEM	DETAILS/SPEAKERS
16:00 (10')	**Welcome words and meeting logistics**	Matthew James Roberts, Managing Director at the IMO: Service and Research division Theódóra Matthíasdóttir - IMO
16:10 (10')	**Introduction to the WMO Regional Climate Centers (RCCs) and ArcRCC Network**	Helge Tangen - ArcRCC network coordinator/MET Norway
16:20 (5')	**ACF-13 Consensus Statement - Explanation**	Vasily Smolyanitsky - AARI
16:25 (50')	**ArcRCC Regional Climate Overview Briefings** • Temperature, precipitation and sea-ice conditions and extremes for North America, Europe, Northern Eurasia, and Central Arctic • Review of winter 2023/2024 and outlook for summer 2024	Session Chair: Andrew Palmer - ECCC North America (15') • Alaska & Western Canada (Brian Brettschneider) • Central & Eastern Canada (Jesse Wagar) Northern Europe (15') • Western Nordic (Kristín Björg) • Eastern Nordic (Cyril Palerme) Northern Eurasia (15') • Western & Eastern Siberia (Svetlana Emelina) • Chukchi & Bering (Svetlana Emelina) Central Arctic (5') - (Anna Timofeeva)
17:15 (15')	**Q&As and Discussion on Climate Overviews**	Moderator: Andrew Palmer - ECCC
17:30 (15')	**BREAK**	

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Agenda
DAY 1

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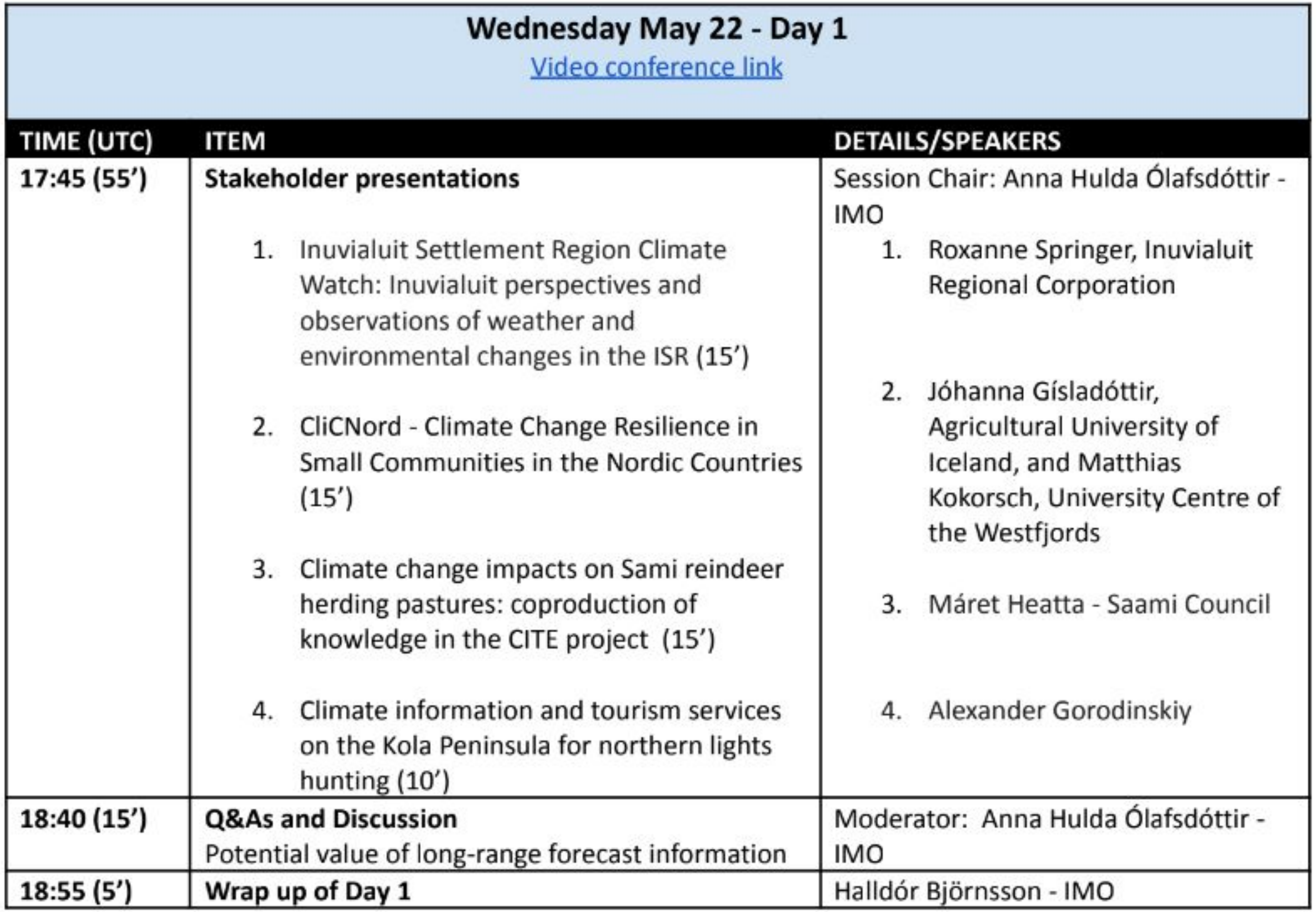

Wednesday May 22 - Day 1

[Video conference link]

TIME (UTC)	ITEM	DETAILS/SPEAKERS
17:45 (55’)	**Stakeholder presentations** 1. Inuvialuit Settlement Region Climate Watch: Inuvialuit perspectives and observations of weather and environmental changes in the ISR (15’) 2. CliCNord - Climate Change Resilience in Small Communities in the Nordic Countries (15’) 3. Climate change impacts on Sami reindeer herding pastures: coproduction of knowledge in the CITE project (15’) 4. Climate information and tourism services on the Kola Peninsula for northern lights hunting (10’)	Session Chair: Anna Hulda Ólafsdóttir - IMO 1. Roxanne Springer, Inuvialuit Regional Corporation 2. Jóhanna Gísladóttir, Agricultural University of Iceland, and Matthias Kokorsch, University Centre of the Westfjords 3. Máret Heatta - Saami Council 4. Alexander Gorodinskiy
18:40 (15’)	**Q&As and Discussion** Potential value of long-range forecast information	Moderator: Anna Hulda Ólafsdóttir - IMO
18:55 (5’)	**Wrap up of Day 1**	Halldór Björnsson - IMO

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Arctic Climate Forum

WORLD METEOROLOGICAL ORGANIZATION

Welcome Address

Dr. Matthew James Roberts

Icelandic Met Office
Managing Director at the Service and Research division

Arctic Climate Forum (ACF-13)
22 – 23 May 2024, video conference

Veðurstofa Íslands

Vísindi á vakt

The Icelandic Meteorological Office – A Multi Hazard Agency

Matthew J. Roberts, Service and Research Division

The role of the Icelandic Met Office (IMO)

State mandate to monitor all forms of natural hazards, ranging from severe weather to volcanic eruptions.

The office collates and analyses long-term observational datasets, such as air temperature records, crustal deformation, and seismicity levels.

A central goal is to issue warnings to the public of impending natural hazards such as mass movements, floods, and volcanic unrest.

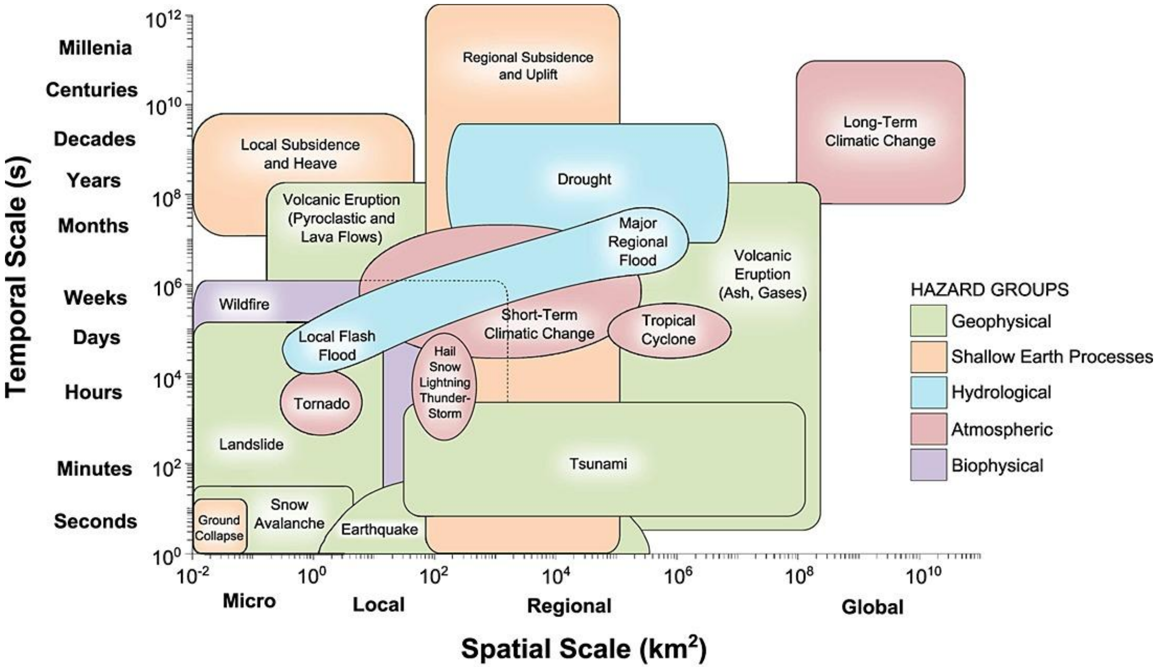
Additionally, IMO is responsible for various forms of Earth-science research, including hazard and risk assessments.

Icelandic Met Office

Spatial and temporal scales of selected natural hazards

Interacting natural hazards

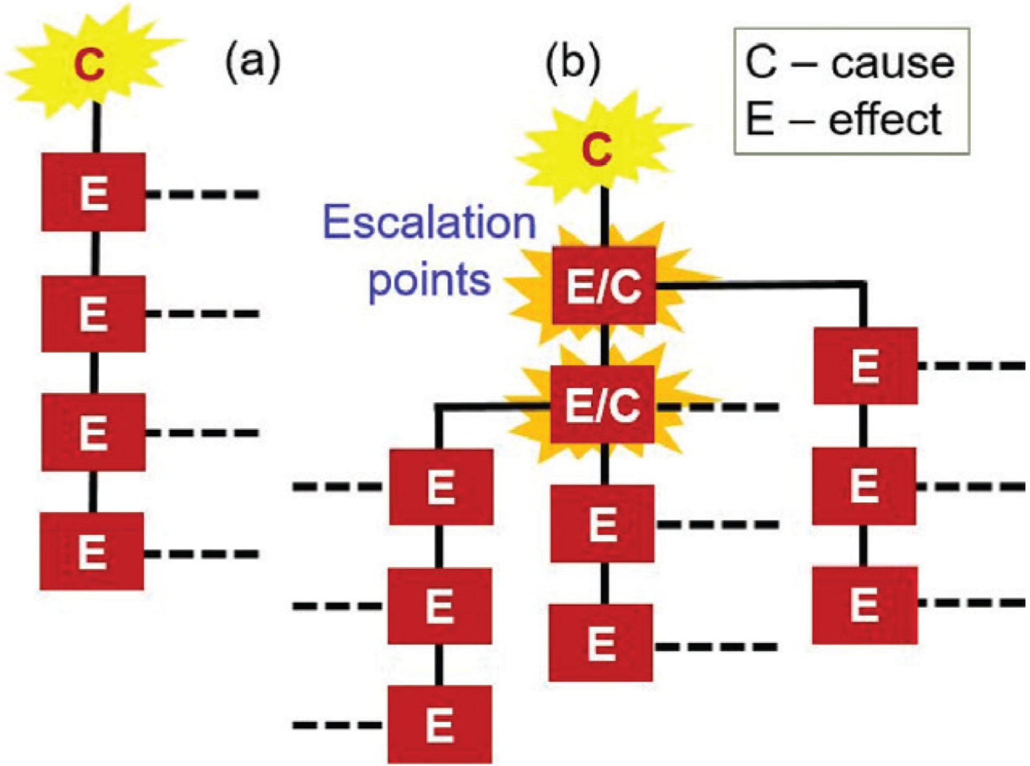
- Natural hazards can occur simultaneously, consecutively, and they can also interact to create compounding effects.
- Crucially, hazards on different timescales can interact, such as long-term ground subsidence leading to a landslide.
- Some interactions can create compound and emergent hazards, such as consecutive rainfall episodes on saturated ground.



Source: *Reviewing and visualizing the interactions of natural hazards* Reviews of Geophysics, 2014, 52 (4). DOI: (10.1002/2013RG000445)

Escalation of nat. haz: Effects could be greater than the cause

Linear and non-linear escalation of cascading natural hazards



Source: What are cascading disasters? UCL Open Environment (2019) DOI: 10.14324/111.444/ucloe.000003

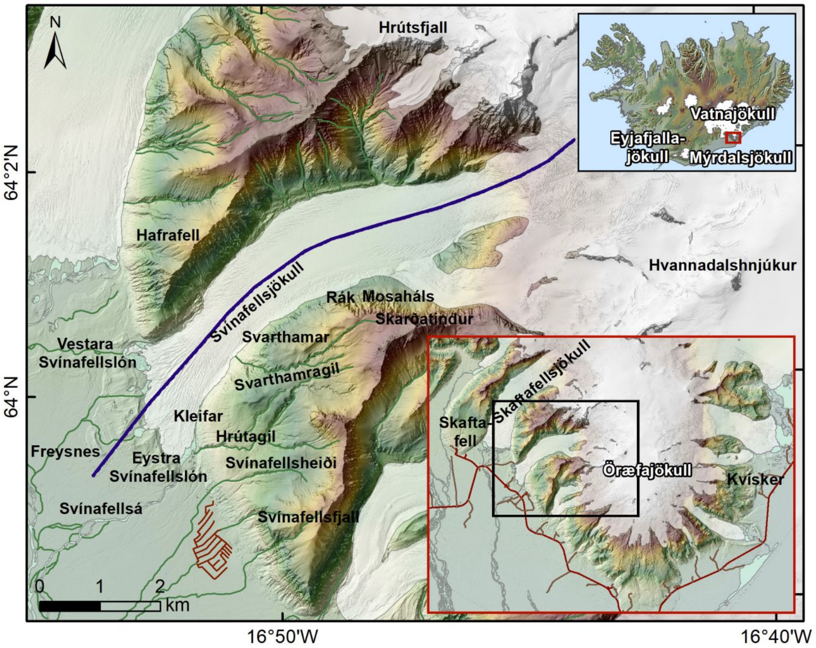
Recognition of interacting natural hazards

Alongside many other types of hazards, severe weather and flooding often result in emergent hazards, which can grow in intensity and geographic impact.

In Iceland, the effects of a warming climate underlie the potential impact of several newly apparent hazards, such as:

1. Rockfall and landslide hazards from recently deglaciated mountain sides.
2. The formation and growth of ice-marginal lakes at retreating glacier edges.
3. Thawing of permafrost in mountainous regions.

The fact that such hazards can be triggered by extreme weather conditions is a cause for concern, particularly where real-time monitoring is inadequate or lacking.



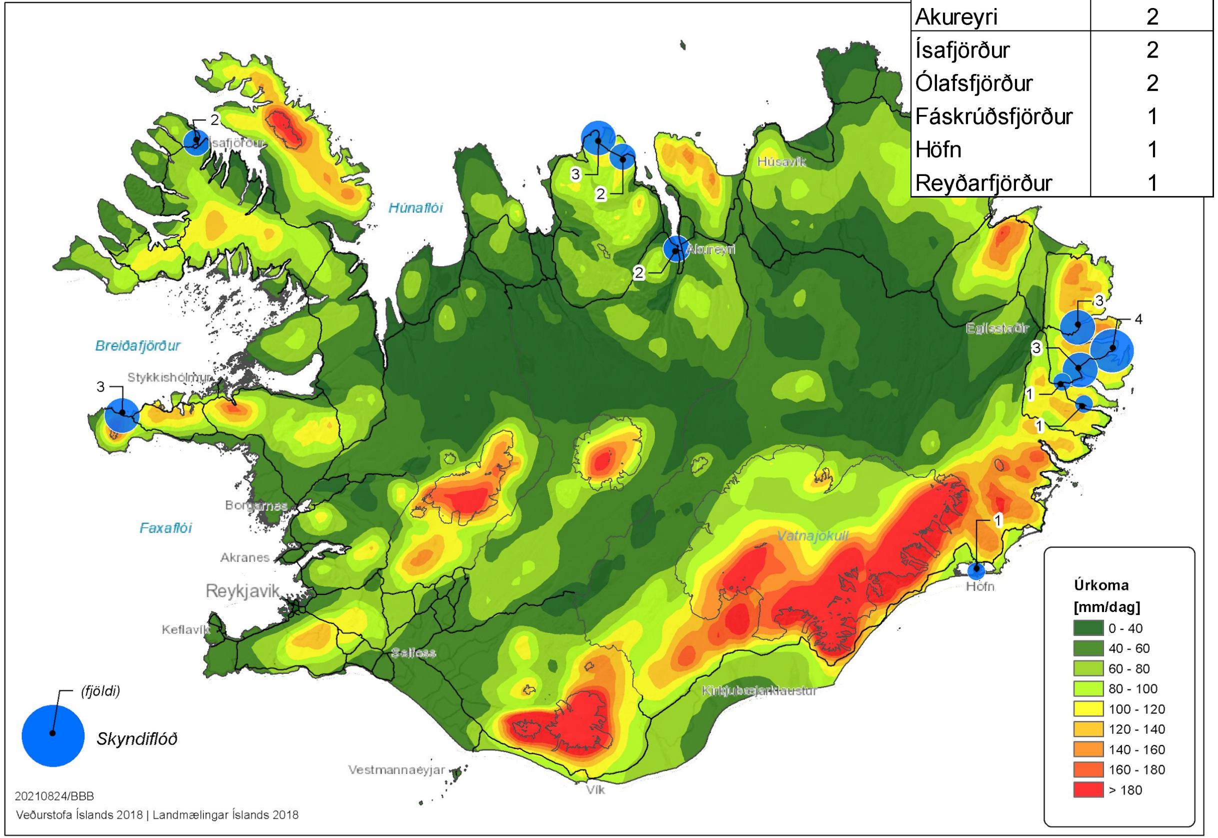
Example: Flash floods in coastal villages

High levels of rainfall can cause rapid, localised runoff

Ongoing hazard assessment project, funded by the Icelandic Avalanche and Landslide Fund

- In recent decades: 25 flash floods in 11 populated regions.
- Around half of the floods occurred in the East Fjords.
- Rapid runoff due to lack of infiltration on steep bedrock slopes.
- Steep slopes increase the speed of onset of the flood.
- 40% of the studied flooded occurred at or within 2-year return levels.

Staður	Fjöldi
Neskaupstaður	4
Eskifjörður	3
Ólafsvík	3
Seyðisfjörður	3
Siglufjörður	3
Akureyri	2
Ísafjörður	2
Ólafsfjörður	2
Fáskrúðsfjörður	1
Höfn	1
Reyðarfjörður	1

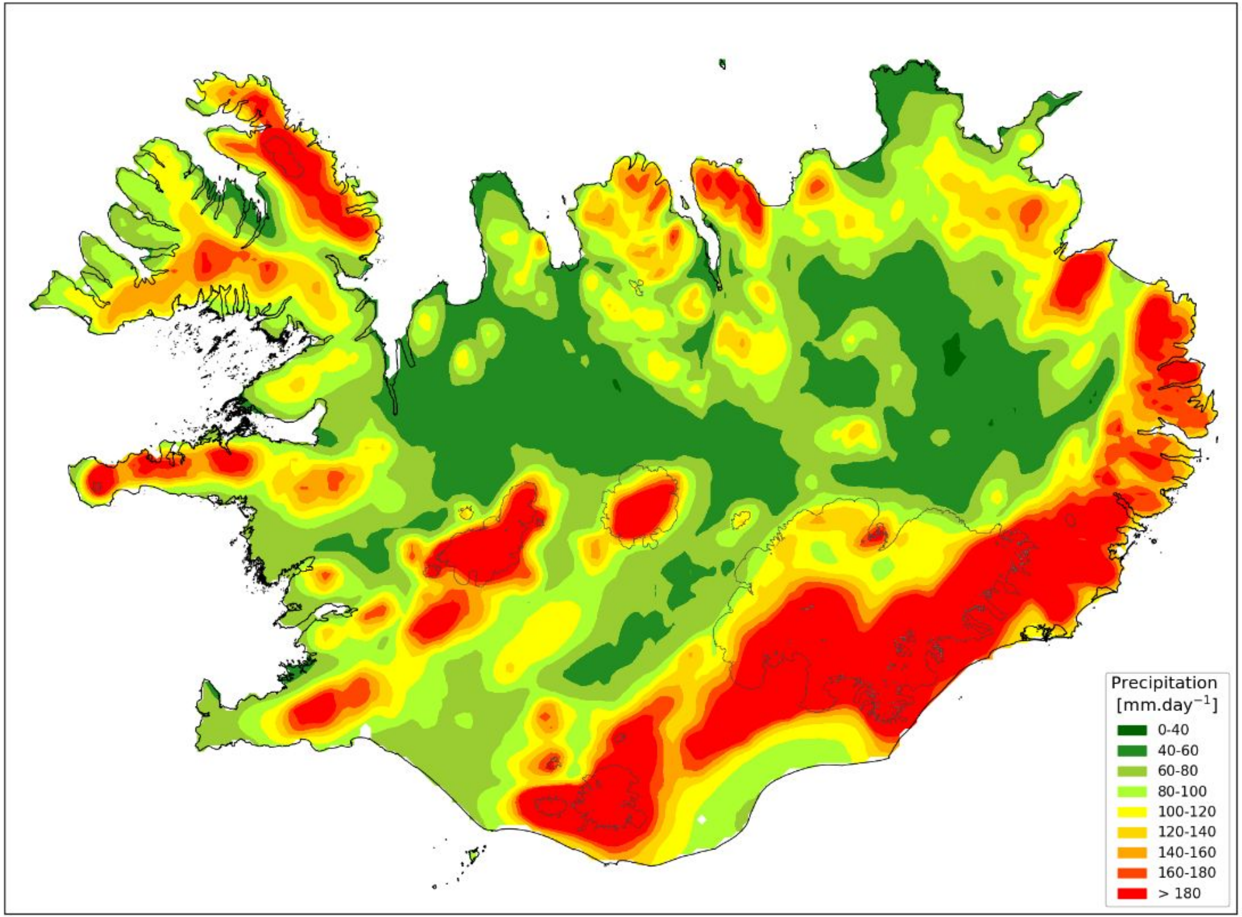


1M5 map for 24-hour precipitation (climate-change scenario RCP 8.5)

New 1M5 map using a worst-case scenario

- RCP 8.5 for the interval 2080 – 2100, based on the 90th percentile from the climate model ensemble (CMIP5).
- Results obtained using the Peak-over-Threshold method with MLE.
- Note the spread of higher precipitation values to mountainous coastal locations.

Andréa-Giorgio Raphael Massad, Guðrún Nína Petersen, Halldór Björnsson, Matthew J. Roberts, and Tinna Þórarinsdóttir (2021). ***Extreme precipitation in Iceland: Climate projections and historical changes in precipitation type*****. VÍ Technical Report AGM/2021-01.**



Icelandic Met Office

Norwegian Meteorological Institute

Environment and
Climate Change Canada

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

https://www.arctic-rcc.org

Helge Tangen
Norwegian Meteorological Institute
ArcRCC Network Coordinator

Photo: Helge Tangen

AARI

ACF
Arctic Climate Forum

FINNISH METEOROLOGICAL
INSTITUTE

SMHI

DMI

Welcome to Arctic Climate Forum #13
ACF-13

- A forum for Arctic Regional Climate Centre Network to meet stakeholders and users
- Every spring (last part of May) and every fall (last part of November)

ACF
Arctic Climate Forum

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**

<u>It answers these questions</u>

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

Climate

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

<u>It answers these questions</u>

- ***What is an average winter like in Reykjavik?***
- ***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

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

NATIONAL		REGIONAL		CIRCUMPOLAR
Countries	**Meteorological Organizations**	**Regional Climate Centres (RCCs)**		**Arctic Regional Climate Centre**
United States	NOAA	North American Node	Forecasting	
Canada	ECCC			
Denmark	DMI	Nordic Node	Data Services	
Iceland	IMO			
Norway	NMI			
Sweden	SMHI			
Finland	FMI			
Russia	AARI	Northern Eurasia Node	Monitoring	

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 collaborative 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.

Way forward

- Obtaining Designation from WMO - getting status as a fully operational Regional Climate Centre Network after a successful demonstration phase
    - Expected very soon…..
- Continue with 2 Arctic Climate Forums per year - to ensure user contact
- Develop new products, built on user needs

World
Meteorological
Organization
Weather • Climate • Water

Thank you!

ACF
Arctic Climate Forum

Arctic Consensus Statement

Summary of winter – spring 2023/2024
Outlook for summer 2024

What it is and how it is generated

Vasily Smolyanitsky (Arctic and Antarctic Research Institute)

ACF-13, May 22-23 2024

Arctic Regional Climate Centre Network

What is the ArcRCC Consensus Statement?

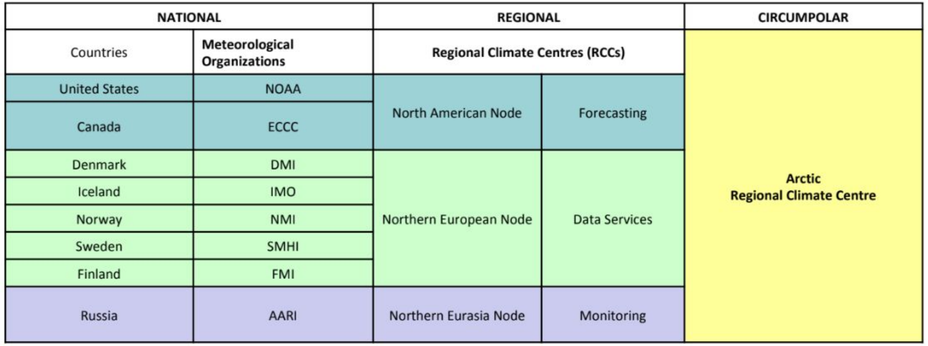
A report synthesizing the trends, data for the past season and forecasts for the upcoming season presented during the Arctic Climate Forums (ACFs).

It provides following information significant for the domain of the ArcRCC:

- Review of the climate trends and variability during the previous season for the WMO essential climate variables (or ECVs), including air temperature, precipitation, and sea-ice
- Verification of the seasonal outlooks (forecasts) for the stated ECVs from the previous ACF
- Outlooks for the upcoming season for the stated ECVs including possible risks
- Review of the extremes events that happened during the previous season based on non-technical reports during the forum

How is it produced?

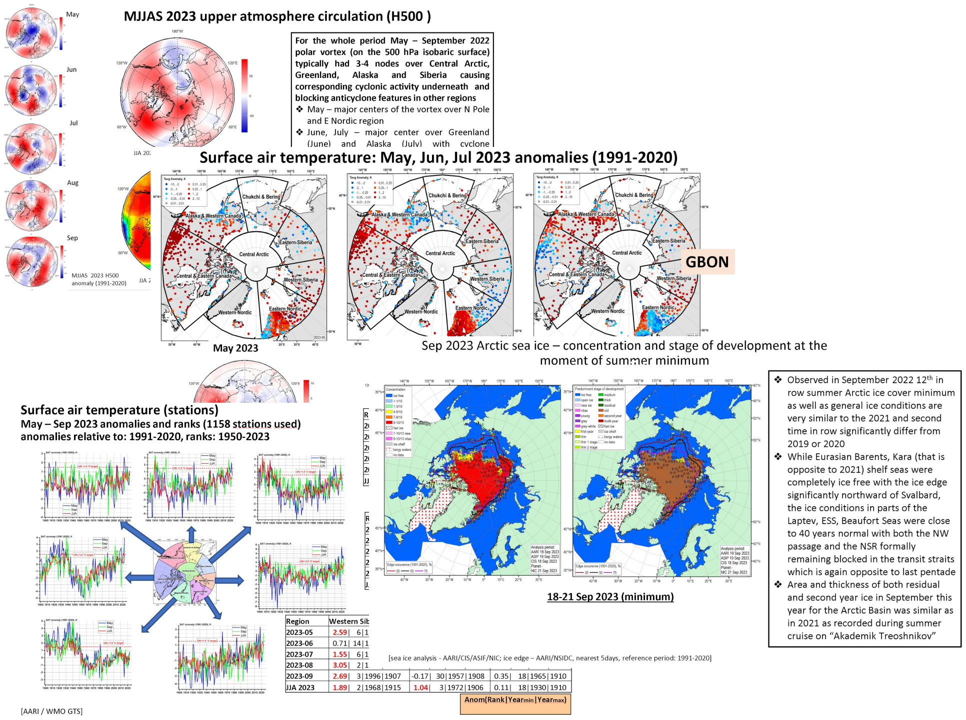
- It is a joint effort by all NMHs of the ArcRCC
- Climate monitoring and forecasted information is collected from the responsible nodes
- Additional regional information on impacts and risks is included from the non-technical provided
- Consensus statement document draft is circulated among the team
- Final version published after the Arctic Climate Forum



NATIONAL		REGIONAL		CIRCUMPOLAR
Countries	**Meteorological Organizations**	**Regional Climate Centres (RCCs)**		**Arctic Regional Climate Centre**
United States	NOAA	North American Node	Forecasting	
Canada	ECCC			
Denmark	DMI	Northern European Node	Data Services	
Iceland	IMO			
Norway	NMI			
Sweden	SMHI			
Finland	FMI			
Russia	AARI	Northern Eurasia Node	Monitoring	

What does it look like?

- ❖ **Graphics and text describing past and forecasted variability for the major Arctic Climate Variables based on observations and numerical analysis**



MJJAS 2023 upper atmosphere circulation (H500)

For the whole period May – September 2022 polar vortex (on the 500 hPa isobaric surface) typically had 3-4 nodes over Central Arctic, Greenland, Alaska and Siberia causing corresponding cyclonic activity underneath and blocking anticyclone features in other regions

- ❖ May – major centers of the vortex over N Pole and E Nordic region
- ❖ June, July – major center over Greenland (June) and Alaska (July) with cyclone

Surface air temperature: May, Jun, Jul 2023 anomalies (1991-2020)

Sep 2023 Arctic sea ice – concentration and stage of development at the moment of summer minimum

Surface air temperature (stations)
May – Sep 2023 anomalies and ranks (1158 stations used)
anomalies relative to: 1991-2020, ranks: 1950-2023

18-21 Sep 2023 (minimum)

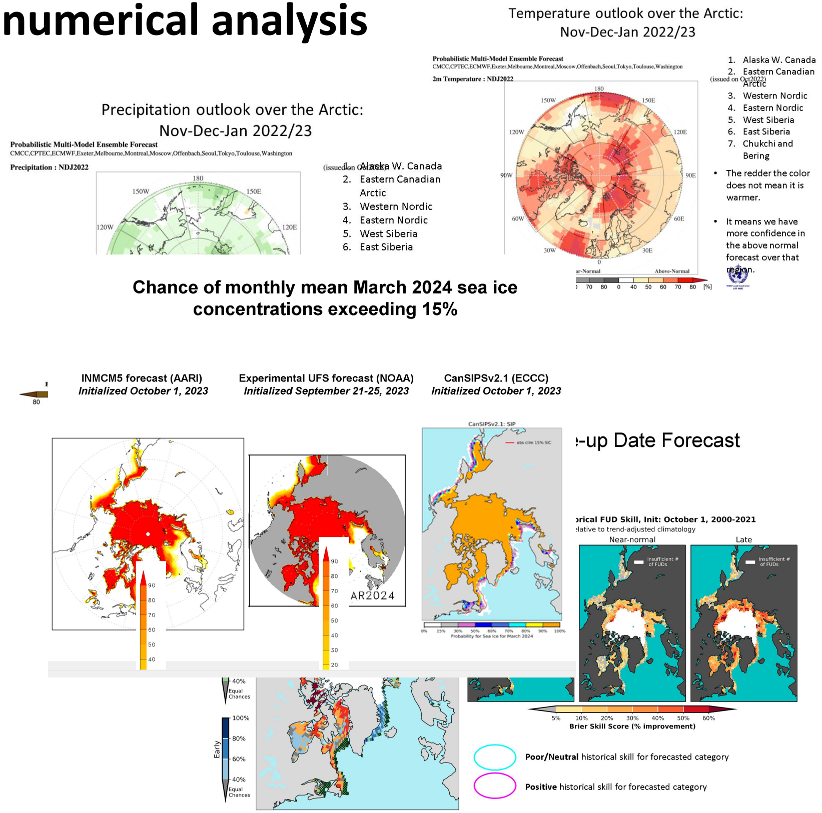
- ❖ Observed in September 2022 12th in row summer Arctic ice cover minimum as well as general ice conditions are very similar to the 2021 and second time in row significantly differ from 2019 or 2020
- ❖ While Eurasian Barents, Kara (that is opposite to 2021) shelf seas were completely ice free with the ice edge significantly northward of Svalbard, the ice conditions in parts of the Laptev, ESS, Beaufort Seas were close to 40 years normal with both the NW passage and the NSR formally remaining blocked in the transit straits which is again opposite to last pentade
- ❖ Area and thickness of both residual and second year ice in September this year for the Arctic Basin was similar as in 2021 as recorded during summer cruise on "Akademik Treoshnikov"

[sea ice analysis - AARI/CIS/ASIF/NIC; ice edge – AARI/NSIDC, nearest 5days, reference period: 1991-2020]

Region	Western Sib		
2023-05	2.59| 6|1		
2023-06	0.71| 14|1		
2023-07	1.55| 6|1		
2023-08	3.05| 2|1		
2023-09	2.69| 3|1996|1907	-0.17| 30|1957|1908	0.35| 18|1965|1910
JJA 2023	1.89| 2|1968|1915	1.04| 3|1972|1906	0.11| 18|1930|1910

Anom(Rank|Year$_{min}$|Year$_{max}$)

[AARI / WMO GTS]



Temperature outlook over the Arctic:
Nov-Dec-Jan 2022/23

1. Alaska W. Canada
2. Eastern Canadian Arctic
3. Western Nordic
4. Eastern Nordic
5. West Siberia
6. East Siberia
7. Chukchi and Bering

- The redder the color does not mean it is warmer.
- It means we have more confidence in the above normal forecast over that region.

Precipitation outlook over the Arctic:
Nov-Dec-Jan 2022/23

1. Alaska W. Canada
2. Eastern Canadian Arctic
3. Western Nordic
4. Eastern Nordic
5. West Siberia
6. East Siberia

Chance of monthly mean March 2024 sea ice concentrations exceeding 15%

INMCM5 forecast (AARI)
Initialized October 1, 2023

Experimental UFS forecast (NOAA)
Initialized September 21-25, 2023

CanSIPSv2.1 (ECCC)
Initialized October 1, 2023

-up Date Forecast

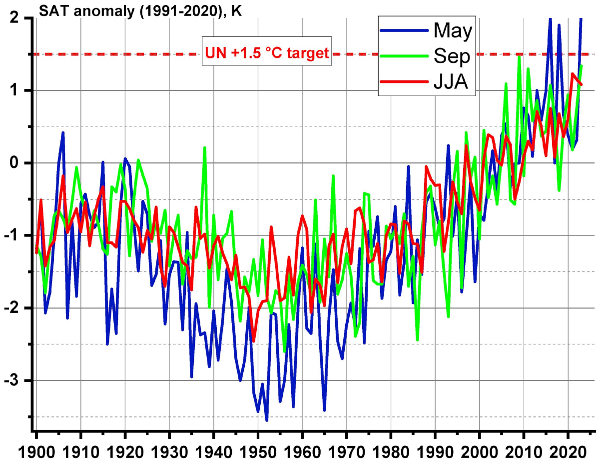
orical FUD Skill, Init: October 1, 2000-2021
elative to trend-adjusted climatology

Poor/Neutral historical skill for forecasted category

Positive historical skill for forecasted category

What does it contain ?

