

# Arctic Climate Forum May 2021



## Regional Overview: Summary of Winter 2020/2021 and Outlook for Summer 2021



Arctic Regional Climate Center  
Network

# Temperature and Precipitation Terrestrial Regions



## North American Node

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

## Northern European Node

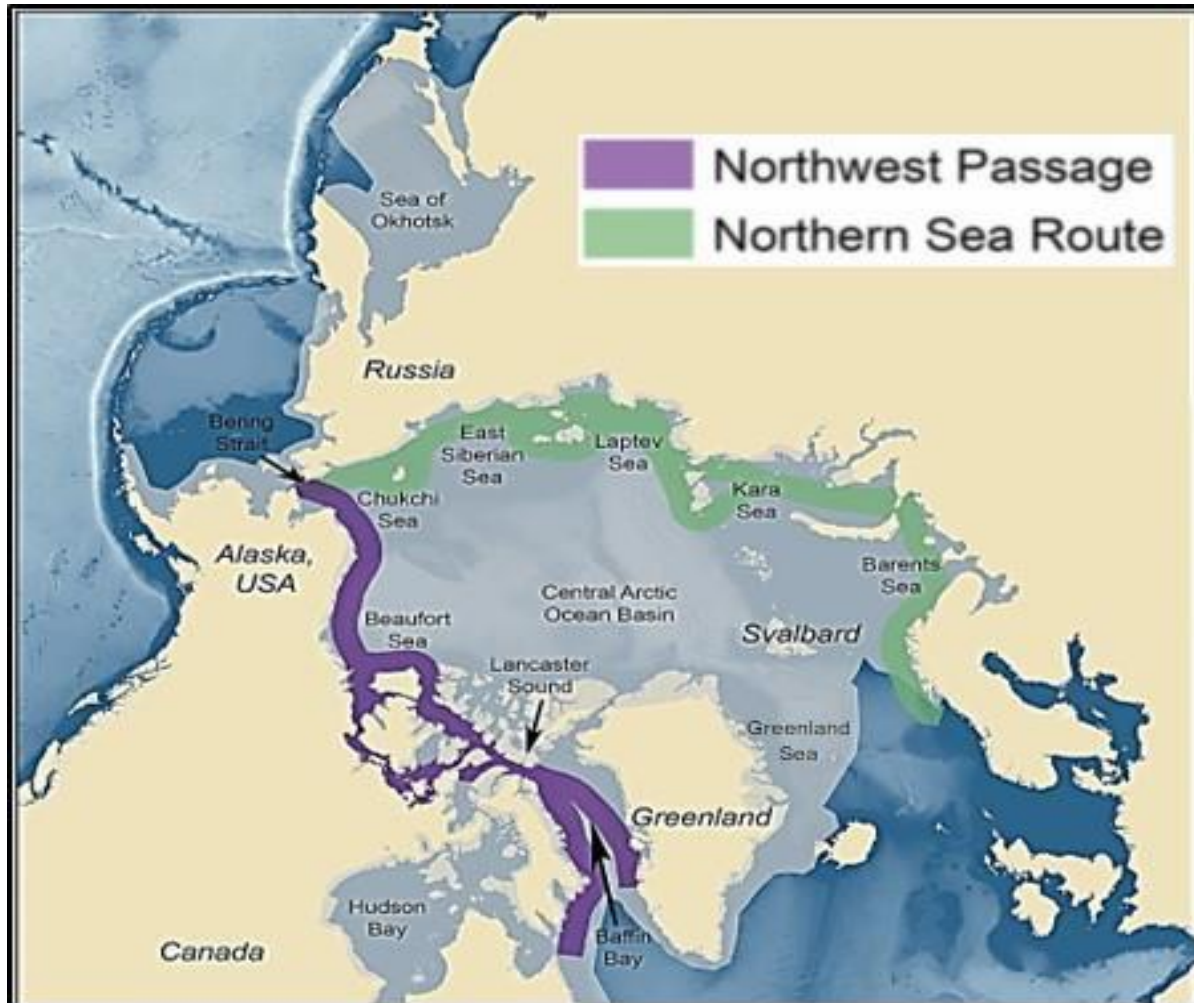
- **Western Nordic:** Western Greenland, Iceland
- **Eastern Nordic:** Svalbard and Scandinavia

