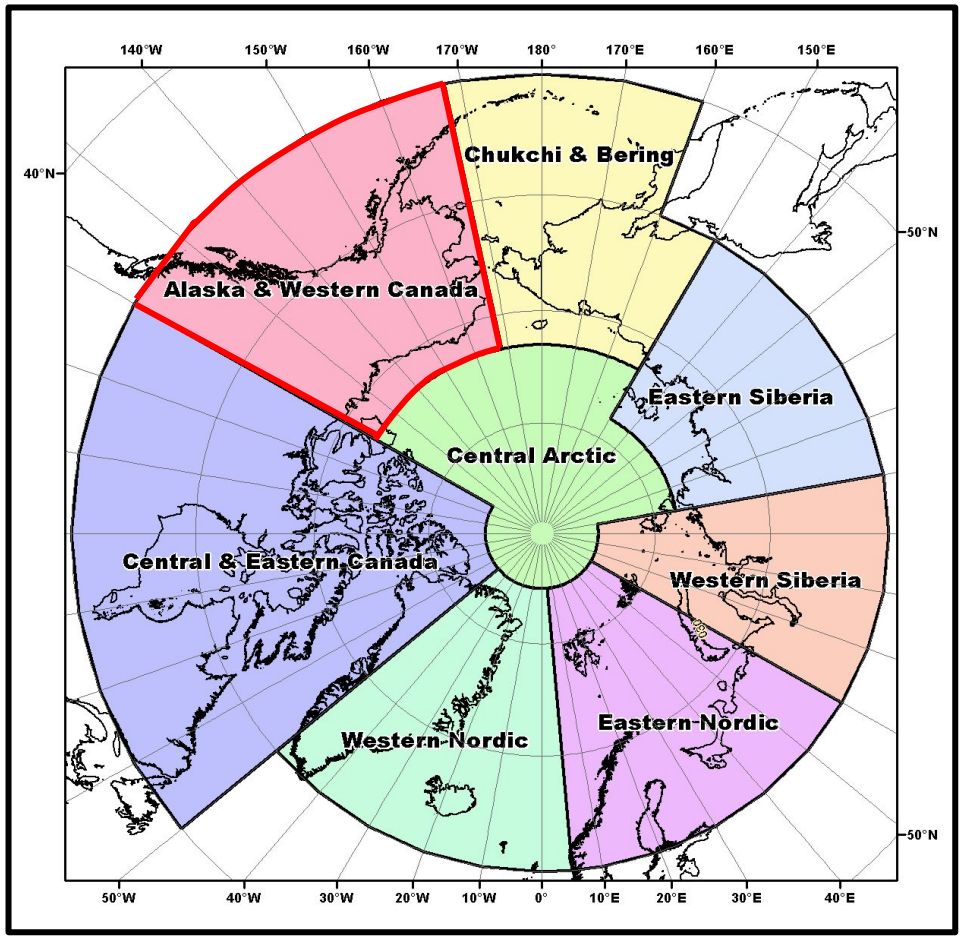
Alaska and Western Canada

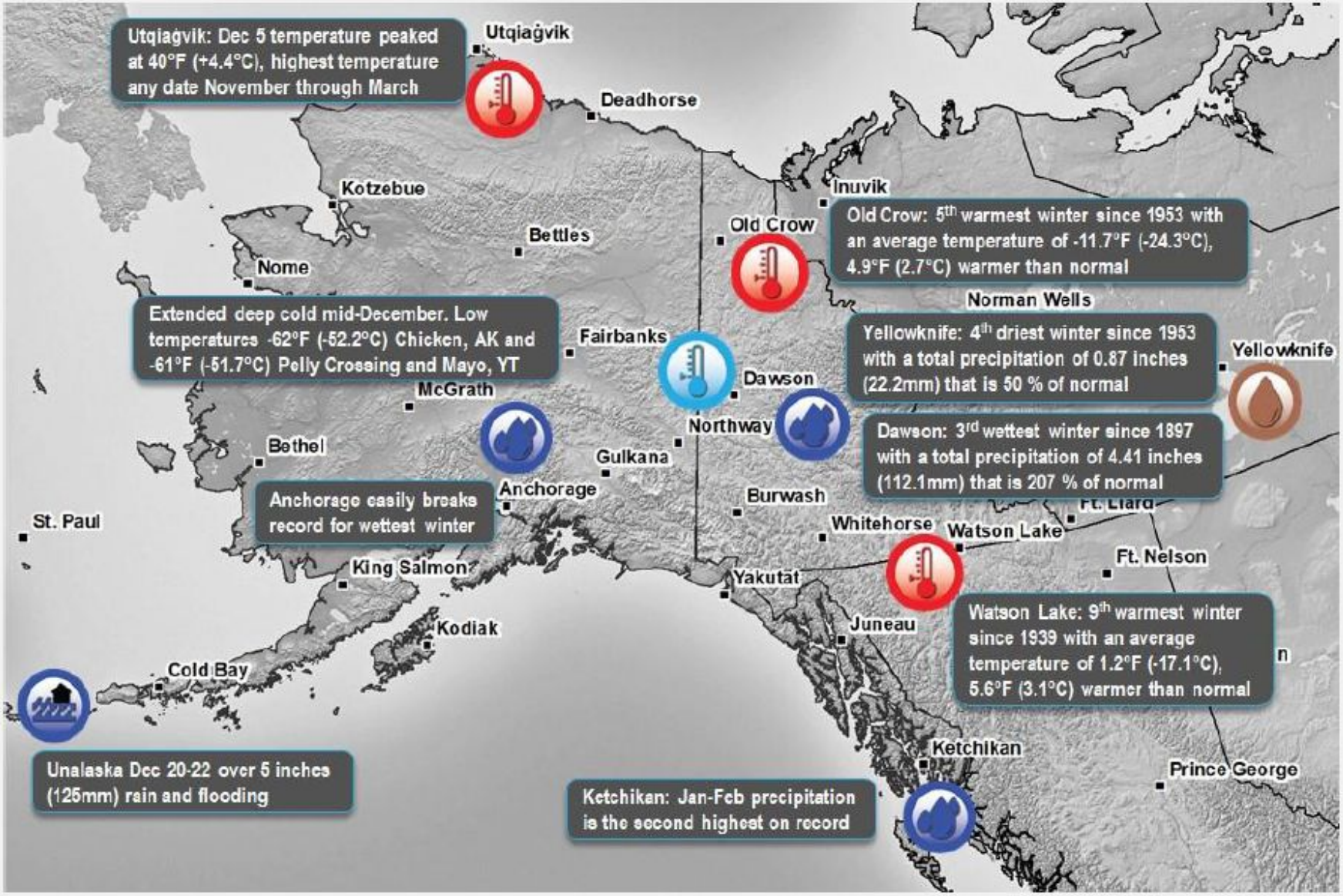


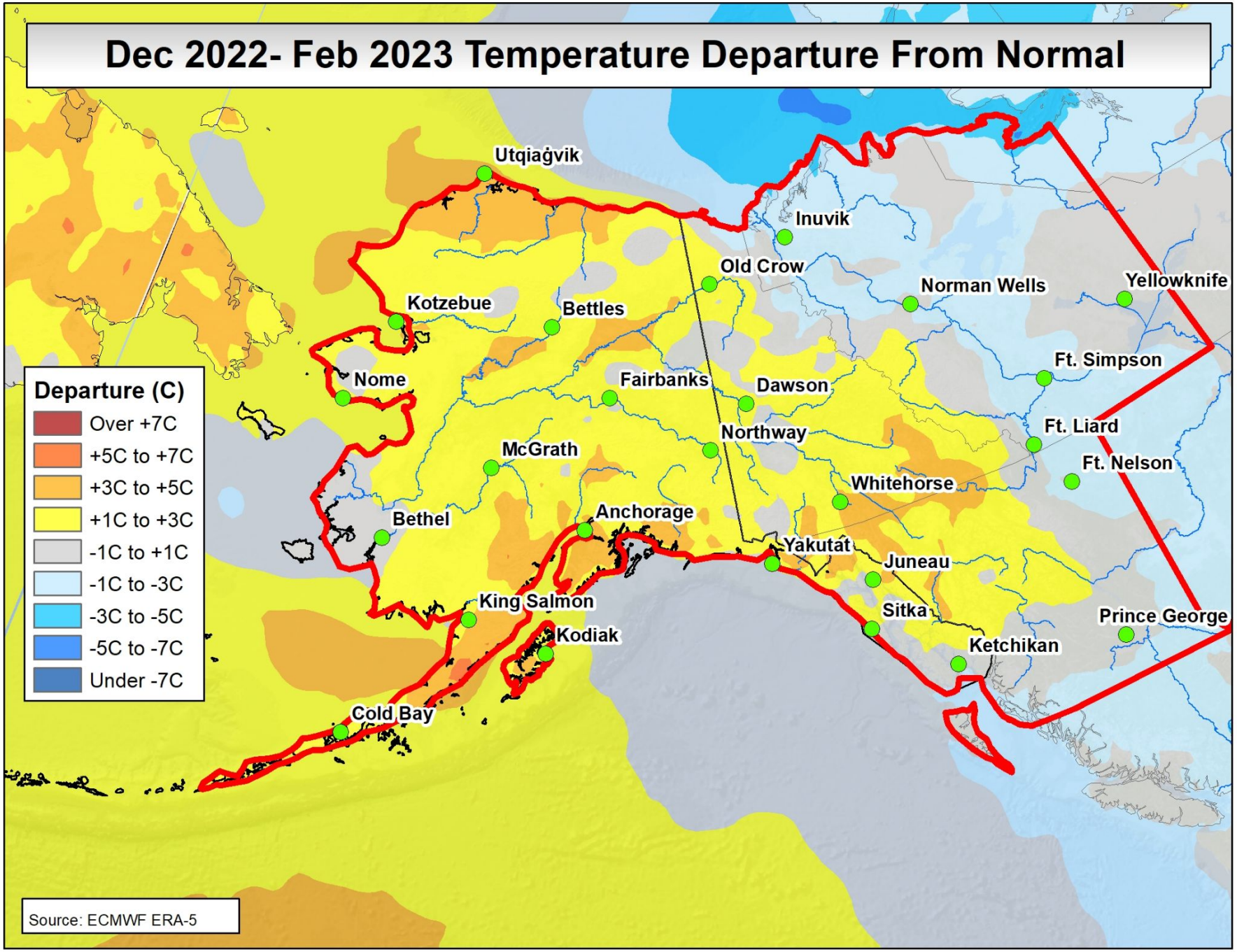
Alaska and Western Canada

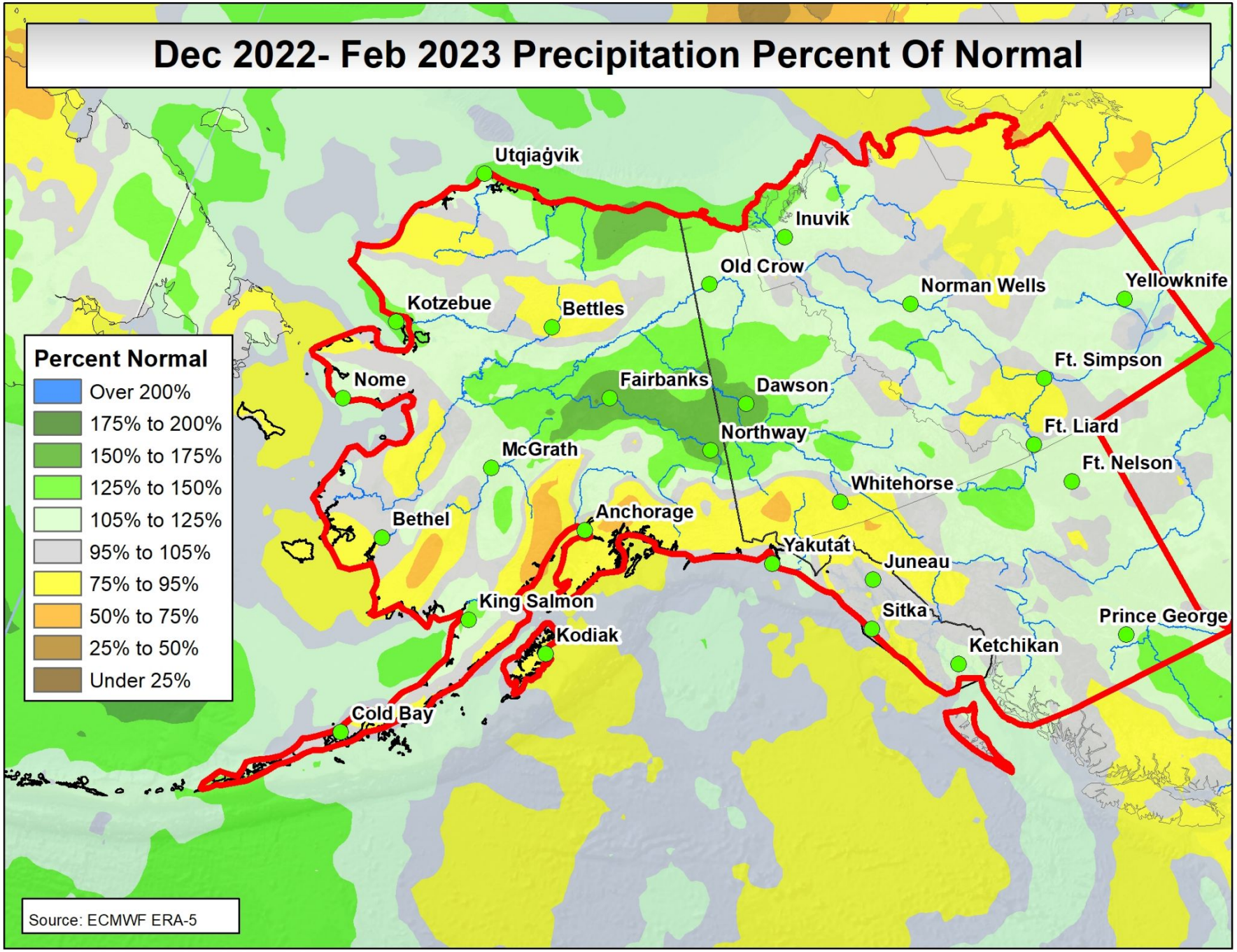
Seasonal Summary: Winter 2022-2023			
Observations above (+) and below (-) normal			
Temperature Normal 1991-2020	Winter temperatures in Alaska and NW Canada were 0.5°C above the 1991-2020 average.	ERA5 since 1940 Warmest: 2015-16	ERA5 since 1940 Coolest: 1964-65
Precipitation Normal 1991-2020	Winter precipitation in Alaska and NW Canada 102 percent of 1991-2020 average.	ERA5 since 1940 Wettest: 2021-22	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 66 percent of 1991-2020 normal.	Maximum extent was 729,000 km² on Feb 17, 85% of 1991-2020 average maximum extent. Extent closer average in Spring 2023.	