- ❖ Highlights, summary of the previous season and the outlooks (forecasts) for the next season



Region	Arctic total
2023-05	2.15| 1|1952|2023
2023-06	1.24| 3|1949|2021
2023-07	0.45| 9|1949|2018
2023-08	1.58| 1|1956|2023
2023-09	1.34| 2|1956|2009
JJA 2023	1.08| 3|1949|2021

Anom(Rank|$Year_{min}$|$Year_{max}$)

HIGHLIGHTS

During NDJ (November - January) 2021/2022 an intense bi-center polar vortex was observed with centers over the Hudson Bay and the Barents Sea which led to prevalence of meridian circulation (transfer south/north) in the troposphere over Western Siberia and Canada regions, zonal one over other parts of the Arctic and subsequent effects in surface circulation. Further in season during FMA (February - April) 2022 bi-center polar vortex shifted counter-clockwise with centers over the Hudson Bay and central Siberia and caused general meridian type of circulation in Eastern Canada and Siberia regions. Blocking positive mean sea level pressure (MSLP) anomalies were observed in February from Central Siberia through Alaska to Central Canada and in April as a vast area of high pressure over Arctic Ocean, Northern Canada and Alaska.

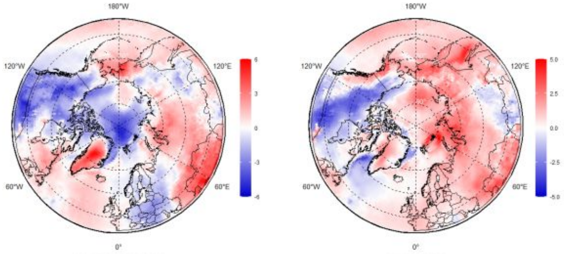
Temperature: During the first part of winter prominent negative surface air temperature (SAT) anomalies (ref. WMO period 1991-2020) were observed mainly in the Alaska & Western Canada and Eastern Nordic regions while Central and Eastern Canada, Western Nordic and Siberia experienced prominent positive anomalies. Second part of winter and early spring experienced slight negative anomalies in Alaska, Canada in general and Nordic regions and similar positive anomalies over Siberia and Chukchi regions. The whole land Arctic during the season experienced slight negative anomalies though strong differences between the months were observed.
Surface air temperatures during summer 2022 are forecasted to be above normal in almost all regions across the Arctic. The confidence of the forecast is low to moderate for most of the land areas of the Arctic region with the exception of Eastern Canada, Northwest Greenland and south parts of Siberia where the confidence is high.

Precipitation: During the whole season the general wetter (snowy) conditions occurred in most parts of Canadian, Alaska, Bering & Chukchi and Western Nordic regions. Drier conditions occurred in parts of Eastern Nordic, Siberia and Central Arctic regions. The least amount of precipitation was for the Eastern Nordic and Siberia regions. More abundant precipitation was observed in the Western Nordic, Bering and Chukchi and Canada and Alaska regions.
Somewhat drier or close to normal conditions are estimated for the Central Arctic. Confidence in the precipitation forecast Arctic-wide is low. There is no model agreement over most land and ocean areas in the Arctic. Above normal precipitation is forecasted for the Canadian Arctic Archipelago, Alaska, eastern Siberia and the Beaufort/ Chukchi /Bering Seas. Below normal precipitation is forecasted over parts of Western Canada and Northern Europe.

Sea-ice: Arctic maximum winter ice extent, 13th in row (15.2 mln km^2) was reached 2 weeks earlier than average (since 1979) on 21-22 Feb 2022, though prevalence of negative surface air temperature anomalies at the end of winter 2022 stimulated ice growth till end of April 2022 and led to greater than median (for 1979-2022) ice extent in Canadian Arctic. Estimates of the total Arctic sea ice volume continue to show its significantly decreased state – close to 3rd lowest for 2004-2022 after 2020 and 2021.
A later than normal break-up is forecasted for the Barents, Beaufort, Greenland and Labrador Seas. A near normal break-up is forecasted for Baffin and Hudson Bays and the Chukchi Sea. An earlier than normal break-up is forecasted for the Canadian Arctic Archipelago and the Kara and Laptev seas. The forecast for most of the Arctic is a near normal September ice extent. Below normal ice extent is forecasted for the Laptev and Kara Seas.

What does it contain ?

- ❖ **Review of the observations during the previous season for temperature, precipitation and sea-ice, land hydrology and weather severity**



NDJ 2021-2022 FMA 2022

Figure 6: NDJ 2021/2022 and FMA 2022 SAT anomalies (ref. 1991-2020). Data source: AARI. Maps produced by the AARI. Data source: CCCS ERA5

Further by the end of winter and early spring in March – April 2022 both positive and negative anomalies were observed over Alaska (29th and 55th in row), Canada (11th and 29th) and Nordic regions and mostly positive over Siberia (16th – 30th in row) and Chukchi (6th – 10th in row) regions (Figure 5).

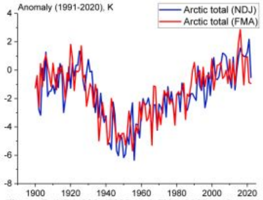


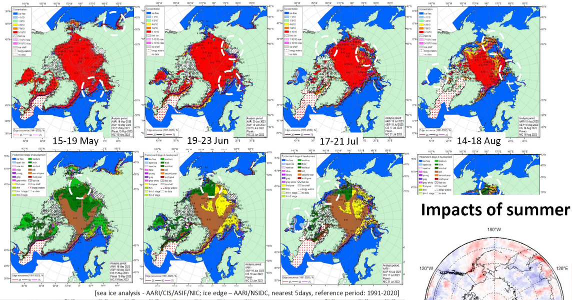
Figure 7: NDJ 2021/2022 and FMA 2022 surface air temperature anomalies (ref. 1991-2020) Graphics produced by the AARI. Data source: WMO polar stations within the ArcRCC-N domain (see fig.2).

Due to lack of surface marine observations conclusions for the Central Arctic done on the basis of reanalysis, include partly colder conditions in November 2021, predominantly warmer in February – March 2021, and colder in December 2021 and April 2022 (figure 6).
For the whole land Arctic, the prominent warmer conditions were observed in November 2021 (12th in row) with prominent colder in December 2021 (47th in row) and April 2022 (38th in row).

It should be mentioned that though extreme monthly negative anomalies occurred with a very few exceptions in the mid-20th century, that could not be the case for extreme positive anomalies which could occur for different months and regions as early as the 1920s (figure 7).

Simultaneously, it should be kept in mind that though positive trends from 1940s-1950s are obvious, the quantitative estimates depend on the chosen WMO reference period and density of the stations, in particular for the marine Arctic within a particular temporal sub-period.

May – Aug 2023 Arctic sea ice – concentration and stage of development



[sea ice analysis - AARI/CIS/ASIF/NIC; ice edge – AARI/NSIDC, nearest 5days, reference period: 1991-2020]

Figure 18: Blended Arctic sea-ice chart (AARI, CIS, NIC) for 14-18 March 2022 and sea-ice ec
for 1991-2020 reference period. Left: total concentration, right: predominant stage of develop
AARI.

Other special features of ice conditions in the Arctic during autumn – w
(figure 18) occurrence of residual and further in season of second-yea
northern parts of the East Siberian Sea or within eastern lanes of
(NSR), lighter than median ice conditions in the Eastern Canadian Arc
winter but heavier than median during late winter (not shown here) a
the Sea of Okhotsk during the whole winter period which is opposite t

ESA CryoSAT-2 altimetric measurements show the Arctic Basin se
distribution in March 2022 similar to the mean 2011-2022 patterr
estimate of the total Arctic ice volume (e.g. by DMI, see polarportal.dk
somewhat the ~3rd lowest for 2004-2022 after 2020 and 2021 (not sho

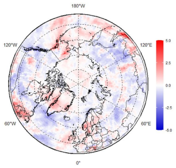
Sea-Ice Outlook for summer 2022 and verification for March 202

The forecast for March 2022 sea ice extent was based on output from
two climate models, and verified well (right column, Table 7). Nea
correctly forecasted for the Barents Sea, Greenland Sea, North Balt
Sea. Below normal ice extent in the Gulf of St. Lawrence was correctly forecast. The model did not forecast the below normal ice extent in the Bering Sea.

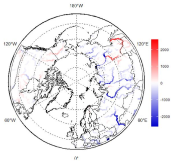
Outlook for Spring Break-up 2022

Sea ice break-up is defined as the first day in a 10-day interval where ice concentration falls below 50% in a region. The outlook for spring break-up shown in Figure 19 displays the sea ice break-up anomaly from CanSIPSv2 based on the nine-year climatological period from 2012-2020. The qualitative 3-category (high, moderate, low) confidence in the forecast is based on the historical model skill (Figure 20). A summary of the forecast for the 2022 spring break-up for the different Arctic regions are shown in Table 8.

Impacts of summer 2023 precipitation and evaporation on river discharge (reanalysis)



JJA 2023 precipitation anomaly, 1991-2020

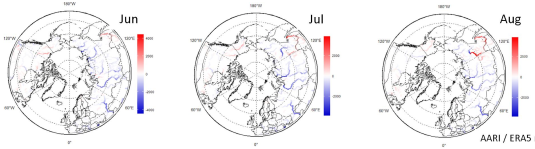


JJA 2022 river discharge anomaly, 1991-2020

Impacts of wetter/drier conditions and evaporation were reflected in the JJA 2022 Arctic rivers discharge:

- ❖ Lesser drainage than normal was seen for practically all Great Arctic rivers with more significant negative anomalies for Ob, Yenisei, Indigirka for all months
- ❖ Greater drainage was seen for Mackenzie and Yukon and parts of Lena river system
- ❖ With exception of Yenisei such drier situation this summer is similar for Eurasian Arctic to summer 2021 but is opposite for American sector as in summer 2021 Mackenzie and Yukon rivers experienced normal or lesser discharge

2022 river discharge anomaly (1991-2020)



AARI / ERA5 reanalysis

What does it contain ?

- **Verification of the seasonal outlooks and seasonal outlooks for the next season - temperature, precipitation, sea-ice, snow water equivalent, sea surface temperature, bioclimatic indexes**

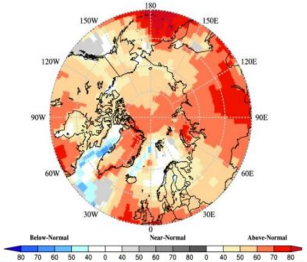


Figure 9: Multi model ensemble probability forecast for temperature for June, July, and August 2022. Red indicates warmer conditions, blue colder conditions and white, no agreement amongst the models. Source: www.wmolc.org.

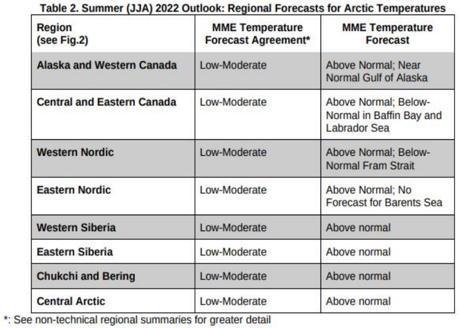


Table 2. Summer (JJA) 2022 Outlook: Regional Forecasts for Arctic Temperatures

Region (see Fig.2)	MME Temperature Forecast Agreement*	MME Temperature Forecast
Alaska and Western Canada	Low-Moderate	Above Normal; Near Normal Gulf of Alaska
Central and Eastern Canada	Low-Moderate	Above Normal; Below-Normal in Baffin Bay and Labrador Sea
Western Nordic	Low-Moderate	Above Normal; Below-Normal Fram Strait
Eastern Nordic	Low-Moderate	Above Normal; No Forecast for Barents Sea
Western Siberia	Low-Moderate	Above normal
Eastern Siberia	Low-Moderate	Above normal
Chukchi and Bering	Low-Moderate	Above normal
Central Arctic	Low-Moderate	Above normal

*: See non-technical regional summaries for greater detail

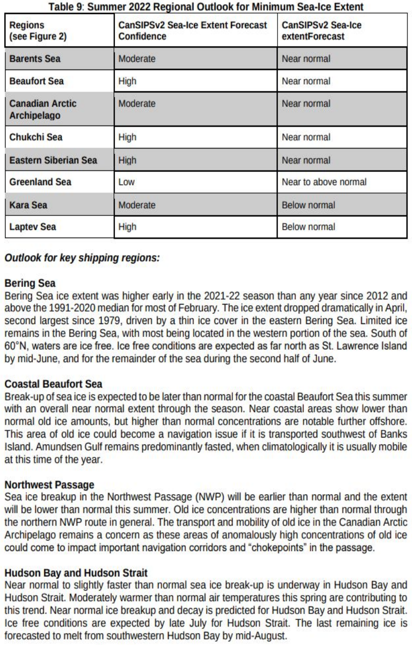


Table 9: Summer 2022 Regional Outlook for Minimum Sea-Ice Extent

Regions (see Figure 2)	CanSIPSv2 Sea-Ice Extent Forecast Confidence	CanSIPSv2 Sea-Ice extentForecast
Barents Sea	Moderate	Near normal
Beaufort Sea	High	Near normal
Canadian Arctic Archipelago	Moderate	Near normal
Chukchi Sea	High	Near normal
Eastern Siberian Sea	High	Near normal
Greenland Sea	Low	Near to above normal
Kara Sea	Moderate	Below normal
Laptev Sea	High	Below normal

Outlook for key shipping regions:

Bering Sea

Bering Sea ice extent was higher early in the 2021-22 season than any year since 2012 and above the 1991-2020 median for most of February. The ice extent dropped dramatically in April, second largest since 1979, driven by a thin ice cover in the eastern Bering Sea. Limited ice remains in the Bering Sea, with most being located in the western portion of the sea. South of 60°N, waters are ice free. Ice free conditions are expected as far north as St. Lawrence Island by mid-June, and for the remainder of the sea during the second half of June.

Coastal Beaufort Sea

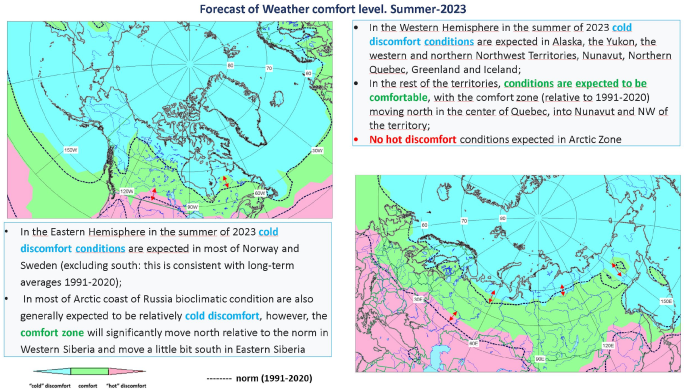
Break-up of sea ice is expected to be later than normal for the coastal Beaufort Sea this summer with an overall near normal extent through the season. Near coastal areas show lower than normal old ice amounts, but higher than normal concentrations are notable further offshore. This area of old ice could become a navigation issue if it is transported southwest of Banks Island. Amundsen Gulf remains predominantly fasted, when climatologically it is usually mobile at this time of the year.

Northwest Passage

Sea ice breakup in the Northwest Passage (NWP) will be earlier than normal and the extent will be lower than normal this summer. Old ice concentrations are higher than normal through the northern NWP route in general. The transport and mobility of old ice in the Canadian Arctic Archipelago remains a concern as these areas of anomalously high concentrations of old ice could come to impact important navigation corridors and “chokepoints” in the passage.

Hudson Bay and Hudson Strait

Near normal to slightly faster than normal sea ice break-up is underway in Hudson Bay and Hudson Strait. Moderately warmer than normal air temperatures this spring are contributing to this trend. Near normal ice breakup and decay is predicted for Hudson Bay and Hudson Strait. Ice free conditions are expected by late July for Hudson Strait. The last remaining ice is forecasted to melt from southwestern Hudson Bay by mid-August.



Forecast of Weather comfort level. Summer-2023

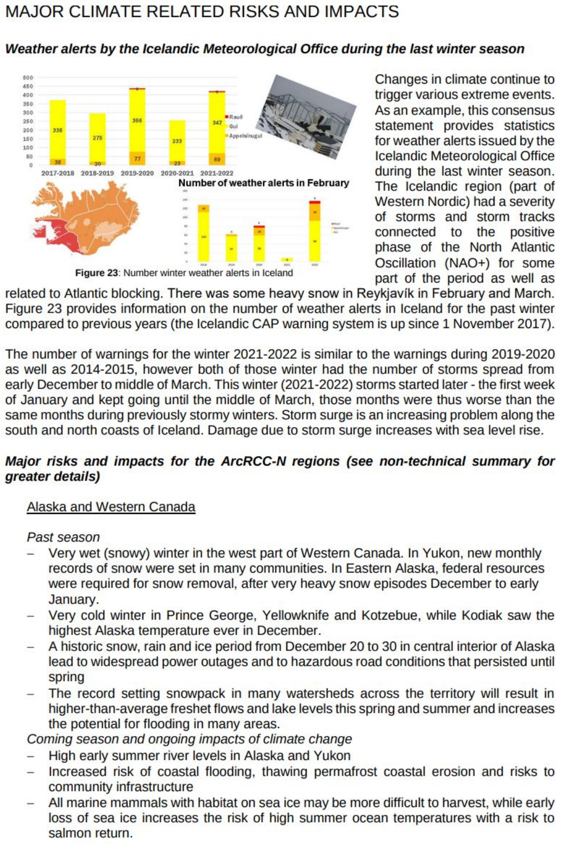
- In the Western Hemisphere in the summer of 2023 **cold discomfort conditions** are expected in Alaska, the Yukon, the western and northern Northwest Territories, Nunavut, Northern Quebec, Greenland and Iceland;
- In the rest of the territories, **conditions are expected to be comfortable**, with the comfort zone (relative to 1991-2020) moving north in the center of Quebec, into Nunavut and NW of the territory;
- **No hot discomfort** conditions expected in Arctic Zone

- In the Eastern Hemisphere in the summer of 2023 **cold discomfort conditions** are expected in most of Norway and Sweden (excluding south: this is consistent with long-term averages 1991-2020);
- In most of Arctic coast of Russia bioclimatic condition are also generally expected to be relatively **cold discomfort**, however, the **comfort zone** will significantly move north relative to the norm in Western Siberia and move a little bit south in Eastern Siberia

-------- **norm (1991-2020)**

What does it contain ?

- ❖ Example material on land and metocean warnings and alerts
  - ➢ <u>Proposals from participants are welcome</u>
- ❖ Major risks and impacts for the ArcRCC-N regions (past season and expected risks for the next season by eight ArcRCC-N regions



MAJOR CLIMATE RELATED RISKS AND IMPACTS

Weather alerts by the Icelandic Meteorological Office during the last winter season

Figure 23: Number winter weather alerts in Iceland

Changes in climate continue to trigger various extreme events. As an example, this consensus statement provides statistics for weather alerts issued by the Icelandic Meteorological Office during the last winter season. The Icelandic region (part of Western Nordic) had a severity of storms and storm tracks connected to the positive phase of the North Atlantic Oscillation (NAO+) for some part of the period as well as related to Atlantic blocking. There was some heavy snow in Reykjavík in February and March. Figure 23 provides information on the number of weather alerts in Iceland for the past winter compared to previous years (the Icelandic CAP warning system is up since 1 November 2017).

The number of warnings for the winter 2021-2022 is similar to the warnings during 2019-2020 as well as 2014-2015, however both of those winter had the number of storms spread from early December to middle of March. This winter (2021-2022) storms started later - the first week of January and kept going until the middle of March, those months were thus worse than the same months during previously stormy winters. Storm surge is an increasing problem along the south and north coasts of Iceland. Damage due to storm surge increases with sea level rise.

Major risks and impacts for the ArcRCC-N regions (see non-technical summary for greater details)

<u>Alaska and Western Canada</u>

Past season

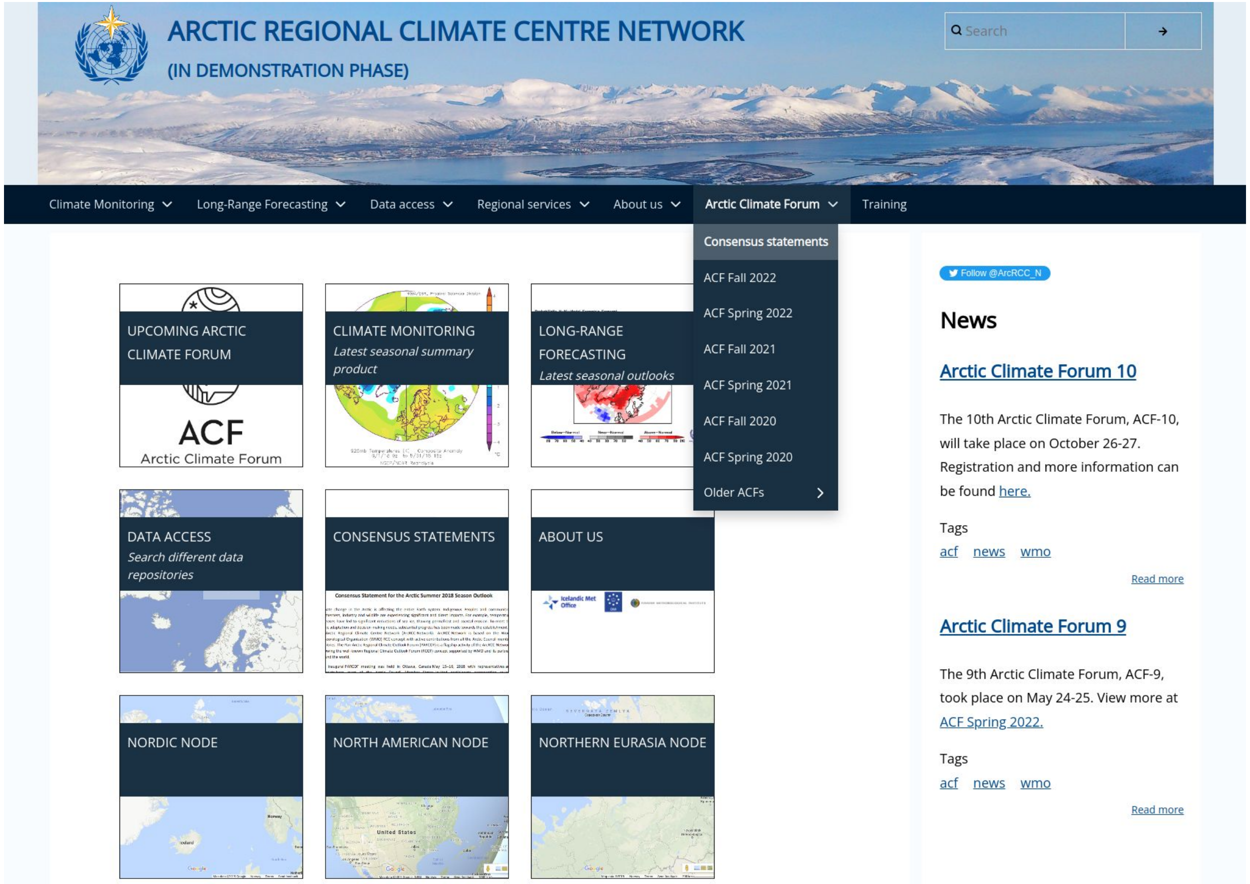
- Very wet (snowy) winter in the west part of Western Canada. In Yukon, new monthly records of snow were set in many communities. In Eastern Alaska, federal resources were required for snow removal, after very heavy snow episodes December to early January.
- Very cold winter in Prince George, Yellowknife and Kotzebue, while Kodiak saw the highest Alaska temperature ever in December.
- A historic snow, rain and ice period from December 20 to 30 in central interior of Alaska lead to widespread power outages and to hazardous road conditions that persisted until spring
- The record setting snowpack in many watersheds across the territory will result in higher-than-average freshet flows and lake levels this spring and summer and increases the potential for flooding in many areas.

Coming season and ongoing impacts of climate change

- High early summer river levels in Alaska and Yukon
- Increased risk of coastal flooding, thawing permafrost coastal erosion and risks to community infrastructure
- All marine mammals with habitat on sea ice may be more difficult to harvest, while early loss of sea ice increases the risk of high summer ocean temperatures with a risk to salmon return.

Where is it published?

Website: arctic-rcc.org



News

Arctic Climate Forum 10

The 10th Arctic Climate Forum, ACF-10, will take place on October 26-27. Registration and more information can be found here.

Tags

acf news wmo

Read more

Arctic Climate Forum 9

The 9th Arctic Climate Forum, ACF-9, took place on May 24-25. View more at ACF Spring 2022.

Tags

acf news wmo

Read more

ACF
Arctic Climate Forum

Thank you!

vms@aari.aq

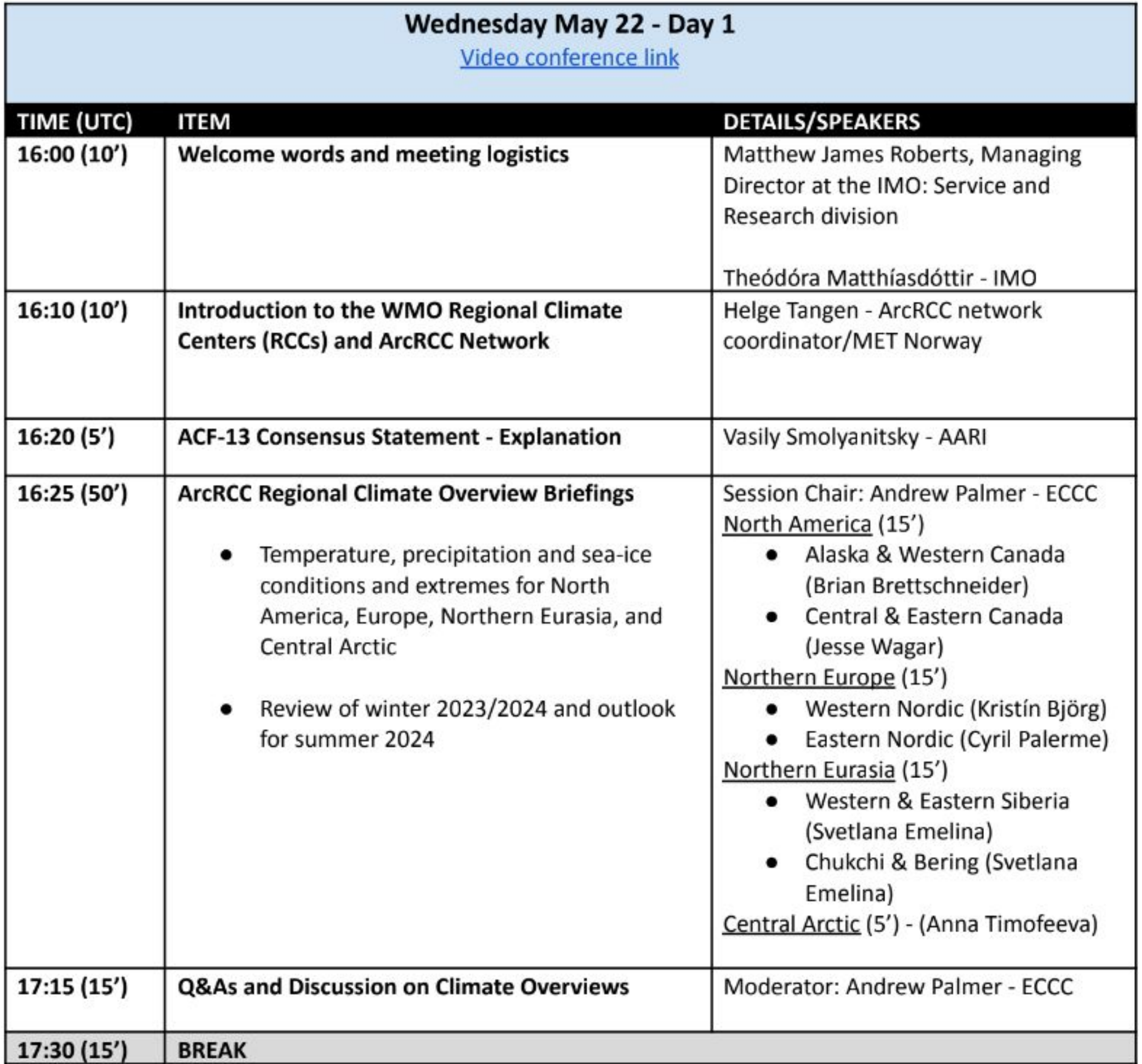
Arctic Regional Climate Centre Network

ACF
Arctic Climate Forum

Regional Climate Overview Briefings

WORLD METEOROLOGICAL ORGANIZATION

Icelandic Met Office



Wednesday May 22 - Day 1

Video conference link

TIME (UTC)	ITEM	DETAILS/SPEAKERS
16:00 (10’)	**Welcome words and meeting logistics**	Matthew James Roberts, Managing Director at the IMO: Service and Research division Theódóra Matthíasdóttir - IMO
16:10 (10’)	**Introduction to the WMO Regional Climate Centers (RCCs) and ArcRCC Network**	Helge Tangen - ArcRCC network coordinator/MET Norway
16:20 (5’)	**ACF-13 Consensus Statement - Explanation**	Vasily Smolyanitsky - AARI
16:25 (50’)	**ArcRCC Regional Climate Overview Briefings** • Temperature, precipitation and sea-ice conditions and extremes for North America, Europe, Northern Eurasia, and Central Arctic • Review of winter 2023/2024 and outlook for summer 2024	Session Chair: Andrew Palmer - ECCC North America (15’) • Alaska & Western Canada (Brian Brettschneider) • Central & Eastern Canada (Jesse Wagar) Northern Europe (15’) • Western Nordic (Kristín Björg) • Eastern Nordic (Cyril Palerme) Northern Eurasia (15’) • Western & Eastern Siberia (Svetlana Emelina) • Chukchi & Bering (Svetlana Emelina) Central Arctic (5’) - (Anna Timofeeva)
17:15 (15’)	**Q&As and Discussion on Climate Overviews**	Moderator: Andrew Palmer - ECCC
17:30 (15’)	**BREAK**	

13th Arctic Climate Forum
May 2024

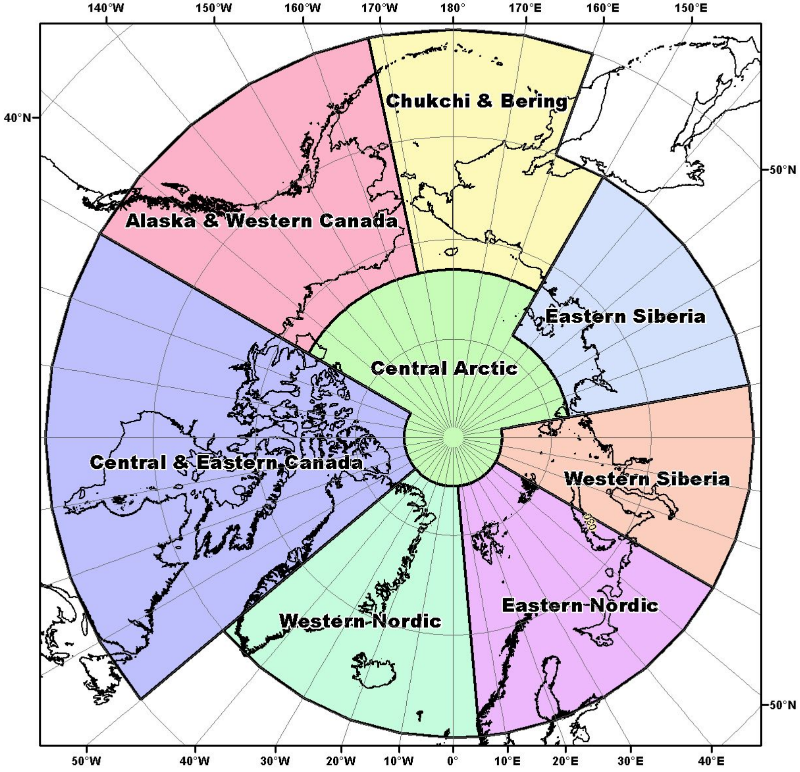
ACF
Arctic Climate Forum

Regional Overview

Summary of Winter 2023/2024 and
Outlook for Summer 2024

Arctic Regional Climate Centre Network
World Meteorological Organization

Terrestrial Regions covered



North American Node

- **Alaska & Western Canada**: Includes Alaska, and the Yukon and the Northwest Territories in Canada
- **Central & Eastern Canada**: Central and Eastern Canada and Western Greenland

Northern European Node

- **Western Nordic**: Eastern Greenland, Iceland
- **Eastern Nordic:** Svalbard and Scandinavia

Eurasian Node

- **Western Siberia**
- **Eastern Siberia**
- **Chukchi & Bering**

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

Available observations

+

State of the art modeling for temperature, precipitation and sea-ice

+

Arctic regional climate expertise from National meteorological organizations*

+

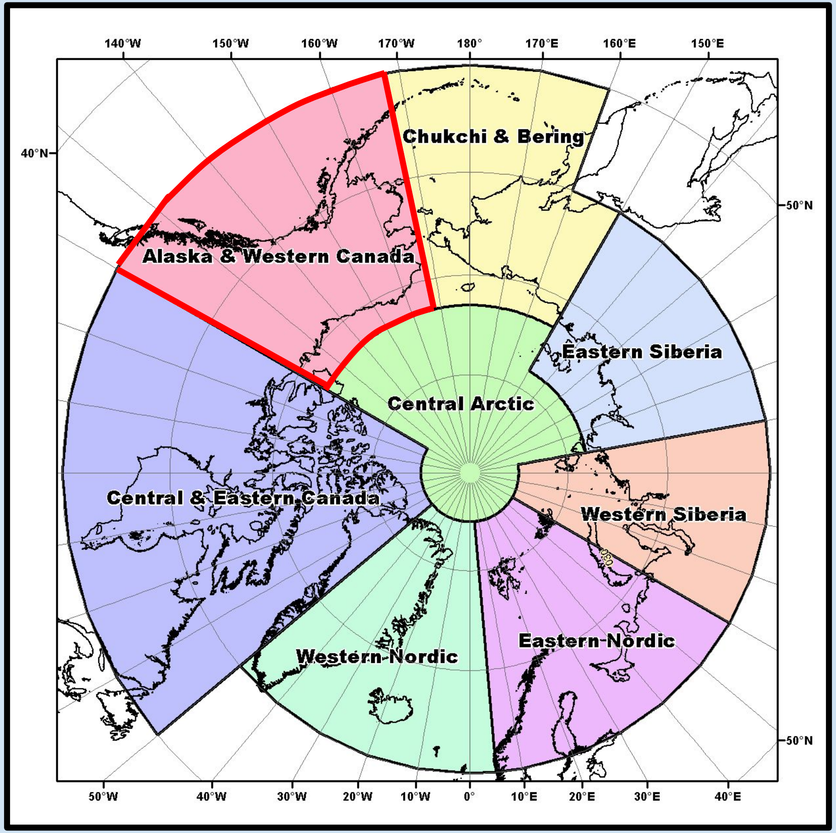
Information about potential impacts for regional users