## Eurasian Node

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



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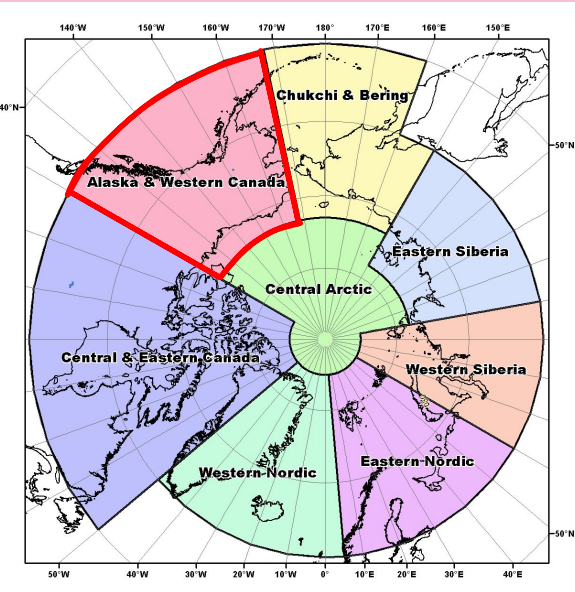
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# North American Node



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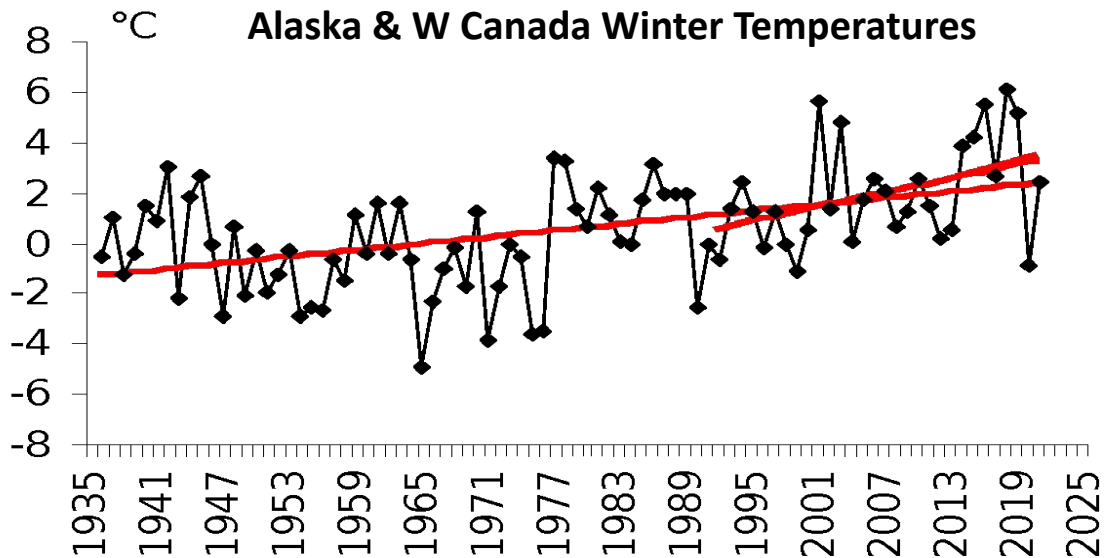
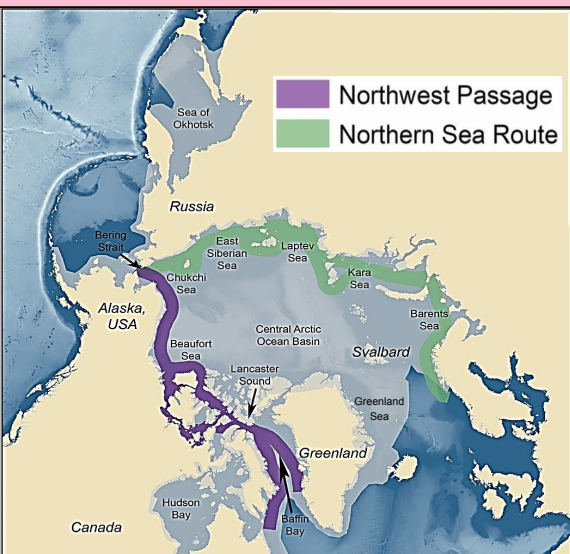
# Alaska & Western Canada (Yukon, NWT)