ALASKA and NORTHWESTERN CANADA

Weather and Climate Highlights and Impacts, December 2022 to February 2023
Climate Outlook, April to June 2023




Dec 2022- Feb 2023 Temperature Departure From Normal
Departure (C)
Over +7C
+5C to +7C
+3C to +5C
+1C to +3C
-1C to +1C
-1C to -3C
-3C to -5C
-5C to -7C
Under -7C
Utqiaġvik
Inuvik
Old Crow
Norman Wells
Yellowknife
Kotzebue
Bettles
Ft. Simpson
Nome
Fairbanks
Dawson
Ft. Liard
Northway
McGrath
Ft. Nelson
Whitehorse
Bethel
Anchorage
Yakutat
Juneau
King Salmon
Sitka
Prince George
Kodiak
Ketchikan
Cold Bay
Source: ECMWF ERA-5

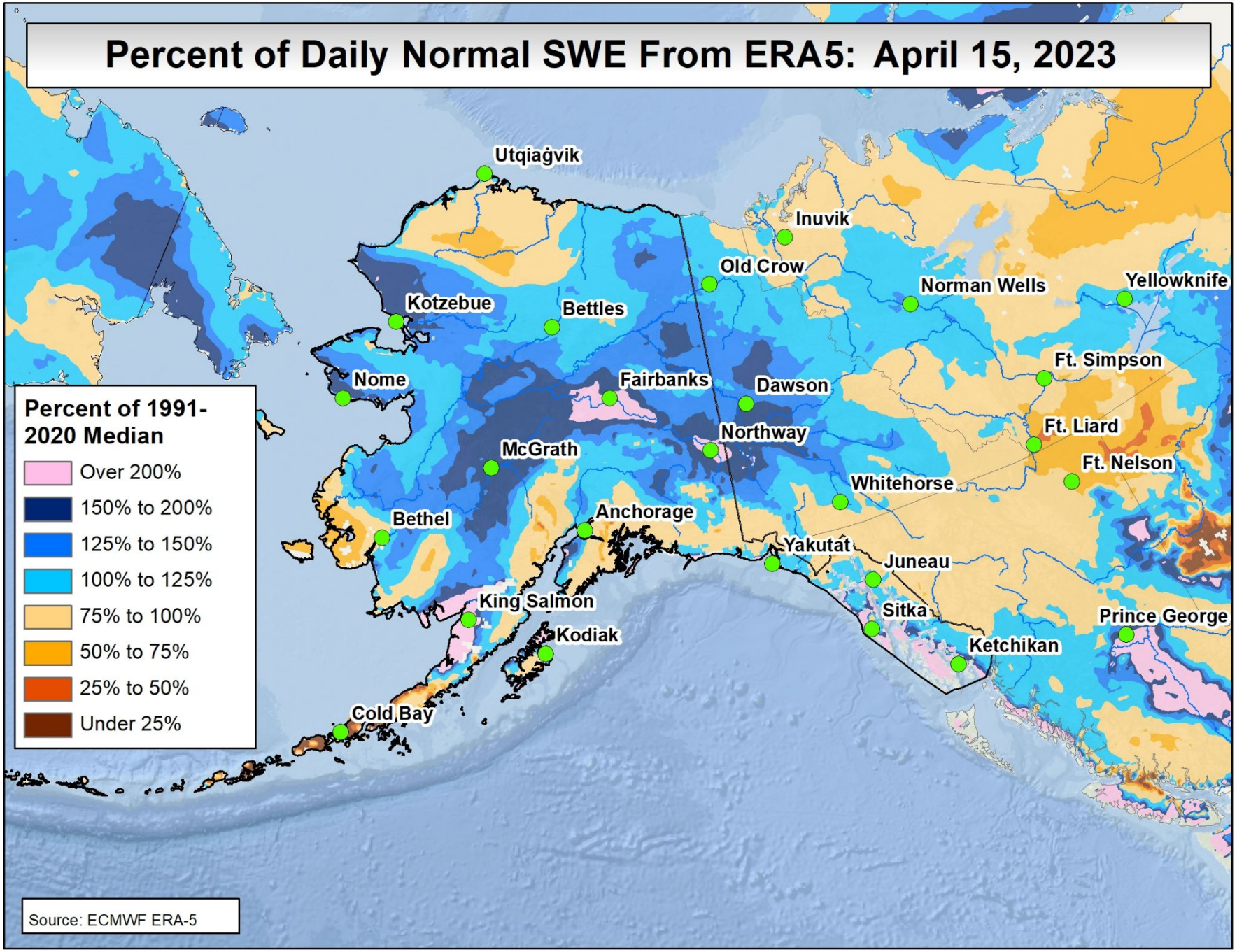

Dec 2022- Feb 2023 Precipitation Percent Of Normal
Percent Normal
Over 200%
175% to 200%
150% to 175%
125% to 150%
105% to 125%
95% to 105%
75% to 95%
50% to 75%
25% to 50%
Under 25%
Source: ECMWF ERA-5
Utqiaġvik
Inuvik
Old Crow
Norman Wells
Yellowknife
Kotzebue
Bettles
Nome
Fairbanks
Dawson
Ft. Simpson
Ft. Liard
Northway
McGrath
Ft. Nelson
Whitehorse
Bethel
Anchorage
Yakutat
Juneau
King Salmon
Sitka
Prince George
Kodiak
Ketchikan
Cold Bay

Alaska and Western Canada

December 2022: Anchorage, Alaska after repeated heavy snows. Credit: Alaska Daily News

Observed extreme climate events
Winter 2022-23

Category	Location	Rarity	Impacts associated with event
Precipitation and Temperature	Alaska	• Early Dec: Widespread rain western Alaska with loss of snowpack parts of Bering Strait, Utqiaġvik +4C Dec 4, highest temperature any data from late October to late April (100 years) • Mid-Dec: extreme snowfall Anchorage area (2nd highest two-week total)	• Western Alaska severe icing from Dec rain ○ Ecosystem impacts • Loss of snowpack causing water access problems in a few communities • Weeks-long travel hazard in Anchorage area from heavy snowfall
Precipitation	Yukon	•New monthly total records in many communities, setting new monthly total records in some communities.	The record setting snowpack in many watersheds across the territory resulted in higher than average freshet flows and lake levels this spring and increases the potential for flooding in many areas.

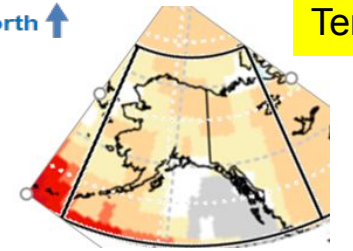

Percent of Daily Normal SWE From ERA5: April 15, 2023
Utqiaġvik
Inuvik
Old Crow
Norman Wells
Yellowknife
Kotzebue
Bettles
Ft. Simpson
Nome
Fairbanks
Dawson
Ft. Liard
Northway
McGrath
Ft. Nelson
Whitehorse
Bethel
Anchorage
Yakutat
Juneau
King Salmon
Sitka
Prince George
Kodiak
Ketchikan
Cold Bay
Percent of 1991-2020 Median
Over 200%
150% to 200%
125% to 150%
100% to 125%
75% to 100%
50% to 75%
25% to 50%
Under 25%
Source: ECMWF ERA-5

Alaska and Western Canada

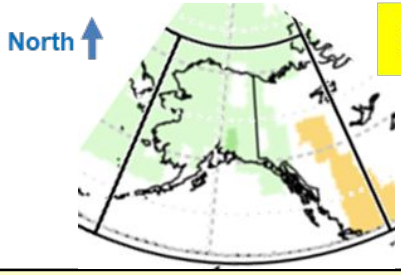
May 2023: Circle, Alaska Yukon River ice jam flooding. Photo credit: National Weather Service

Observed extreme climate events
Spring 2023

Category	Location	Rarity	Impacts associated with event
Flooding	Alaska and Yukon	• May: Severe to historic level at some communities	• Homes and community buildings lost • Road damage and severe erosion
Precipitation	Alaska	• March: Extreme monthly and shorter duration precipitation NW Alaska	• Infrastructure impacts • High costs of repeated snow removal • Disaster declaration NW Arctic
Temperature	Alaska	• April: Extreme cold central and western Alaska. Nome tied all time record low for the month (-34C, 116 years of observations)	• The persistent cold delayed snow melt and contributed to ice jam flooding • Greatly slowed sea ice melt in the northern Bering Sea



Alaska and Western Canada



Outlook: Summer 2023				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**		✓	

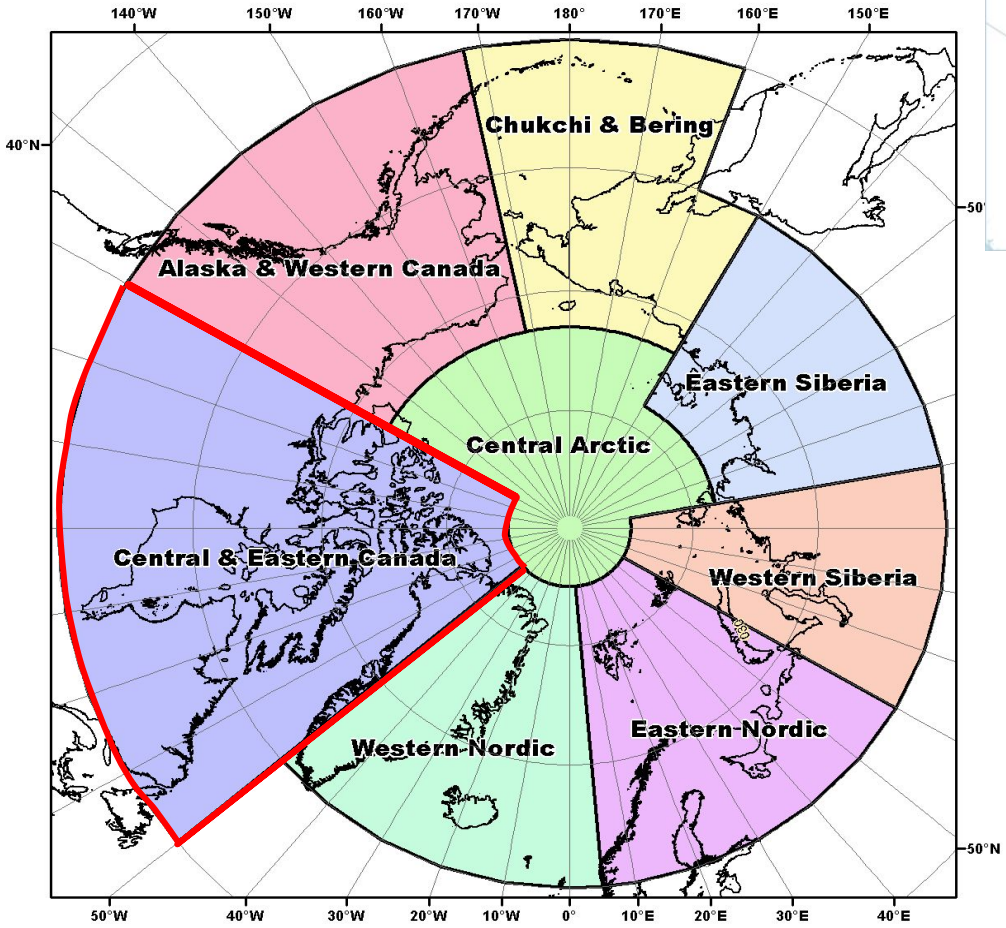
Alaska and Western Canada: possible impacts
Summer 2023

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

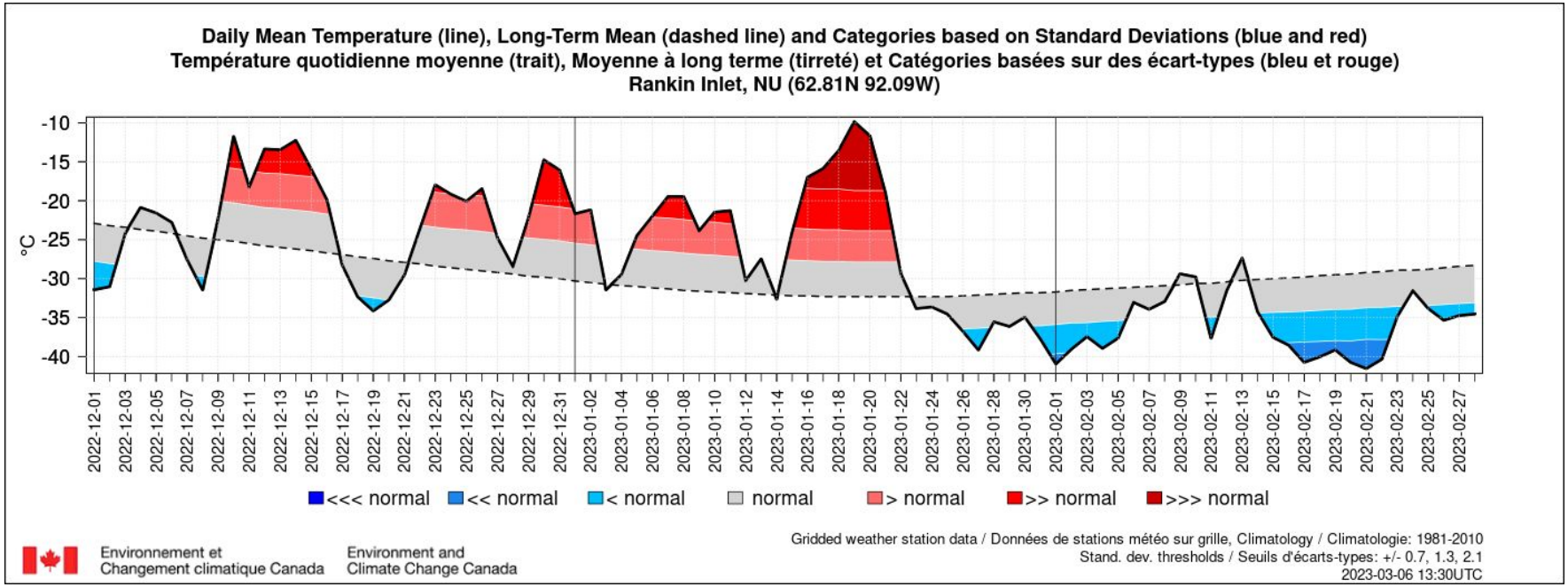
Seasonal Summary: Winter 2022-2023

Observations above (+) and below (-) normal

Temperature Normal 1981-2010	**Normal conditions** +0.2 °C	Warm December & January	Cold February
Precipitation Normal 1981-2010 *data from 1985-present	**Wetter than normal** in eastern Nunavut from around Baker Lake to Pond Inlet, and Inuvik and surrounding areas **Drier than normal** in western Nunavut Received 36% to 143% of normal Winter precipitation	**Wetter** Inuvik (4th wettest winter) and Baker Lake (10th wettest winter)* Great variation in precipitation amounts over region	**Drier** Cambridge Bay (3rd driest winter)* Great variation in precipitation amounts over region
Sea-Ice	Freeze-up: slow freeze-up of ice in Canadian Arctic Archipelago; slightly early initially in Hudson Bay and Baffin Bay before slowing.	March maximum sea-ice extent in the Arctic was 5th lowest in last 45 years. • East Coast of Canada: 6th lowest ice extent since 1969 • Gulf of St. Lawrence: 4th lowest ice extent since 1969	

Daily Mean Temperature: Rankin Inlet

- Much above normal daily mean temperatures in December and most of January
- Below normal end of January and most of February