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

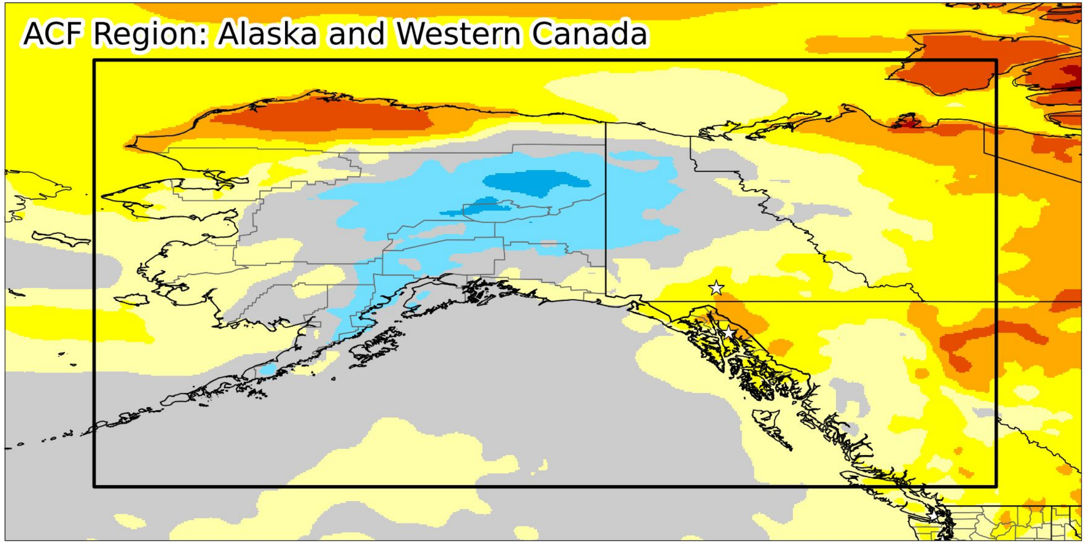
North American Node

- Alaska and Western Canada
- Central and Eastern Canada

Alaska and Western Canada



Temperature Departure for Dec-Feb 2023-24

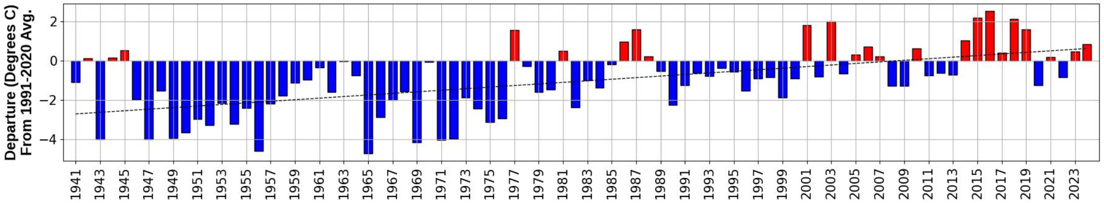


Source: ERA5 Reanalysis

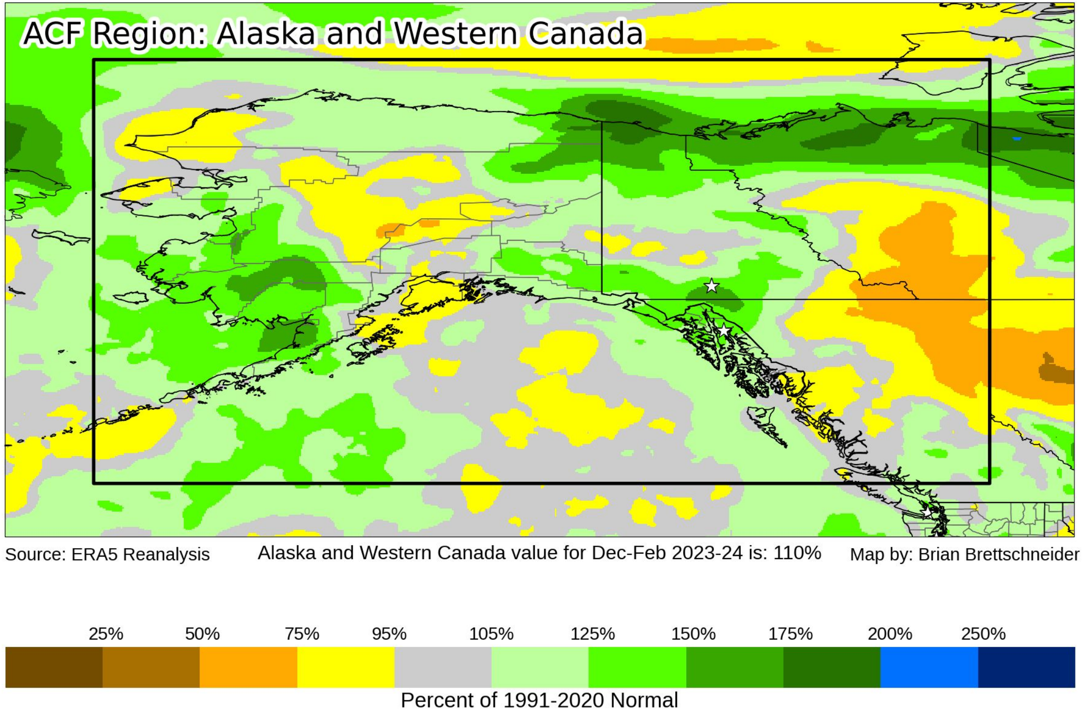
Alaska and Western Canada value for Dec-Feb 2023-24 is: +0.9C

Map by: Brian Brettschneider

Departure From 1991-2020 Normal (C)



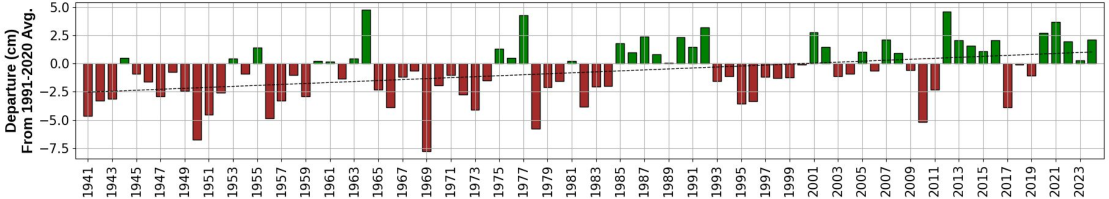
Precipitation Departure for Dec-Feb 2023-24



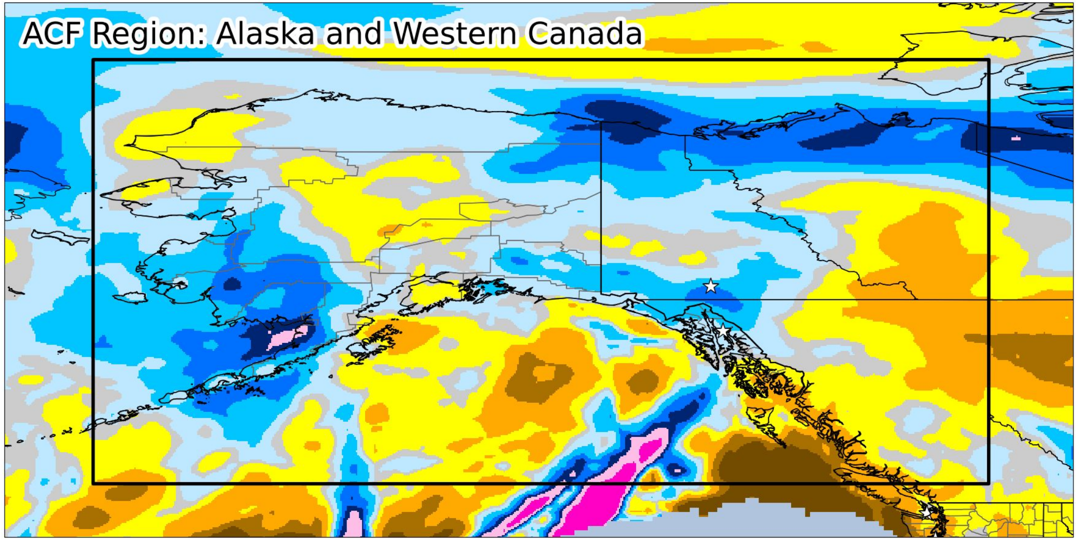
Source: ERA5 Reanalysis

Alaska and Western Canada value for Dec-Feb 2023-24 is: 110%

Map by: Brian Brettschneider



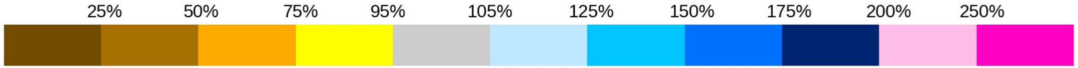
Snowfall Departure for Dec-Feb 2023-24



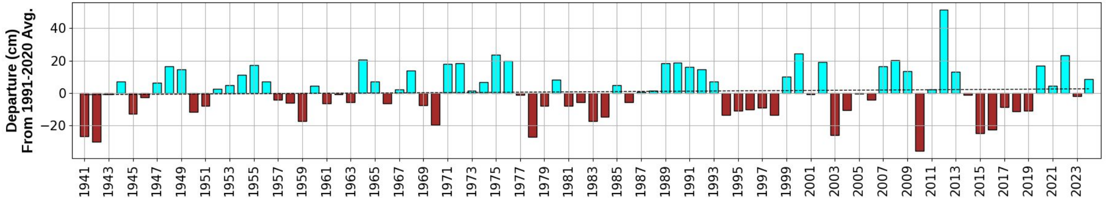
Source: ERA5 Reanalysis

Alaska and Western Canada value for Dec-Feb 2023-24 is: 107%

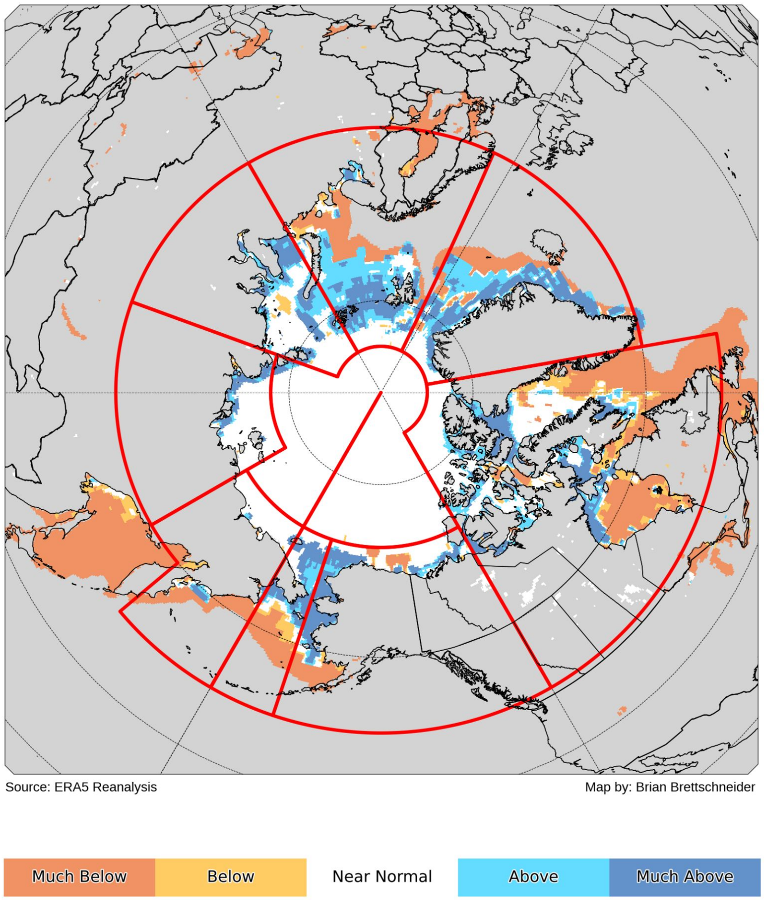
Map by: Brian Brettschneider



Percent of 1991-2020 Normal



Sea Ice Concentration for Dec-Feb 2023-24



Source: ERA5 Reanalysis

Map by: Brian Brettschneider

Compared to 1991-2020 Base Period

Dec-Feb 2023-24 Sea Ice Extent Pct of Normal

Alaska & Western Canada: 98%

Central & Eastern Canada: 95%

Western Nordic: 112%

Eastern Nordic: 96%

Western Siberia: 100%

Eastern Siberia: 100%

Chukchi & Bering: 96%

Central Arctic: 100%

Dec-Feb 2023-24 Sea Ice Concentration Pct of Normal

Alaska & Western Canada: 97%

Central & Eastern Canada: 93%

Western Nordic: 113%

Eastern Nordic: 96%

Western Siberia: 99%

Eastern Siberia: 102%

Chukchi & Bering: 98%

Central Arctic: 101%

Alaska and Western Canada

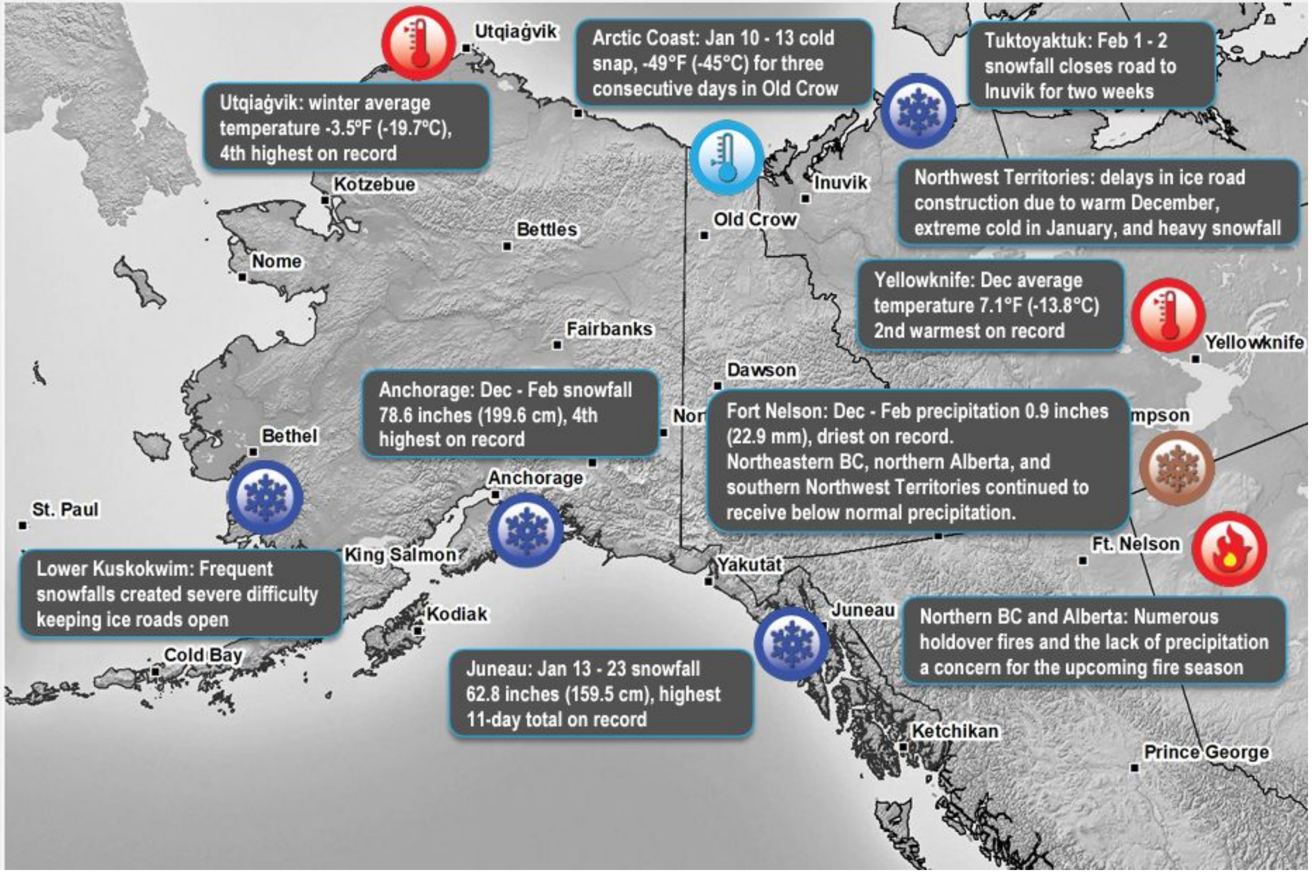
Seasonal Summary: Winter 2023-2024			
Observations above (+) and below (-) normal			
Temperature Normal 1991-2020	Winter temperatures in Alaska and NW Canada were 0.835°C above the 1991-2020 average.	ERA5 since 1940 Warmest: 2015-16	ERA5 since 1940 Coolest: 1964-65
Precipitation Normal 1991-2020	Winter precipitation in Alaska and NW Canada 109 percent of 1991-2020 average.	ERA5 since 1940 Wettest: 1963-64	ERA5 since 1940 Driest: 1968-69
Sea-Ice Since 1979	Beaufort Sea and Chukchi Sea (after mid-December) completely iced over. Bering Sea Dec-Feb average ice extent was 88 percent of 1991-2020 normal.	Maximum extent was 734,000 km² on March 19, 88% of 1991-2020 average maximum extent.	

ALASKA and NORTHWESTERN CANADA

Weather and Climate Highlights and Impacts, December 2023 to February 2024
Climate Outlook, April 2024 to June 2024

ACCAP
Alaska Center for Climate Assessment and Policy
a NOAA CAP/RISA team

Environment and Climate Change Canada
Environnement et Changement climatique Canada



Utqiaġvik: winter average temperature -3.5°F (-19.7°C), 4th highest on record

Arctic Coast: Jan 10 - 13 cold snap, -49°F (-45°C) for three consecutive days in Old Crow

Tuktoyaktuk: Feb 1 - 2 snowfall closes road to Inuvik for two weeks

Northwest Territories: delays in ice road construction due to warm December, extreme cold in January, and heavy snowfall

Yellowknife: Dec average temperature 7.1°F (-13.8°C) 2nd warmest on record

Anchorage: Dec - Feb snowfall 78.6 inches (199.6 cm), 4th highest on record

Fort Nelson: Dec - Feb precipitation 0.9 inches (22.9 mm), driest on record.
Northeastern BC, northern Alberta, and southern Northwest Territories continued to receive below normal precipitation.

Lower Kuskokwim: Frequent snowfalls created severe difficulty keeping ice roads open

Northern BC and Alberta: Numerous holdover fires and the lack of precipitation a concern for the upcoming fire season

Juneau: Jan 13 - 23 snowfall 62.8 inches (159.5 cm), highest 11-day total on record

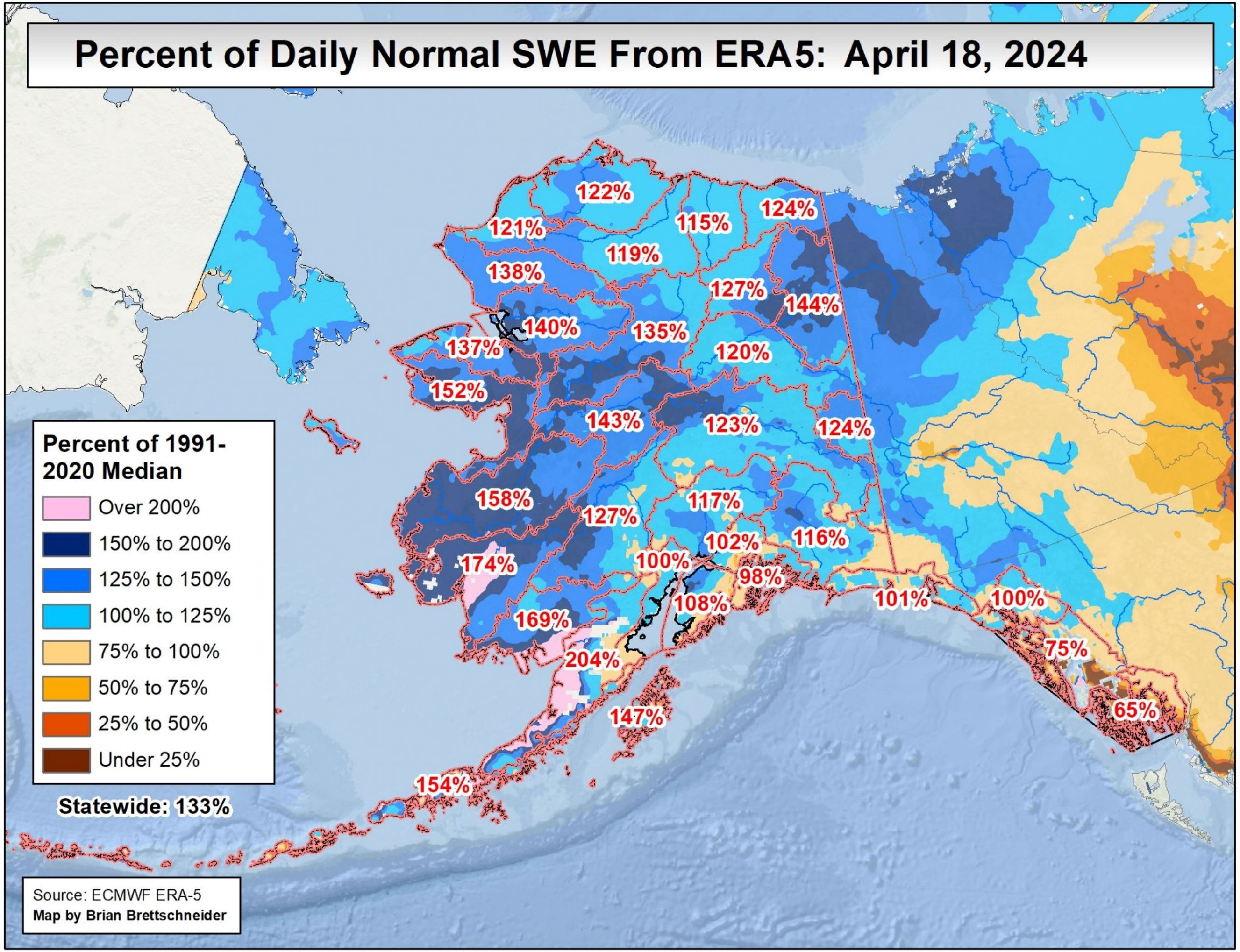
Alaska and Western Canada

December 2023: Anchorage, Alaska after repeated heavy snows.
Credit: B. Brettschneider

OBSERVED EXTREME CLIMATE EVENTS
WINTER 2023-24

Category	Location	Rarity	Impacts associated with event
Precipitation and Temperature	Alaska	● 2nd snowiest January on record at the Juneau Intl Airport followed by melt. ● Nov-Dec: extreme snowfall Anchorage area (Highest Nov-Dec amount on record).	● Record snowfall in a two-week period in Juneau followed by a rapid warm-up and rainfall caused local flooding issues. ● Weeks-long travel hazard in Anchorage area from heavy snowfall and numerous structure collapses due to heavy snow load.
Precipitation	Yukon	● Unusually thin ice on the Yukon River at Dawson City.	● The government-sponsored ice bridge across the Yukon River at Dawson City was not built this year due to warm temperatures and thin ice.

Percent of Daily Normal SWE From ERA5: April 18, 2024



Statewide: 133%

Source: ECMWF ERA-5

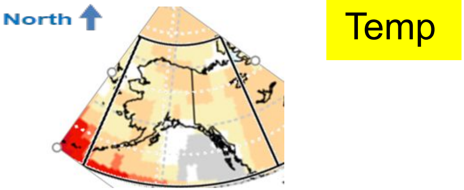
Map by Brian Brettschneider

Alaska and Western Canada

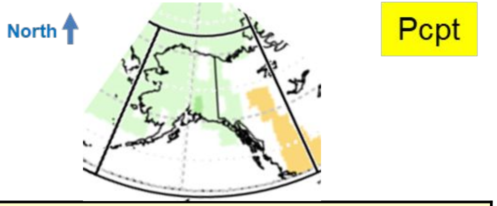
May 2023: Circle, Alaska Yukon River ice jam flooding. Photo credit: National Weather Service

OBSERVED EXTREME CLIMATE EVENTS
SPRING 2024

Category	Location	Rarity	Impacts associated with event
Flooding	Alaska and Yukon	• April-May: Early river breakup at most locations. Flooding significant in a few areas. Not as bad as last year.	• Road damage and severe erosion along the lower Kuskokwim River.
Precipitation	Alaska	• March-April: Very heavy snow along most of the Alaska west coast. High season SWE.	• Travel impacts. • Subsistence impacts
Temperature	Alaska	• April: Extreme cold during first week of April.	• Delayed snow melt-off. Concern regarding late-month breakup did not materialize.

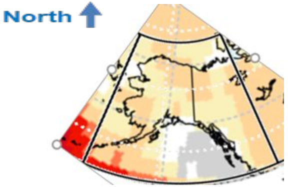


Alaska and Western Canada

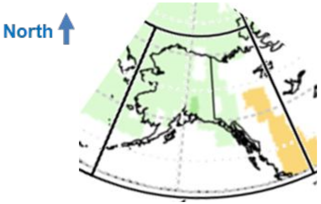


Outlook: Summer 2024				Multi Model Agreement		
Forecast				**High**	**Moderate**	**Low**
Temp *	Bering Sea		Above Normal		✓	
	Beaufort Sea		Above Normal			
	Gulf of Alaska		Above Normal			
	SE Alaska, NW of Western Canada		Above Normal			
	Mainland Alaska and Canada north of 60N		Above Normal			
Precip *	Gulf of Alaska		Near normal			
	Alaska and Western Canada, Beaufort Sea		Near normal			
Sea-Ice	**Break-up**	Chukchi	Near normal			
		Beaufort Sea	Near normal			
		Bering Sea / Bering Strait	Happening but late			
	Min. Ice Extent September 2023	Chukchi and Beaufort Seas	Below normal			
Snow Water Equivalent (experimental product)	For Northern Alaska Yukon and Western part of the Northwest Territories (NWT)		**Near normal**			
	Most of Alaska, Central NWT		No model agreement			
	Eastern half of the NWT		**Near normal**			

Alaska and Western Canada



Temp



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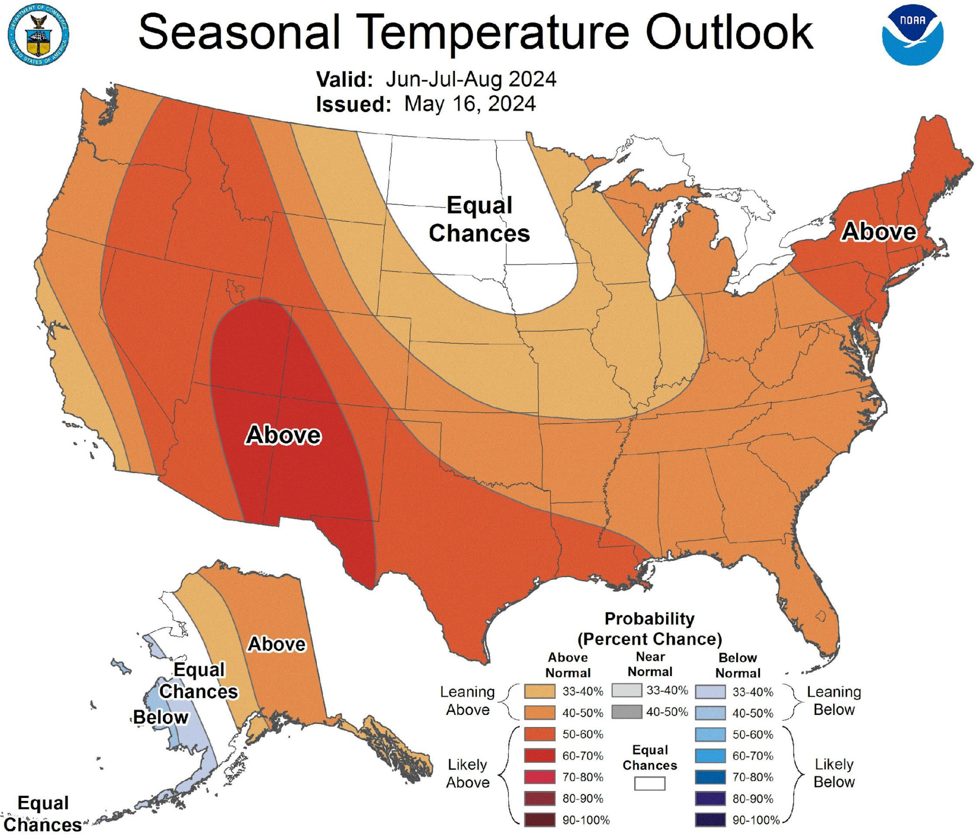
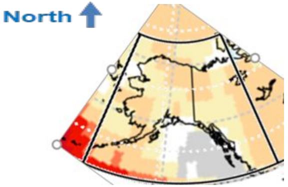

Seasonal Temperature Outlook

Valid: Jun-Jul-Aug 2024
Issued: May 16, 2024

Alaska and Western Canada

Temp



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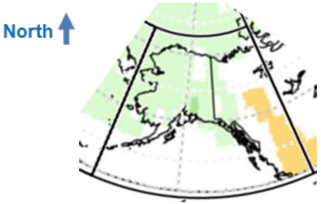
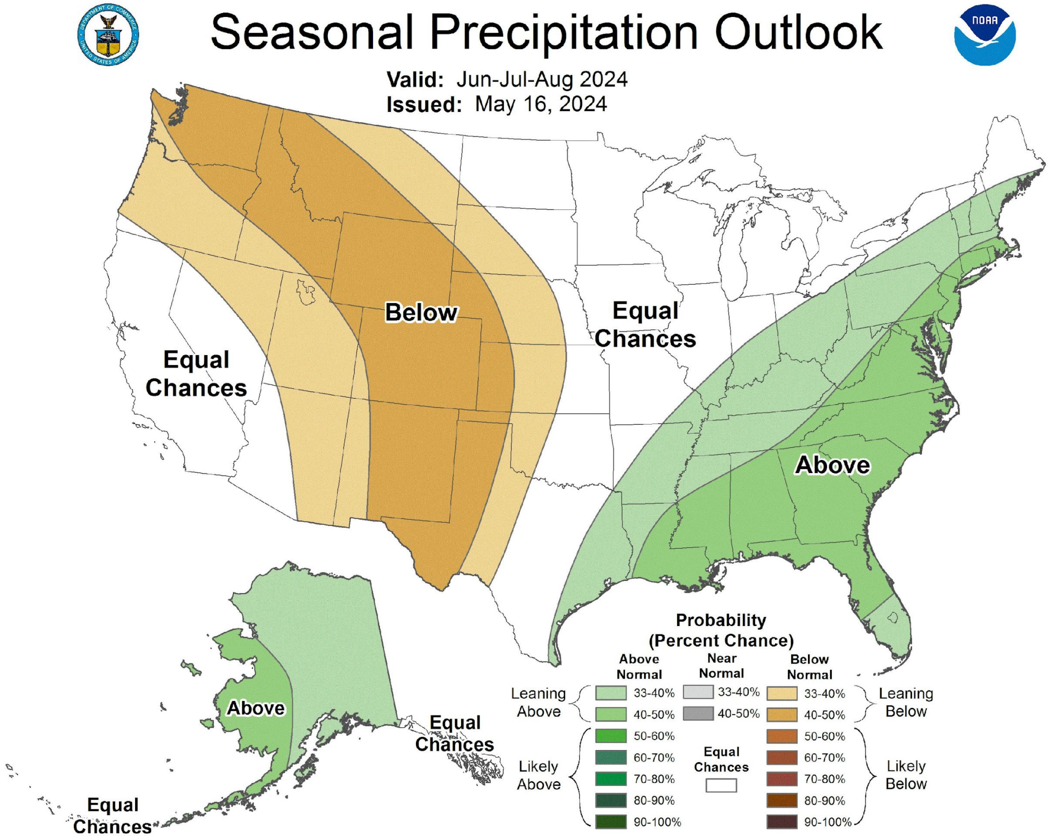
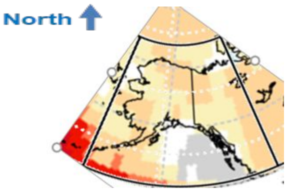


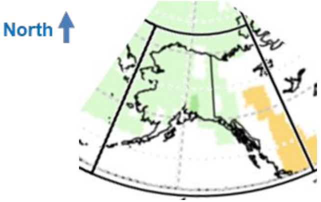

Seasonal Precipitation Outlook

Valid: Jun-Jul-Aug 2024
Issued: May 16, 2024



Temp

Alaska and Western Canada



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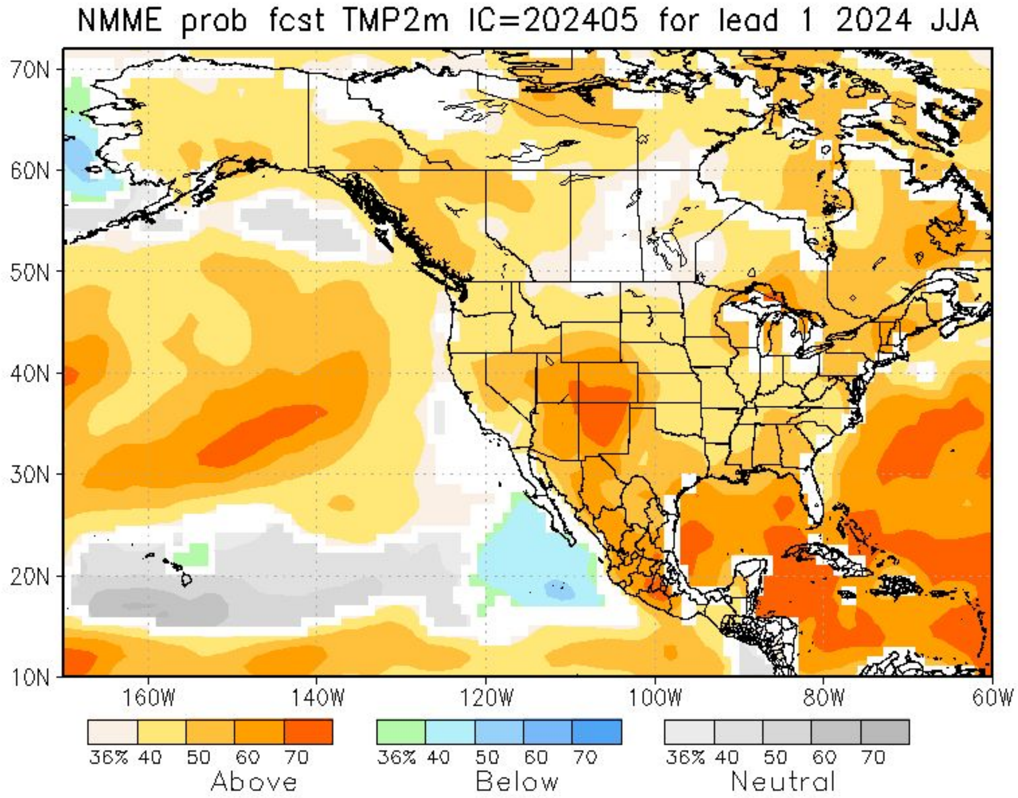
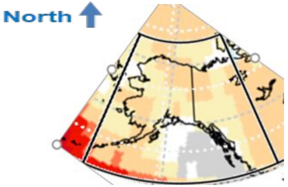