## Seasonal Summary: Winter 2020/21

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

<b>Temperature</b> Normal 1961-1990	<b>+0.7°C</b> <ul style="list-style-type: none"> <li>On average, 14<sup>th</sup> warmest winter</li> <li>BUT – the north slope had colder than normal temperatures</li> </ul>	Warmest year was 2018 (+6.1°C)	Coldest year was 1965 (-5.6°C)
<b>Precipitation</b> Normal 1961-1990	<ul style="list-style-type: none"> <li>Wet northern Southeast Alaska and southern Yukon</li> </ul>	Wettest year was 1951 (+65 %)	Driest year was 1968 (-46 %)
<b>Sea-Ice</b> Since 1979	Freeze-up <ul style="list-style-type: none"> <li>Chukchi – late, end of December</li> <li>Bering Sea – late</li> <li>Beaufort Sea – near normal</li> </ul>	March maximum sea-ice extent: <ul style="list-style-type: none"> <li>Bering – below normal</li> <li>Beaufort Sea - normal due to colder temperatures</li> </ul>	







Environment and  
Climate Change Canada

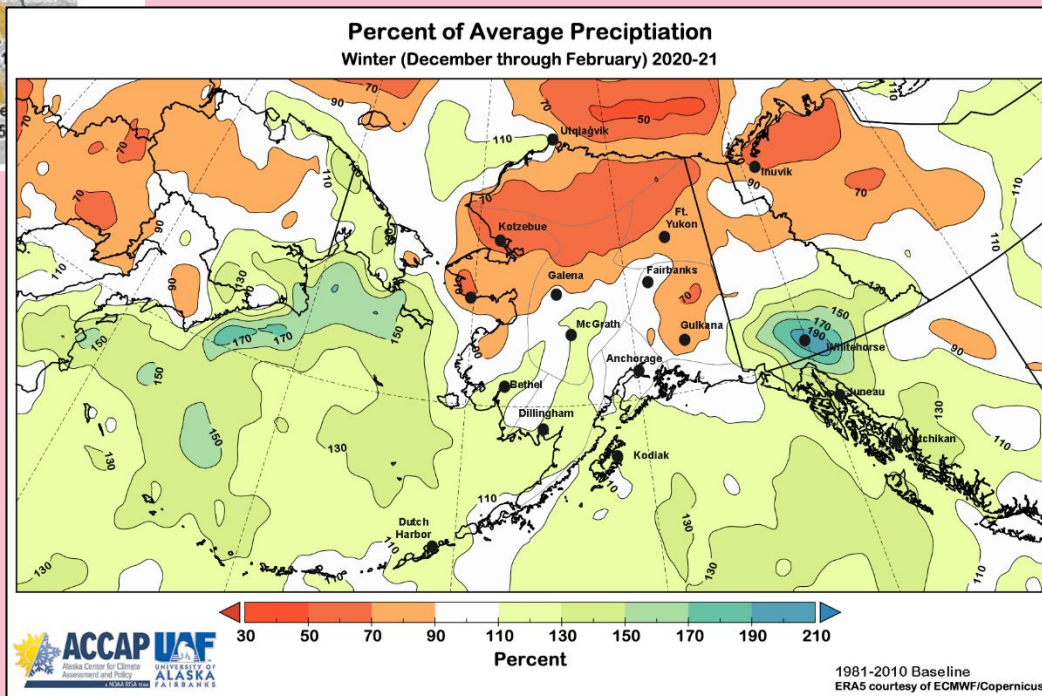
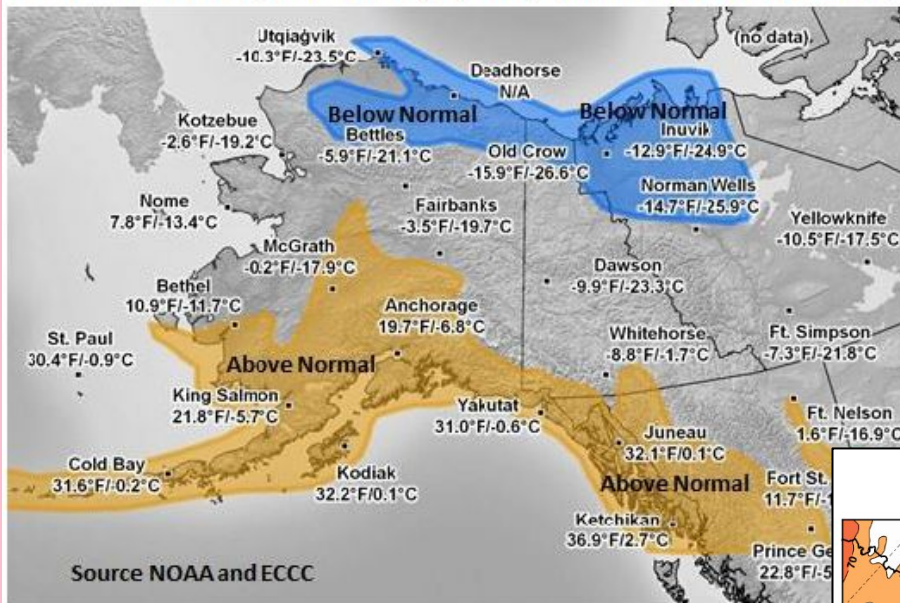
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# ALASKA and NORTHWESTERN CANADA