0.6°C above normal

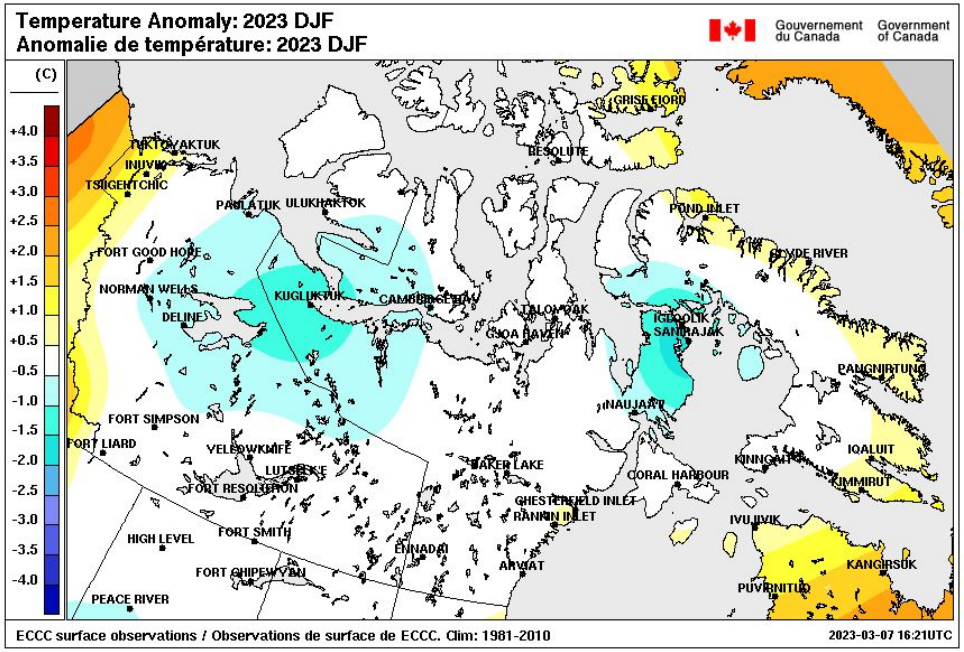
Central and Eastern Canadian Arctic

Observed extreme climate events
WINTER 2022-2023

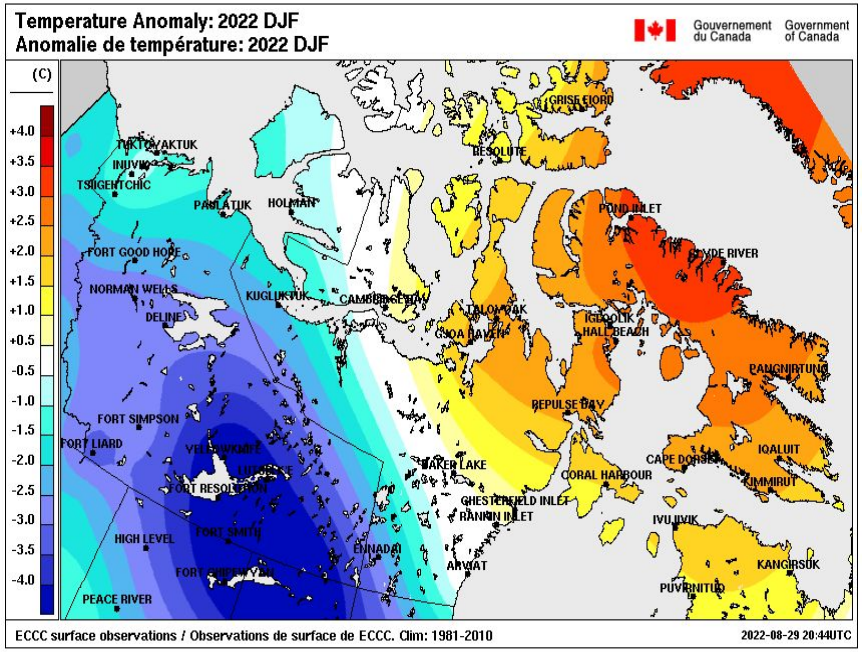
Category	Location	Rarity	Impacts associated with event
Blizzards	Rankin Inlet, Nunavut	• Relatively low blizzard hours	• Reduced SAR events, reduced societal disruptions
Flooding	Tuktoyaktuk, Northwest Territories	• Coastal flooding in December	• Coastal property damage
Precipitation	Nunatsiavut	• Below normal precipitation, 5th driest winter on record for Happy Valley-Goose Bay (Nunatsiavut)	• Little to no snow on sea ice made on-ice travel difficult (Nunatsiavut)
Temperature	Nunavut Nunavik Nunatsiavut	• Warm January, some record high max and min temperatures broken through the Kivalliq (SE Nunavut) • End of January - extreme cold, windchill approaching -50 • 5th coldest February on record for Hopedale and Nain, Feb 23-28, 2023, record low min temperatures broken at Nain	• Unsteady sea ice conditions led to changes in ice fishing activities and reduced over ice journeys earlier than normal

Winter 2022-2023 Temperature Anomalies

Winter 2022-2023, T anomaly in °C



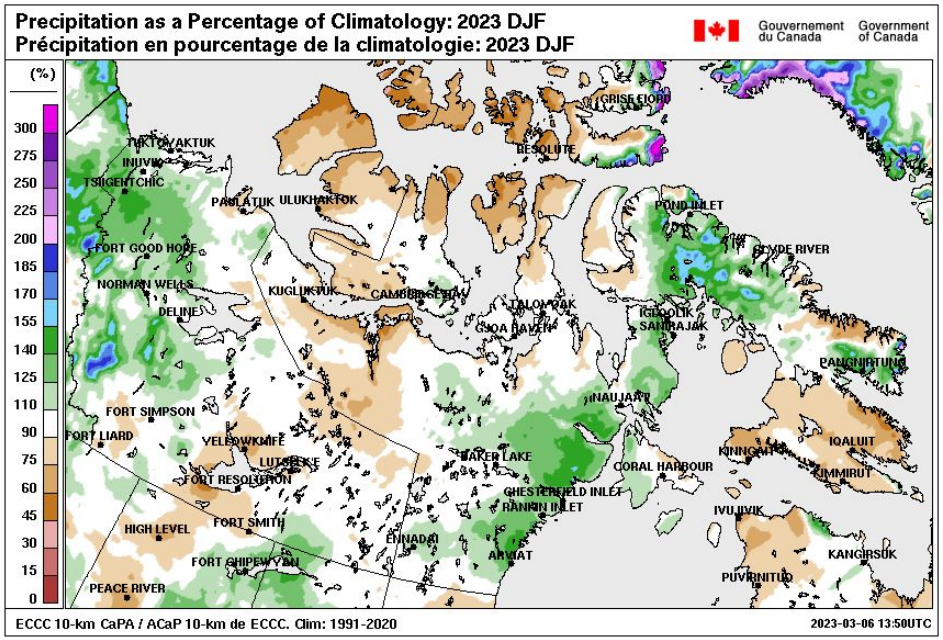
Previous Winter 2021-2022, T anomaly in °C



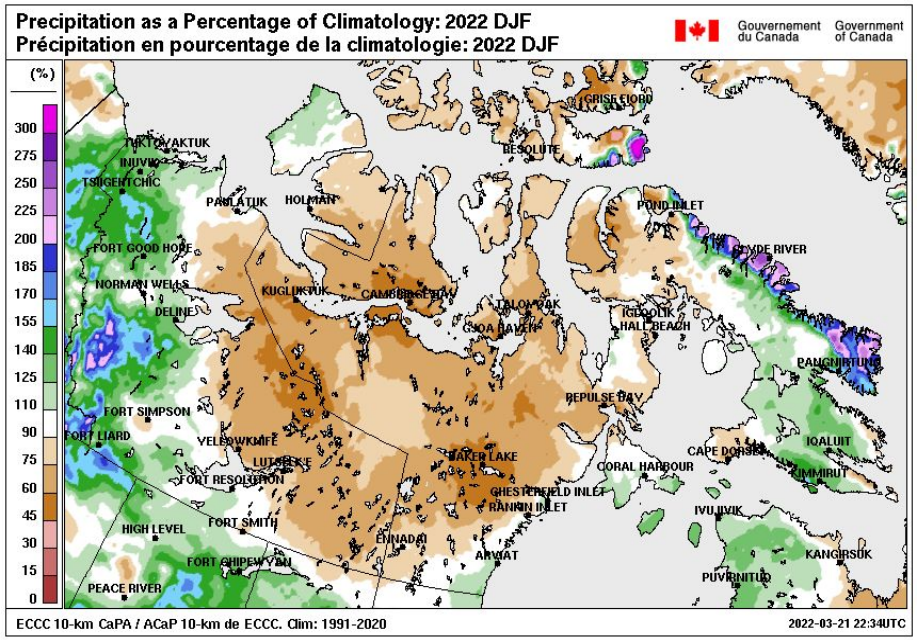
In general, normal conditions this year in contrast to Winter 2021-2022

Winter 2022-2023 Precipitation Anomalies

Winter 2022-2023



Previous Winter 2021-2022

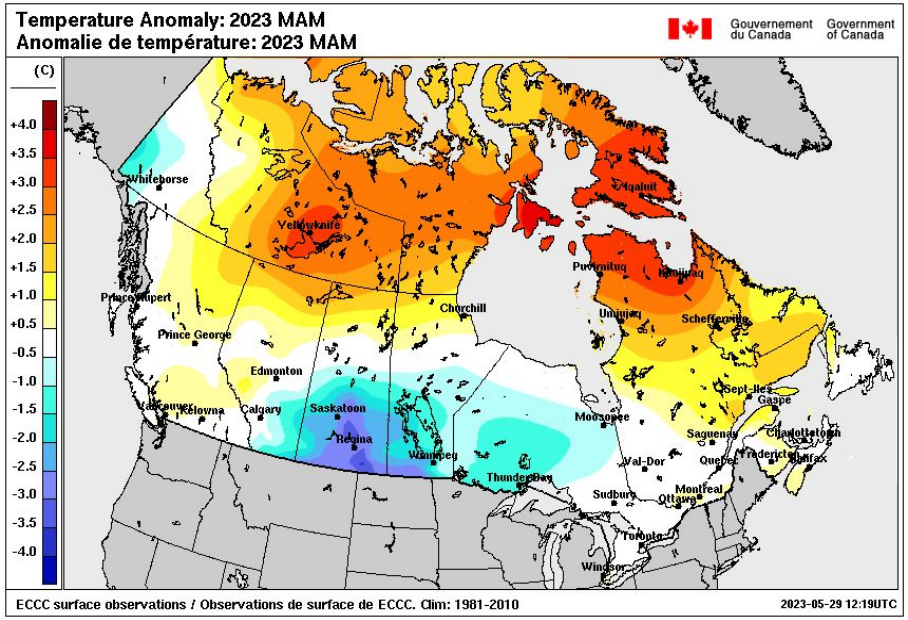


In general:

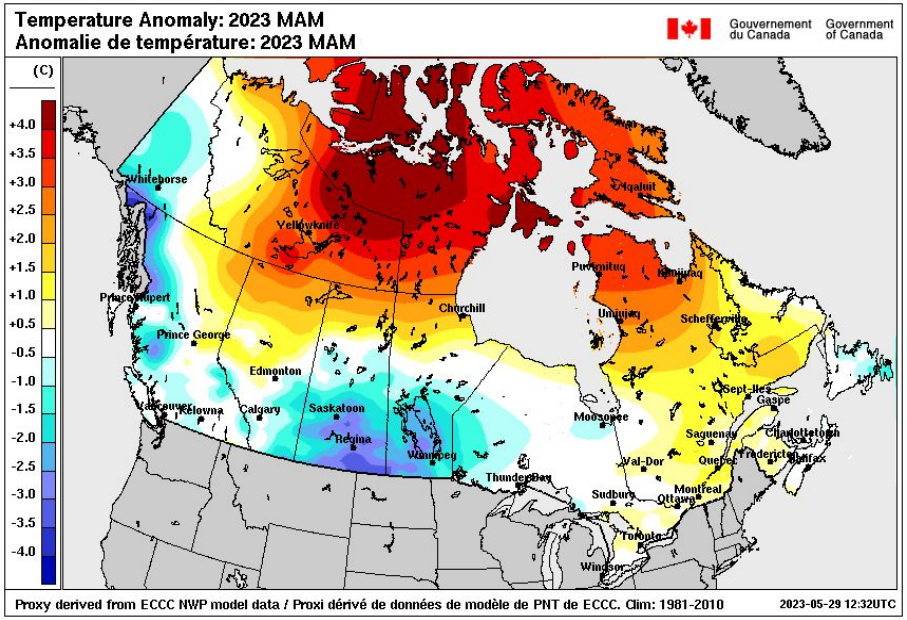
- Deficit in western Nunavut
- Surplus in eastern Nunavut from Baker Lake northwards to Pond Inlet, and Inuvik surrounding areas

Spring 2023 Temperature Anomalies

Spring 2023, T anomaly in °C (observed)



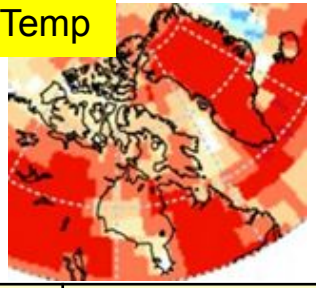
Spring 2023, T anomaly in °C (proxy)



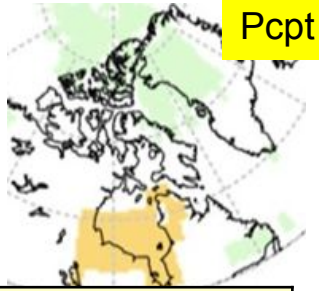
Spring 2023 – highly anomalous - warm

Central and Eastern Canadian Arctic

Temp



Pcpt



Outlook: Summer 2023				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Nunavut - northern regions		Above Normal		✓	
	Nunavut - southern regions and Baffin Island; Baffin Bay				✓	
	Hudson Bay, Davis Strait					✓
	Western Greenland, Nunavik, Nunatsiavut and Labrador Sea			✓		
Precip	Nunavut – southern regions, Nunatsiavut		Equal chance			✓
	Nunavut – northern regions, West Greenland		Above Normal			✓
	Hudson Bay, Hudson Strait, Nunavik		Below Normal			✓
Sea-Ice	Break-up	Baffin Bay	Near Normal	✓		
		Hudson Bay	Near Normal	✓		
		Labrador Sea	Early	✓		
	Min Ice Extent September 2023	Canadian Arctic Archipelago	Below normal	✓		
Snow Water Equivalent	Nunavut - northern regions		No model agreement			
	Nunavut - southern regions, south Baffin Island		Below Normal	✓		