NMME prob fcst TMP2m IC=202405 for lead 1 2024 JJA

Alaska and Western Canada



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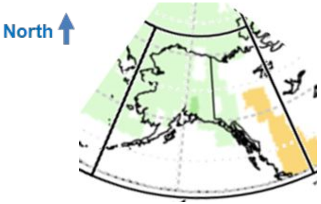
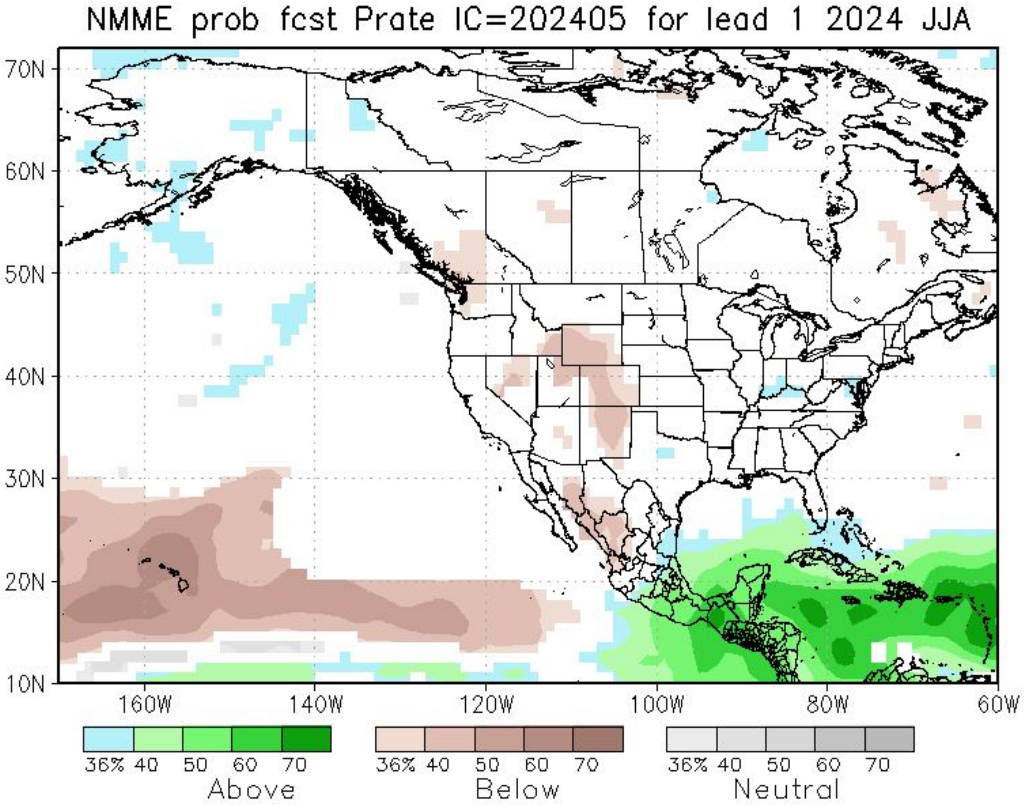
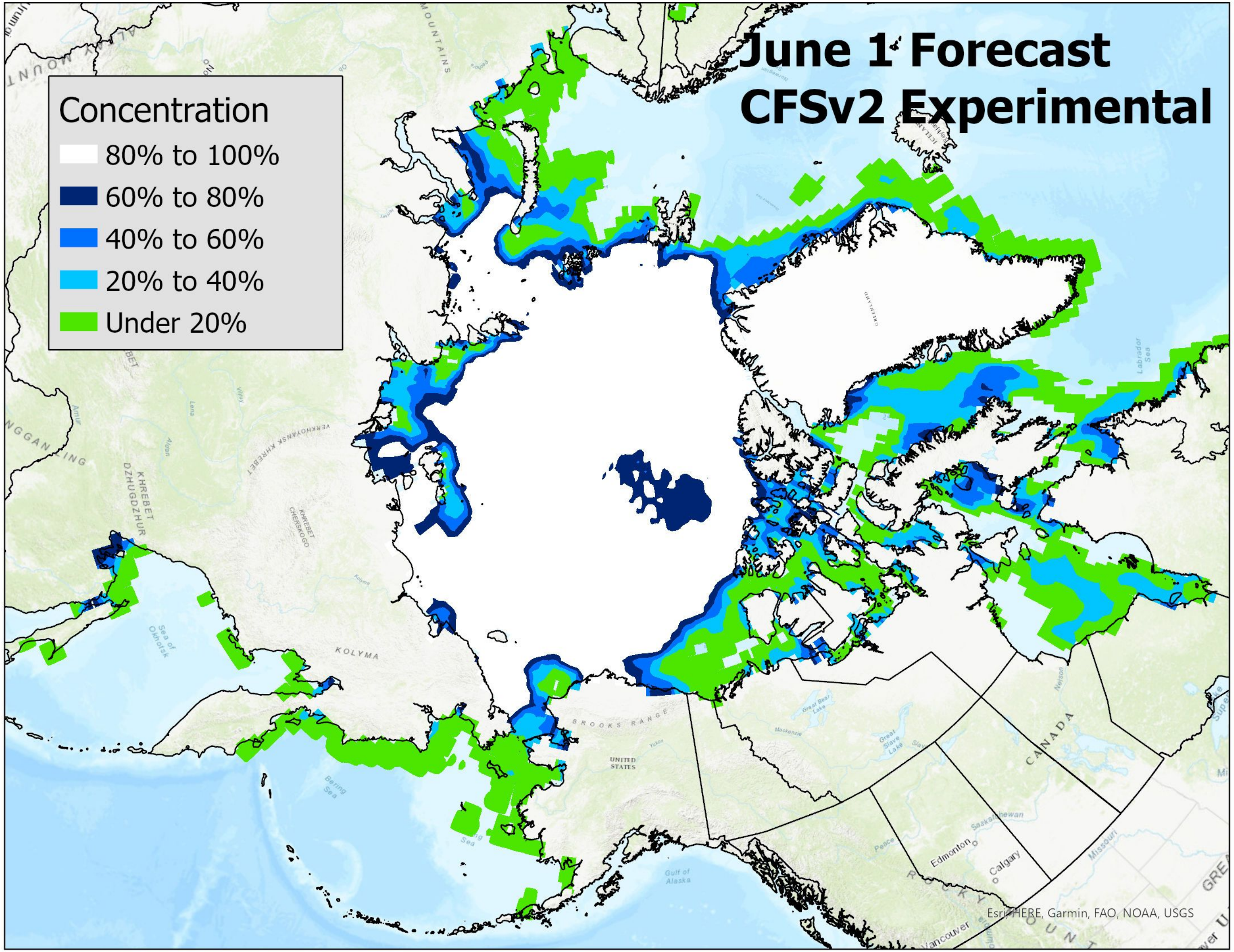


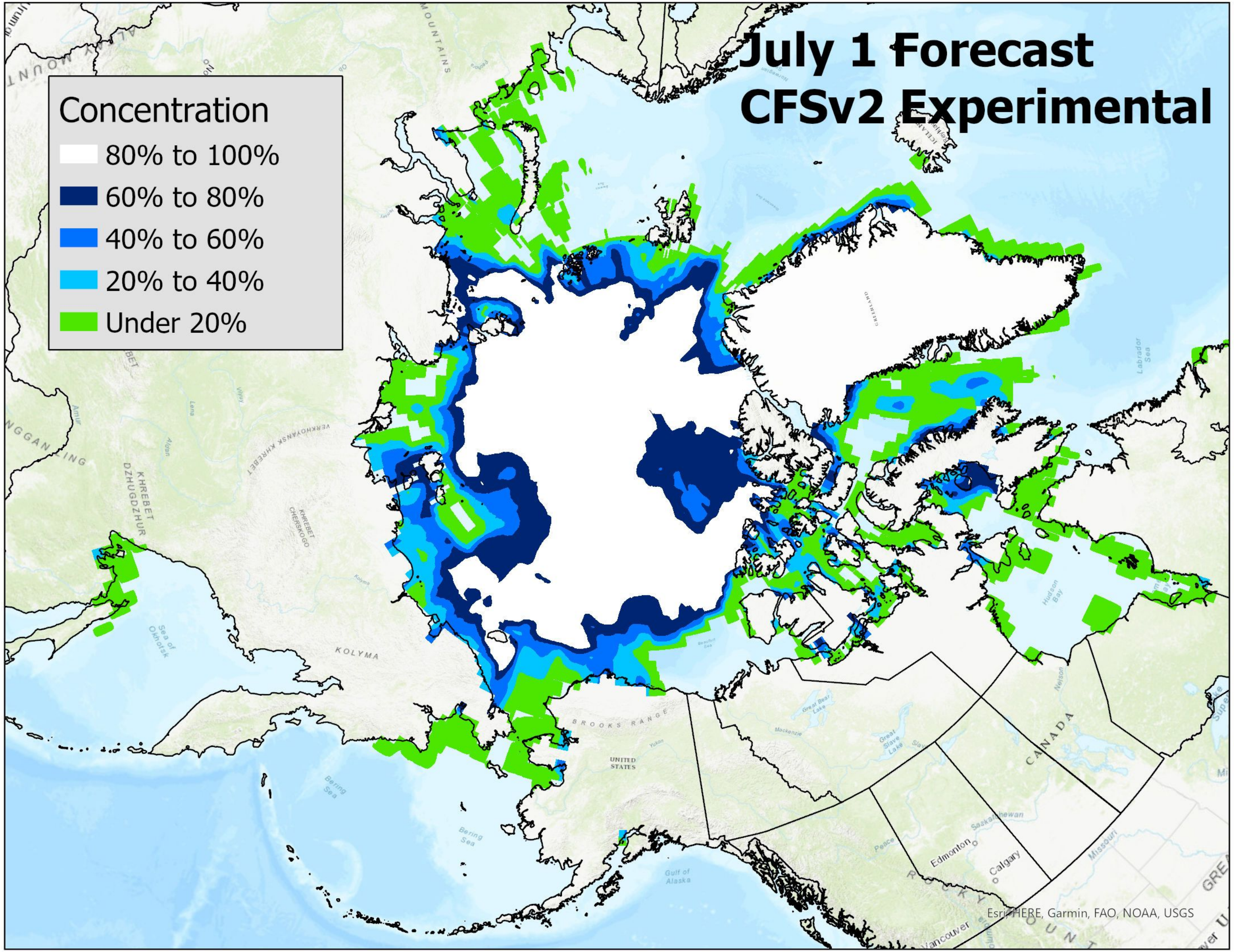
Pcpt



June 1 Forecast
CFSv2 Experimental



July 1 Forecast CFSv2 Experimental



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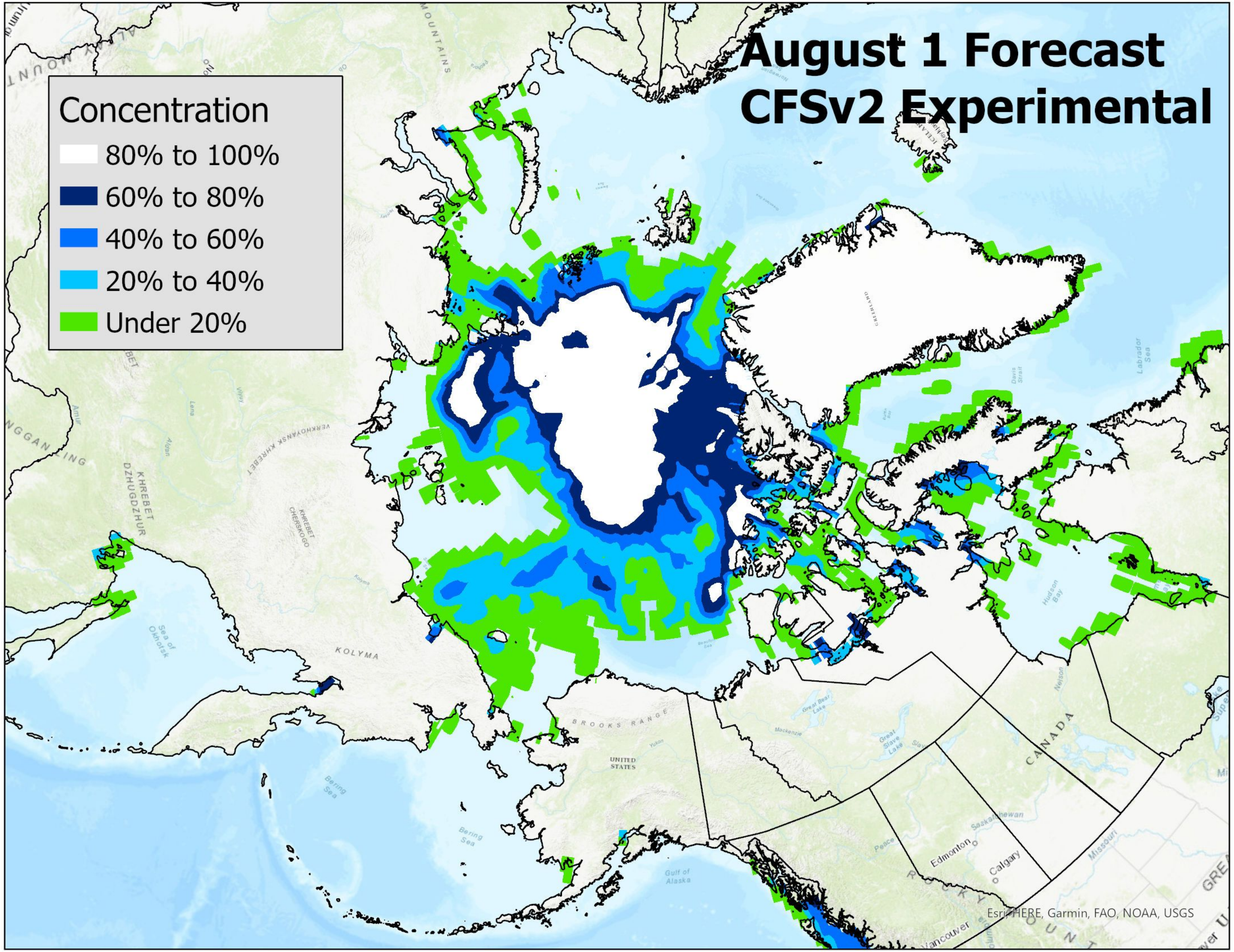
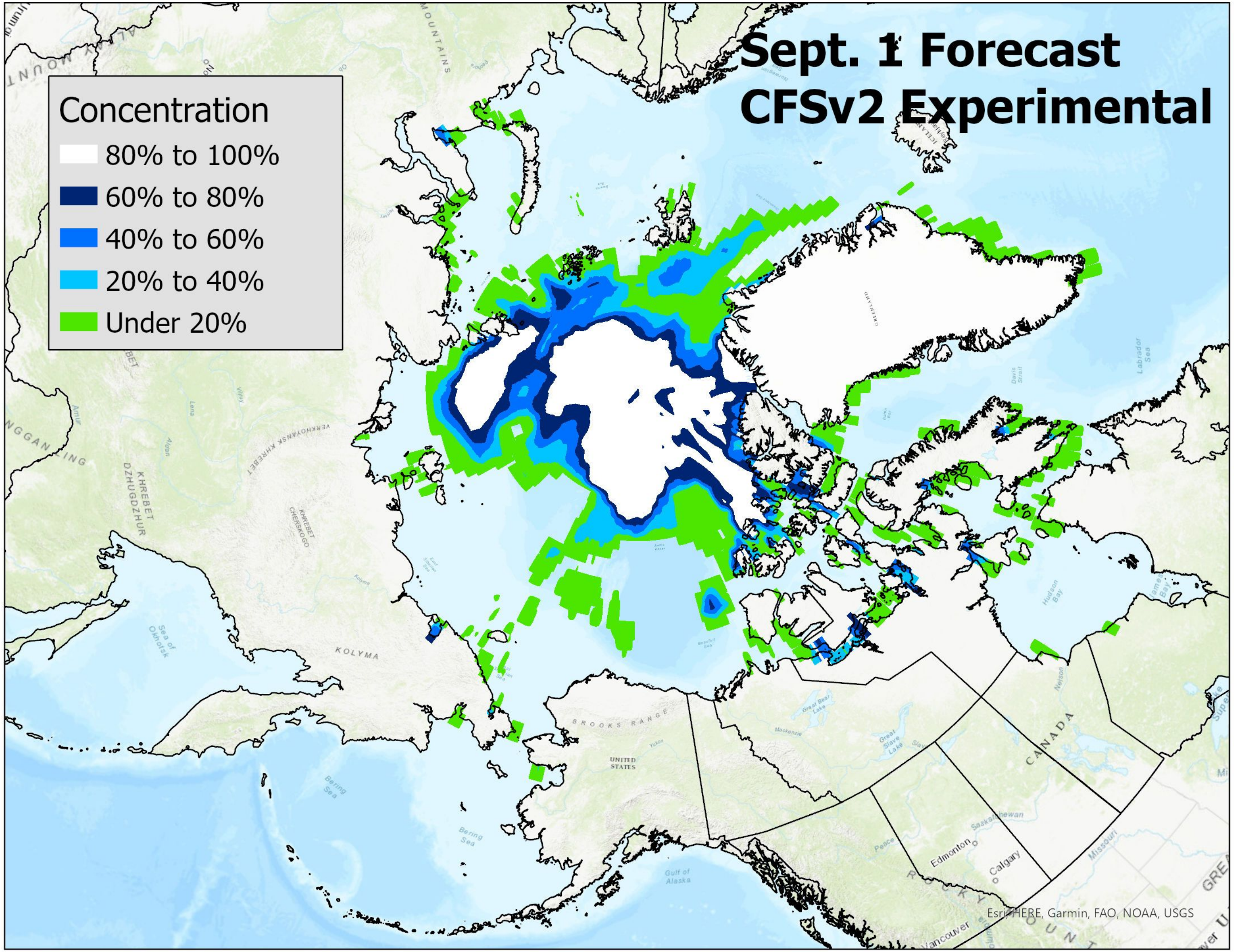
CFSv2 Experimental



Sept. 1 Forecast
CFSv2 Experimental



Esri, HERE, Garmin, FAO, NOAA, USGS

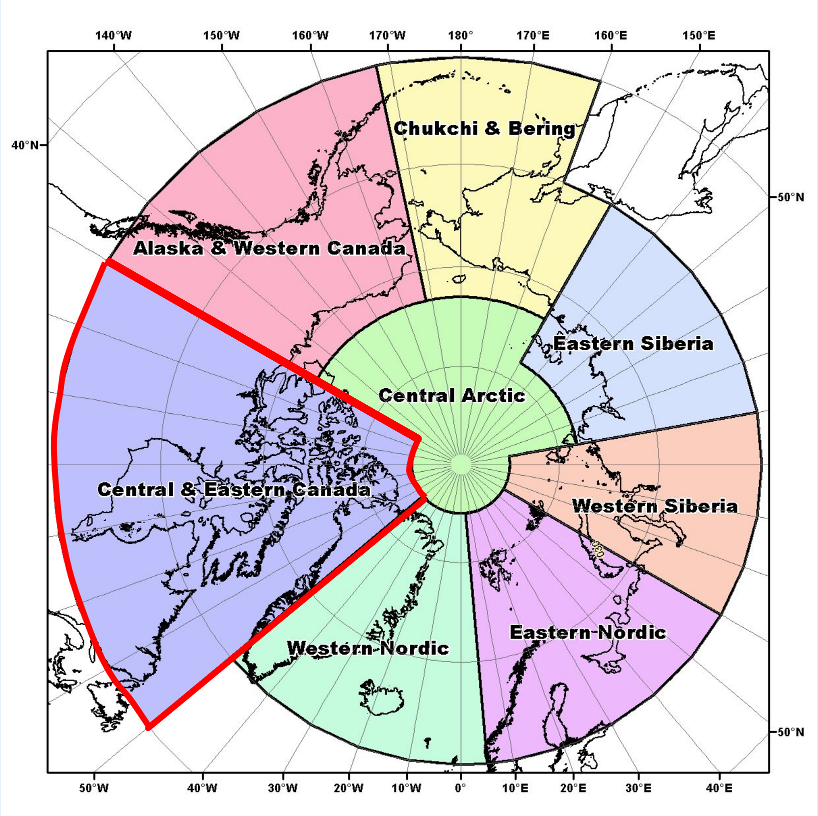
Alaska and Western Canada: possible impacts
Summer 2024

Economy sector/ Livelihood conditions	Outlook	Impacts associated
Community Infrastructure		
Harvesting Activities on the land and sea-ice	• Delayed start to wildfire season eastern Alaska/NW Canada • High early summer rivers levels Alaska/Yukon	Possible cash income loss Higher risk increased river erosion Lower risk of shipping delays for barge supplied communities
Bering Sea Fisheries	Late (but patchy) sea ice melt and resulting cool sea surface temperatures at least through early summer	Potential for more historically usual ocean ecosystem patterns

Ongoing Impacts of Climate Change

- Increase risk of coastal flooding and thawing permafrost coastal erosion and community infrastructure
- All marine mammals with habitat on sea ice may be more difficult to harvest

Central & Eastern Canadian Arctic



Central & Eastern Canadian Arctic

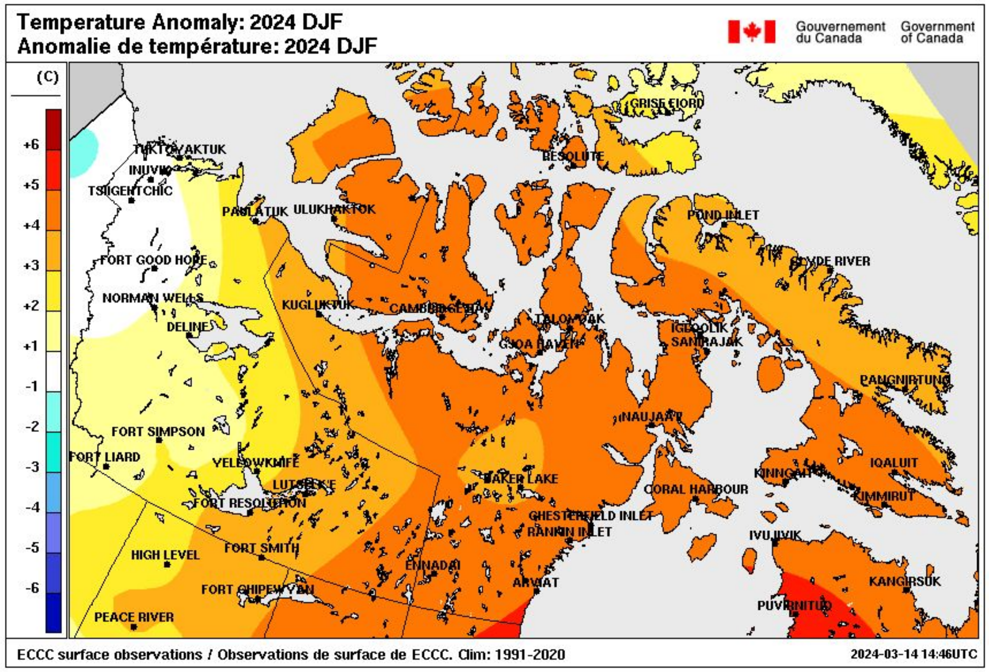
Seasonal Summary: Winter 2024

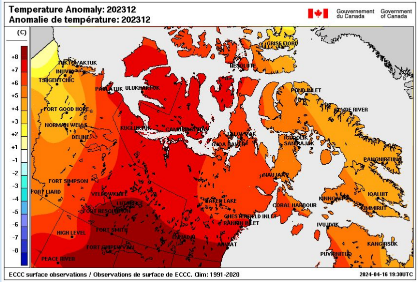
Observations above (+) and below (-) climatological normal

Temperature Normal 1981-2010	+4.5°C **Warmer than normal** Except Western ISR near normal	**Record warmest** – Arviat, Cambridge Bay, Rankin Inlet, Inukjuak	Record coldest – none
Precipitation Normal 1981-2010	Predominately wetter than normal Some isolated areas of drier than normal conditions	**Wetter** Record wettest: Rankin Inlet: 337% Sanirajak: 254% Qikiqtarjuaq: 205%	**Drier** Gjoa Haven 36% of normal Nain: 47% of normal
Sea-Ice Normal 1991-2020 Ice extent rank since 1979	**Late freeze-up throughout the region**	Below normal along Nunatsiavut coast: • Below normal, slow start freeze-up ~4 weeks behind normal by mid-January Baffin Bay/ Labrador Sea: • below normal March ice extent; 16th lowest since 1979	

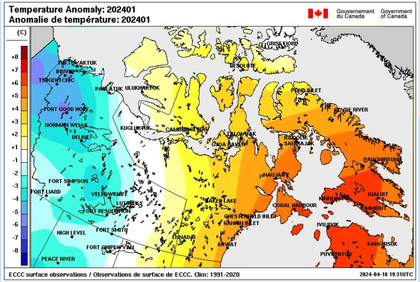
Central & Eastern Canadian Arctic

Winter 2024 Mean Temperature Anomalies

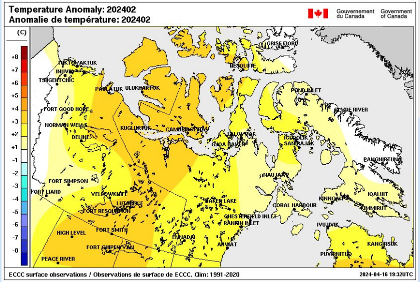




c 2023



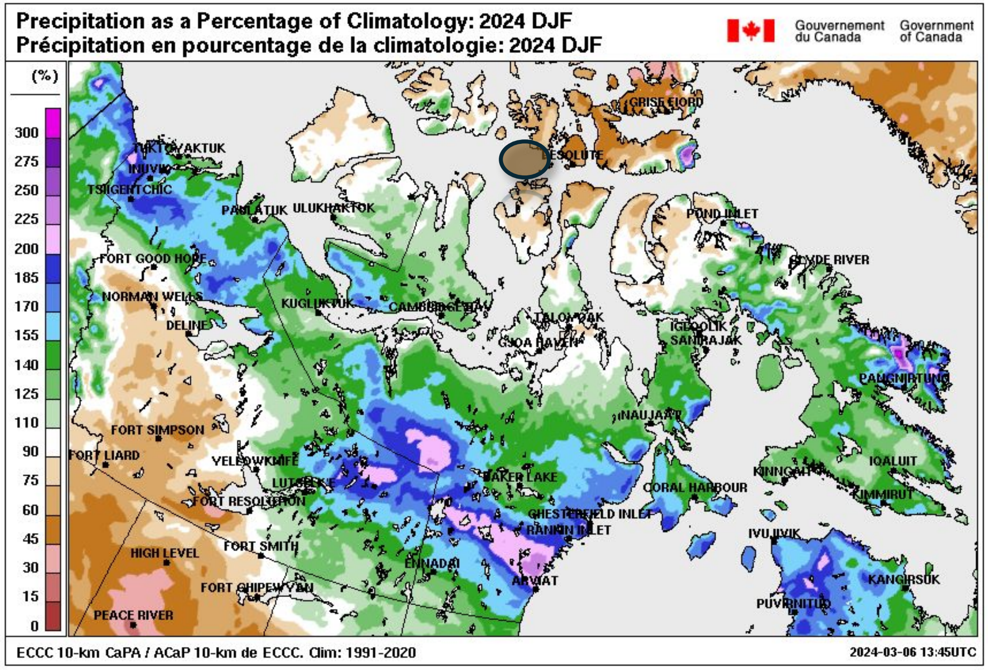
Jan 2024



Feb 2024

Central & Eastern Canadian Arctic

Winter 2024 Precipitation Anomalies

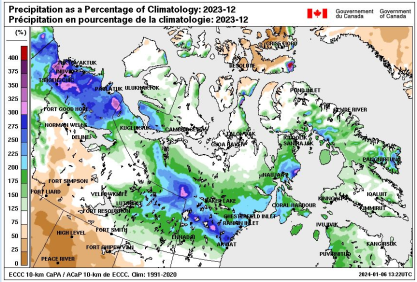

Precipitation as a Percentage of Climatology: 2024 DJF
Précipitation en pourcentage de la climatologie: 2024 DJF

Gouvernement du Canada Government of Canada

ECCC 10-km CaPA / ACaP 10-km de ECCC. Clim: 1991-2020

2024-03-06 13:45UTC

● Dry conditions in error


Precipitation as a Percentage of Climatology: 2023-12
Précipitation en pourcentage de la climatologie: 2023-12

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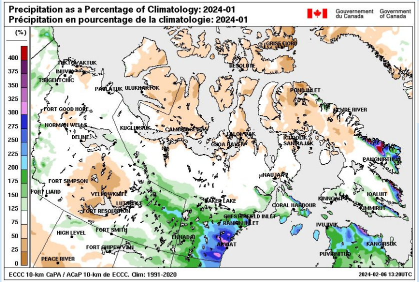
c 2023


Precipitation as a Percentage of Climatology: 2024-01
Précipitation en pourcentage de la climatologie: 2024-01

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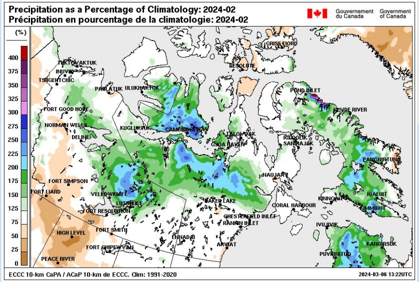
Jan 2024


Precipitation as a Percentage of Climatology: 2024-02
Précipitation en pourcentage de la climatologie: 2024-02

ECCC 10-km CaPA / ACaP 10-km de ECCC. Clim: 1991-2020

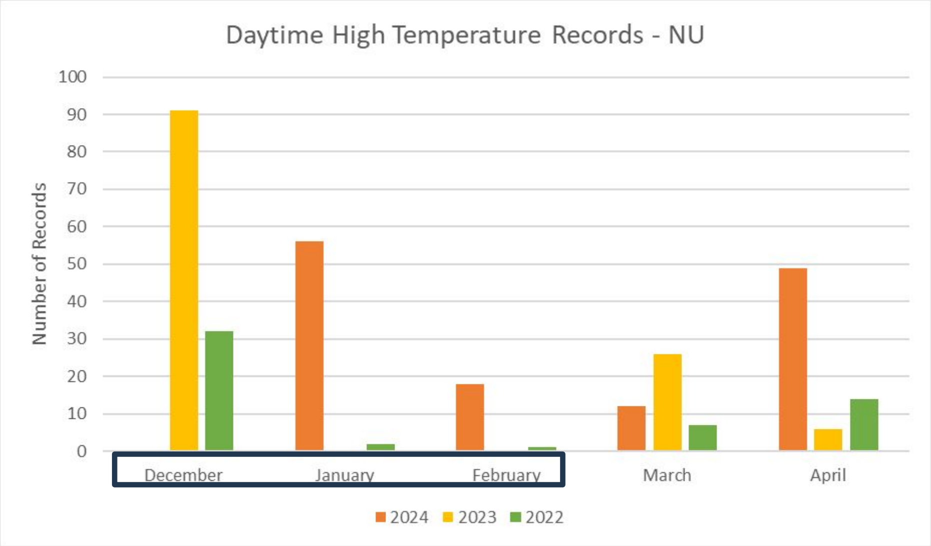
2024-03-06 13:22UTC

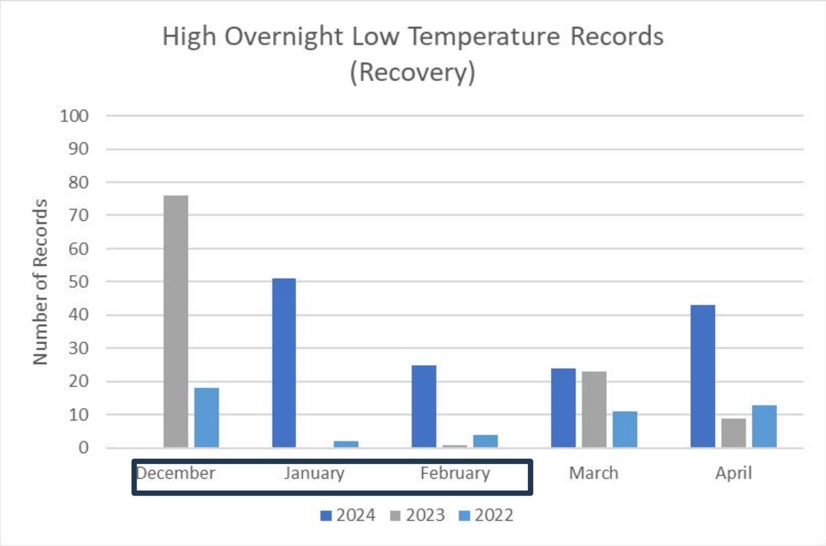
Feb 2024

Central & Eastern Canadian Arctic

Number of Temperature Records Broken in Nunavut

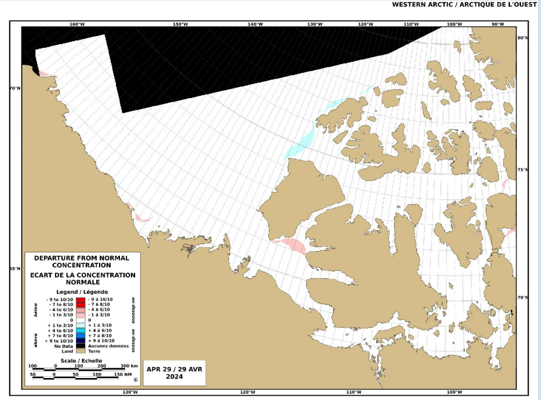
*Daytime High Temperature and High Overnight Low Temperature Records



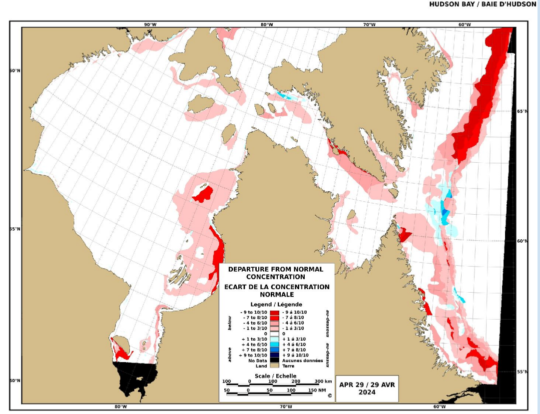


Central & Eastern Canadian Arctic

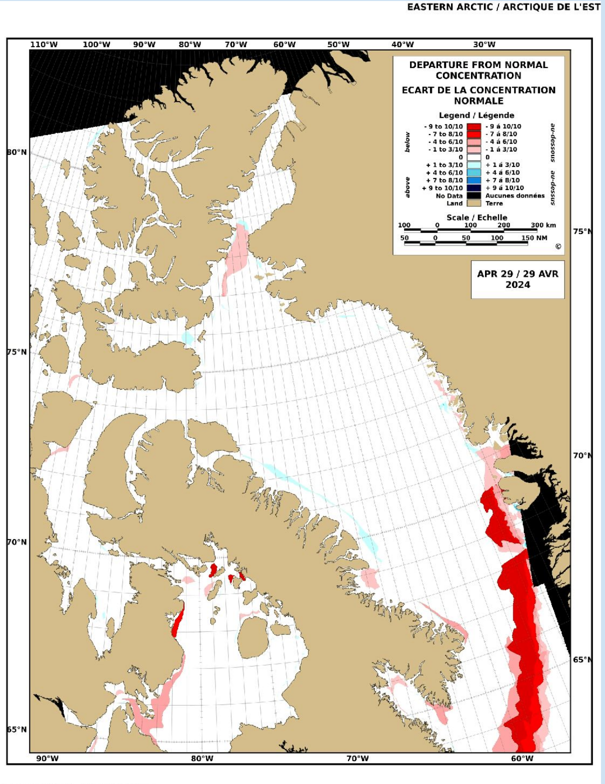
Sea Ice Concentration Anomaly as of Apr 29, 2024