Weather and Climate Highlights and Impacts, Dec 2020 - Feb 2021; Climate Outlook April - June 2021

<https://www.drought.gov/sites/default/files/2021-03/AK-CAN%20Winter%202021.pdf>

Dec 2020-Feb 2021 Temperature Averages ( $^{\circ}\text{F}/^{\circ}\text{C}$ ) & Anomalies - **Below** / **Above** / Normal





# Alaska/NW Canada Highlights 2020-21

**Bering Strait: Apr-May 2021**  
Successful subsistence activities

**Buckland: May 2021**  
Severe ice jam flooding

**Dalton Highway: Apr-May 2021**  
Low winter snow, no aufeis problems

**Lower Kuskokwim:**  
Stable ice roads all winter

**Whitehorse: Apr 2021**  
Record deep late season snowpack

**Lots of snow**  
good skiing season

**Southern Bering: Jan-Mar**  
Near record warmth  
no sea ice

**Haines: Dec 2020**  
Devastating landslides



# Alaska & Western Canada

## (Yukon, NWT)

### OBSERVED EXTREME CLIMATE EVENTS WINTER 2020/21

Category	Location	Rarity	Impacts associated with event
Temperature	Southern Bering Sea	Third Warmest February on record	Top five warmest years in past 75, helped keep sea ice to the north. Prelim results suggest no "cold pool" at the bottom of Bering Sea with potential ecosystem/fisheries
Snow	Whitehorse, Yukon	3rd high snowfall back to 1943 with 171% of normal precipitation in November	40 – 50 cm in snow early November
Precipitation	Old Crow, YT	6th driest on record since 1953 at 60% of normal	Environmental stress
	Mackenzie and Yukon rivers	Increased precipitation	Greater river discharge during spring break-up during the ice jam/freshet season in May 700 people evacuated from Fort Simpson and Jean Marie River in SW NWT. Significant damage due to sewage and diesel contamination
Temperature and Precipitation	Southeast Alaska	Landslides	Loss of life and infrastructure impacts

# Alaska & Western Canada



Outlook: Summer 2021			Multi Model Agreement		
Forecast			High	Moderate	Low
Temp *	Bering and Chukchi Seas	Warmer			✓
	Beaufort Sea			✓	
	Alaska & Western Canada			✓	
Precip *	Alaska	Wetter			✓
	Yukon & NWT	No Forecast	No model agreement		
Sea-Ice	Break-up	Chukchi Sea	Early		✓
		Beaufort Sea	West – late East - early	✓	
		Bering Sea	Late	✓	
	Min. Ice Extent September 2021	Chukchi Sea	Near Normal		
		Beaufort Sea		✓	

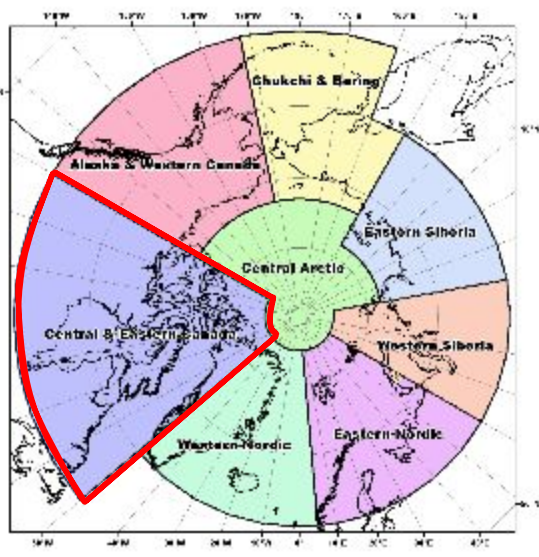
# Alaska & Western Canada: Possible Impacts

## SUMMER 2020/2021

Economy sector/ Livelihood conditions	Outlook	Impacts associated
Wildfires	Above normal temperatures and precipitation  Late break-up forecasted for Bering and Beaufort	Near normal based on warmer temperatures predicted
Infrastructure, Coastal Erosion		High
Subsistence Hunting		Sea ice conditions look reasonable for subsistence hunting on the sea ice in Alaska
Shipping		Large amount of multi-year sea ice in the Beaufort Sea will likely cause a later break-up. Shipping could be delayed with presence of hazardous multi-year ice.