ACF
Arctic Climate Forum

Northern European Node

- **Western Nordic**
- **Eastern Nordic**

Arctic Regional Climate Center Network

Western Nordic

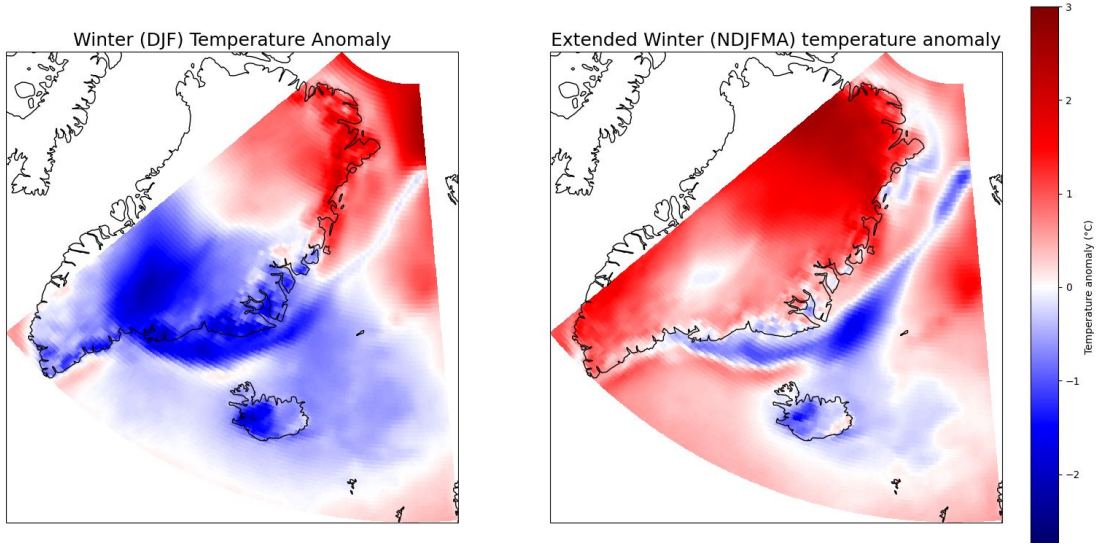
Western Nordic

Seasonal Summary: Winter 2022-2023

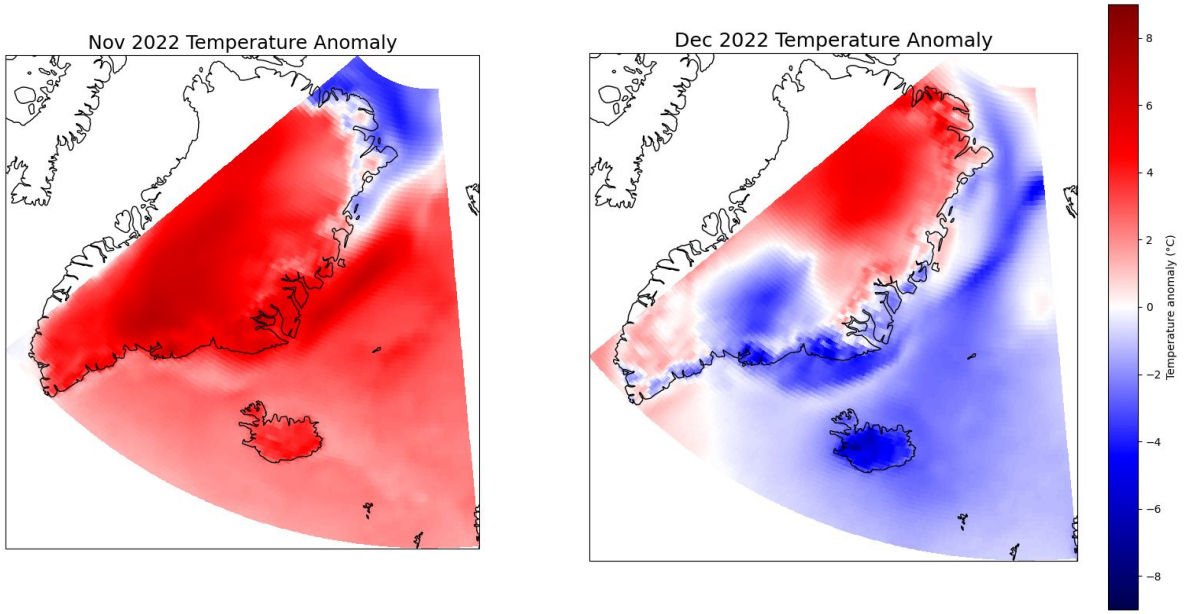
Observations above (+) and below (-) normal			
Temperature Normal 1991-2020	• **-0.2°C** (DJF) below normal for the entire region. • Winter highly variable, Nov (**+2.8**), Dec (**-0.6**), Jan (**-0.8**) and Feb (**+0.9**), Mar (**-0.7**) and Apr (**+1.0**).	Warmest winter was 2009/2010 (+1.7˚C) Coldest winter was 1992/3 (-2.7 °C)	Warmest Nov in many weather stations in Iceland Coldest Dec since 1973 in Iceland in general. Coldest Dec in 100 years in many places in Iceland. Unusually cold winter in Iceland with some spectacular anomalies.
Precipitation Normal 1991-2020	• Winter (DJF) **9% above** normal for the region as a whole. NDJFMA was **5%** below normal.	Wettest winter was 2014/15 (+26%) Driest winter was 2000/1 (-22%)	In the west of Iceland, precipitation was well below normal, but near normal in NE and E.
Sea-Ice Since 1979	**Greenland Sea:** • Conditions continue to be below normal in the Arctic (March 7th maximum was 5th lowest since 1979) but in Greenland Sea conditions where close to normal at time of the March maximum.		

Western Nordic – temperature anomalies

Winter & extended winter anomalies



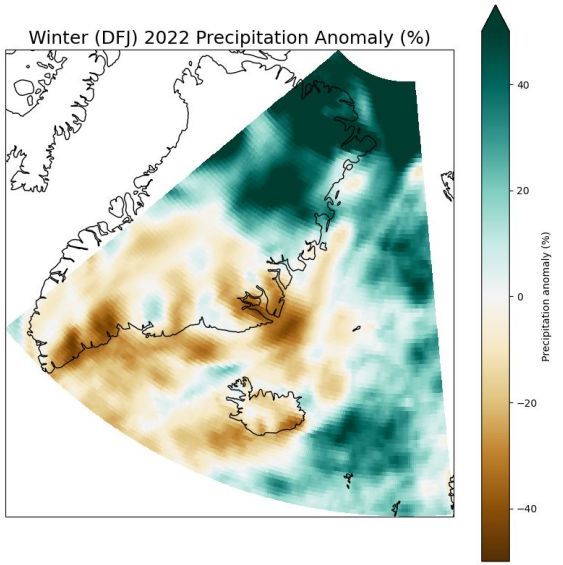
November & December anomalies



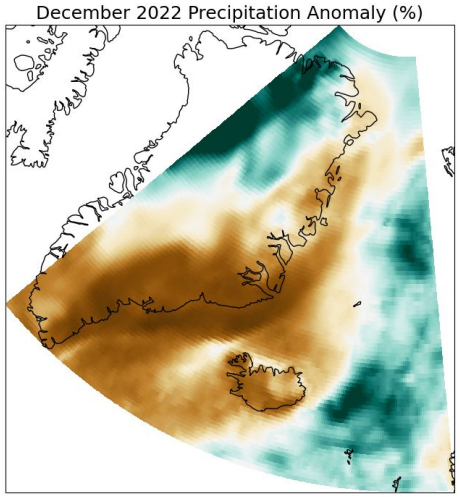
Western Nordic - precipitation

- In general drier conditions in parts of Western Nordic.
- NDJ drier and FMA drier to wetter.

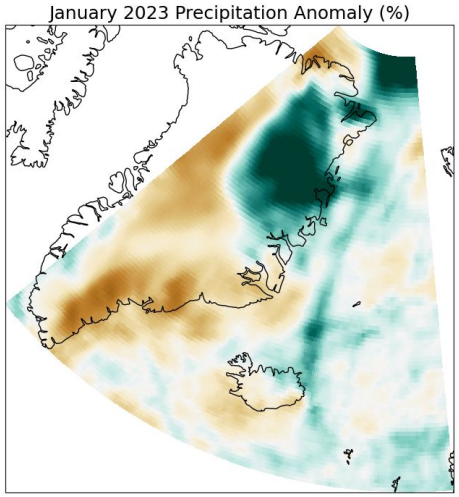
Winter (DJF)



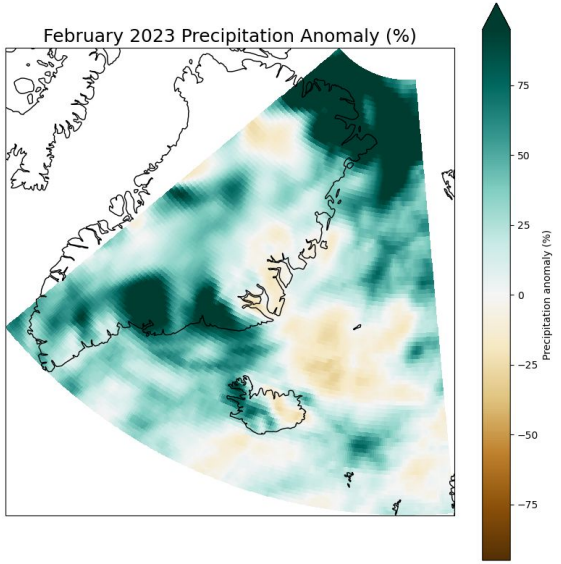
December



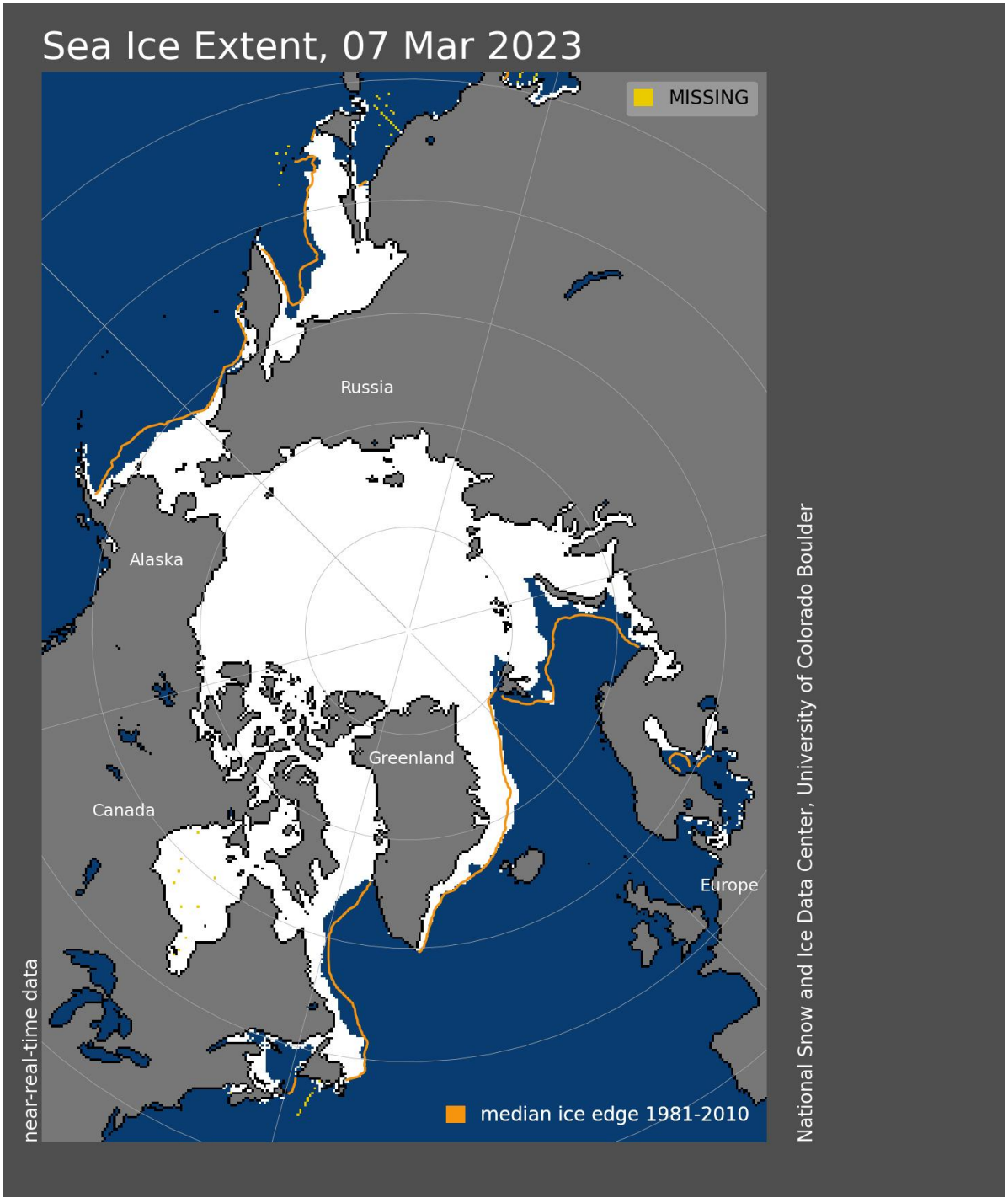
January



February



Anomalies for 2022/2023 winter (DJF) and individual months.



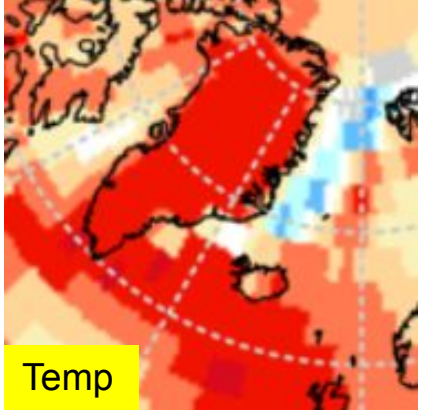
For the entire Arctic the maximum sea ice extent (reached in early March) was low, - the 6th lowest in the satellite era.

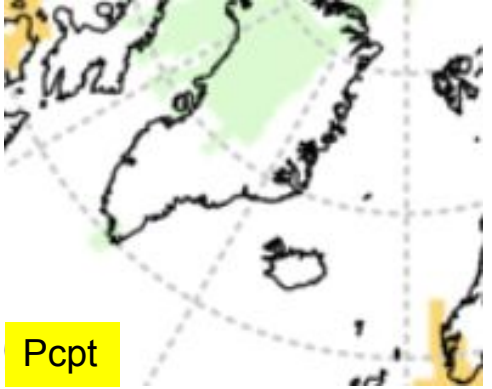
In the Western Nordic region, sea ice extent east of Greenland the extent was near or above normal.

Western Nordic - Observed extreme climate events in Iceland – Winter 2022/Spring 2023

Category	Location	Rarity	Impacts associated with event
Extreme winds and precipitation	East Iceland, September	Extreme forecast index from the ECWMF forecast showed higher levels than ever.	Damages due to winds were severe in places in the East fjords in september, vegitation, buildings, infrastructure and boats were damaged. Storm surge created problems in Eyjafjörður due to prolonged northwest winds and very long fetch.
Extreme winds and precipitation	East Iceland, October	This is the second time in 4 years suchs a storm hits, and after the 2019 storm the return period was estimated ~30 years.	Major impacts were road closures and infrastructure issues such as buildup of ice on power lines.
Precipitation	Iceland, winter	Unusually cold airmasses with baroclinic instability over warmer ocean creating multiple small low-pressure areas -> unusually stable and major precipitation systems.	Precipitation falling in sub-zero temperatures the physical properties of the snow allowed for many days of blowing snow, which kept causing problems and disruptions.
Precipitation	East Iceland, 27.-31. March	Many avalanches in the East Iceland.	Significant damage but no loss of life. Landslide risk along side slush flooding and avalanche risk.