STATISTICS BASED UPON 1991-2020
LES STATISTIQUES BASÉE SUR 1991-2020



STATISTICS BASED UPON 1991-2020
LES STATISTIQUES BASÉE SUR 1991-2020

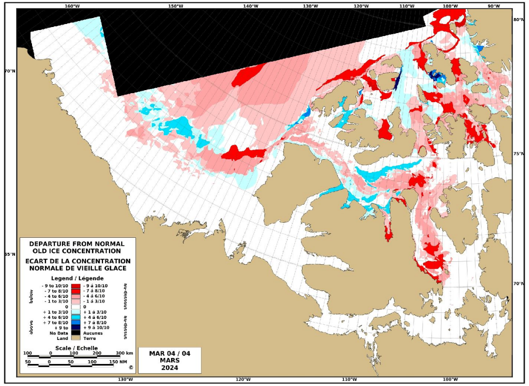


STATISTICS BASED UPON 1991-2020
LES STATISTIQUES BASÉE SUR 1991-2020

Central & Eastern Canadian Arctic

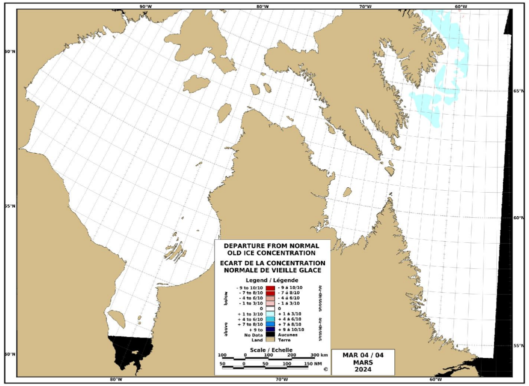
Old Ice Anomalies as of March 4, 2024

WESTERN ARCTIC / ARCTIQUE DE L'OUEST



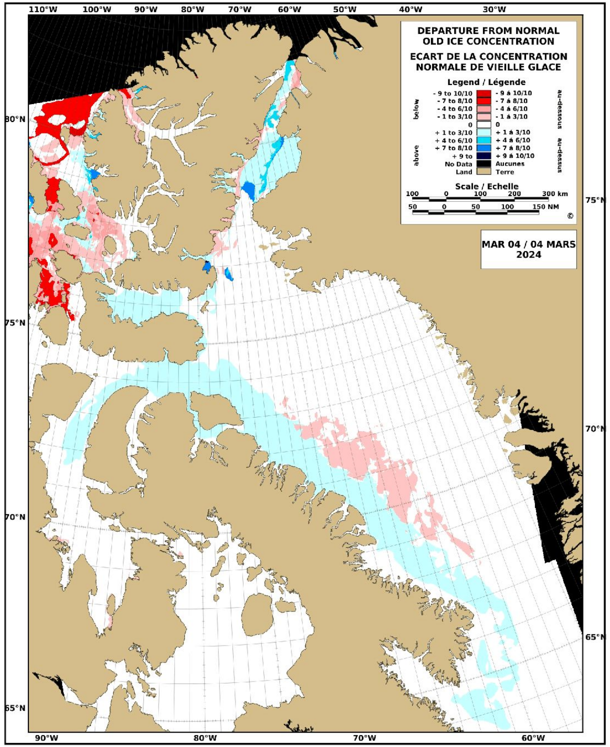
STATISTICS BASED UPON 1991-2020 (INTERPOLATED BETWEEN 01-MAR AND 01-APR)
LES STATISTIQUES BASÉE SUR 1991-2020 (INTERPOLÉES ENTRE LE 01-MARS ET LE 01-AVR)

HUDSON BAY / BAIE D'HUDSON



STATISTICS BASED UPON 1991-2020 (INTERPOLATED BETWEEN 01-MAR AND 01-APR)
LES STATISTIQUES BASÉE SUR 1991-2020 (INTERPOLÉES ENTRE LE 01-MARS ET LE 01-AVR)

EASTERN ARCTIC / ARCTIQUE DE L'EST



STATISTICS BASED UPON 1991-2020 (INTERPOLATED BETWEEN 01-MAR AND 01-APR)
LES STATISTIQUES BASÉE SUR 1991-2020 (INTERPOLÉES ENTRE LE 01-MARS ET LE 01-AVR)

Central & Eastern Canadian Arctic

OBSERVED EXTREME CLIMATE EVENTS
WINTER 2024

Category	Location	Rarity	Impacts associated with event
High Temperatures	ISR and Nunavut Nunavik Nunatsiavut	Arviat, Cambridge Bay, Rankin Inlet ranked 1st warmest winter on record In mid-January, the region experienced well above normal temperatures, at times 15°C above normal Makkovik ranked 2nd warmest winter on record, Nain ranked 3rd warmest winter on record	December: dangerous subsistence fishing and traveling on the ice – people falling through the ice In mid-January, precipitation fell as rainfall over Baffin Island due to unusually warm temperatures. Major water pooling issues as well as significant ice after re-freezing. Iqaluit city shut down due to unsafe icy conditions • Jan 6, 2011 was the last January rain in Iqaluit
High Precipitation / Heavy Snow	ISR Nunatsiavut	Inuvik ranked 1st wettest December on record Makkovik received 150 cm of snow over a single week, more than twice the normal amounts for February	Aklavik-Inuvik winter road opening was delayed due to heavy snowfall. For the first time since 2006, the road opened in January, when it usually opens before Christmas Day. In February, the highway was closed for an extended period of time due to successive snowfall events followed by strong winds blowing in the exceptionally high snow bank, creating a concern over available critical supply resources
Blizzards/Wind	Nunavut	Early season blizzard (>48 hrs) with record setting wind gusts in many communities • Strongest wind gust on record – Kugaaruk (100 km/h) • Strongest sustained winds and/or gusts on record for the month of November o 100-126 km/h o 27 hrs: wind gusts exceeding 100 km/h	Infrastructure damage due to strong winds, prolonged power outages (> 4 days), 1 death, local state of emergency declared
Sea Ice	All regions	Freeze-up nearly 4 weeks behind normal by mid-January - Nunatsiavut	Late start to on ice travel between communities and subsistence activities

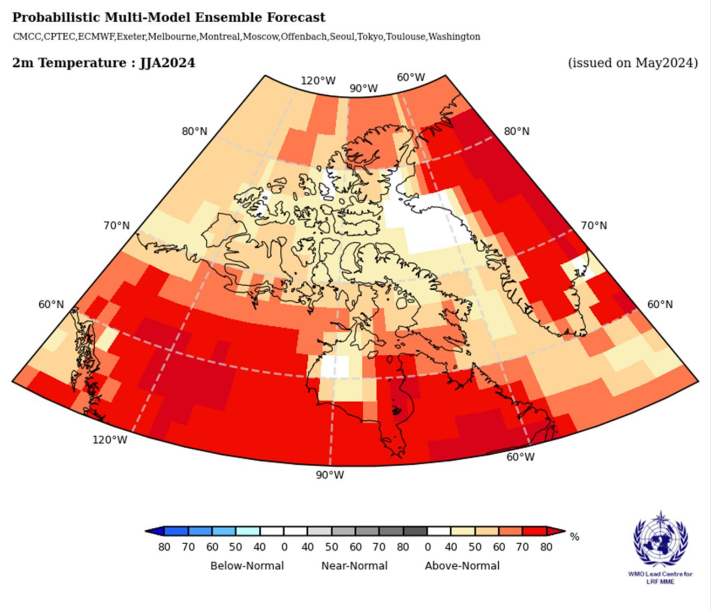
Central & Eastern Canadian Arctic

Seasonal Outlook: Summer 2024

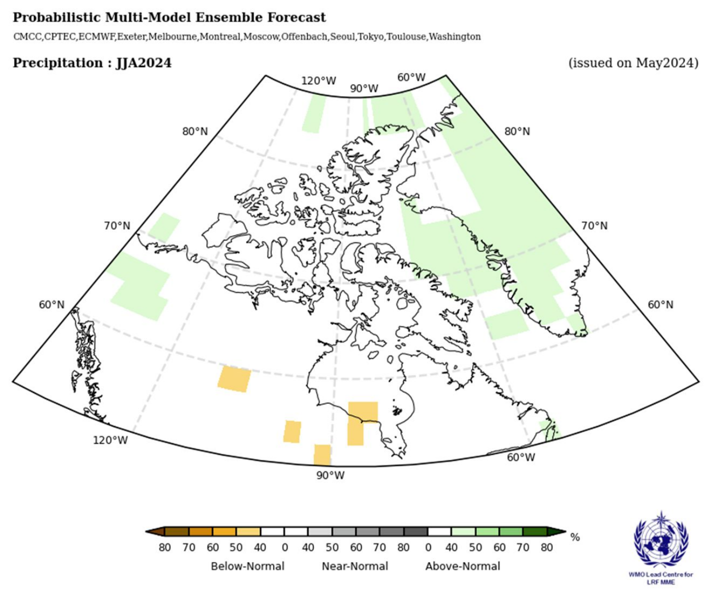
Climatological variables			Forecast relative to climatological normal	Multi Model Agreement			
				High	Moderate	Low	*No*
Temperature	Nunavut – northern regions		Above Normal	✓			
	Nunavut – central regions				✓		
	Western Hudson Bay						✓
	Eastern Hudson Bay, Hudson Strait, Nunavik; Nunatsiavut			✓			
	Baffin Island; Baffin Bay and Labrador Sea					✓	
	Western Greenland					✓	
	Inuvialuit Settlement Region				✓		
Precipitation	Nunavut – central regions, Nunavik		Above Normal			✓	
	Nunavut – northern regions, Ellesmere Island, Baffin Bay, Davis Strait				✓		
	Nunavut – southern regions, Nunatsiavut; Labrador Sea					✓	
	Western Greenland				✓		
	Inuvialuit Settlement Region					✓	
Sea-Ice	**Break-up**	**Baffin Bay**	Late	✓			
		Hudson Bay / Labrador Sea	Early **(late NE HBay)**	✓			
		Beaufort Sea	Early **(late SE)**		✓		
		Canadian Arctic Archipelago	Early			✓	
	Minimum Ice Extent [September, 2024]	**Canadian Arctic Archipelago**	Below normal			✓	
Snow Water Equivalent	Nunavut – ISR, Eastern Baffin Island		Above Normal	✓			
	Nunavut – central and southern regions, Nunavik, Nunatsiavut		Below Normal	✓			

Central & Eastern Canadian Arctic

JJA Multi-Model Temperature Outlook



JJA Multi-Model Precipitation Outlook



Central & Eastern Canadian Arctic

Potential societal and environmental impacts		
Economy sector/ Livelihood conditions	**Relevant variables from the Seasonal Outlook**	**Impacts associated**
Subsistence fishing and hunting	Below normal ice, above normal temperatures	Unsafe subsistence fishing
Marine Traffic Sea Lift, Resupply Marine Domain Awareness	Below normal ice, above normal temperatures	Increasing marine traffic, world shipping corridors adjustments Increasing demand for patrol and enforcement
Tourism	Below normal ice, above normal temperatures	Increasing tourism in the north, particularly adventure travelers through the NWP

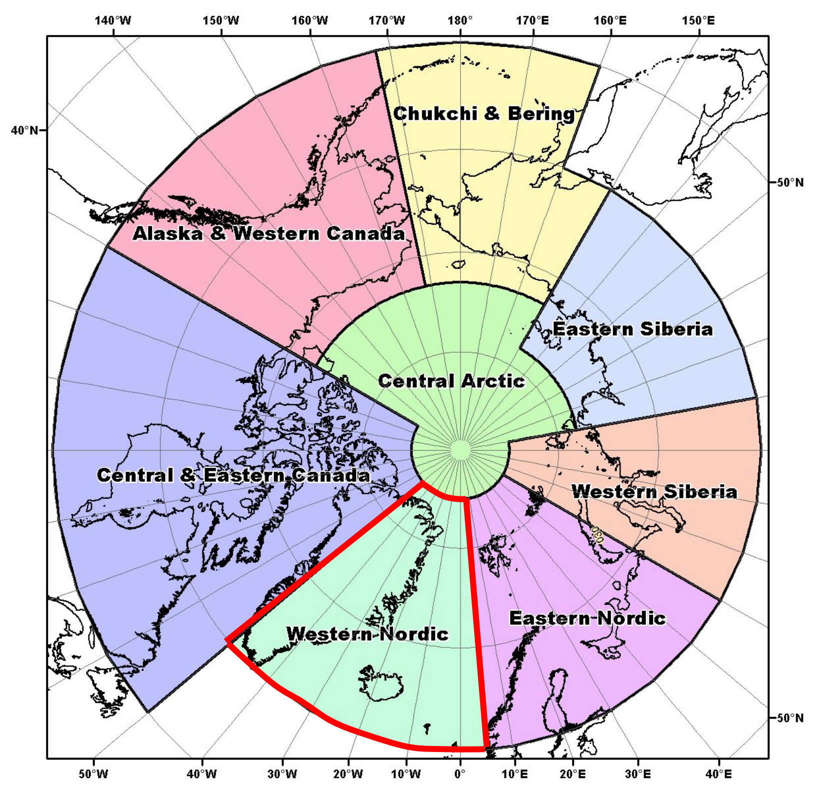
ACF
Arctic Climate Forum

Northern European Node

- Western Nordic
- Eastern Nordic

Arctic Regional Climate Centre Network

Western Nordic



Western Nordic

Seasonal Summary: Winter 2023/2024

Observations above (+) and below (-) climatological normal

Temperature Normal 1991-2020	NDJ**: -1.0 below** normal FMA**: -1.0 below** normal **Iceland : Based on observations:** **-1.6 °C below** normal in winter (DJF) **-0.8 °C below** normal in extended winter (NDJFMA)	Warmest year NDJ: 1933 Warmest year FMA: 1929	Coldest year NDJ: 1965 Coldest year FMA: 1969
Precipitation Normal 1991-2020	NDJ: drier than normal FMA: wetter to drier		
Sea-Ice Normal 1991-2020 Ice extent rank since 1979	• Sea ice extent east of Greenland (at the maximum in March) was slightly above the 1991-2020 average • The sea ice extent in Greenland sea was slightly above average persistently from October to April		

Western Nordic

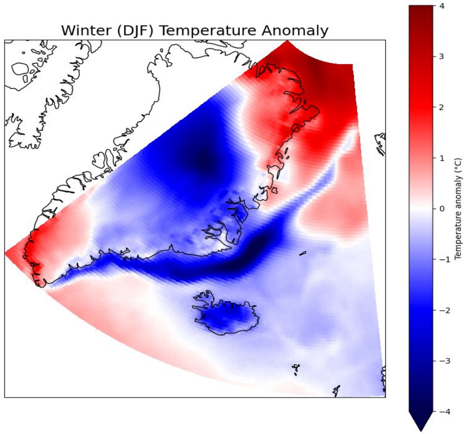
OBSERVED EXTREME CLIMATE EVENTS
WINTER 2023/2024

Category	Location	Rarity	Impacts associated with event
Precipitation	Greenland, North Winter (DJF)	Unusually wet winter in North Greenland. The wettest on record at Station Nord since the beginning of measurements 1961. January and February especially wet.	
Sunshine, Drought	Iceland, Southwest	Winter (NDJFMA). Sunniest winter in Reykjavík since the beginning of measurements (1911). Among the drier winters in the area	None

Western Nordic

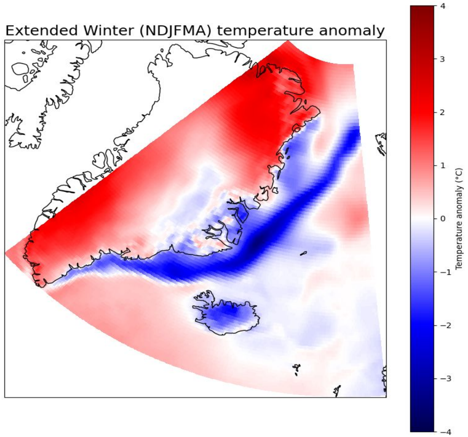
Temperature anomalies

Winter (DJF)



Reference period: 1991-2020
Data: ERA5

Extended winter (NDJFMA)



Reference period: 1991-2020
Data: ERA5

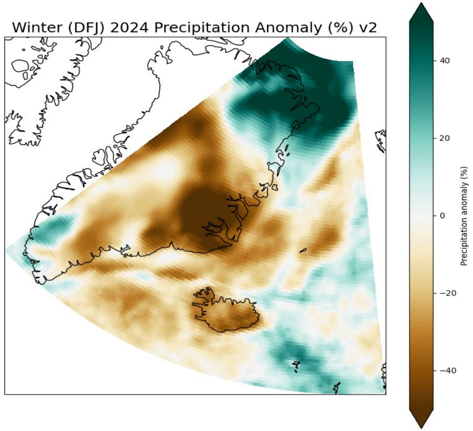
- The winter (DJF) was colder than normal in Iceland,
- Temperature above normal in south and north Greenland, below normal at the east coast and at the Summit.
- Temperature well below normal along the Greenland coast

- Extended winter (NDJFMA), temperature below normal in Iceland
- Well below normal along the Greenland coast.
- Above normal in Greenland

Western Nordic

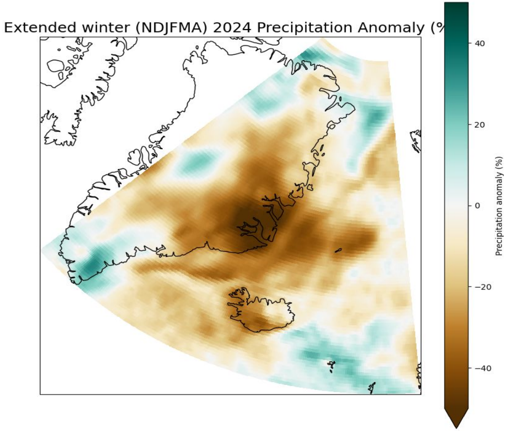
Precipitation anomalies

Winter (DJF)



Reference period: 1991-2020
Data: ERA5

Extended winter (NDJFMA)

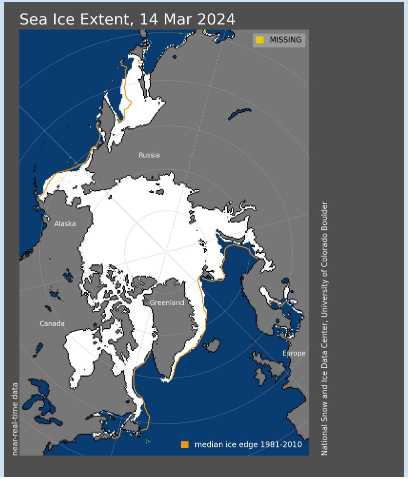


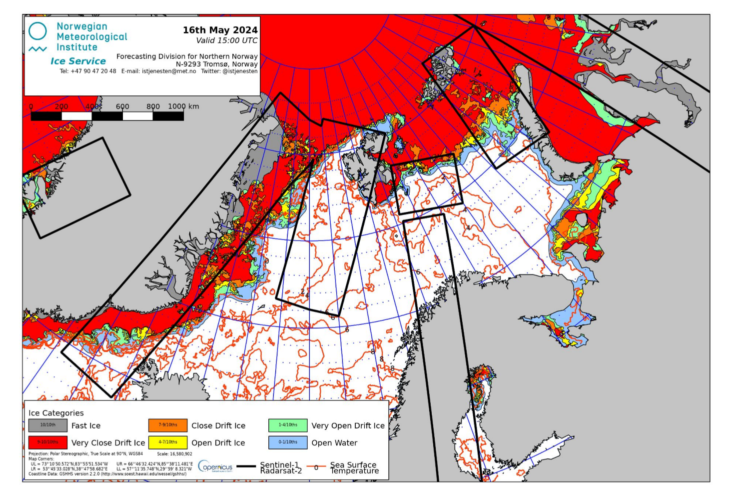
Reference period: 1991-2020
Data: ERA5

- Winter (DJF) drier than normal in large part of the area.
- Wet in north Greenland

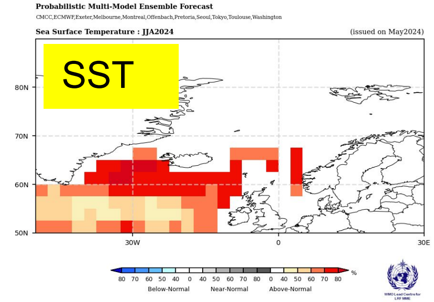
- Extended winter (NDJFMA) drier than normal in most of the area.

Western Nordic

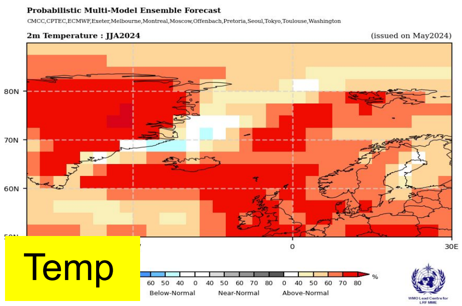


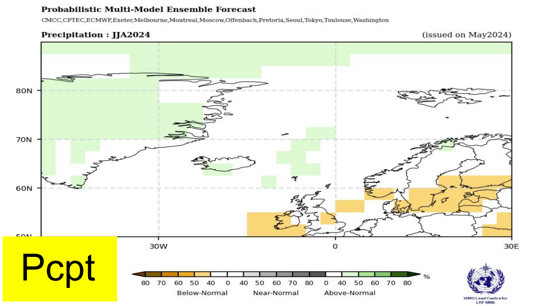


- The Arctic Sea Ice reached it maximum extent on March 14th. It was the 14th lowest extent in the 46-yr satellite record. The highest extent since 2013.
- In the Western Nordic region, sea ice extent east of Greenland was slightly above average
    - There was unusual ice near the Odden Ice tongue region
- The sea ice extent in Greenland sea was above average persistently from October to April



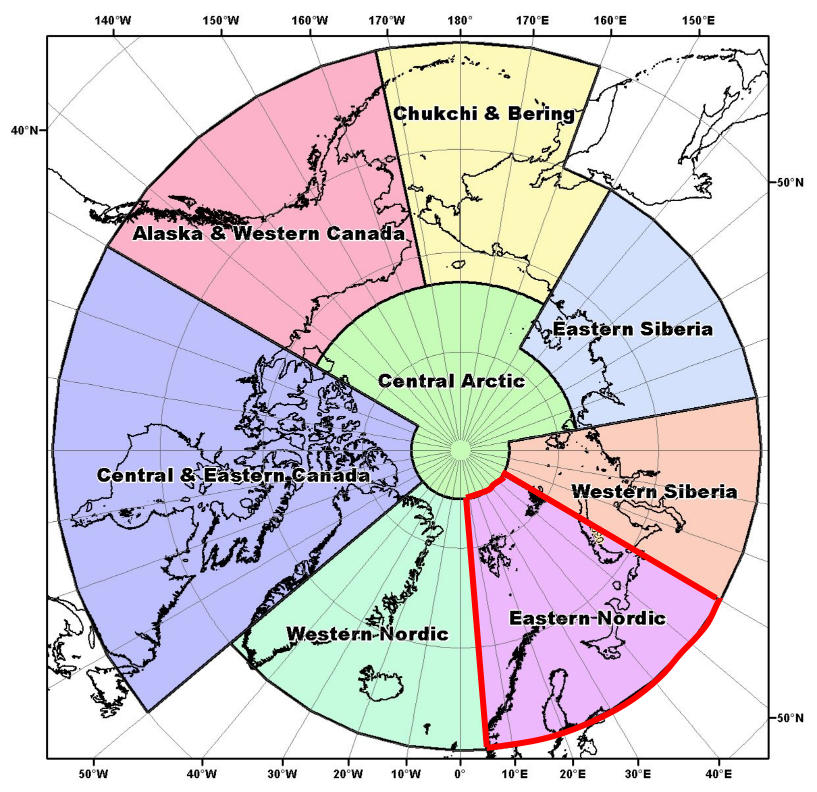
Western Nordic





Outlook: Summer 2024				Multi Model Agreement		
Forecast				High	Moderate	Low
Temperature	Northern, southern and continental Greenland		**Warmer**	✓		
	Iceland		**Warmer**	✓		
	North Atlantic		**Warmer**	✓	✓	
	Greenland seas		**Colder - warmer**		✓	
Precipitation	North,south and continental Greenland		**Wetter**		✓	✓
	Iceland		**Wetter**		✓	✓
	Svalbard		**No model agreement**			
	Other parts Northern Atlantic		**Little model agreement**			
SST & Sea-Ice	Northern Atlantic	**SST**	**Warmer**	✓		
	Greenland Sea	**Break-up**	**Late-normal (South)** **Early (North)**			✓
		Minimum Ice Extent [September 2024]	**Below normal**		✓	

Eastern Nordic



Eastern Nordic

SEASONAL SUMMARY: WINTER 2023-2024

Observations above (+) and below (-) climatological normal

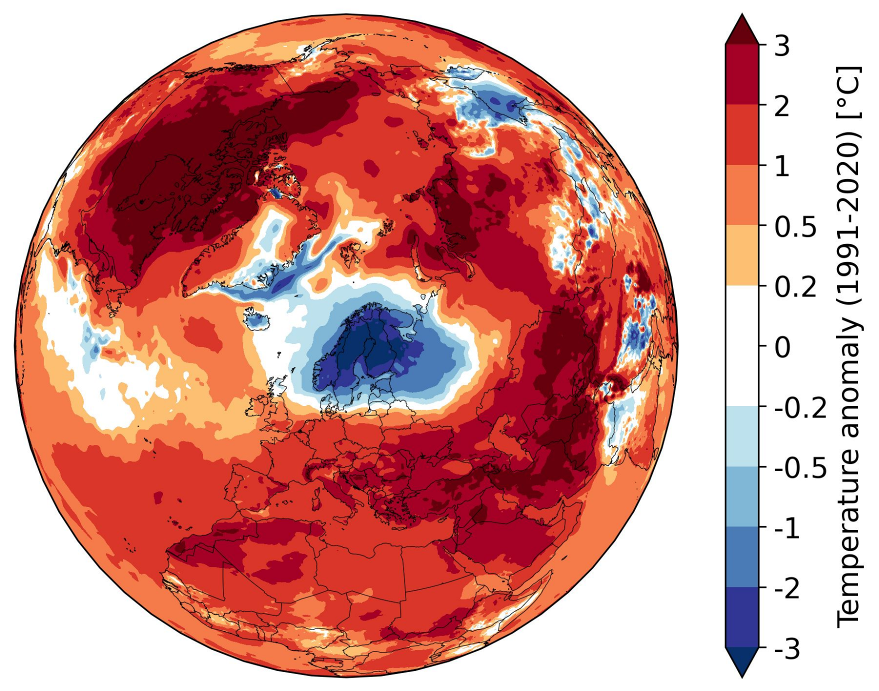
Temperature Normal 1991-2020	NDJ: **-2.70℃** FMA: **-0.52℃**	Warmest year NDJ: 2011 Warmest year FMA: 2014	Coldest year NDJ: 1915 Coldest year FMA: 1917
Precipitation Normal 1991-2020	NDJ: **slightly wetter than normal** FMA: **wetter than normal in Scandinavia, slightly drier in the Barents sea**		
Sea-Ice Normal 1991-2020	- On average, sea ice extent close to normal, but high sea ice extent in March - April. - Fast ice was significant by the end of the season, covering Storfjord, areas around Nordaustlandet and the waters between Prins Karls Forland and Spitsbergen. Many fjords also had thicker ice than we have seen in the last years.		

Eastern Nordic

OBSERVED EXTREME CLIMATE EVENTS
WINTER 2023-2024

Category	Location	Rarity	Impacts associated with event
Storm Ingunn 3 intense storms	Northern Norway	Very rare during such a short time span	- Several thousands people without electricity - Disrupted flight traffic - Bridge closed in Tromsø
Sea ice	Lot of sea ice in Isfjorden (Longyearbyen)	Rare in the last few years	

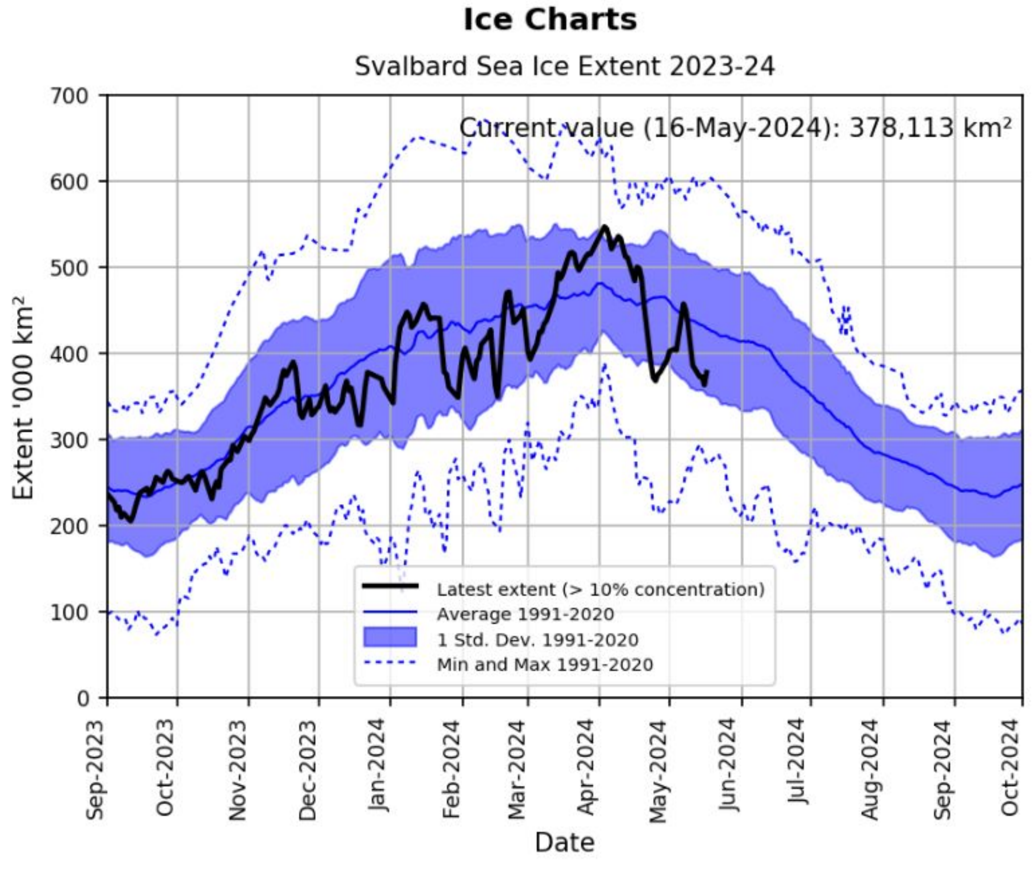
Eastern Nordic



Seasonal forecasts were not able to predict the cold air anomalies

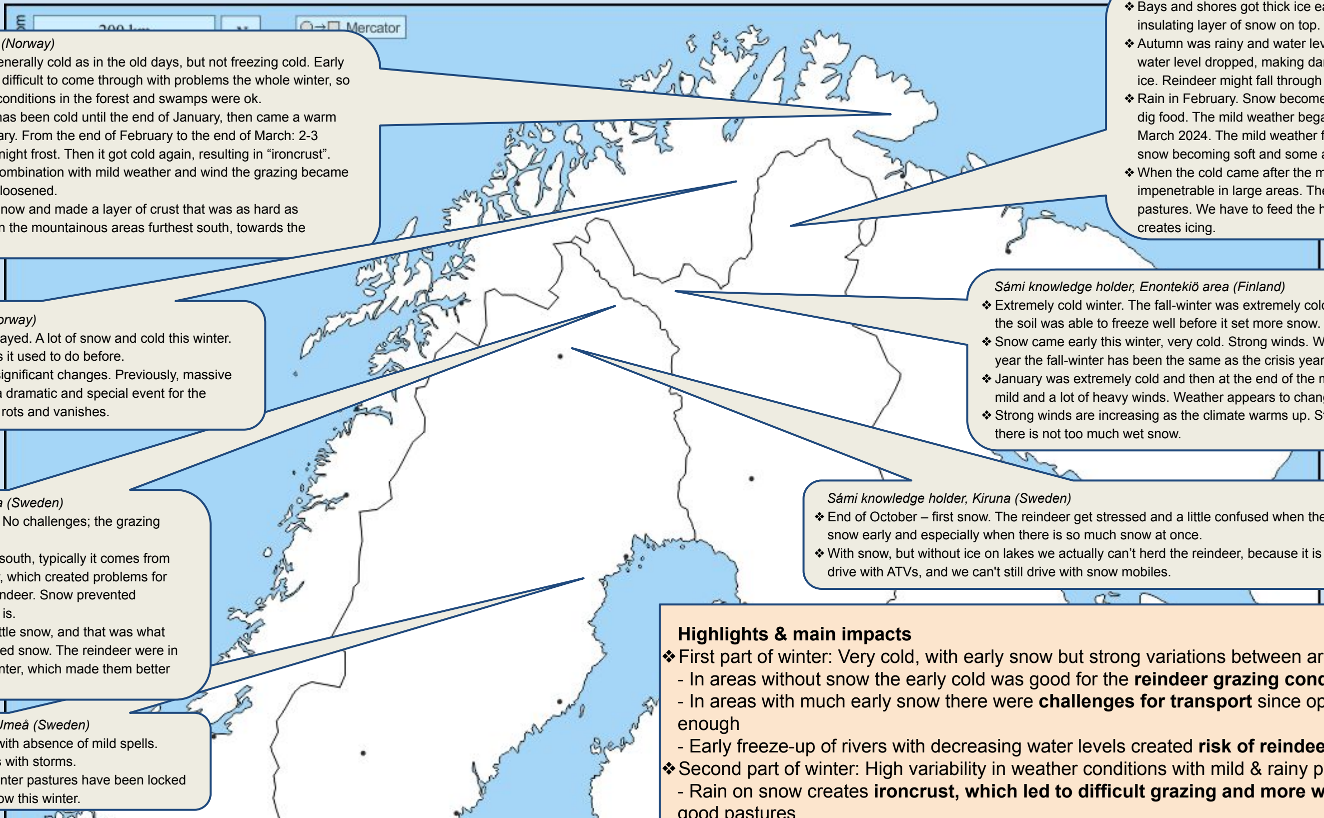
Mean temperature anomalies during the period October 2023 - January 2024 (figure from Mika Rantanen)

Eastern Nordic



Eastern Nordic

Experiential observations of the past season's conditions among Indigenous Sámi communities
Winter 2023/2024 (November-March)



Sámi knowledge holder, Várjjat/Varanger (Norway)

- ❖ Normal winter from November to April. Generally cold as in the old days, but not freezing cold. Early winter with wet snow that froze, hard and difficult to come through with problems the whole winter, so the reindeer didn't stay in that area. The conditions in the forest and swamps were ok.
- ❖ Snow came early this winter. The winter has been cold until the end of January, then came a warm spell with a lot of wind at the end of January. From the end of February to the end of March: 2-3 weeks long mild weather, almost without night frost. Then it got cold again, resulting in "ironcrust".
- ❖ Not been much snow this winter, and in combination with mild weather and wind the grazing became a little better, because the hard snow got loosened.
- ❖ A lot of rain in March which froze on the snow and made a layer of crust that was as hard as concrete with difficult grazing conditions in the mountainous areas furthest south, towards the Finnish border.