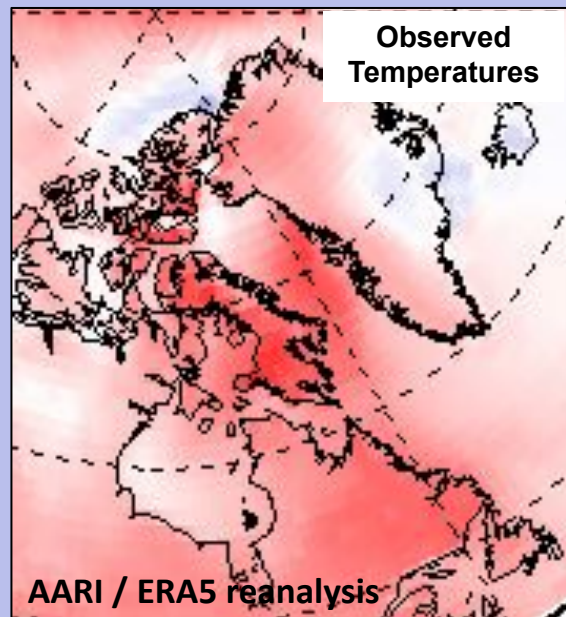


# Central & Eastern Canadian Arctic, Western Greenland

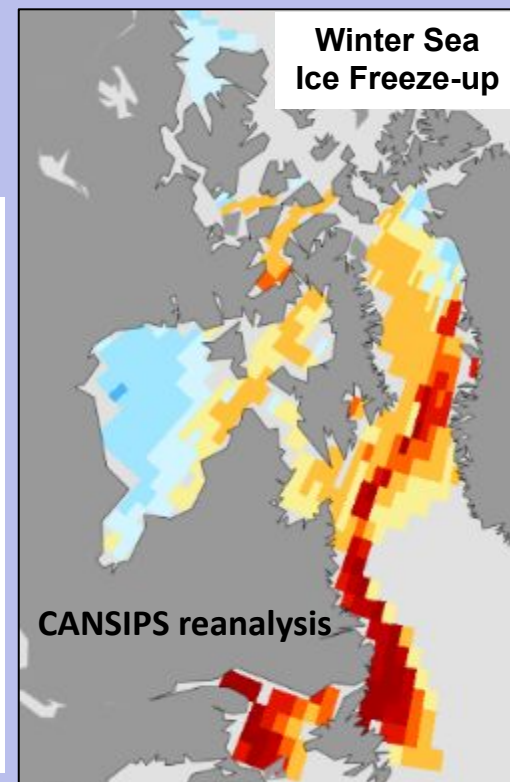
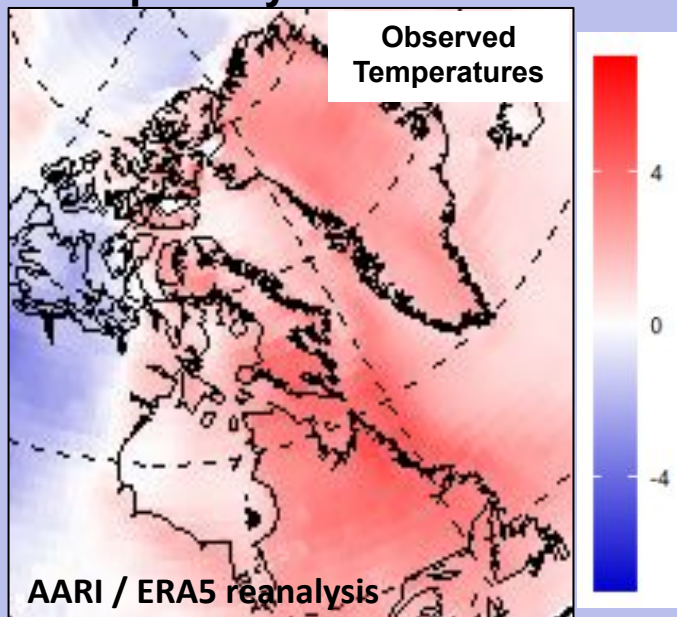