Western Nordic





Outlook: Summer 2023				Multi Model Agreement		
Forecast				High	Moderate	Low
Temperature	Northern, southern and continental Greenland		Warmer	✓		
	Iceland		Warmer		✓	
	North Atlantic		Warmer	✓		
	Greenland seas		Colder		✓	
Precipitation	North East Greenland		Wetter		✓	
	Svalbard		No model agreement			
	Other parts of Greenland, Iceland, Northern Atlantic, Scandinavia		No model agreement			
Sea-Ice	Greenland Sea	Break-up	Late	✓		
		Max Ice Extent Sept 2023	Near normal	✓		

Eastern Nordic

Eastern Nordic

Seasonal Summary: Winter 2022/2023

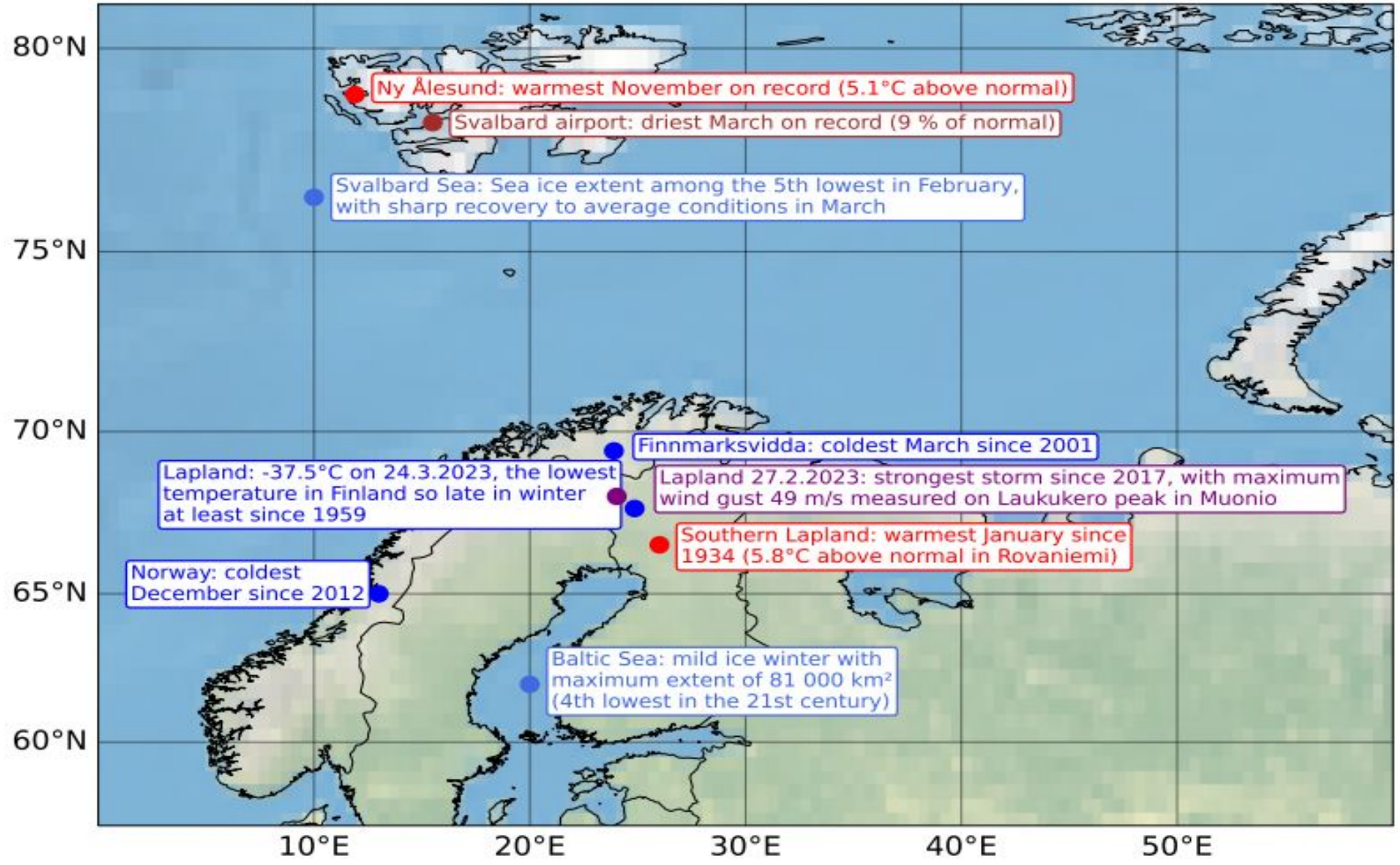
Observations above (+) and below (-) normal

Temperature Normal 1991-2020	NDJFMA: **warmer (+0.7 °C)** DJF: **warmer (+1.6 °C)**	Coldest winter: 1979 (**-4.4 °C**)	Warmest winter: 1937 (**+6.5°C**)
Precipitation Normal 1991-2020	NDJ: **drier** FMA: **wetter**	Driest winter: 1980 (**-32 %**)	Wettest winter: 1981 (**+28 %**)
Sea-Ice Normal 1991-2020	Less sea ice than normal around Svalbard during the first part of the winter (Nov-Feb), close to normal conditions at the end of the winter (Mar-Apr).		

Observed extreme climate events - Winter 2022/2023

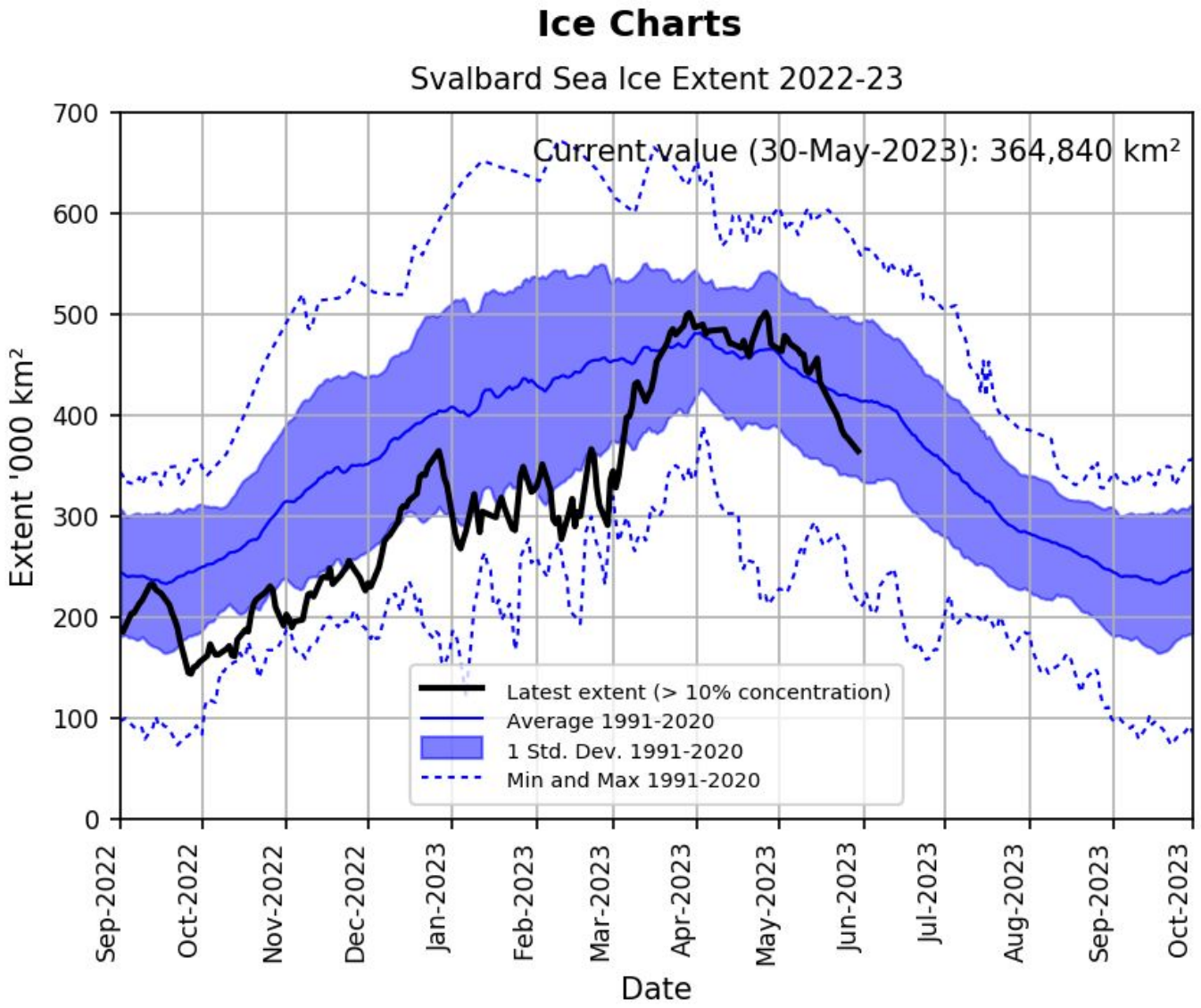
Category	Description
Temperature	Much warmer than normal in January and February, around 3 °C higher than normal averaged over the entire area (ranked as 4th and 9th warmest since 1950)
Sea ice	Less sea ice than normal around Svalbard in February (ranked as 5th lowest since 1979)

Eastern node: Some weather and climate events during the winter 2022/2023

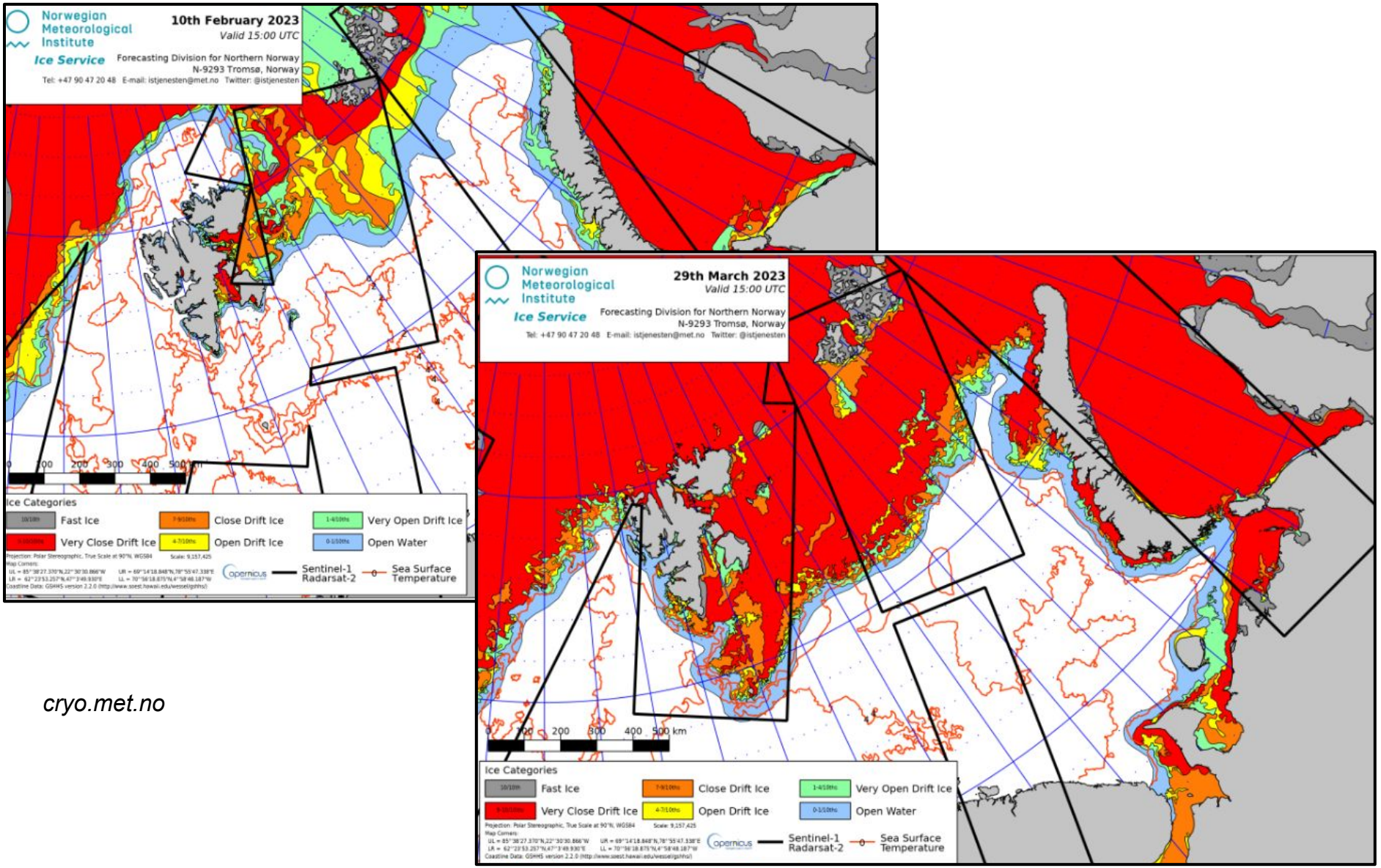


Sea ice conditions around Svalbard winter 2022/2023

cryo.met.no

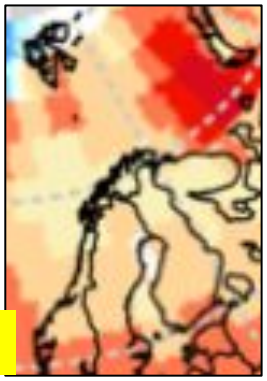


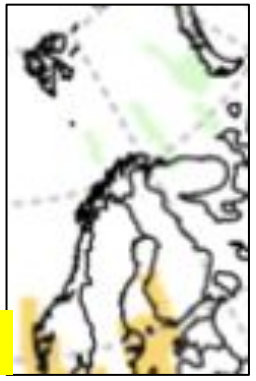
Sea ice conditions around Svalbard winter 2022/2023



cryo.met.no

Eastern Nordic





Outlook: Summer 2023

Multi Model Agreement

Forecast				High	Moderate	Low
Temperature	Northern Svalbard		**No model agreement**			
	Eastern Barents Sea		**Warmer**	✓		
	Southern Svalbard, Western Barents Sea, Murmansk, White Sea, Northern Scandinavia, Norwegian Sea		**Warmer**		✓	✓
	Southern Scandinavia, Northern North Sea		**Warmer**		✓	
Precipitation	Svalbard, Barents Sea, Murmansk, White Sea, Northern Scandinavia		**No model agreement**			
	Southern Scandinavia, Northern North Sea		**Drier**			✓
Sea-Ice	Barents Sea	**Break-up**	**Near normal**	✓		
		Minimum ice extent i Sept 2023	**Near normal**		✓	
Snow Water Equivalent (experimental product)	Eastern Svalbard, Novaya Zemlya		**Above normal**			✓