Sámi knowledge holder, Karasjok area (Norway)

- ❖ First snow came early, in October and it stayed. A lot of snow and cold this winter. Long cold spells, although not below 40 as it used to do before.
- ❖ The ice breakup process has undergone significant changes. Previously, massive ice sheets would block the river, creating a dramatic and special event for the community to witness. Now the ice simply rots and vanishes.

Sámi knowledge holder, Karesuando area (Sweden)

- ❖ A lot of snow all winter, and it came early. No challenges; the grazing conditions were good anyway.
- ❖ Spring-winter came more snow, from the south, typically it comes from the north. Some areas saw 1m new snow, which created problems for driving snow machines and gather the reindeer. Snow prevented reindeer to access trees where the lichen is.
- ❖ Northern part of grazing areas had very little snow, and that was what saved us this year. Long spring with crusted snow. The reindeer were in very good conditions at the start of the winter, which made them better prepared.

Sámi knowledge holder, north of Ubmeje/Umeå (Sweden)

- ❖ Very stable temperatures below freezing, with absence of mild spells. There have been strong winds, some days with storms.
- ❖ The grazing conditions have been poor, winter pastures have been locked with ice layers lasting all winter. A lot of snow this winter.

Sámi knowledge holder, Inari area (Finland)

- ❖ Bays and shores got thick ice early. Open water froze quite late and got insulating layer of snow on top. Traveling is more dangerous.
- ❖ Autumn was rainy and water levels were high when rivers froze. Then water level dropped, making dangerous empty spaces between water and ice. Reindeer might fall through ice, starve to death or drown.
- ❖ Rain in February. Snow becomes more compact and heavier for reindeer to dig food. The mild weather began at the end of February and lasted until March 2024. The mild weather first led to the pastures becoming better, the snow becoming soft and some areas became bare.
- ❖ When the cold came after the mild weather, the snow became hard and impenetrable in large areas. The reindeer started to walk more to find good pastures. We have to feed the herd more often due to mild weather that creates icing.

Sámi knowledge holder, Enontekiö area (Finland)

- ❖ Extremely cold winter. The fall-winter was extremely cold, which was good for the reindeer because the soil was able to freeze well before it set more snow.
- ❖ Snow came early this winter, very cold. Strong winds. Winds and rain/ snow seem to increase. This year the fall-winter has been the same as the crisis year of 2020.
- ❖ January was extremely cold and then at the end of the month the weather turned and suddenly it got mild and a lot of heavy winds. Weather appears to change rapidly.
- ❖ Strong winds are increasing as the climate warms up. Strong winds improves pasture, as long as there is not too much wet snow.

Sámi knowledge holder, Kiruna (Sweden)

- ❖ End of October – first snow. The reindeer get stressed and a little confused when there is too much snow early and especially when there is so much snow at once.
- ❖ With snow, but without ice on lakes we actually can't herd the reindeer, because it is a huge risk to drive with ATVs, and we can't still drive with snow mobiles.

Highlights & main impacts

- ❖ First part of winter: Very cold, with early snow but strong variations between areas
  - In areas without snow the early cold was good for the **reindeer grazing conditions**
  - In areas with much early snow there were **challenges for transport** since open water did not yet freeze enough
  - Early freeze-up of rivers with decreasing water levels created **risk of reindeer falling through the ice**
- ❖ Second part of winter: High variability in weather conditions with mild & rainy periods, as well as cold spells
  - Rain on snow creates **ironcrust, which led to difficult grazing and more walking of reindeer** to find good pastures

Eastern Nordic

Seasonal Outlook: Summer 2024				Multi Model Agreement			
Climatological variables			Forecast relative to climatological normal	High	Moderate	Low	*No*
Temperature	Svalbard, Barents sea		**Warmer than normal in JJA 2024**	✓			
	Murmansk/White Sea/Continent				✓		
	Scandinavia, Norwegian Sea			✓			
Precipitation	Svalbard, Barents sea		**No model agreement in JJA 2024**				✓
	Murmansk/White Sea/Continent						✓
	Scandinavia, Norwegian Sea						✓
Sea-Ice	**Break-up**	Barents sea	**Early (West), Late (East)**	✓			
	Minimum Ice Extent Sept 2024	Barents sea	**Below to near normal**		✓		
Snow Water Equivalent	Equivalent Eastern Nordic		**No model agreement**				✓

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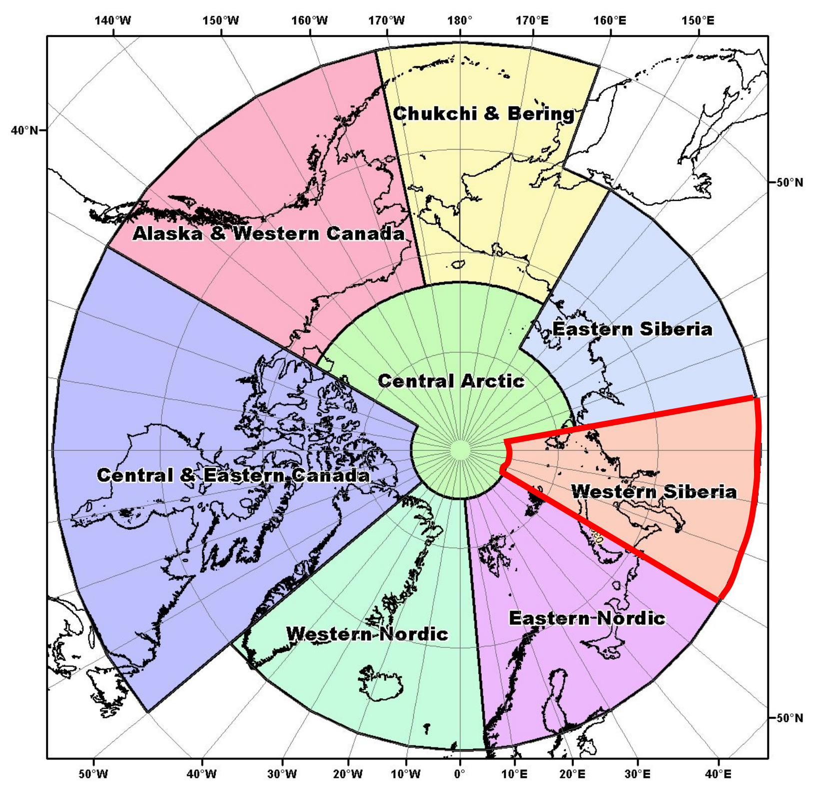
Eurasian Node

- **Western Siberian**
- **Eastern Siberian**
- **Chukchi & Bering**

Arctic Regional Climate Centre Network

Western Siberia



Western Siberia

SEASONAL SUMMARY: WINTER 2023/2024

Observations above (+) and below (-) climatological normal

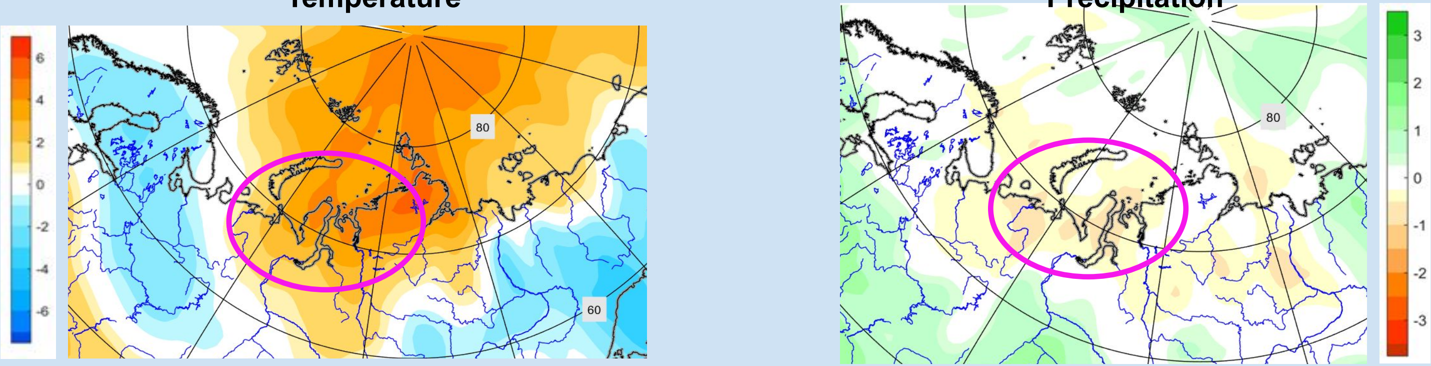
Temperature Normal 1991-2020	NDJ: **+2,79 °C** (rank 8) FMA: 0,07 °C Feb*:* **+3,36 °C** (rank 7)	Coldest years were: 1968 (NDJ) and 1966 (FMA)	Warmest years were: 1936 (NDJ) and 2020 (FMA)
Precipitation Normal 1991-2020	NDJ: Normal FMA: **Slightly drier**	Wettest year was 2002 (122.6%)	Driest year was 1946 (72.4 %)
Sea-Ice Normal 1991-2020 Ice extent rank since 1979	Kara Sea: near normal to late freeze-up March maximum sea-ice extent: ice covered		

Western Siberia

OBSERVED EXTREME CLIMATE EVENTS
WINTER 2023/2024

Category	Location	Rarity	Impacts associated with event
Warm weather in February and cold in March	Yamalo-Nenets Autonomous Okrug	Ones every 5-6 years	Warm February, despite the lack of precipitation, caused thaws and precipitation in the form of sleet. Thaws were recorded at 50% of stations in the Yamalo-Nenets District. After the thaw, an ice crust formed on the snow (in some areas up to 13 cm thick), which, due to the cold weather in the spring, did not melt until April. According to the Agrological Bulletin, problems with obtaining food in reindeer pastures were observed from February to April 2024. Private farms are reporting large losses in their herds.

Winter 23/24 anomalies (ERA5)



Temperature

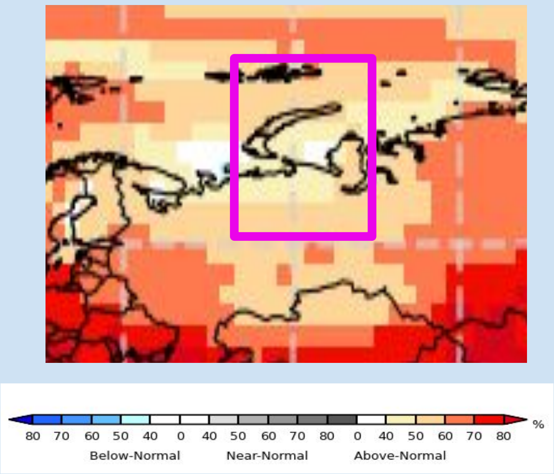
Precipitation

Western Siberia

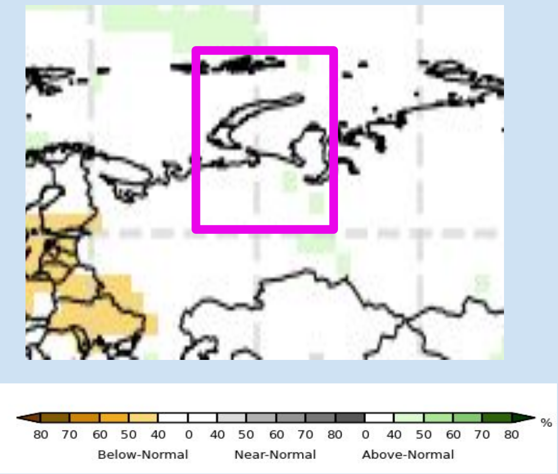
SEASONAL OUTLOOK: SUMMER 2024				Multi Model Agreement			
Climatological variables			Forecast relative to climatological normal	High	Moderate	Low	*No*
Temperature	Kara Sea		**Warmer**			✓	
	Continent				✓		
Precipitation	Kara Sea		**uncertainty**				✓
	Continent						✓
Sea-Ice	**Break-up**	Kara Sea (east)	**Late**		✓		
		Kara Sea (west)	**Early**		✓		
Snow Water Equivalent	Continent (West)		**Below**		✓		
	Continent (East)		**Below**	✓			
	West coast of Kara Sea		**Above**		✓		

Western Siberia

Temperature
JJA-2024



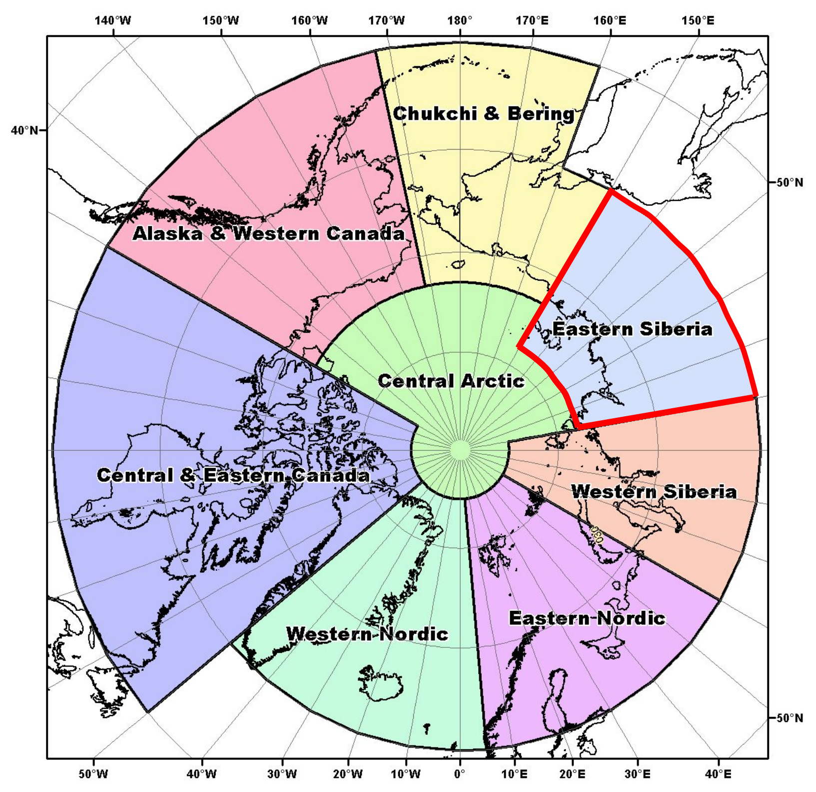
Precipitation
JJA-2024

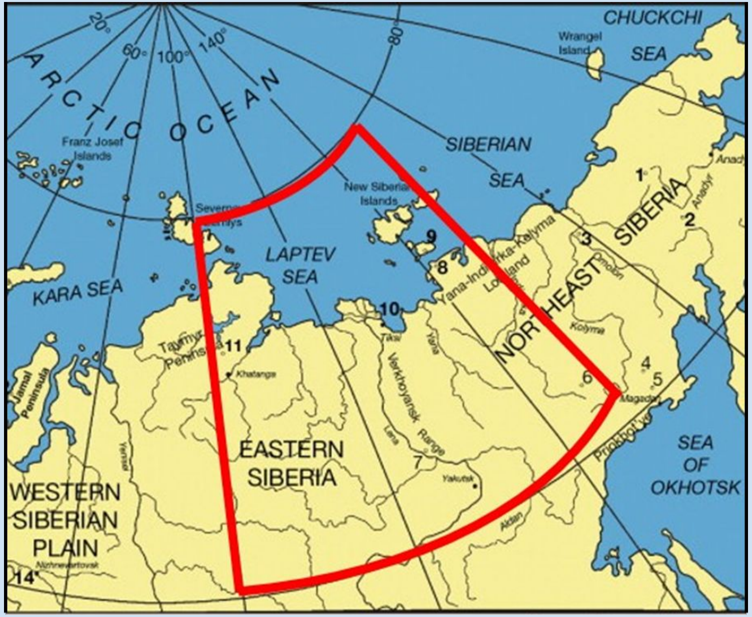


Potential societal and environmental impacts

Economy sector/ Livelihood conditions	Relevant variables from the Seasonal Outlook	Impacts associated
Livestock farming	Above norm T2m and Prec on the east	In the east of the Yamalo-Nenets Okrug, warm conditions can cause heat waves, warm and humid weather causes muggy weather with a lot of insects, which is unfavorable for local and domestic animals.

Eastern Siberia





Eastern Siberia

Seasonal Summary: Winter 2023/2024

Observations above (+) and below (-) climatological normal			
Temperature Normal 1991-2020	NDJ: +0.91˚C FMA: + 1.06˚C	Coldest years were: 1907 (NDJ) and 1966 (FMA)	Warmest years were: 1924 (NDJ) and 1920 (FMA)
Precipitation Normal 1991-2020	NDJ: Normal FMA: Normal	Wettest year was 1988 (125,2%)	Driest year as 1967 (78,4%)
Sea-Ice Normal 1991-2020 Ice extent rank since 1979	Laptev Sea: near normal freeze-up March maximum sea-ice extent: ice covered		

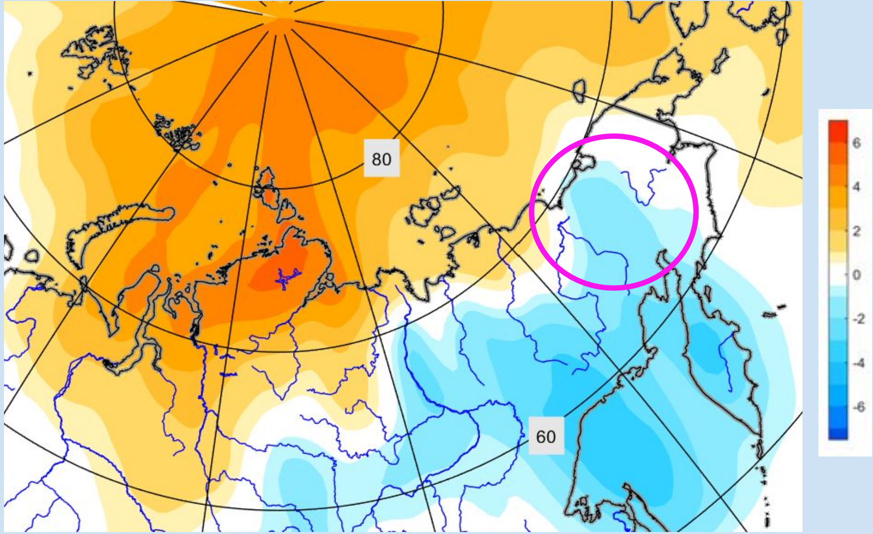
Eastern Siberia

OBSERVED EXTREME CLIMATE EVENTS
WINTER 2023/2024

Category	Location	Rarity	Impacts associated with event
Cold wave	NE of Sakha republic 15-21 FEB	In mid-February for the first time in 30 years	New daily air temperature records (-50..-52°C) have been set. Schools have been switched to distance learning. Cases of frostbite among the local population and electrical accidents were reported.

Winter 23/24 temperature anomalies

(ERA5)

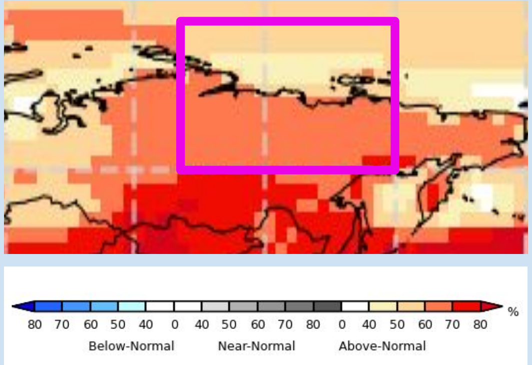


Eastern Siberia

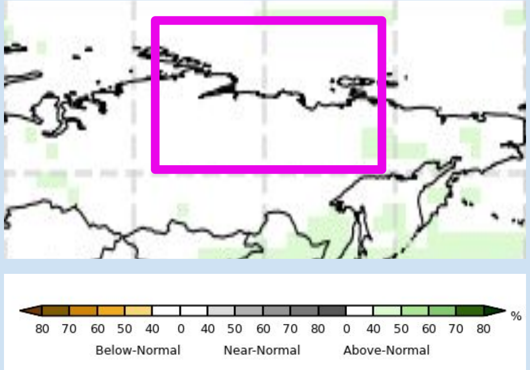
Seasonal Outlook: Summer 2024				Multi Model Agreement			
Climatological variables			Forecast relative to climatological normal	High	Moderate	Low	*No*
Temperature	Laptev Sea		Warmer			✓	
	Continent				✓		
Precipitation	Laptev Sea		**Uncertainty**				✓
	Continent						✓
Sea-Ice	**Break-up**	Laptev Sea	**Early**		✓		
Snow Water Equivalent	Continent		**Below**	✓			
	Northeast coast of Laptev sea		**Above**		✓		

Eastern Siberia

Temperature
JJA-2024



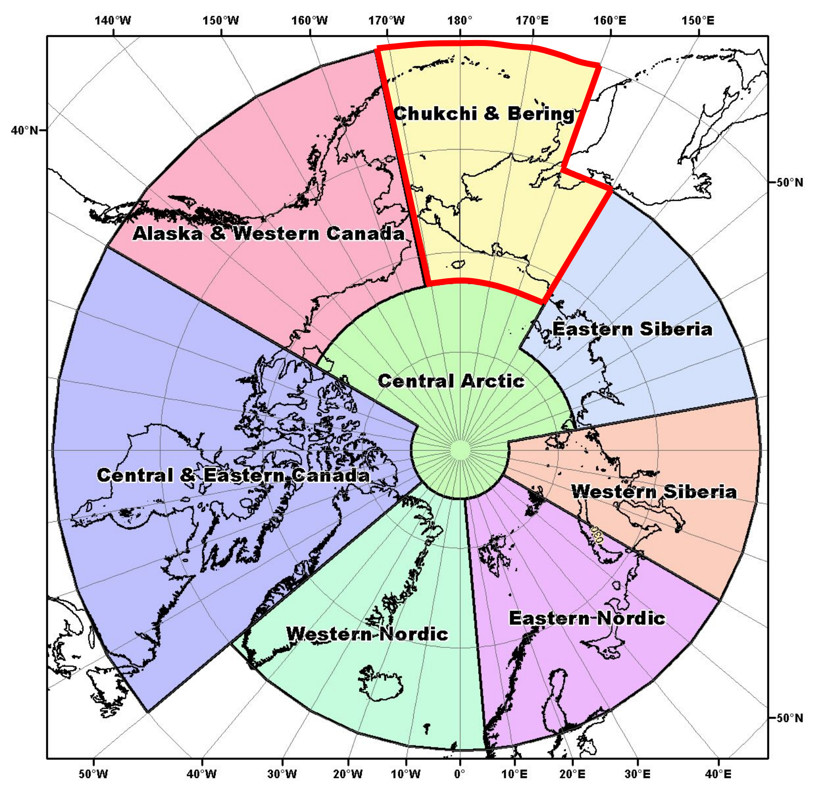
Precipitation
JJA-2024



Potential societal and environmental impacts

Economy sector/ Livelihood conditions	Relevant variables from the Seasonal Outlook	Impacts associated
Forestry	Above norm T2m	An increased risk of wildfires is expected due to above-normal temperatures forecast for northern Eastern Siberia.
Health/Wildlife	Above norm T2m	Heat waves
Hydrology	Uncertainty in precipitation	Small snow reserves may affect the flood season on of main Arctic rivers (Lena, Yana, Indigirka), if there is uncertainty in precipitation - a small risk can be assumed

Chukchi and Bering



Chukchi and Bering

Seasonal Summary: Winter 2023/2024

Observations above (+) and below (-) climatological normal

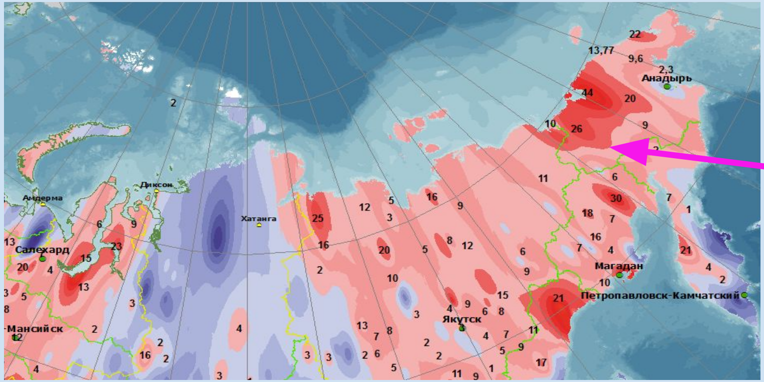
Temperature Normal 1991-2020	NDJ: **+1.72˚C** FMA: **+ 1.36˚C**	Coldest years were: 1994 (NDJ) and 1902 (FMA)	Warmest years were: 1925 (NDJ) and 1926 (FMA)
Precipitation Normal 1991-2020	NDJ: slightly wetter FMA: wetter to slightly drier	Wettest year was 1954 (139,6%)	Driest year was 1982 (60,2%)
Sea-Ice Normal 1991-2020 Ice extent rank since 1979	Chukchi Sea: early (on south) and late (on the north) freeze-up; Bering Sea early freeze-up; march maximum sea-ice extent above normal; Okhotsk Sea: early freeze-up, march maximum sea-ice extent above normal, by May 15, 2024 ice cover in the Sea of Okhotsk was 10% lower than in 2023* *according to satellite data "Planeta"		

Chukchi and Bering

Observed extreme climate events
Winter 2023/2024

Category	Location	Impacts associated with event
Precipitation above normal –> High snow cover -> river floods	Northern Chukotka and northeast of the Sakha Republic	The frequent recurrence of snowfalls in the winter months has led to significant positive snow cover anomalies. Large-scale floods are expected on the Kolyma and Yana rivers (dangerous water levels have already been recorded on these rivers upstream). In the village of Zyryanka the airport (runway) was flooded.

Snow cover anomalies (cm), observations February, 2024



Zyryanka airport May 16, 2024

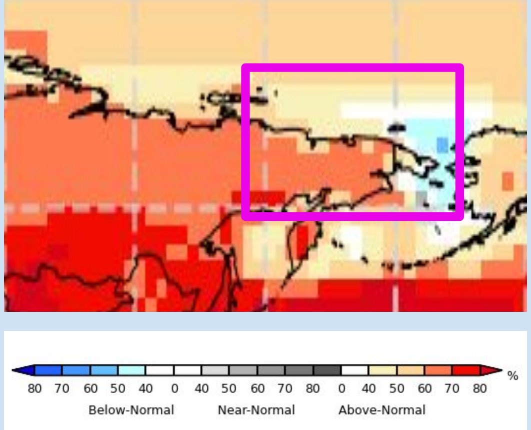
Photo: 14.mchs.gov.ru

Chukchi and Bering

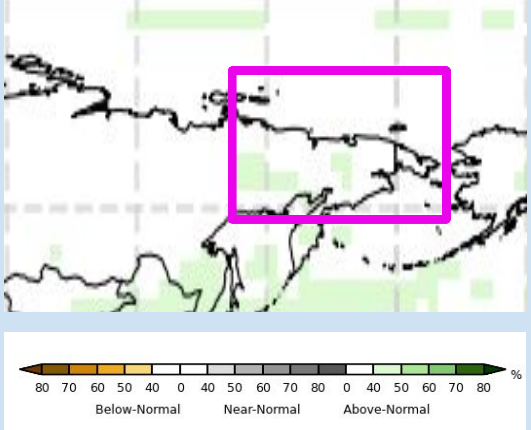
SEASONAL OUTLOOK: SUMMER 2024				Multi Model Agreement			
Climatological variables			Forecast relative to climatological normal	High	Moderate	Low	*No*
Temperature	East Siberian Sea		Warmer			✓	
	Continent				✓		
	Coast of Okhotsk Sea			✓			
	Chukchi Sea		Colder		✓		
Precipitation	Almost entire region		**Uncertainty**				✓
	Local central parts		Wetter			✓	
Sea-Ice	**Break-up**	East Siberian Sea (north), Chukchi Sea (North)	**Early**			✓	
		East Siberian Sea, Chukchi Sea	**Late**		✓		
		Bering Sea	**Late**	✓			
	Minimum Ice Extent	Bering sea, Okhotsk sea	**Below**		✓		
Snow Water Equivalent	North of the region		Above		✓		
	South of the region		Below		✓		

Chukchi and Bering

Temperature
JJA-2024



Precipitation
JJA-2024



Potential societal and environmental impacts

Economy sector/ Livelihood conditions	Relevant variables from the Seasonal Outlook	Impacts associated
Shipping/transport	Late break-up of Bering sea and south of Chukchi sea	Shipping across the Northern Sea Route is expected to be start later than normal
Transport & Livelihood	Floods	Due to warm weather and high snow cover (by May 20 in Chukotka the snow height reached 20-30 cm), heavy floods are expected on the northern rivers in early June

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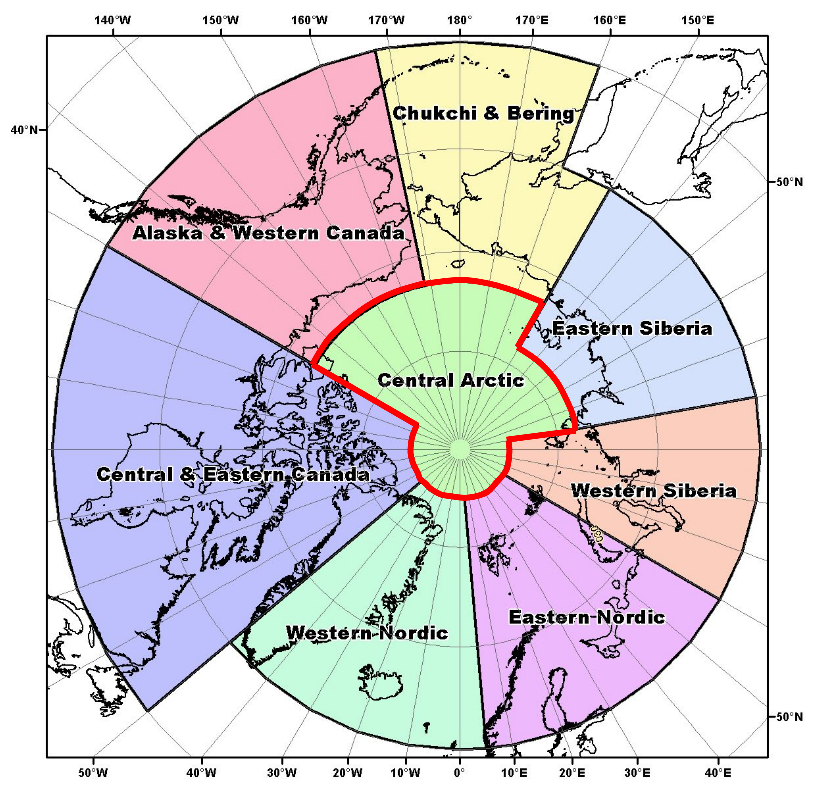
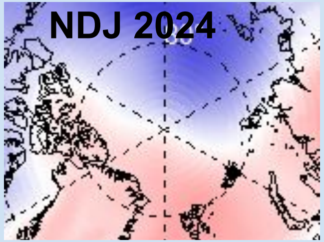
Central Arctic

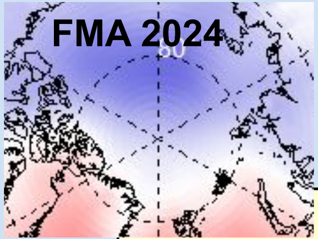


Arctic Regional Climate Centre Network

Central Arctic

SAT anomalies

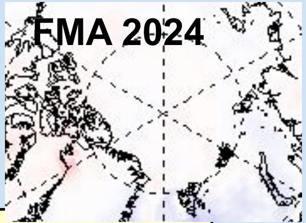




SEASONAL SUMMARY: Fall 2022 / Winter 2023-2024

Observations above (+) and below (-) climatological normal	
Temperature Normal 1991-2020	Temperature Anomaly NDJ 2023-2024 varied from -2 in eastern part to +2 in western part. Anomaly FMA 2024 has similar distribution with tendency to extension of area with negative anomaly
Precipitation Normal 1991-2020	close to normal / slightly wetter
Sea-Ice Since 1979	Maximum Arctic winter ice extent, 15th in row (~15.3 mln km^2) was reached 12-13 March 2024, which is close in time to climatic date and later by 1 weeks than previous year. Prominent area of residual ice in late summer led to decadal normal ice extent growth in the Eurasian Arctic.