Winter 2020/21			
Observations above (+) and below (-) normal			
<b>Temperature</b> Normal 1961-1990	<b>+4.2°C</b> 3rd warmest year on record	Warmest year was 2010 (+5.0°C)	Coldest year was 1972 (-3.6°C)
<b>Precipitation</b> Normal 1961-1990	Near normal	Wettest year was 2005 (+23.5 %)	Driest year was 1977 (-25 %)
<b>Sea-Ice</b> Since 1979	Freeze-up: <ul style="list-style-type: none"> <li>Hudson Bay - <b>Early</b></li> <li>Baffin Bay - <b>Late</b></li> <li>Labrador Sea - <b>Late</b></li> </ul>	March minimum sea-ice extent: <ul style="list-style-type: none"> <li>Below to normal in the Gulf of St. Lawrence and Labrador sea.</li> </ul>	

Nov – Jan: started off warm



Feb – Apr: Stayed warm in the east

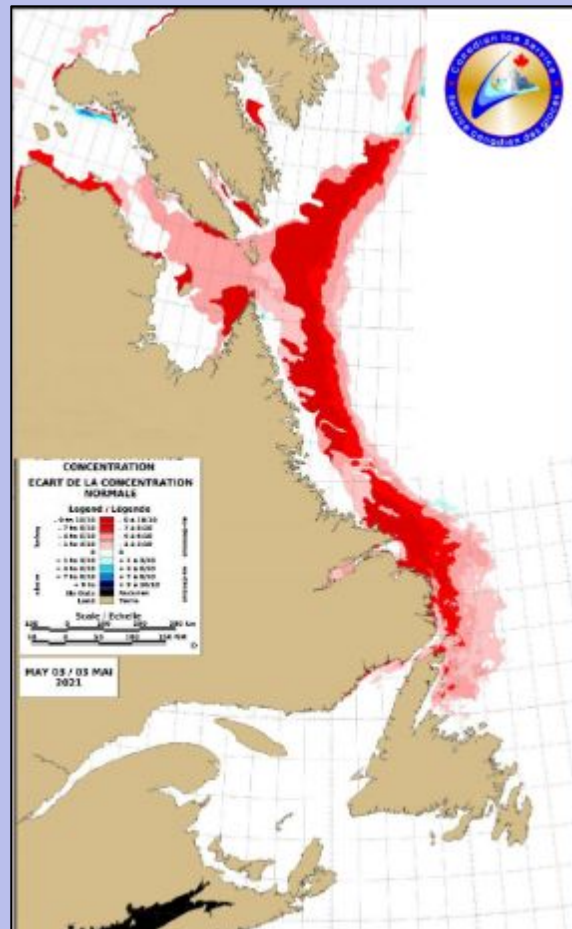


# Central and Eastern Canadian Arctic, Western Greenland

## OBSERVED EXTREME CLIMATE EVENTS

WINTER 2020/21

Category	Location	Rarity	Impacts associated with event
Temperatures (1981-2010)	+8.2°C in Iqaluit +6.8°C in Thule +5.9°C in Resolute +5.0°C Kuujjuaq  +6.7°C Hopedale and Makkovik	1st warm spell in early December broke 9 records in Nunavut 2nd warm spell in early February broke 20 records  Mildest winter on record.	Above normal temps contributed to a lower than normal ice extent. Freeze thaw cycles brought icy conditions.
Precipitation	Happy Valley-Goose Bay	Second wettest winter on record with more than half falling in December	
Sea-ice	Nunatsiavut Labrador	Warm temperatures, strong winds and high sea-surface temperatures reduced the overall ice extent.	The continued warm temperatures have resulted in land fast ice being thinner than normal impacting community travel and hunting
Lake Ice	Melville Lake, Labrador	Ice in Lake Melville fractured almost a month ahead of normal and is the 2nd earliest (2010)	

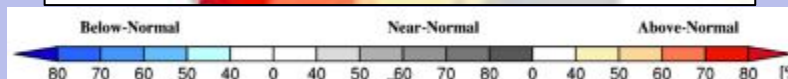
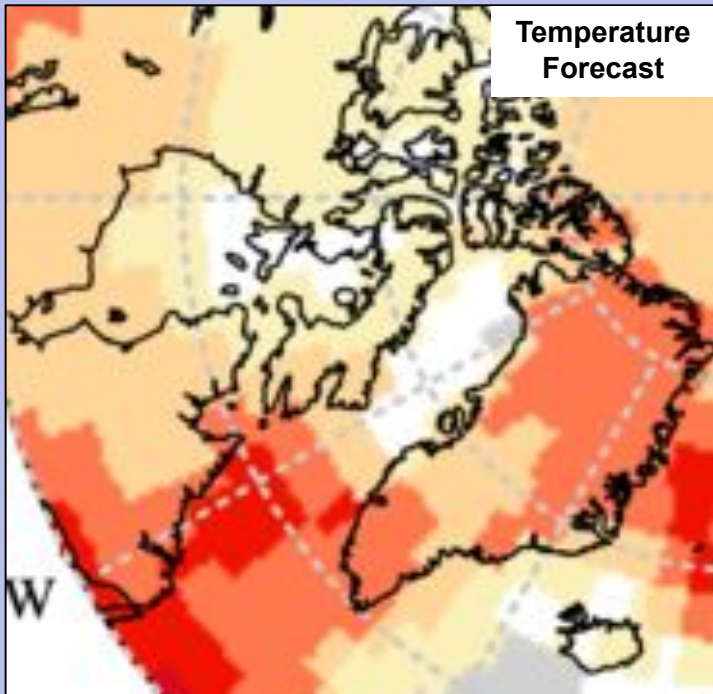