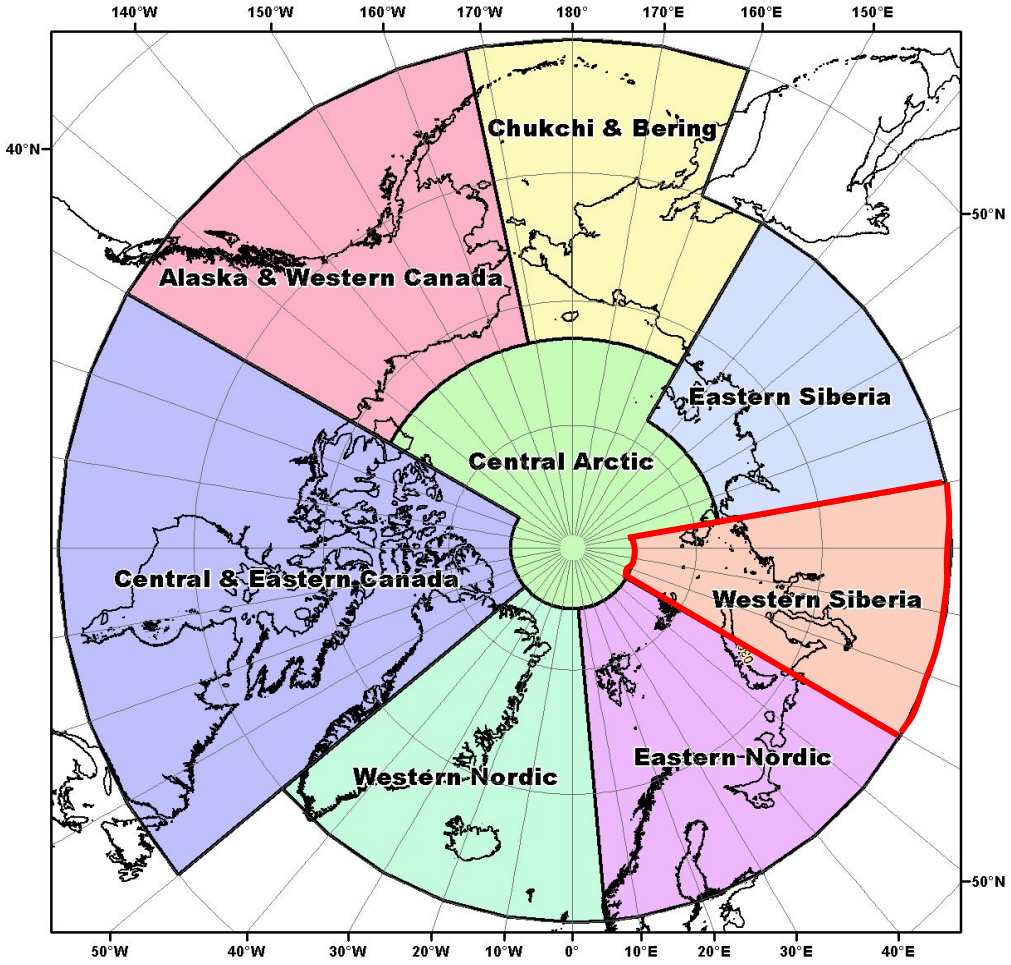
ACF
Arctic Climate Forum

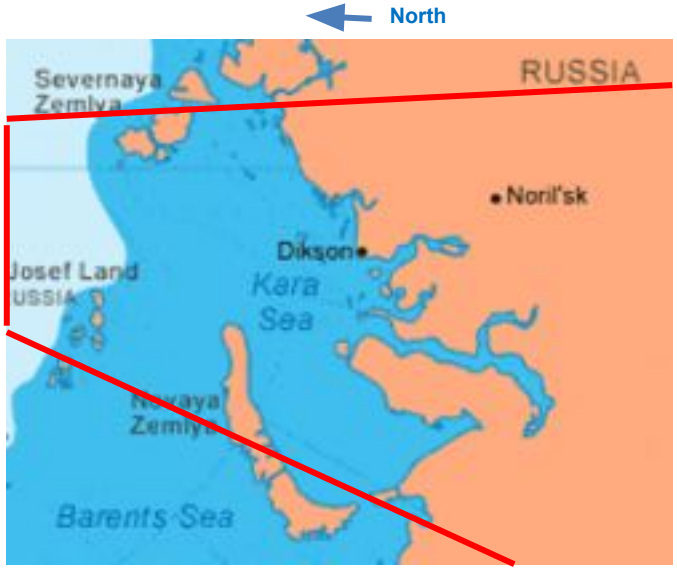
Eurasian Node

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

Arctic Regional Climate Center Network

Western Siberia





Western Siberia

Seasonal Summary: Fall 2022 / Winter 2022-2023

Observations above (+) and below (-) normal			
Temperature Normal 1991-2020	**NDJ: 0.88˚C** **FMA: + 2.43˚C** **(FEB +6.72˚C (rank 4), MAR +2.31˚C)**	Coldest years were: 1968 (NDJ) and 1966 (FMA)	Warmest years were: 1936 (NDJ) and 2020 (FMA)
Precipitation Normal 1991-2020	**NDJ: Slightly drier** **FMA: Wetter**	Wettest year was 2002 (122.6%)	Driest year was 1946 (72.4 %)
Sea-Ice Since 1979	Kara Sea: late freeze-up, march maximum sea-ice extent		

Observed extreme climate events – Winter 2022-2023

Category	Duration	Rarity	Impacts associated with event
Precipitation in February and March	**2 month**	**Unusual**	In February and March, heavy precipitation was observed throughout the territory, new daily precipitation records were set, for example, Salekhard had the heaviest snowfalls since 1934. Flights were regularly delayed at the airports of Salekhard, Novy Uregoy and Noyabrsk

Noyabrsk after snowstorm 12.03.2023

Photo by:/vk.com/typicall_gubkinskiy

Noyabrsk after snowstorm 06.03.2023

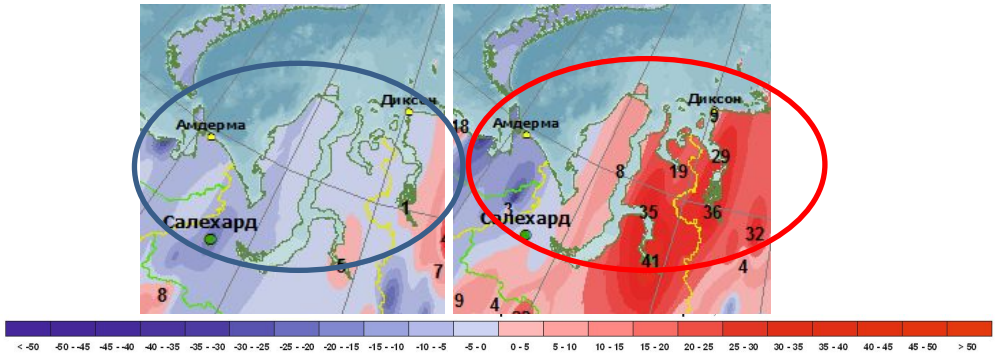
https://yamal-media.ru/

Observed extreme climate events – Winter 2022-2023

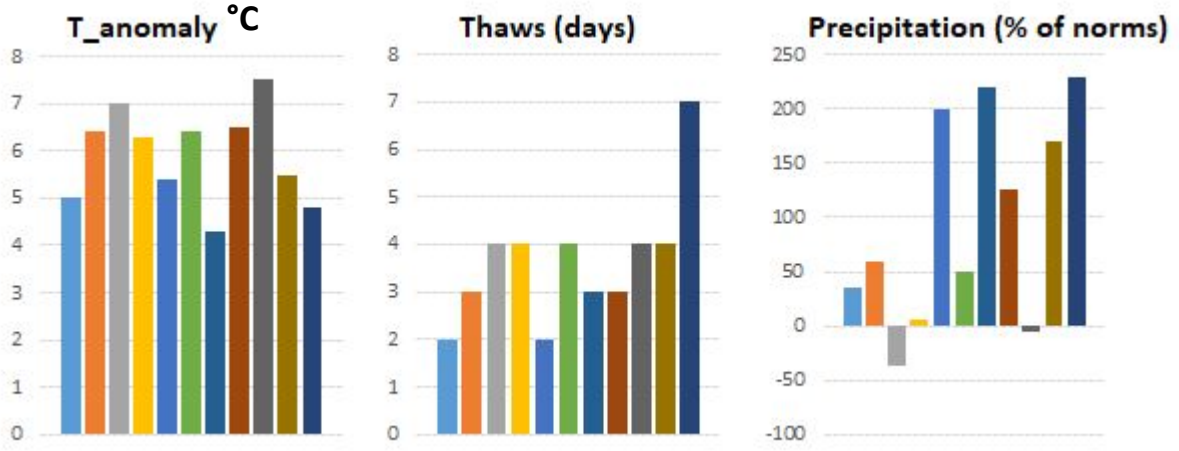
Category	Duration	Rarity	Impacts associated with event
Precipitation and Warm weather	**February - March**	**Unusual**	All three decades of March in most areas of the Yamalo-Nenets Okrug reindeer food was unavailable due to high snow cover. Also, protection and grazing of deer were difficult due to snowstorms, sleet and fogs and thaws. (Agrometeorological Bulletin).

Snow cover anomalies (cm), observations

December 20, 2022 **March, 20 2023**

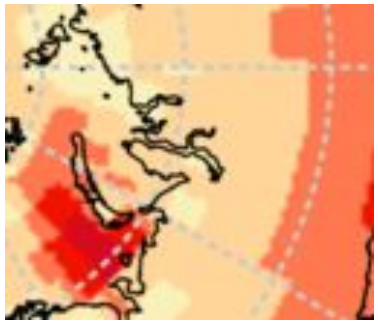


Second Decade of March 2023 in Yamalo-Nenets (Observations, 11 stations)

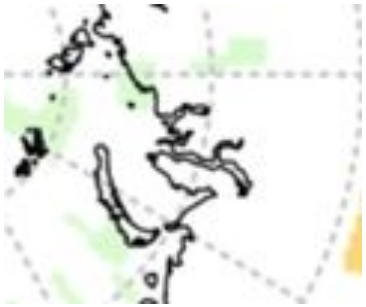


- At all of the stations air temperatures were above the norm (4-8°C) and thaws were recorded (from 2 to 7 days per decade);
- At 3 stations 2 norms of precipitation fell

Western Siberia

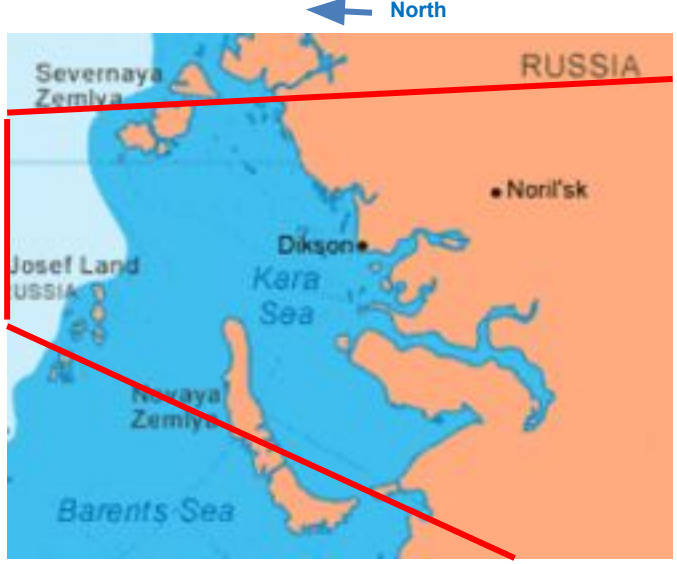


Temp



Pspt

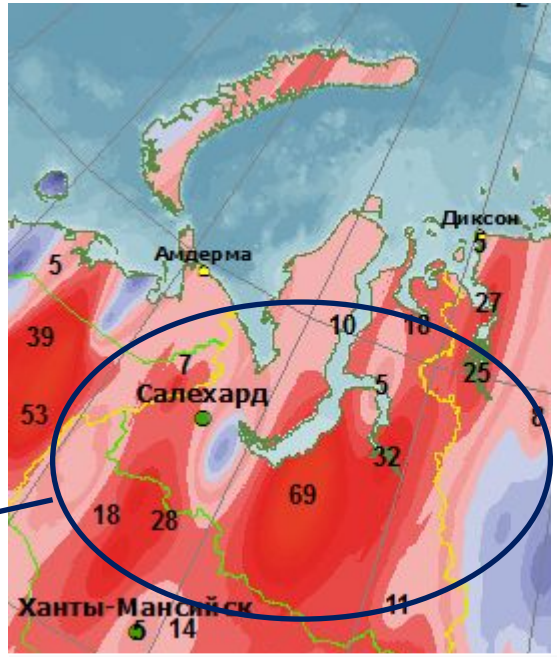
Outlook: Summer 2023				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Western Kara Sea		**Warmer**	✓		
	All the other regions		**Warmer**			✓
Precip	North of Kara Sea		**Wetter**			✓
	All the other regions		No model agreement			
Sea-Ice	**Break-up**	Kara Sea	Early	✓		
	Min Ice Extent September 2023	Kara Sea	**Below normal**		✓	
Snow Water Equivalent (experimental product)	Novaya Zemlya Islands, coastal areas of Kara sea		**Above normal**	✓		
	In the South of Yamal		Near or **below** normal		✓	



Western Siberia

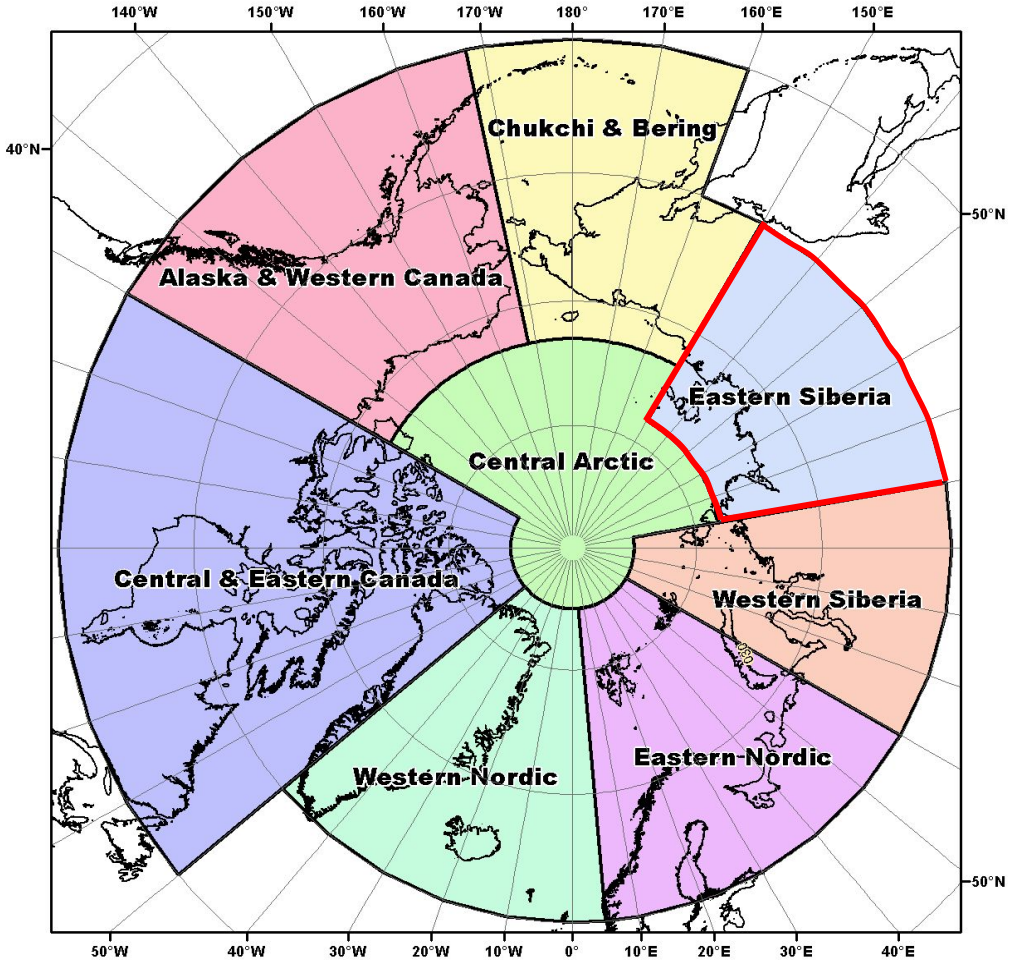
Impacts associated with Outlook for Summer 2023