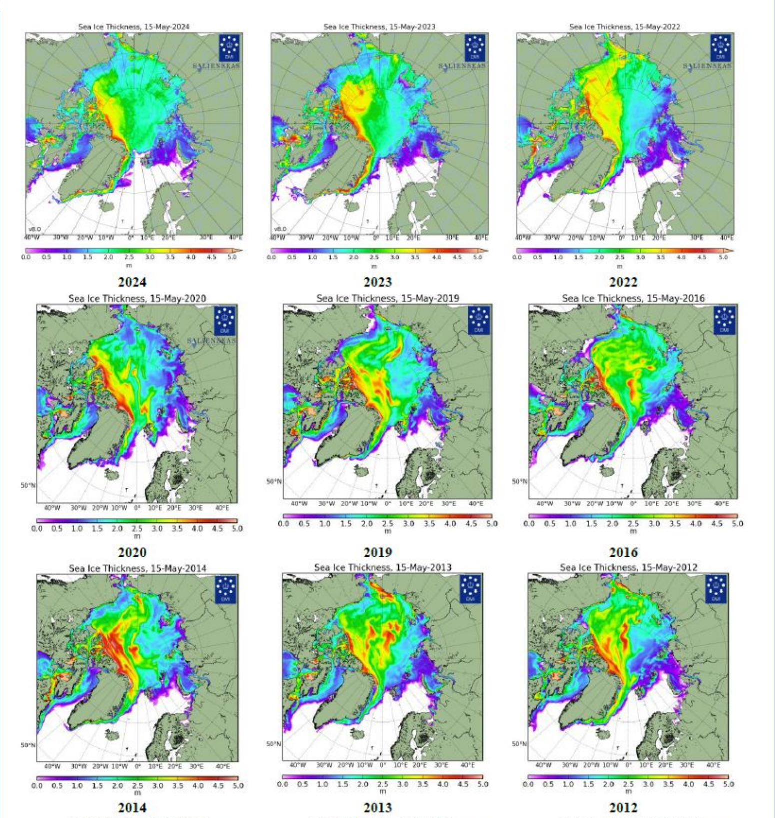
Precipitation anomalies



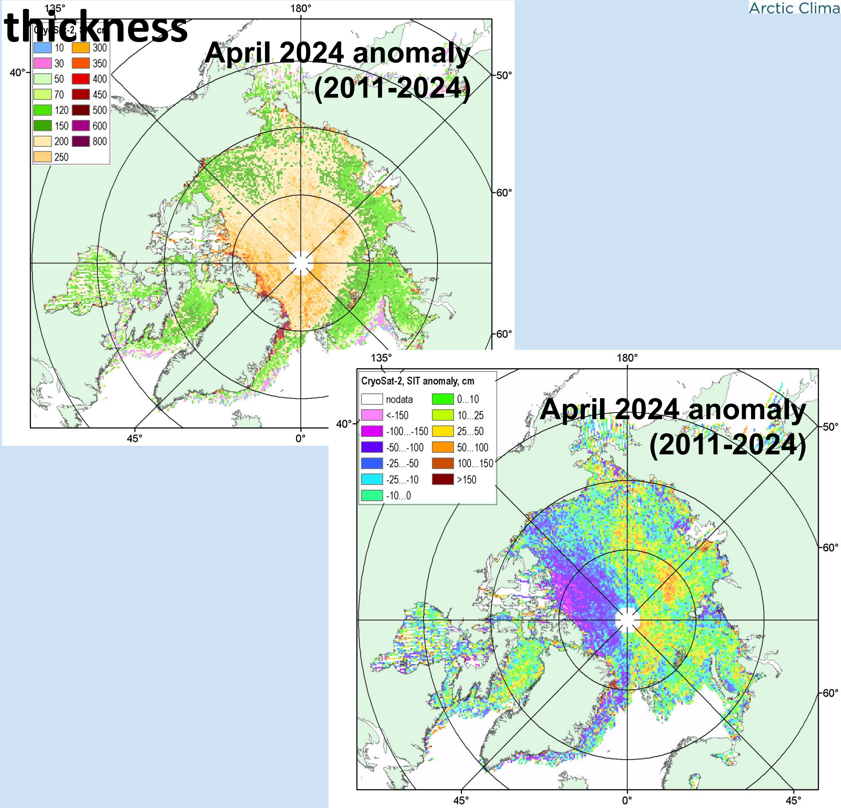
OUTLOOK: SUMMER 2023/2024

Forecast			Multi Model Agreement High	Moderate	Low
Temp	Northern parts of Beaufort and Chukchi, East Siberian Sea	**Near normal**		✓	
	North pole, Laptev and Kara Seas	**Above / Near normal**		✓	
Precip	All regions	**Above / Near normal**		✓	
Sea-Ice	**Break-up**	Ice covered, no forecast			

Central Arctic



ESA CryoSAT-2 sea ice thickness

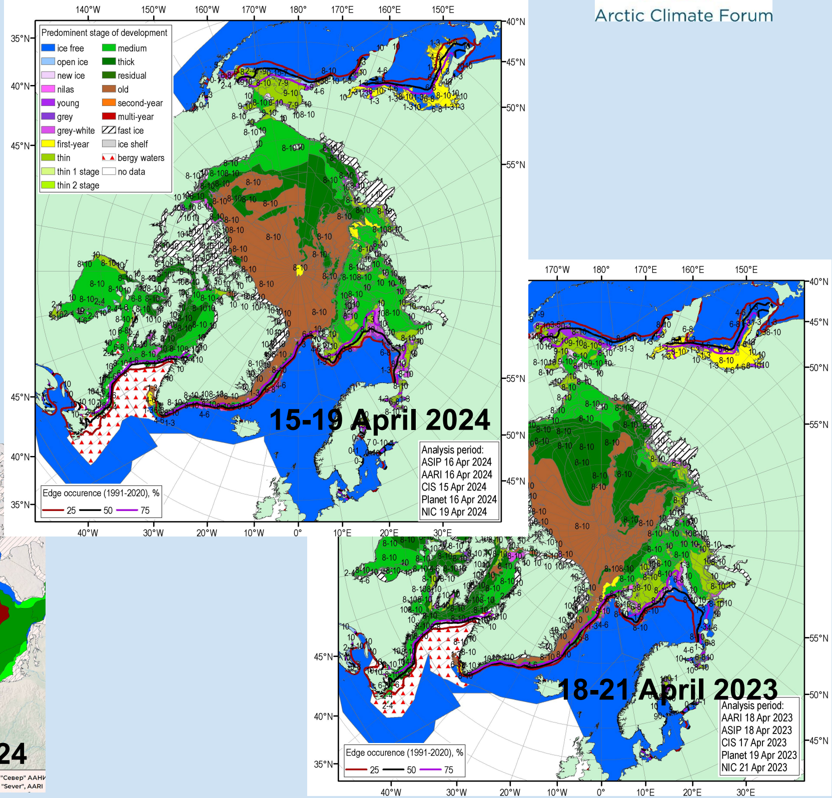


April 2024 anomaly (2011-2024)

April 2024 anomaly (2011-2024)

Central Arctic

- The peculiarity: the old ice preserved in the western part of Laptev Sea (during last years such event almost have not observed, except 2023)
- Later transition to next stages of development
- Less area of one-year thick ice to the end of the growth season
- Fast ice area is lower then the multiyear norm

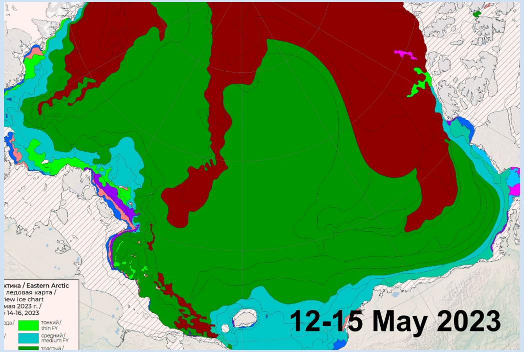


15-19 April 2024

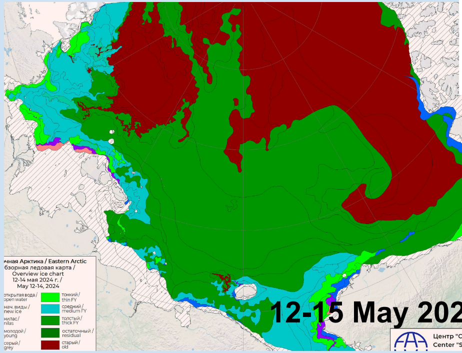
Analysis period:
ASIP 16 Apr 2024
AARI 16 Apr 2024
CIS 15 Apr 2024
Planet 16 Apr 2024
NIC 19 Apr 2024

18-21 April 2023

Analysis period:
AARI 18 Apr 2023
ASIP 18 Apr 2023
CIS 17 Apr 2023
Planet 19 Apr 2023
NIC 21 Apr 2023



12-15 May 2023

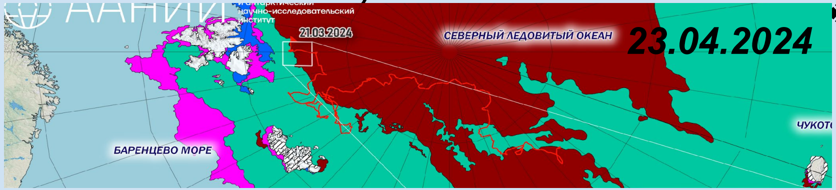


12-15 May 2024

Other events in Central Arctic:

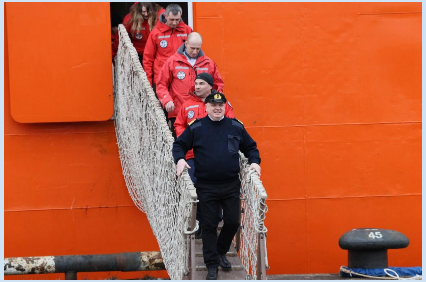
❖ 17 May the platform «Severniy Polus» came to Murmansk

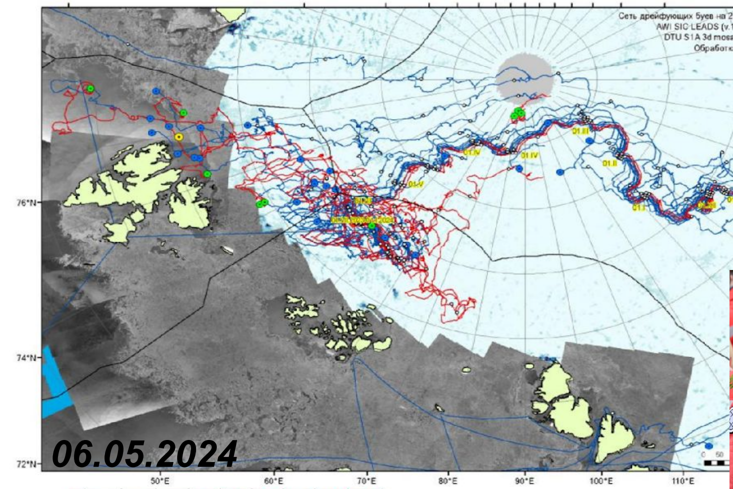
«Severniy Polus» drift



❖ Expedition “North Pole-41” has finished

Terms: 17 September 2022 – 17 May 2024





distributed network (DN) of *buoys drift*

Arctic Climate Forum

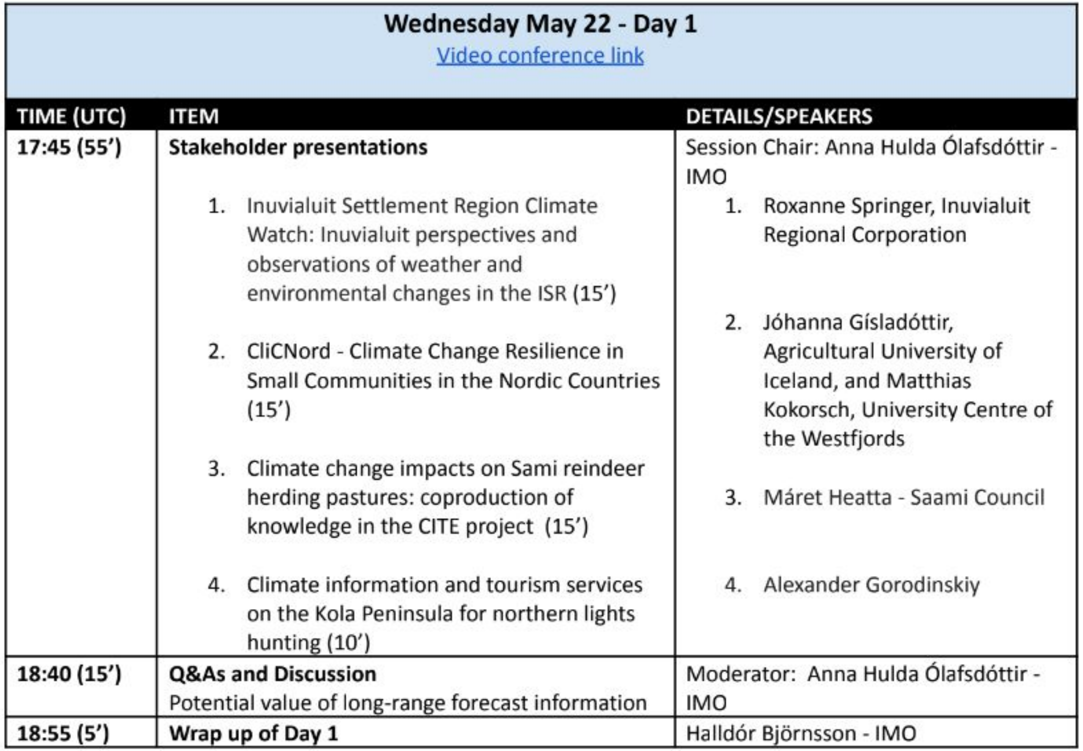
Thank you for your attention!

Icelandic Met Office

ACF
Arctic Climate Forum

WORLD METEOROLOGICAL ORGANIZATION

Break for 15 min



Wednesday May 22 - Day 1
[Video conference link]

TIME (UTC)	ITEM	DETAILS/SPEAKERS
17:45 (55')	**Stakeholder presentations** 1. Inuvialuit Settlement Region Climate Watch: Inuvialuit perspectives and observations of weather and environmental changes in the ISR (15') 2. CliCNord - Climate Change Resilience in Small Communities in the Nordic Countries (15') 3. Climate change impacts on Sami reindeer herding pastures: coproduction of knowledge in the CITE project (15') 4. Climate information and tourism services on the Kola Peninsula for northern lights hunting (10')	Session Chair: Anna Hulda Ólafsdóttir - IMO 1. Roxanne Springer, Inuvialuit Regional Corporation 2. Jóhanna Gísladóttir, Agricultural University of Iceland, and Matthias Kokorsch, University Centre of the Westfjords 3. Máret Heatta - Saami Council 4. Alexander Gorodinskiy
18:40 (15')	**Q&As and Discussion** Potential value of long-range forecast information	Moderator: Anna Hulda Ólafsdóttir - IMO
18:55 (5')	**Wrap up of Day 1**	Halldór Björnsson - IMO

INUVIALUIT
REGIONAL CORPORATION

Inuvialuit Settlement Region Climate Watch

Inuvialuit perspectives and observations of weather and environmental changes in the ISR

May 2024

Roxanne Springer, Climate Change Program Coordinator

Presentation for Arctic Climate Forum

Presentation Outline

- Introduction to the Inuvialuit Settlement Region (ISR)
- Project Background
- Project Activities
- What We Heard
- Q&A

INUVIALUIT
REGIONAL CORPORATION

Inuit Nunangat

Location of the Inuvialuit Settlement Region and it's 6 communities

~ 435,000 km^2 in the Mackenzie Delta, Beaufort Sea, and Amundsen Gulf area

- Land area = ~ 90,650km^2

Population Size (ISR) = 5,336

- Range in size from Inuvik (3,137) to Sachs Harbour (104

Map created by Sarah Simpkin; Map data from Natural Resources Canada (2016), licensed under the Open Government Licence – Canada.

INUVIALUIT REGIONAL CORPORATION

Project Background

- Pilot project

- Started in April 2022 – September 2024

- Objectives:
  1. Share climate-related information from national + regional level with Inuvialuit communities (What information do Inuvialuit want?)

  2. Document local observations of weather and environment from Inuvialuit communities.

INUVIALUIT
REGIONAL CORPORATION

Project Activities

- Multiple community engagements (April – Sep 2022)
- Community visits to gather weather and environmental observations
- Community visit to validate the community observations (Winter 2024).

Community	Season
Inuvik (12)	Fall 2022, Winter 2023
Tuktoyaktuk (30)	Fall 2022, Winter 2023
Paulatuk (20)	Fall 2022, Winter 2023
Ulukhaktok (20)	Fall 2022, Winter 2023, Spring 2023
Sachs Harbour (13)	Summer 2023, Fall 2023, Winter 2024,
Aklavik (13)	Summer 2023, Fall 2023, Winter 2024,

INUVIALUIT
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INUVIALUIT
REGIONAL CORPORATION

What We Heard

Frequency, Source and Use of Weather Information by Inuvialuit

- Daily (74/108)
- Weekly (15/108)
- Seasonally (5/108)

Frequency of checking weather/envirmental information

- Internet/phone (daily/weekly forecasts)
- Personal Observations
- Commmunity Members
- Inuvialuit Knowledge passed on from Elders

Sources for weather/enviromental information

- Travel/Going On-the-land
- Information on the current weather conditons
- To know how to dress for outside activites
- Work

Reason for checking weather/envormental information

- Winds
- Precipitation (rain/snow)
- Termperture
- Ice

Weather/environmental variables of Interest

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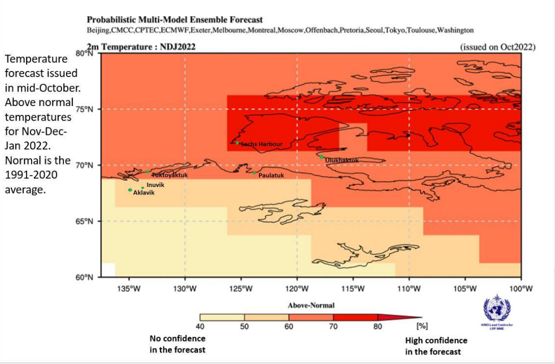
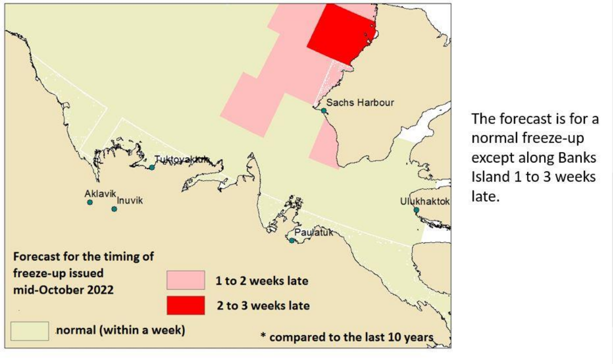
Seasonal Products

Seasonal products - longer-term forecasts (approx. 4 months) produced to give an outlook for the upcoming season (e.g., Fall 2023 or Winter 2023).

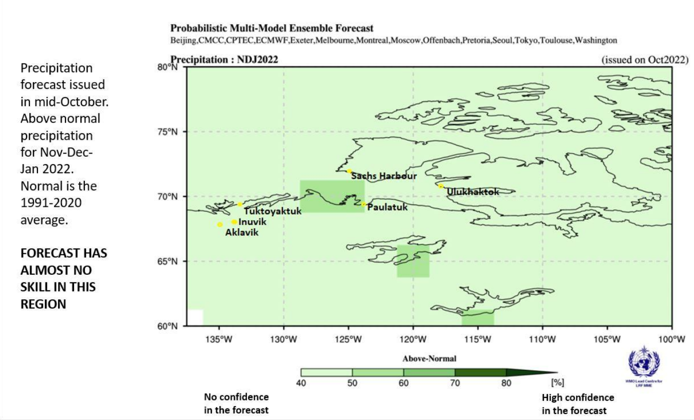


Temperature forecast issued in mid-October. Above normal temperatures for Nov-Dec-Jan 2022. Normal is the 1991-2020 average.



Forecast for the timing of freeze-up issued mid-October 2022

The forecast is for a normal freeze-up except along Banks Island 1 to 3 weeks late.



Precipitation forecast issued in mid-October. Above normal precipitation for Nov-Dec-Jan 2022. Normal is the 1991-2020 average.

FORECAST HAS ALMOST NO SKILL IN THIS REGION

Feedback on Seasonal Products

“My thing is to check in the fall time for the Farmer’s Almanac that comes out to see what the weather forecast is going to be for the year. And to see if it plays out the same with the Almanac and if it's almost correct.” (Paulatuk community member)

- 5 community members were interested in seasonal products
  - Did not know the products existed
  - Unsuitable for the main purposes they would need weather data (prepare for travelling, going out on the land, or knowing how to dress for the weather.)

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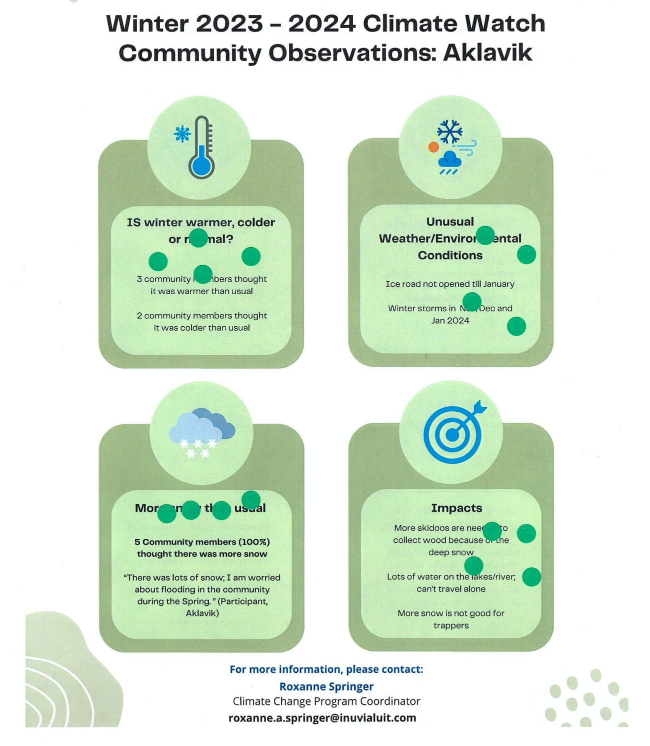
Information Sharing and Validation



Winter 2023 – 2024 Climate Watch Community Observations: Aklavik

IS winter warmer, colder or normal?

3 community members thought it was warmer than usual

2 community members thought it was colder than usual

Unusual Weather/Environmental Conditions

Ice road not opened till January

Winter storms in Nov, Dec and Jan 2024

More snow than usual

5 Community members (100%) thought there was more snow

"There was lots of snow; I am worried about flooding in the community during the Spring." (Participant, Aklavik)

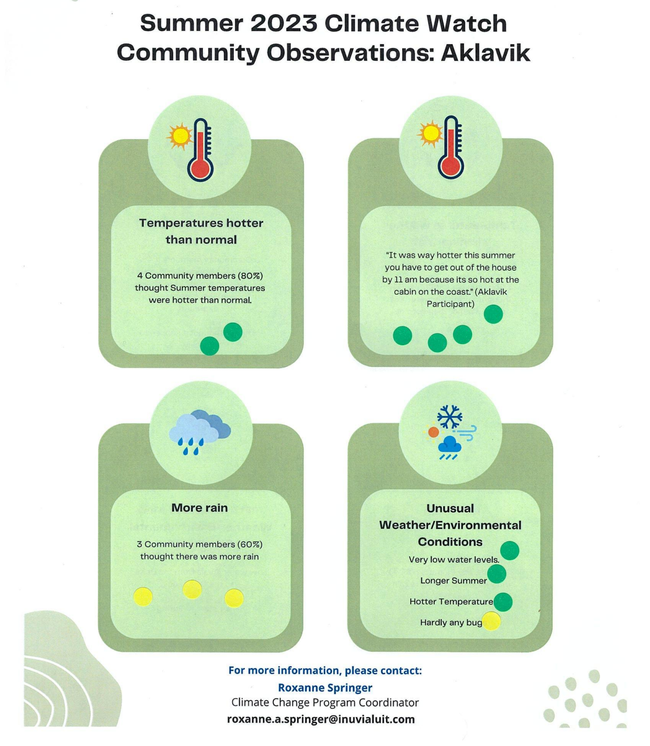
Impacts

More skidoos are needed to collect wood because of the deep snow

Lots of water on the lakes/river; can't travel alone

More snow is not good for trappers

For more information, please contact:
Roxanne Springer
Climate Change Program Coordinator
roxanne.a.springer@inuvialuit.com



Summer 2023 Climate Watch Community Observations: Aklavik

Temperatures hotter than normal

4 Community members (80%) thought Summer temperatures were hotter than normal.

"It was way hotter this summer you have to get out of the house by 11 am because its so hot at the cabin on the coast." (Aklavik Participant)

More rain

3 Community members (60%) thought there was more rain

Unusual Weather/Environmental Conditions

Very low water levels.

Longer Summer

Hotter Temperature

Hardly any bug

For more information, please contact:
Roxanne Springer
Climate Change Program Coordinator
roxanne.a.springer@inuvialuit.com

INUVIALUIT REGIONAL CORPORATION

Key Observations from Inuvik

Fall 2022, Winter 2022 - 2023

- Fall temperatures were warmer than usual (100%)
- Freeze-up was later than usual
- There were drastic shifts between cold and mild temperatures in Winter.

“The weather could be 40 below, then the next day it is -12 or -13. It never used to be like that.” (Inuvik, Elder)

INUVIALUIT
REGIONAL CORPORATION

Key Observations from Tuktoyaktuk

Fall 2022, Winter 2022 – 2023

- Fall temperatures were warmer than usual (57%); Freeze-up was later than usual (90%)
- Winter: less snow (80%); very few blizzards

It was an exceptional winter. Because well in terms of November, December, you know, hardly any snow which was good. And then we get hit by mother nature, January, February, March April (with snow).” (Elder, Tuktoyaktuk)

INUVIALUIT REGIONAL CORPORATION

Key Observations from Sachs Harbour

Summer 2023; Fall 2023

- Summer temperatures were warmer than usual (100%)
- Fall temperatures were warmer than usual (85%)
- Fall precipitation: more rain (77%), less snow (92%).
- Winter took a long time to get cold, when it did it was colder than usual (61%)

“This was one of the warmest summers in 25 years. It got up to the mid 20C for 10 days” (Sachs Harbour Participant)

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REGIONAL CORPORATION

Key Observations from Aklavik

Summer 2023; Fall 2023

- Summer temperatures were warmer than usual (92%); low water levels
- Fall: warmer than usual (92%); freeze-up was later than usual (100%); more snow, more rain, less ice.
- Winter: more snow (100%)

"It was way hotter this summer you have to get out of the house by 11 am because it was so hot at the cabin on the coast." (Participant, Aklavik)

"There was lots of snow; I am worried about flooding in the community during the Spring. " (Participant, Aklavik)

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REGIONAL CORPORATION

Key Observations from Paulatuk

Fall 2022; Fall 2023

- Fall temperatures were warmer than usual (75%); freeze-up was later than usual (75%);
- Winter: less snow; much fewer blizzards

"Ya know our winter this year was really, really exceptional because we never had any big blows" … Thank God we didn't have any this year, but next year…. ya know it tends to skip."   Paulatuk Elder

INUVIALUIT
REGIONAL CORPORATION

Key Observations Ulukhaktok

Fall 2022; Spring 2023

- Fall: warmer than usual (60%); freeze-up was later than usual (75%); less snow, more rain, less ice.
- Spring: warmer than normal (95%), Break-up was earlier (85% and it happened quickly.

Impacts

- Alternating rain and snow in the Fall results in mixed layers of ice and snow. When this happens animal can’t access their food sources.
- Late Fall freeze-up delays fall hunting season.
- Less time to prepare for seasonal hunting.
- Less time to fish and store food which results in less country food. Communities then had to rely more on store-bought food.
- Little to no trout for the Jamboree.
- Affected duck hunting.

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REGIONAL CORPORATION

Next Steps

- Graphical abstracts for each community with their observations.
- Final report
- Continue to pursue knowledge mobilization efforts to share climate-related information with Inuvialuit communities.

Questions? Thank you!

For more information on these projects, please contact:

Roxanne Springer

Climate Change Program Coordinator
Inuvialuit Regional Corporation
Phone: (867) 777-7052
Email: rspringer@inuvialuit.com

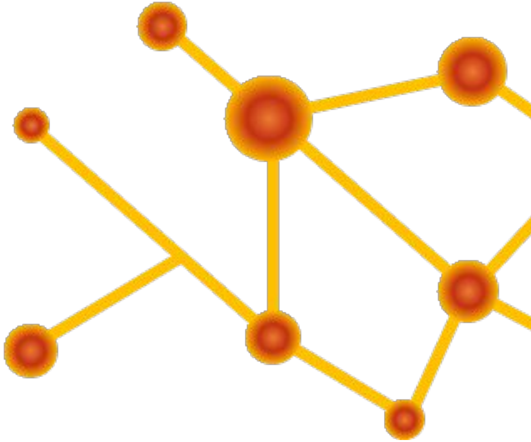
CliCNord

Climate
Change
Resilience in
Small
Communities in the
Nordic Countries

Climate Change Resilience in Small Communities in the Nordic Countries

Johanna Gisladottir, Agricultural University of Iceland

Matthias Kokorsch, University Centre of the Westfjords



UNIVERSITY COLLEGE COPENHAGEN KP

NTNU
Norwegian University of Science and Technology

Háskólasetur Vestfjarða
University Centre of the Westfjords

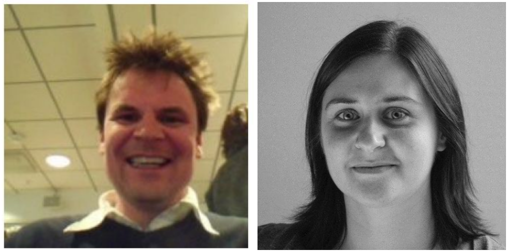
LUND UNIVERSITY

RISE Research Institutes of Sweden

UiT The Arctic University of Norway

NordForsk

This project has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229



NTNU

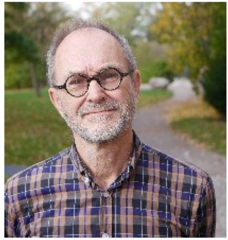
Norwegian University of
Science and Technology

Háskólasetur
Vestfjarða
University Centre
of the Westfjords

UNIVERSITY
COLLEGE
COPENHAGEN
KP

17 Researchers
6 Institutes

THE ARCTIC UNIVERSITY OF NORWAY
• UIT •



LUND
UNIVERSITY

RI.
SE
Research Institutes
of Sweden

Introduction to the CliCNord project

Climate change is affecting the Nordic countries, and there are vulnerable geographical areas that will be particularly affected by an increasing number of devastating natural events.

CliCNord

NordForsk

This project has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229

Objectives of the CliCNord project

The overall objective is:

to build capacity in small communities to cope with the challenges of climate change

The CliCNord Research Project has examined how small remote communities:

- understand their situation
- handle adverse events
- build capacity
- investigated under what circumstances they need help from the established system and civil society organizations

This project has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229

8 cases with 8 different hazards

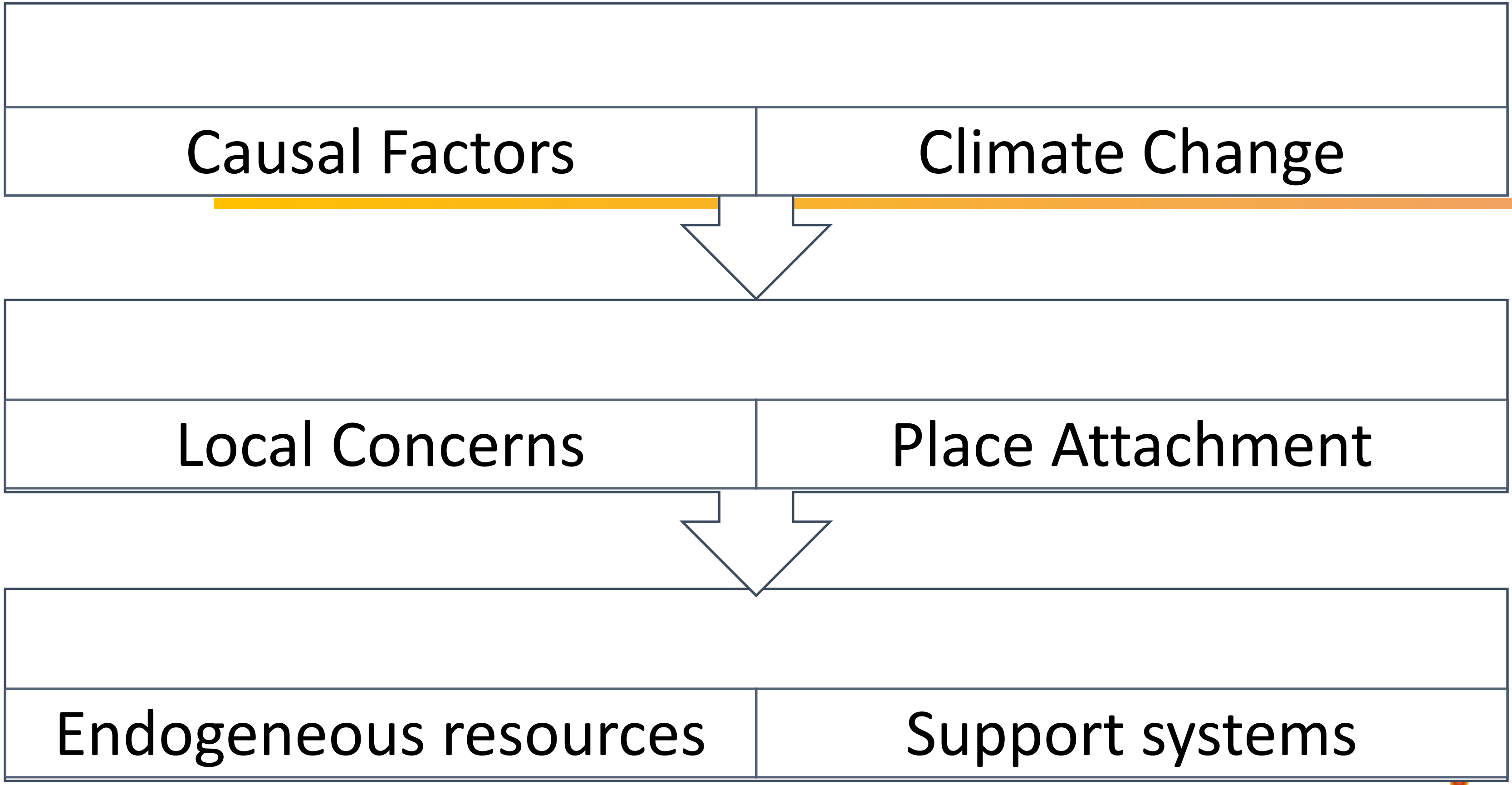
CliCNord will include 8 very different hazards affecting local communities across the Nordic countries

All the hazards are regarded as a direct consequence of climate change

CliCNord

NordForsk

This project has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229



Causal Factors | Climate Change

Local Concerns | Place Attachment

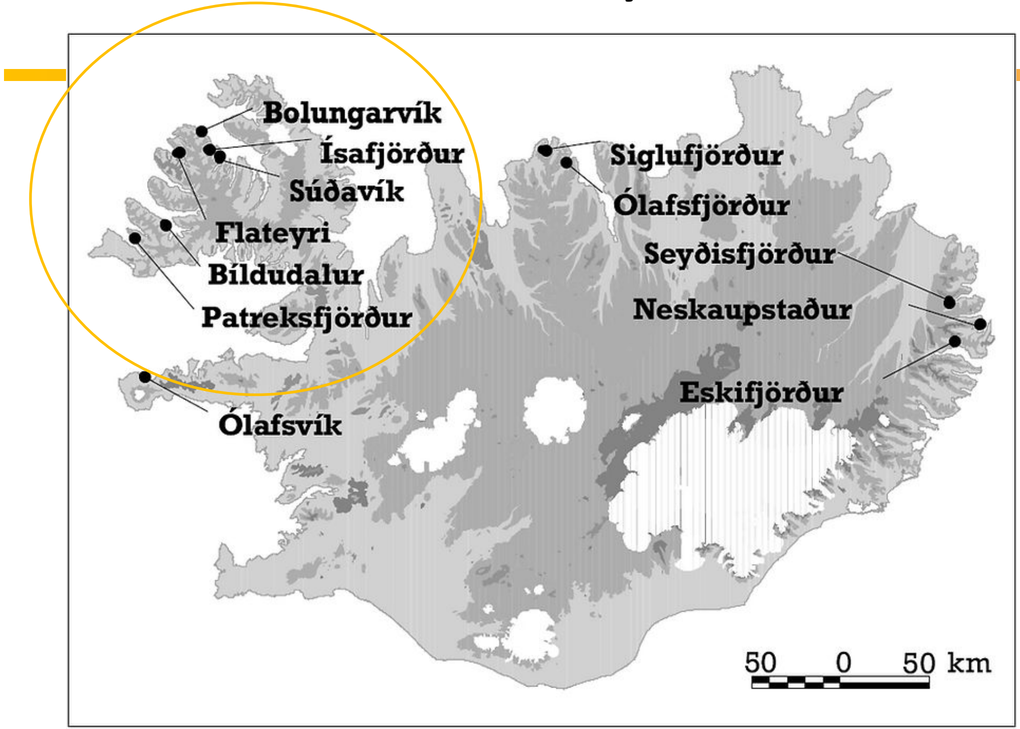
Endogeneous resources | Support systems

CliCNord

NordForsk

This project has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229

Communities threatened by avalanches or landslides



Source: Jóhannesson & Arnalds, 2001:82

CliCNord

NordForsk
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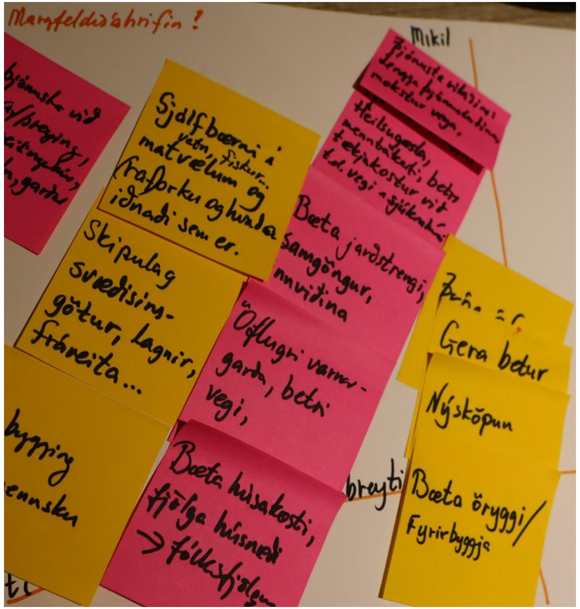
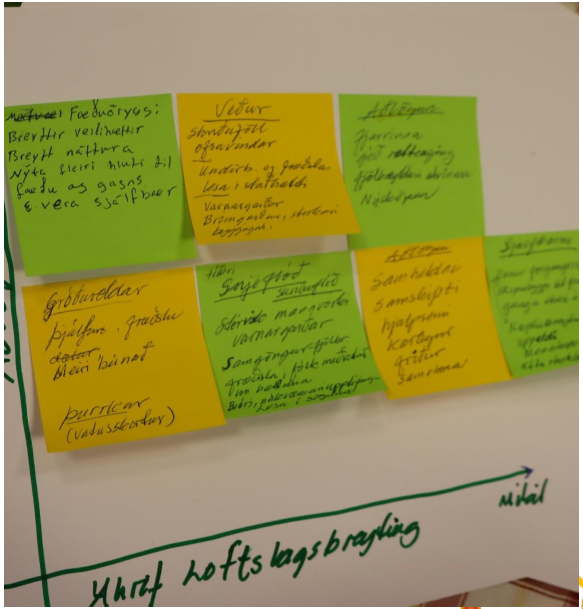
Methods