Sea ice concentrations hit a 50 year low in Nunatsiavut, Labrador coast this spring

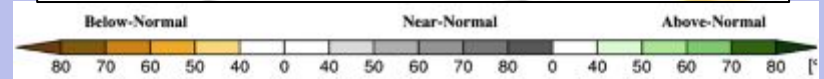
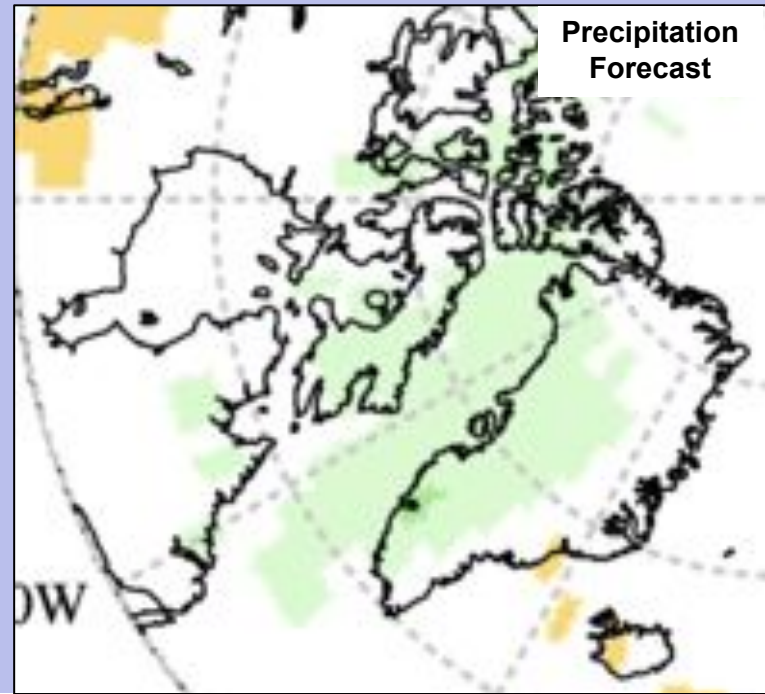
# Central and Eastern Canadian Arctic, Western Greenland

Outlook: Summer 2021- June, July, August			Multi Model Agreement		
Forecast			High	Moderate	Low
Temp	Nunatsiavut and Labrador Sea	Warmer	✓		
	Nunavik and Kivalliq region of Nunavut			✓	
	Kitikmeot and Qikiqtaaluk regions of Nunavut				✓
	Fox Basin, Baffin Bay	No forecast	No model agreement		
Precip	Eastern Kivalliq and Qikiqtaaluk regions of Nunavut, Baffin Bay, Northern Nunavik and Nunatsiavut	Wetter			✓
	Western Kivalliq, Kitikmeot and regions of Nunavut, Hudson Bay/Strait and western Nunavik	No forecast	No model agreement		