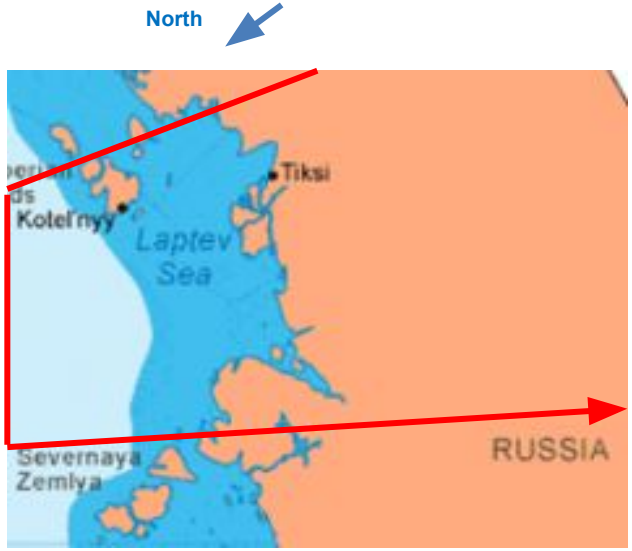
Economy sector	Outlook	Impacts
Transport	**Warm water in northern rivers >> later start of winter roads in autumn**	High air temperatures lead to higher water temperatures in northern rivers. Because of this, the rivers are later covered with ice in autumn. The dates for the start of winter roads will getting later. Such problems are expected on the Ob` and Yenisei rivers (as also observed in 2022)
Transport & lifehood	**Floods**	large amounts of snow accumulation indicates a high risk of floods for north rivers (Ob` and Enisei)
Navigation	**Early start**	Shipping in the Northwest Passage from west to east is expected to start earlier than normal with safe and easy ice conditions for independent navigation

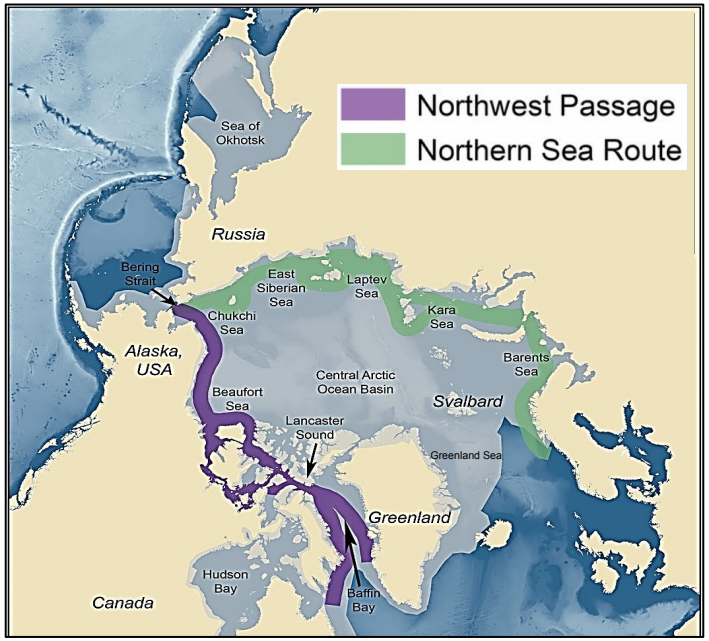


Snow cover anomalies (cm), observations April 30, 2023

Eastern Siberia





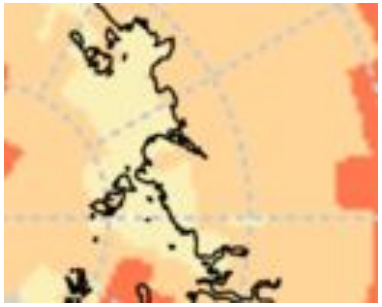


Eastern Siberia

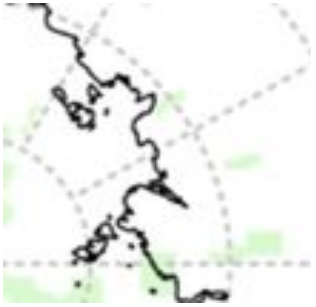
Seasonal Summary: Fall 2021 / Winter 2022-2023			
Observations above (+) and below (-) normal			
Temperature Normal 1991-2020	**NDJ: -1.81˚C** **FMA: + 0.32˚C** **(JAN -5.47˚C)**	Coldest years were: **2023** (NDJ) and 1966 (FMA)	Warmest years were: 1924 (NDJ) and 1920 (FMA)
Precipitation Normal 1991-2020	**NDJ: Normal** **FMA: Wetter**	Wettest year was 1988 (125,2%)	Driest year as 1967 (78,4%)
Sea-Ice Since 1979	Laptev Sea: near normal freeze-up, march maximum sea-ice extent		

Observed extreme climate events – Winter 2022-2023		
Category	**Duration**	**Impacts associated with event**
Extreme cold weather	**1-2 week December, January**	• Cold waves in the north Yakutia (December 10-16 and January 14-20). Minimum temperatures reached -60..-62°C. During these periods, schools were closed for face-to-face attendance; • On January 6-20, cold weather was observed in the north of the Krasnoyarsk Territory, min t -50..-56°C.

Eastern Siberia



Temp



Pspt

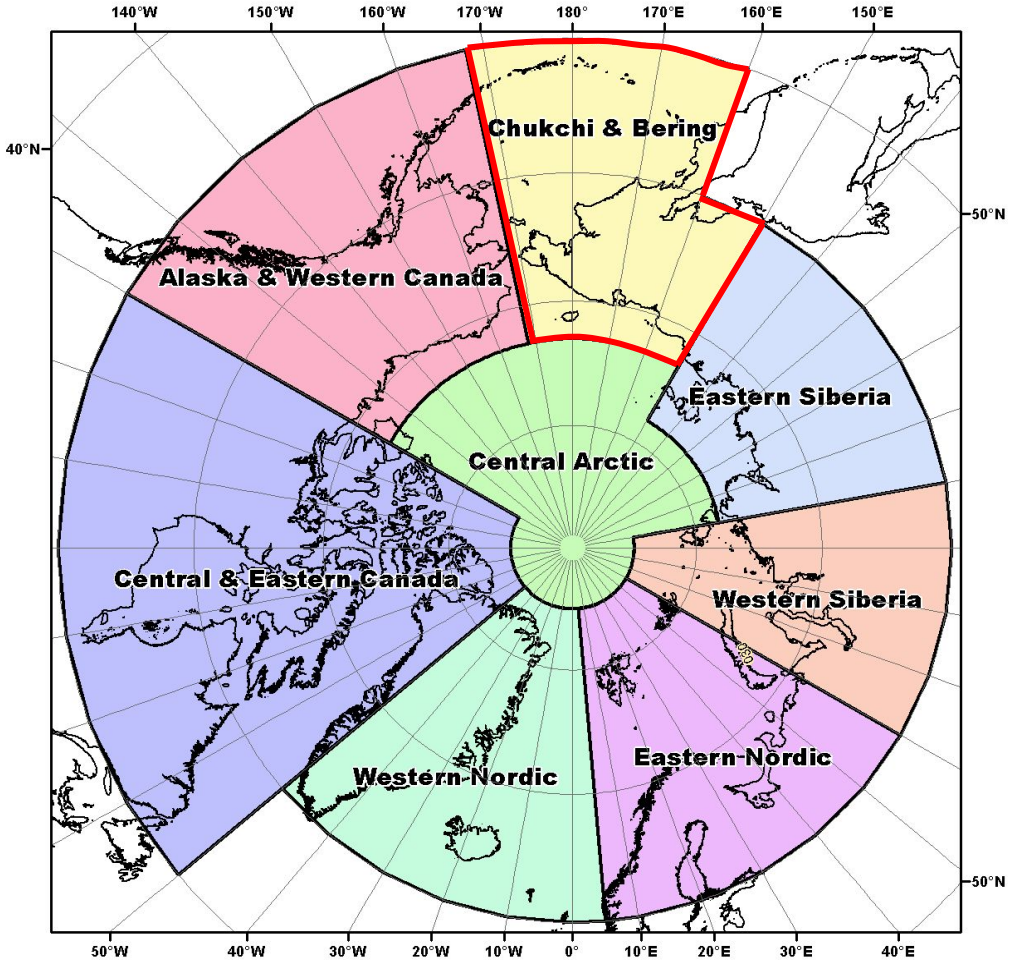
Outlook: Summer 2023				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Southern Laptev sea and East of Taymyr		**Warmer**			✓
	Northern Laptev sea and continental regions		**Warmer**		✓	
Precip	All territory		No model agreement			
Sea-Ice	Laptev Sea	**Break-up**	**Early**			✓
		Min Ice Extent September 2023	**Below normal**		✓	
Snow Water Equivalent (experimental product)	East of Sakha, archipelago Severnaya Zemlya		**Below normal**		✓	
	West of Sakha region		**Above normal**	✓		

Eastern Siberia

Impacts associated with Outlook for Summer 2023

Outlook	Economy sector/ Livelihood conditions	Impacts associated
High Air Temperatures	Coastal Erosion	High temperatures may lead to continued permafrost degradation and coastal erosion
	Health/Wildlife	Hot waves
Early start	Shipping	Shipping across the Northern Sea Route is expected to be start earlier than normal with safe and easy ice conditions
Calm hydrological conditions	Lifehood	small amounts of snow in late spring suggest no problems with floods

Chukchi and Bering



Chukchi and Bering

Seasonal Summary: Fall 2022 / Winter 2022-2023

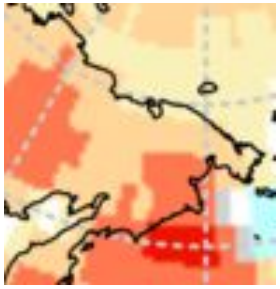
Observations above (+) and below (-) normal			
Temperature Normal 1991-2020	**NDJ: +1.18˚C** **FMA: + 0.08˚C** **(DEC +3.05˚C)**	Coldest years were: 1994 (NDJ) and 1902 (FMA)	Warmest years were: 1925 (NDJ) and 1926 (FMA)
Precipitation Normal 1991-2020	**NDJ: Wetter** **FMA: Slightly drier to wetter**	Wettest year was 1954 (139,6%)	Driest year was 1982 (60,2%)
Sea-Ice Since 1979	East Siberian Sea and Chukchi Sea: late freeze-up; Bering Sea early freeze-up; Okhotsk Sea normal freeze-up March maximum sea-ice extent		

Observed extreme climate events – Winter 2022-2023

Category	Impacts associated with event
Earlier break-up NSR	Early start of navigation in Anadyr. Start May 18, 2023 (in 2022 May 31, in 2020 June 16). This is the only "gateway" for the supply of products and manufactured goods. In March 2023, due to a lack of fuel, the sale of gasoline to the residents of Chukotka was stopped before the start of navigation (fuel supplies to the region are carried out only by sea)

Chukchi and Bering

Temp



Pspt

Outlook: Summer 2023				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Kolyma, west and east of Chukotka,		Warmer		✓	
	Bering Sea			✓		
	Central Chukotka region and Eastern Siberian Sea					✓
Precip	All territory		No model agreement			
Sea-Ice	Break-up	East Siberian Sea	Early			✓
		Chukchi Sea	Near normal		✓	
		Bering Sea	Already Occurred			
	Min Ice Extent September 2023	East Siberian Sea	Below normal		✓	
		Chukchi Sea	Below normal	✓		
Snow Water Equivalent (exp.product)	All coastal regions of Chuktotka		Mostly above normal		✓	

Chukchi and Bering

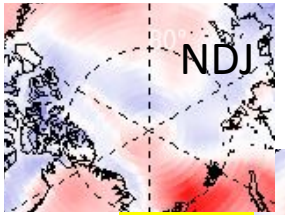
Impacts associated with Outlook for Summer 2023

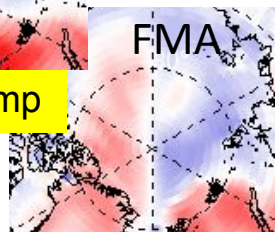
Economy sector/ Livelihood conditions	Impacts associated
Fishing	Warm weather and, accordingly, high water temperatures in the Bering Sea may contribute to the growth of pollock production in the northwest of the Bering Sea. The Navarino region of the Bering Sea is the second most important region of the specialized pollock fishery in Russia
Life hood	More comfortable bioclimatic conditions

Central Arctic

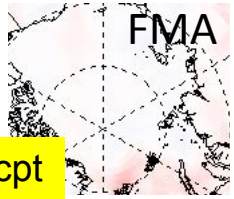
Seasonal Summary: Fall 2022 / Winter 2022-2023

Observations above (+) and below (-) normal			
Temperature Normal 1961-1990	In NDJ 2022-2023 mostly positive temperature anomaly (2,5) observed. Months FMA showed negative anomaly in Siberian part (-2), and positive anomaly in Canadian part (2)		
Precipitation Normal 1961-1990	**NDJ: slightly wetter** **FMA: slightly wetter**	Wettest year was 1989 (+27%)	Driest year was 1998 (-16%)
Sea-Ice Since 1979	Maximum winter ice extent, 7th in row, ~14.9 mln km2 (~15,2 in 2022, 14th in row) was reached 4-5 March 2023, which is close in time to climatic date and later by 2 weeks than previous year.		