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Prepardness

Response

Prevention

Recovery

Source: blakkur.is

CliCNord

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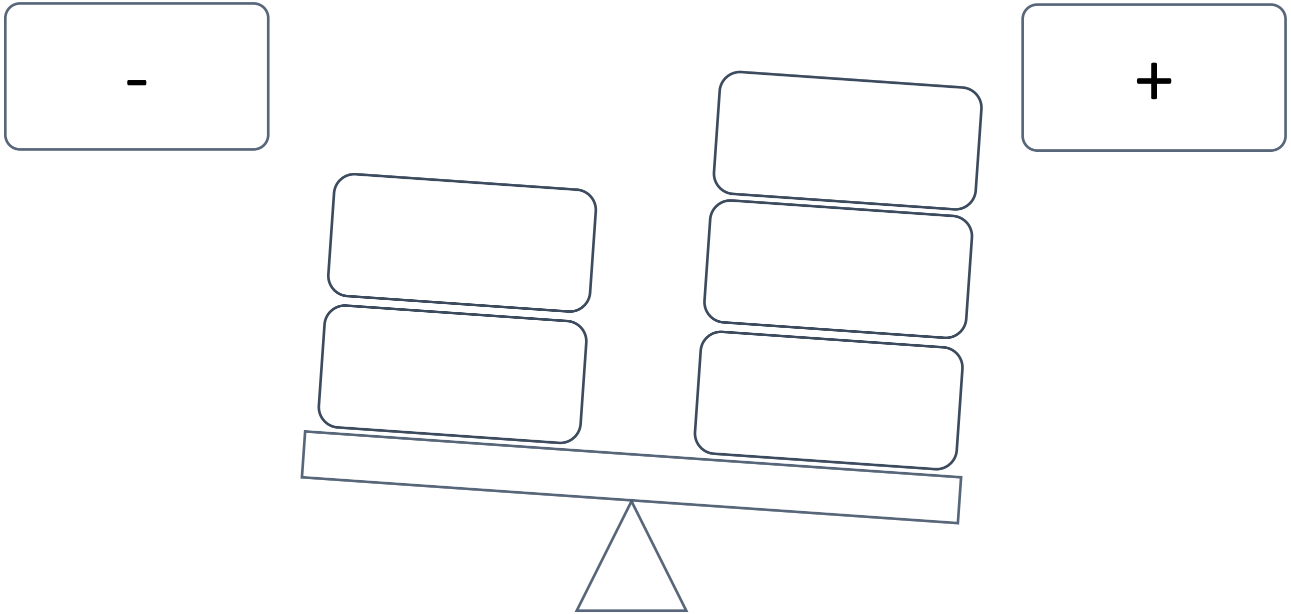
Place attachment



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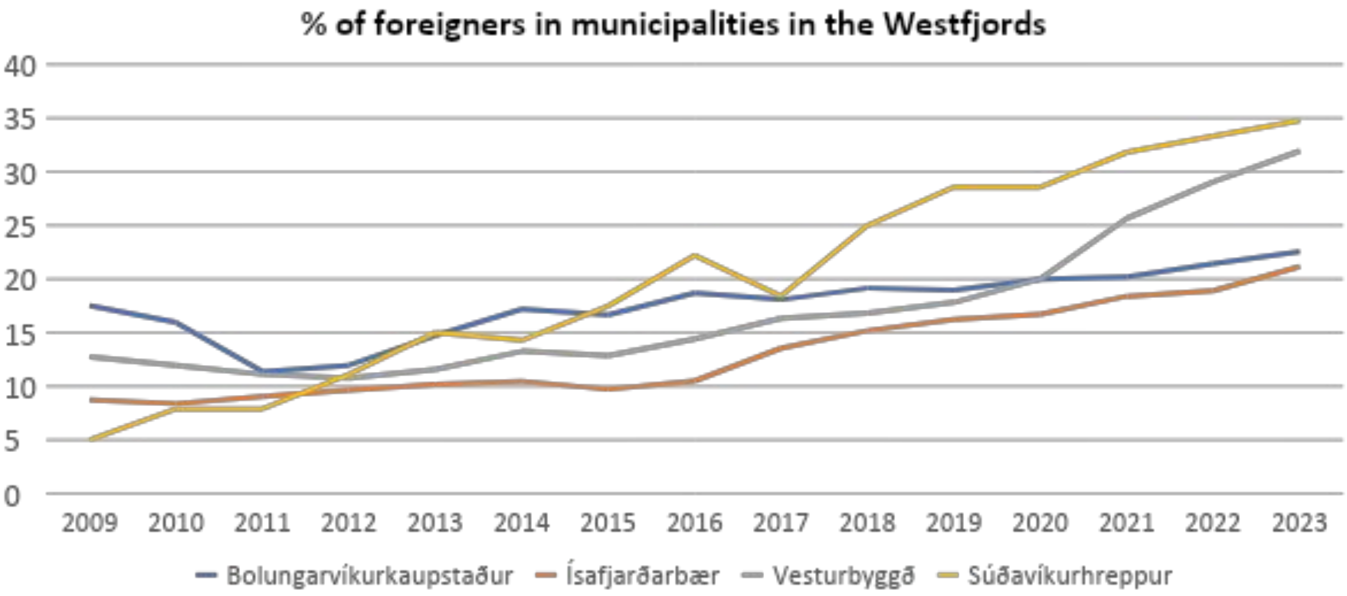

CliCNord

NordForsk

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Read more – and follow…

Climate Change Resilience in Small Communities in the Nordic Countries

ClicNord

NordForsk This project has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229

Home About Partners Cases Publications Collaboration News & Events More

Climate Change Resilience in Small Communities in the Nordic Countries

[ClicNord]

For the last three years, we have worked with the risk of flooding on small Danish Islands – hoping ...

23.10.2023

ClicNord – Research Project

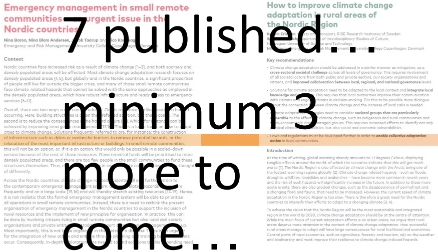
ClicNord Newsletter N°5 is out – which provides a short overview of our main activities for the l...

20.10.2023

ClicNord – Research Project

www.clicnord.org

Policy briefs



Emergency management in small remote communities – an urgent issue in the Nordic countries

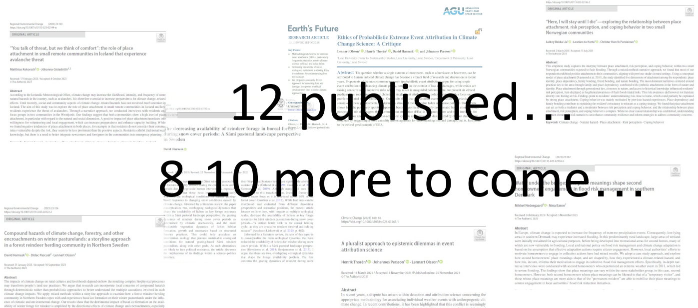
Nina Baron, Nina Blom Andersen, Jakob Taarup and Nico Korsgaard

How to improve climate change adaptation in rural areas of the Nordic Region

7 published…

minimum 3 more to come…

Scientific articles



"You talk of threat, but we think of comfort": the role of place attachment in small remote communities in Iceland that experience avalanche threat

Matthias Kokorsch · Jóhanna Gísladóttir

Earth's Future

Ethics of Probabilistic Extreme Event Attribution in Climate Change Science: A Critique

Lennart Olsson, Henrik Thorén, David Harnesk, and Johannes Persson

"Here, I will stay until I die"—exploring the relationship between place attachment, risk perception, and coping behavior in two small Norwegian communities

Leikny Bakke Lie · Laurien de Korte · Christer Henrik Pursiainen

The decreasing availability of reindeer forage in boreal forests during snow cover periods: A Sámi pastoral landscape perspective in Sweden

David Harnesk

Compound hazards of climate change, forestry, and other encroachments on winter pasturelands: a storyline approach in a forest reindeer herding community in Northern Sweden

David Harnesk · Didac Pascual · Lennart Olsson

A pluralist approach to epistemic dilemmas in event attribution science

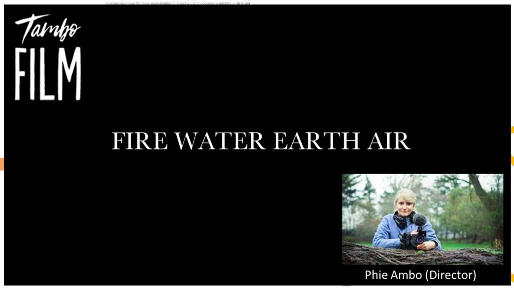
Henrik Thorén · Johannes Persson · Lennart Olsson

Water under the bridges: place meanings shape second homeowner engagement in flood risk management in southern Denmark

Mikkel Nedergaard · Nina Baron

12 published…

8-10 more to come…



Phie Ambo (Director)

ClicNord

NordForsk This project has received funding from the NordForsk Nordic Societal Security Programme under Grant Agreement No. 97229

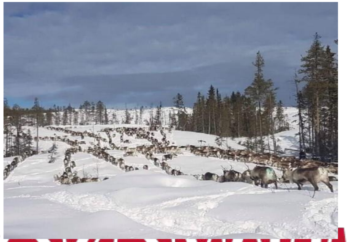
Climate change impacts on Terrestrial Ecosystems (CITE)

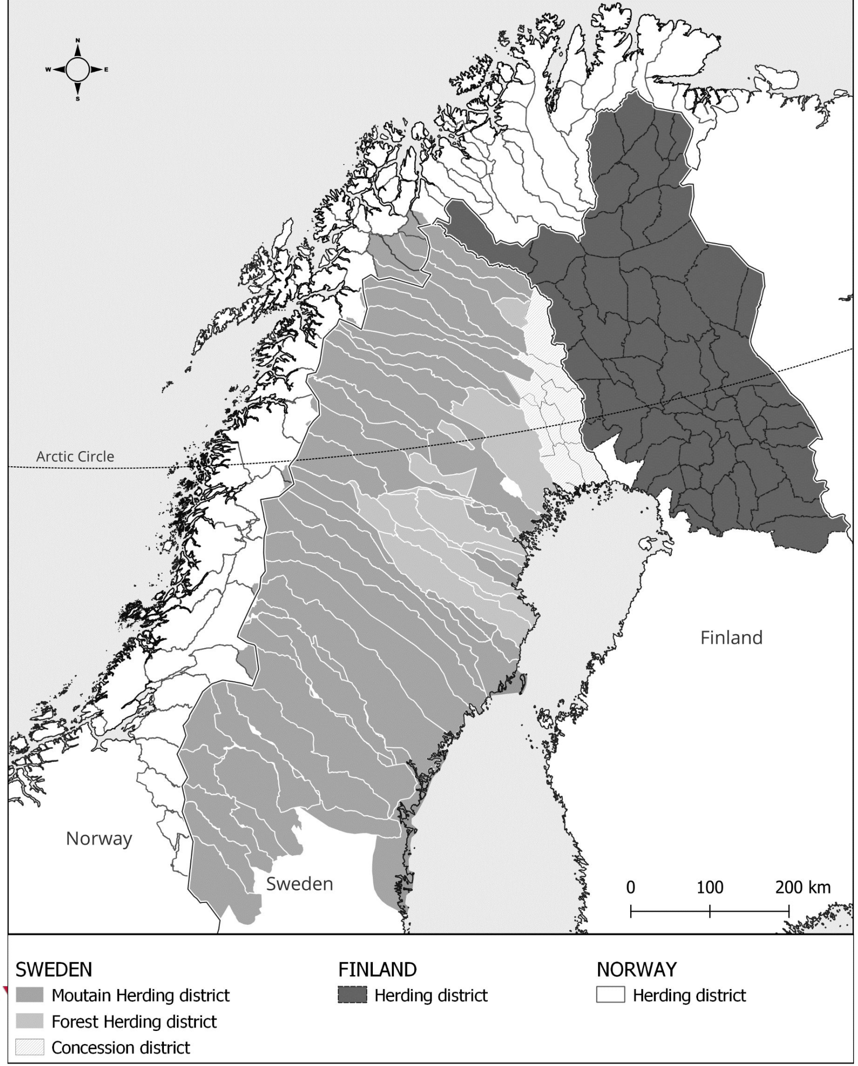
Co-production of a plan to study climate impacts on pasturelands

Maret J. Heatta
The Saami Council
Arctic Climate Forum13 – 22.05.24

Saami reindeer herding

- 4 countries 1 people
- Great importance for culture, employment and economy
- Siida - reindeer grazing districts
- Facing big challenges with climate change and competing land use





CITE

- Background
- Objectives

Sámi herders' traditional knowledge of biodiversity and environmental variability

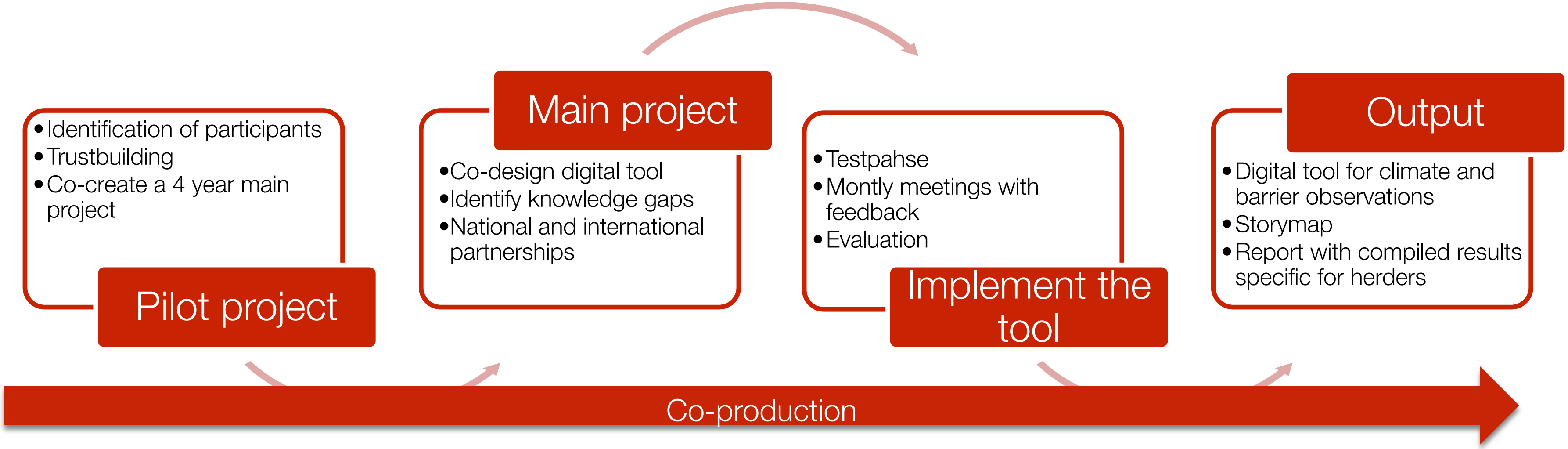
Land use planning within the reindeer herding areas

Policies on Traditional Ecological Knowledge and Social Equity

- Method – COPRODUCTION

SÁMIRÁĐĐI
SAAMELAISNEUVOSTO
SAMERÅDET
COЮЗ CAAMOB
SAAMI COUNCIL

The Co-Production Approach



- Identification of participants
- Trustbuilding
- Co-create a 4 year main project

Pilot project

Main project

- Co-design digital tool
- Identify knowledge gaps
- National and international partnerships

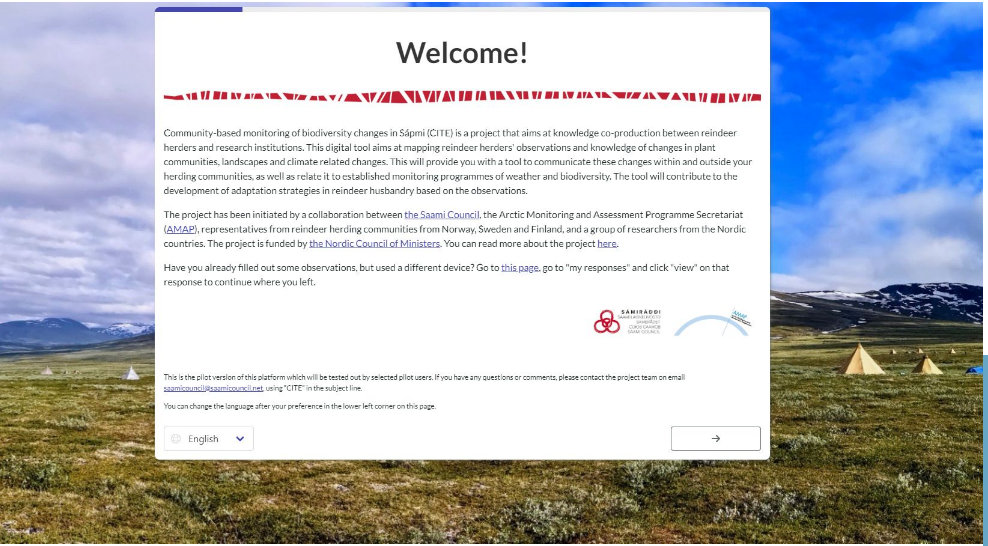
- Testpahse
- Montly meetings with feedback
- Evaluation

Implement the tool

Output

- Digital tool for climate and barrier observations
- Storymap
- Report with compiled results specific for herders

Co-production



Welcome!

Community-based monitoring of biodiversity changes in Sápmi (CITE) is a project that aims at knowledge co-production between reindeer herders and research institutions. This digital tool aims at mapping reindeer herders' observations and knowledge of changes in plant communities, landscapes and climate related changes. This will provide you with a tool to communicate these changes within and outside your herding communities, as well as relate it to established monitoring programmes of weather and biodiversity. The tool will contribute to the development of adaptation strategies in reindeer husbandry based on the observations.

The project has been initiated by a collaboration between the Saami Council, the Arctic Monitoring and Assessment Programme Secretariat (AMAP), representatives from reindeer herding communities from Norway, Sweden and Finland, and a group of researchers from the Nordic countries. The project is funded by the Nordic Council of Ministers. You can read more about the project here.

Have you already filled out some observations, but used a different device? Go to this page, go to "my responses" and click "view" on that response to continue where you left.

This is the pilot version of this platform which will be tested out by selected pilot users. If you have any questions or comments, please contact the project team on email saamicouncil@saamicouncil.net, using "CITE" in the subject line.

You can change the language after your preference in the lower left corner on this page.

SÁMIRÁÐÐI
SAAMELAISNEUVOSTO
SAMERÅDET
СОЮЗ СААМОВ
SAAMI COUNCIL

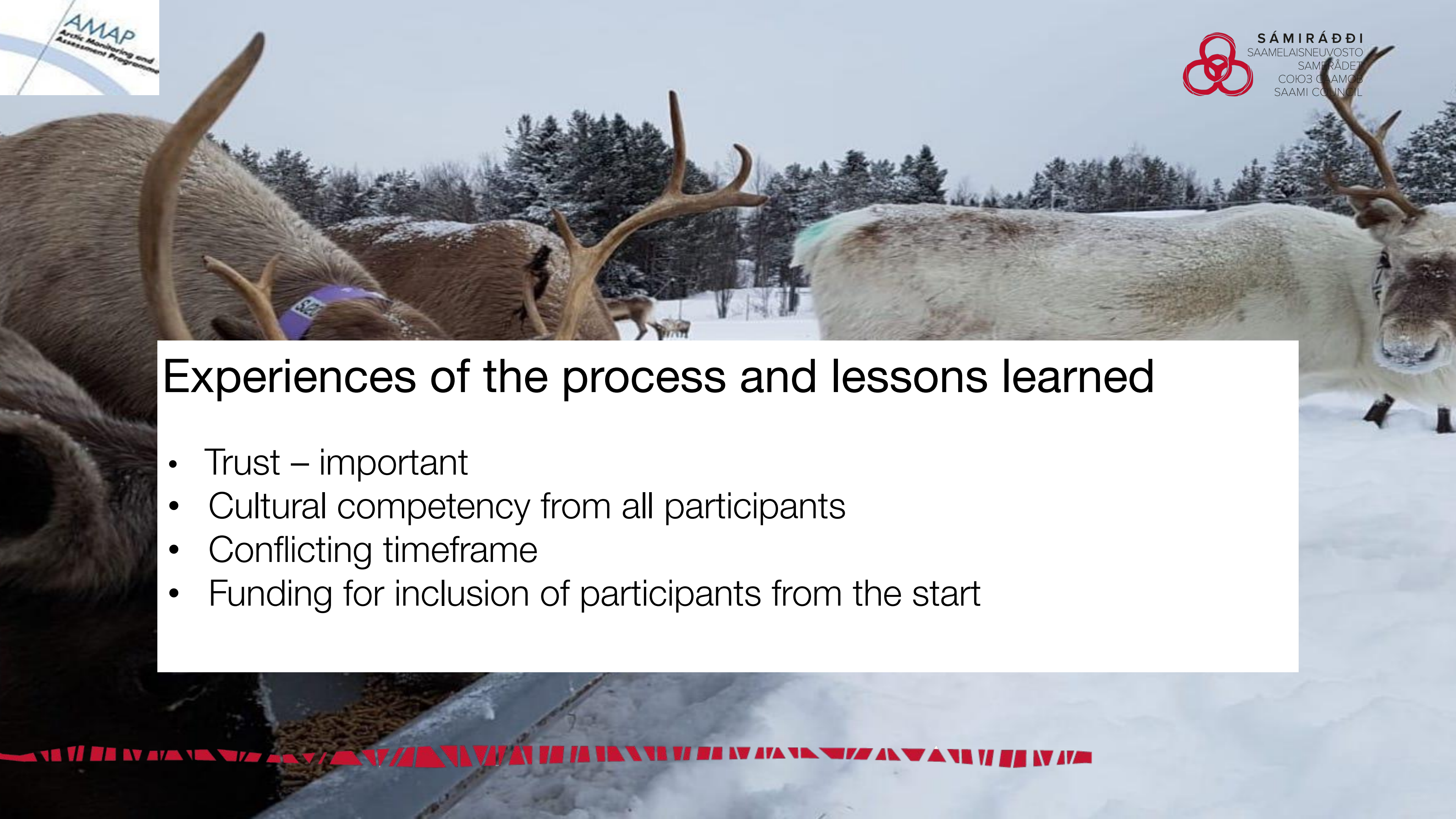
maptionnaire

Interventions:

- Workshops with focus groups
- Digital and physical meetings
- Regular correspondance
- Outreach
- Storymap
- Planned field visits

Main contributions

- Illustrate how to successfully develop and implement a co-production project
- The findings of Maptionnaire digital tool provide valuable information for ongoing assessments
- Mitigation
- Increased knowledge and skills
- Active international efforts and partnerships
- Promoting sustainable use of natural and cultural environment



Experiences of the process and lessons learned

- Trust – important
- Cultural competency from all participants
- Conflicting timeframe
- Funding for inclusion of participants from the start

AMAP
Arctic Monitoring and
Assessment Programme

SÁMIRÁÐÐI
SAAMELAISNEUVOSTO
SAMERÅDET
СОЮЗ СААМОВ
SAAMI COUNCIL

Ollu giitu!

Contacts

Janet Pawlak,
Project coordinator, AMAP
amap@amap.no

Máret J. Heatta
Project coordinator, The Saami Council
Maret.heatta@saamicouncil.net

Climate information

and tourism services on the Kola Peninsula

ALEXANDER GORODINSKIY

MURMANSK, RUSSIA

LOCATION

Murmansk region and Kola Peninsula
The Far North-West of Russia

iStock
Credit: PeterHermesFurian

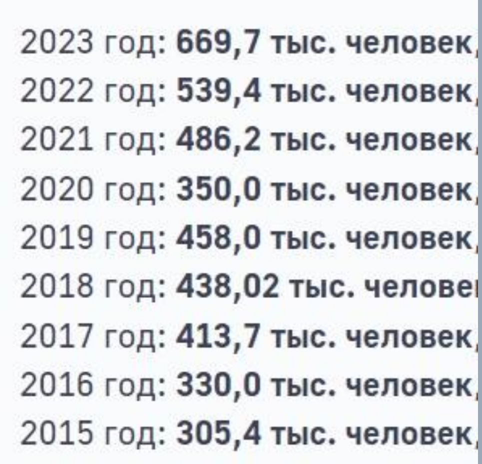
LOCATION

LOCATION and climate

MURMANSK REGION AND KOLA PENINSULA
THE FAR NORTH-WEST OF RUSSIA

Dramatic increase in tourism…

Number of tourists in the region
(year / thousand people)



2023 год: **669,7 тыс. человек**
2022 год: **539,4 тыс. человек**
2021 год: **486,2 тыс. человек**
2020 год: **350,0 тыс. человек**
2019 год: **458,0 тыс. человек**
2018 год: **438,02 тыс. челове**
2017 год: **413,7 тыс. человек**
2016 год: **330,0 тыс. человек**
2015 год: **305,4 тыс. человек**

> 25% annually

Murmansk Committy of tourism data

MURMANSK REGION – TOURISM STATISTICS

Murmansk population is just

around 260000 people

MURMANSK REGION – TOURISM STATISTICS

Arctic eco tourism
Nature tourism
in Murmansk region

Polar Experts

Arctic eco tourism
Nature tourism
in Murmansk region

ISSUES for next years

- how much snow can we expect ?

- early or late winter start ?

- warm or cold summers ?

- does climate change affect whales visits to Kola Peninsula coast ?

Should we expect warmer and longer summers?

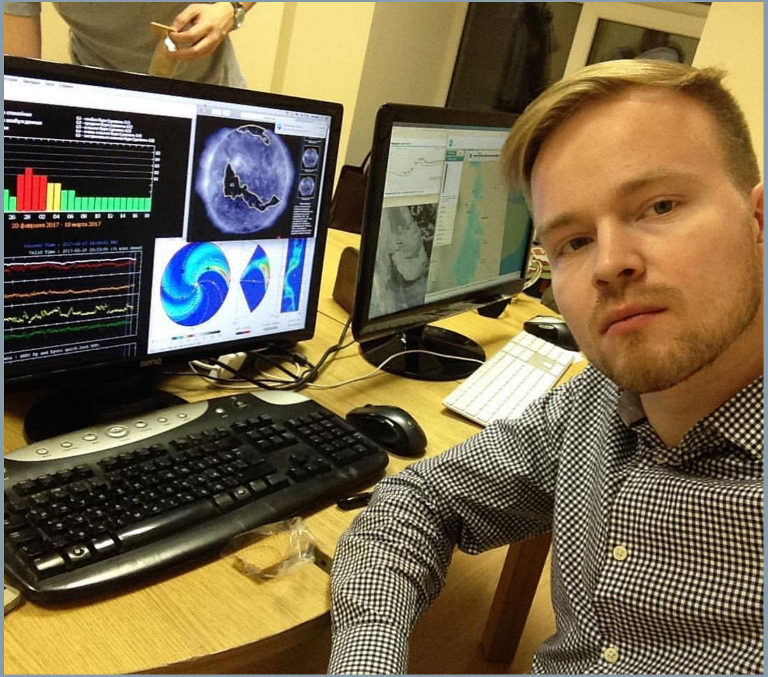
Summer tourism
in Murmansk region

Does climate change affect whale visits to Kola Peninsula?

Summer tourism
in Murmansk region

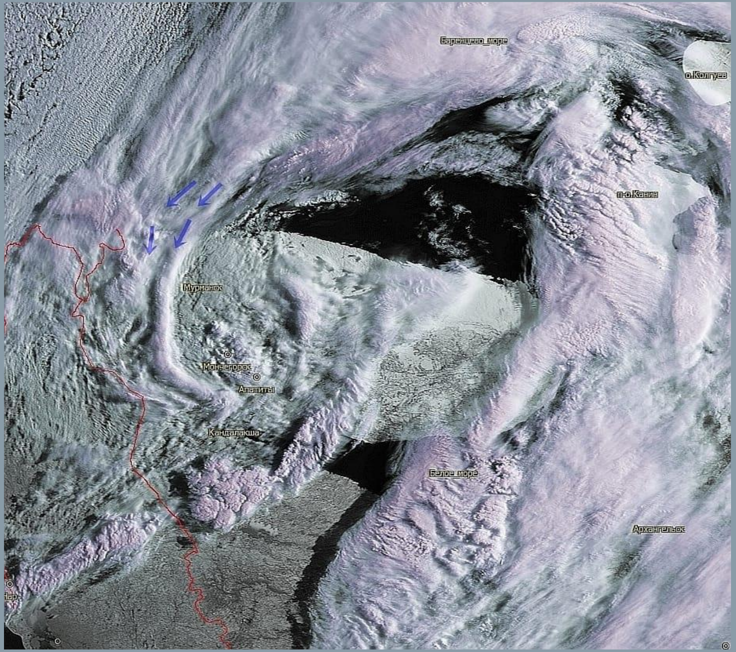
Northern lights chasing

Northern lights chasing



Northern lights prediction is more available then weather and climate prediction

Northern lights chasing and climate change



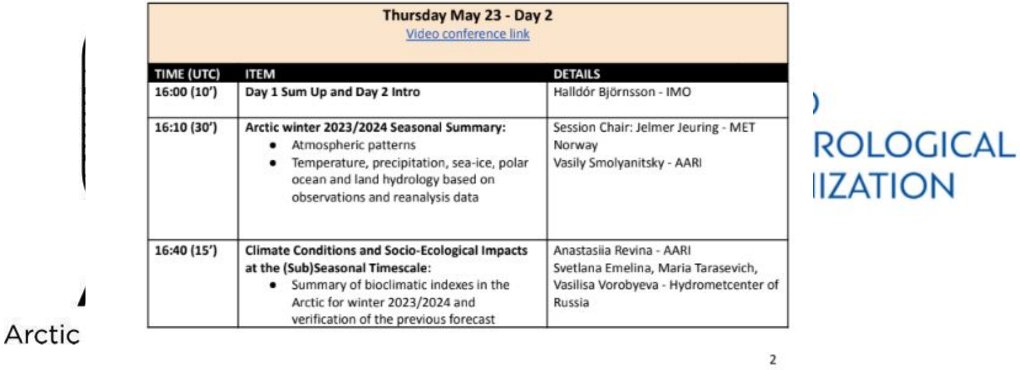
Should we expect more cloudy winters?
Or Which decade?

Thank you !

Pictures rights belong to author

Icelandic Met Office

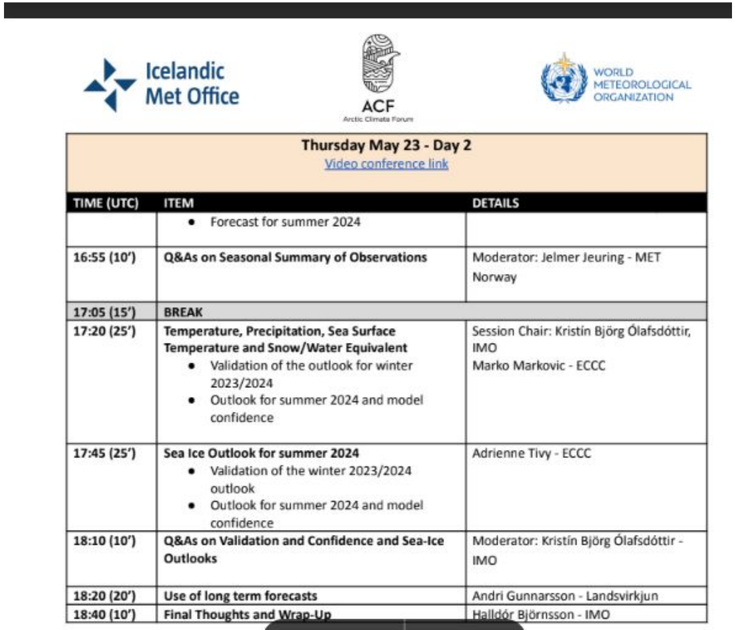
Thank you! See you tomorrow at 1600UTC



Thursday May 23 - Day 2
Video conference link

TIME (UTC)	ITEM	DETAILS
16:00 (10')	**Day 1 Sum Up and Day 2 Intro**	Halldór Björnsson - IMO
16:10 (30')	**Arctic winter 2023/2024 Seasonal Summary:** • Atmospheric patterns • Temperature, precipitation, sea-ice, polar ocean and land hydrology based on observations and reanalysis data	Session Chair: Jelmer Jeuring - MET Norway Vasily Smolyanitsky - AARI
16:40 (15')	**Climate Conditions and Socio-Ecological Impacts at the (Sub)Seasonal Timescale:** • Summary of bioclimatic indexes in the Arctic for winter 2023/2024 and verification of the previous forecast	Anastasiia Revina - AARI Svetlana Emelina, Maria Tarasevich, Vasilisa Vorobyeva - Hydrometcenter of Russia

2


Icelandic Met Office
ACF
Arctic Climate Forum
WORLD METEOROLOGICAL ORGANIZATION

Thursday May 23 - Day 2
Video conference link

TIME (UTC)	ITEM	DETAILS
	• Forecast for summer 2024	
16:55 (10')	**Q&As on Seasonal Summary of Observations**	Moderator: Jelmer Jeuring - MET Norway
17:05 (15')	**BREAK**	
17:20 (25')	**Temperature, Precipitation, Sea Surface Temperature and Snow/Water Equivalent** • Validation of the outlook for winter 2023/2024 • Outlook for summer 2024 and model confidence	Session Chair: Kristín Björg Ólafsdóttir, IMO Marko Markovic - ECCC
17:45 (25')	**Sea Ice Outlook for summer 2024** • Validation of the winter 2023/2024 outlook • Outlook for summer 2024 and model confidence	Adrienne Tivy - ECCC
18:10 (10')	**Q&As on Validation and Confidence and Sea-Ice Outlooks**	Moderator: Kristín Björg Ólafsdóttir - IMO
18:20 (20')	**Use of long term forecasts**	Andri Gunnarsson - Landsvirkjun
18:40 (10')	**Final Thoughts and Wrap-Up**	Halldór Björnsson - IMO