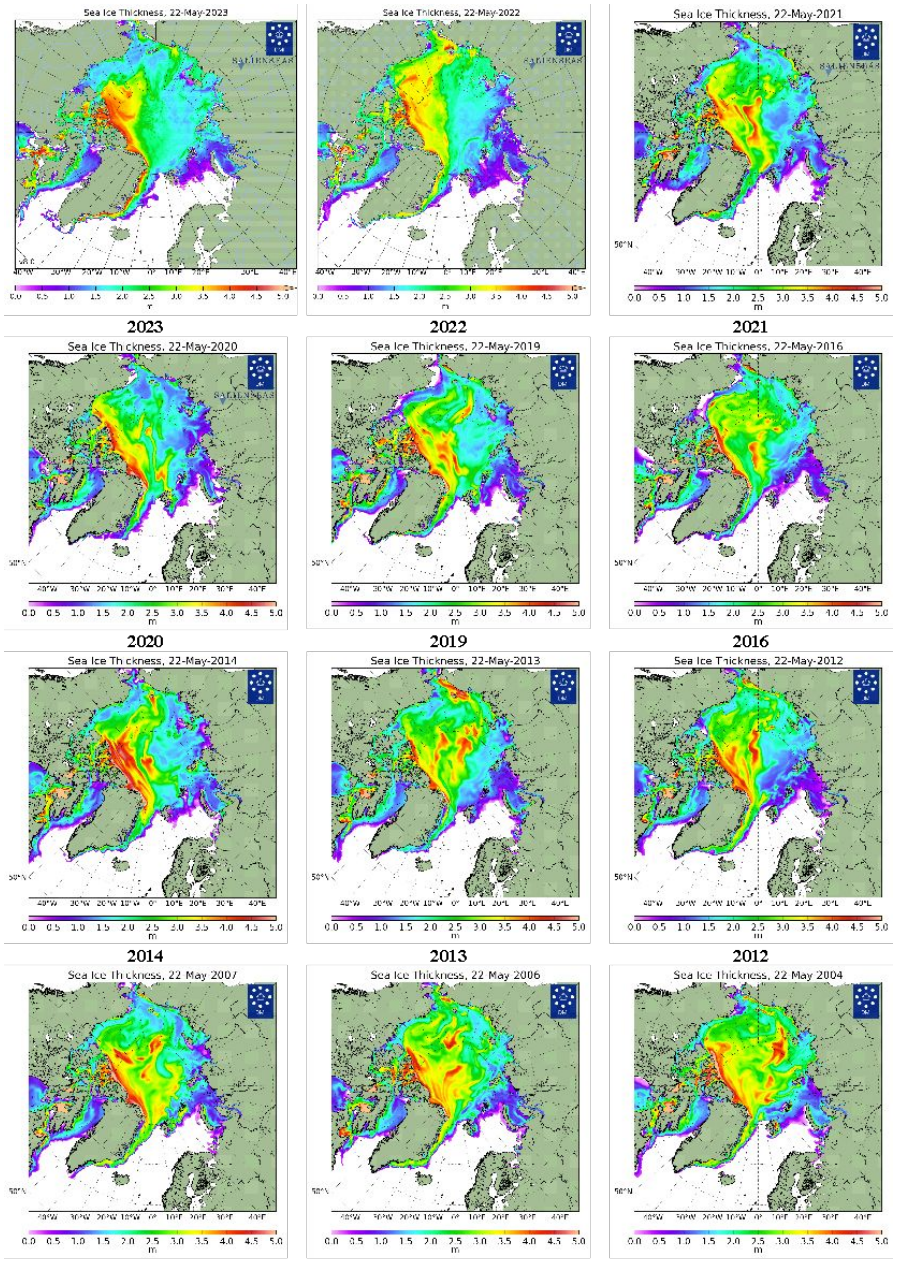
Temp



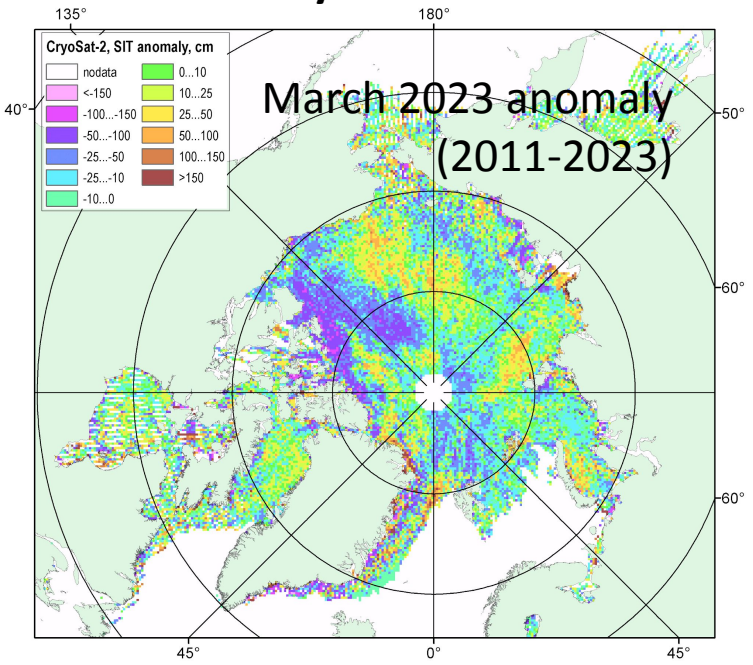
Pcpt

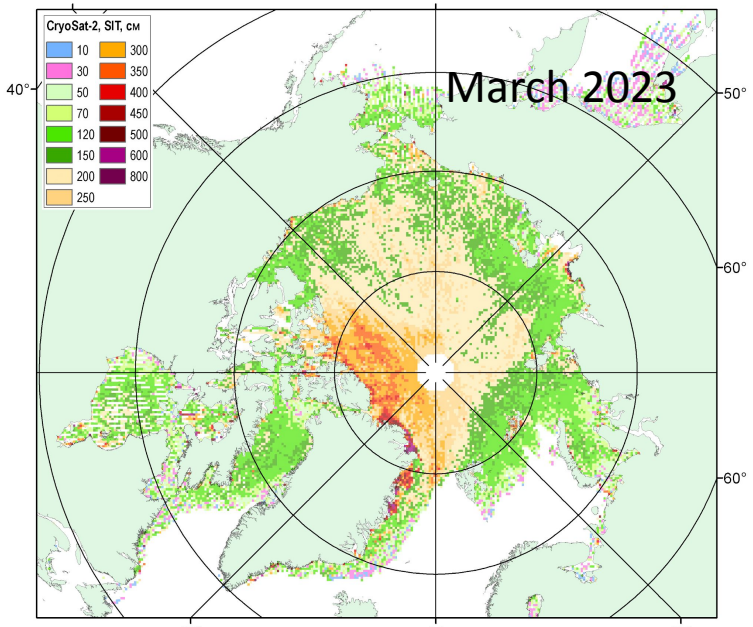
Outlook: Summer 2023			Multi Model Agreement		
	Forecast		**High**	**Moderate**	**Low**
Temp	Norther parts of Beaufort and Chukchi, East Siberian Sea			✓	
	North pole, Laptev and Kara Seas			✓	
Precip	Canadian and US half of Central Arctic			✓	
	European and Eurasian half	No model agreement			
Sea-Ice	**Break-up**	Ice covered, no forecast			

❖ Ice thickness



ESA CryoSAT-2 sea ice thickness





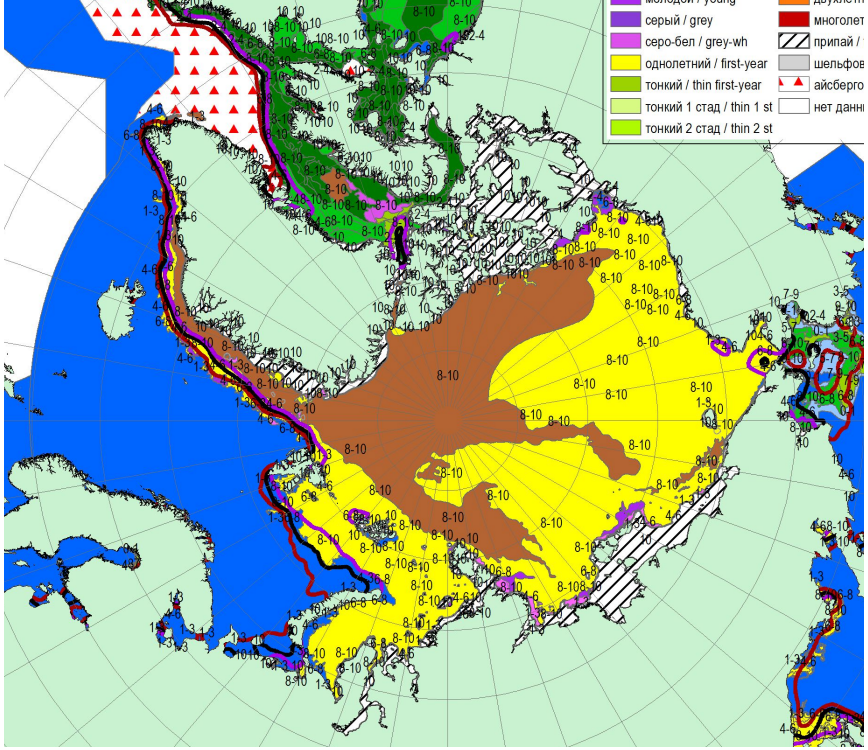
[DMI North Atlantic - Arctic Ocean model HYCOM-CICE - http://ocean.dmi.dk/models/hycom.uk.php]

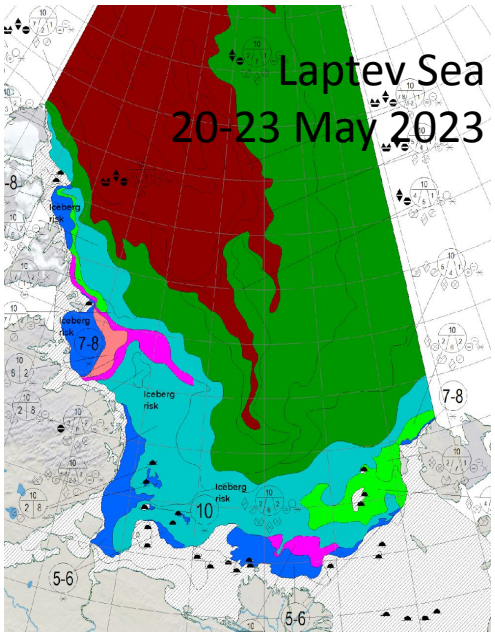
❖ Ice thickness

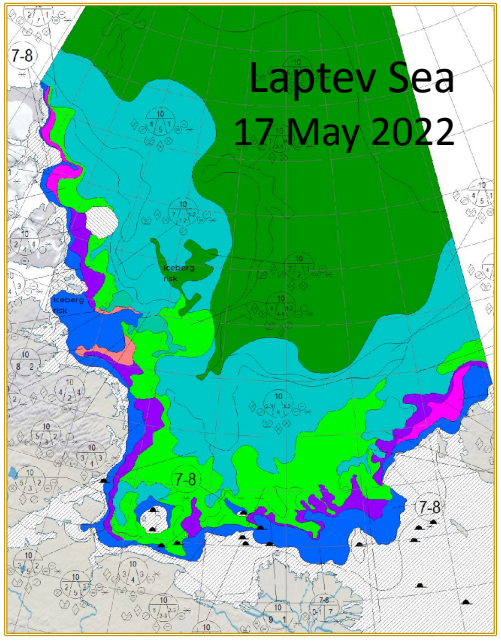
- The peculiarity of this year: the old ice (second-year ice) preserved in the western part of Laptev Sea (such event almost have not observed during last years)

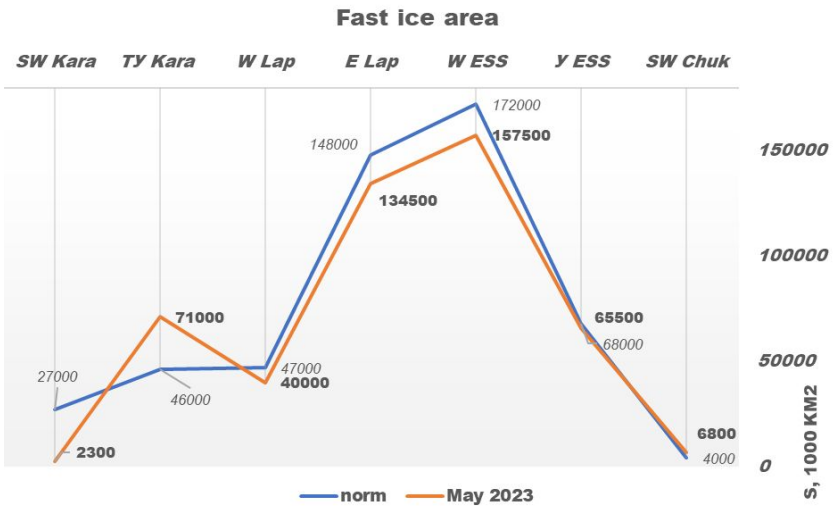
- Fast ice area is lower then the multiyear norm or close to norm (in general lower then in 2022 and 2021)

- General estimation of ice conditions (combination a of such criteria as ice thickness, fast ice area and so on): close to norm for the most of Siberian seas parts, except SW Kara (lighter then norm) and E ESS (harder then nom)



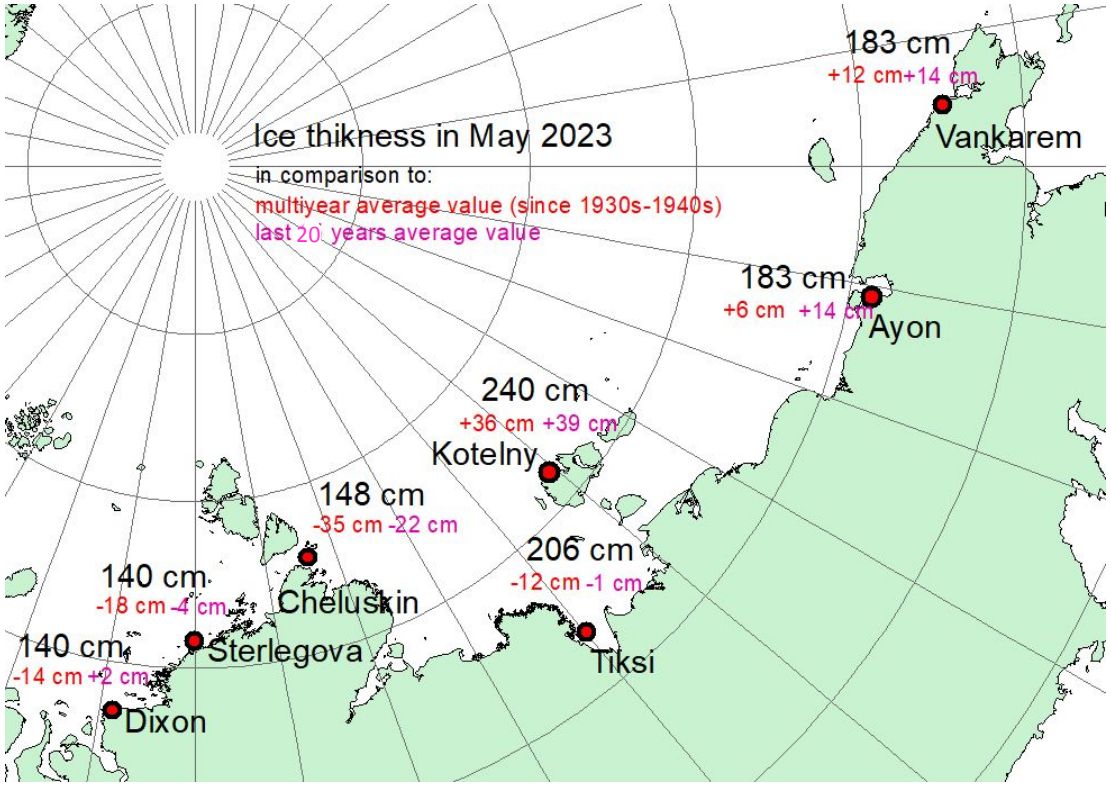






❖ Ice thickness

- Western polar stations measurements show the decrease of ice thickness in comparison to multiyear average values (observation series since 1930s-1940s) to 14-35 cm, but close to mean values of last 20 years .
- Eastern polar stations measurements show the increase of ice thickness or the values close to multiyear values.
- Ice formation began more intensively, the presence of residual ice contributed to that (this was observed for the first time in the last five years) mean



❑Other events in Eurasian and Central Arctic:

❖ the platform «Severniy Polus» continues to drift

❖ on April 20 2023 the first rotation of participants was carried out on ice in the 60 kilometers from the geographical North Pole.

❖

Short expedition to Franz Joseph Land