Temperature Forecast



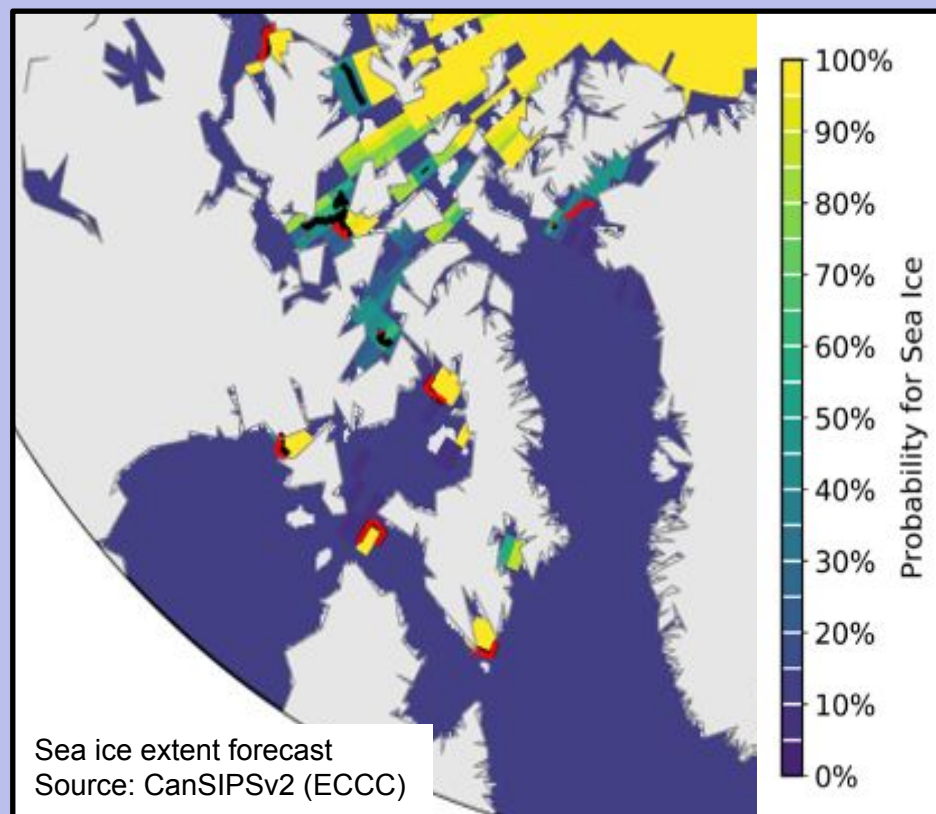
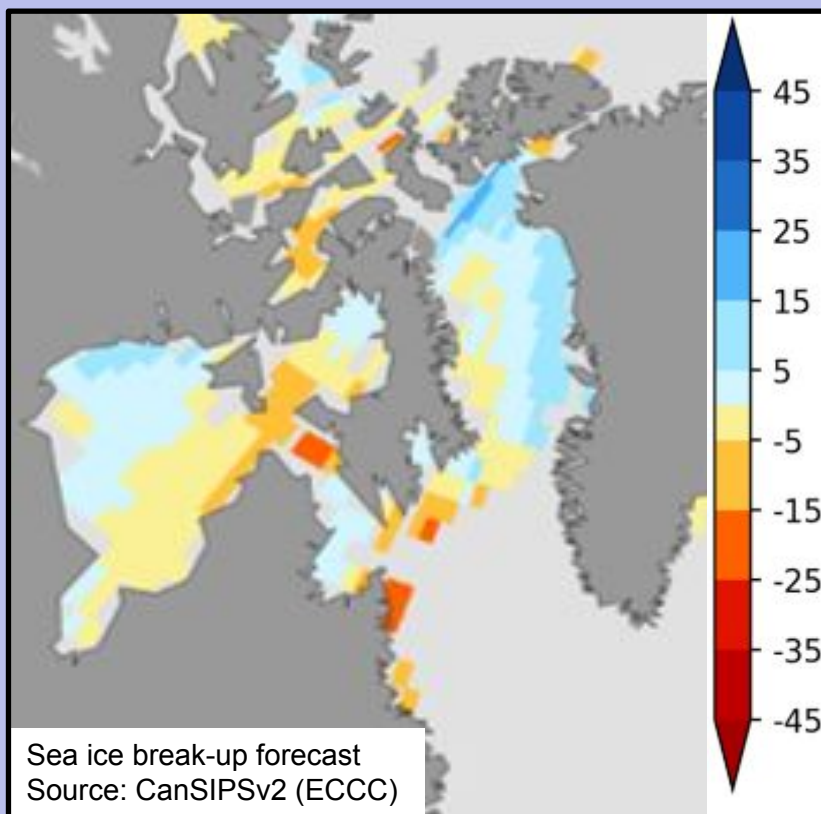
Precipitation Forecast





# Central and Eastern Canadian Arctic, Western Greenland

Outlook: Summer 2021				Multi Model Agreement		
Forecast				High	Moderate	Low
Sea-Ice	Break-up	Baffin Bay	Near normal - Nares Strait Early – Davis Strait	✓		
		Hudson Bay	Near normal – west Early - east		✓	
		Labrador Sea	Early	✓		
	Min Ice Extent September 2021	Canadian Arctic Archipelago	Below Normal		✓	



# Possible Impacts

SUMMER 2021

Economy sector/ Livelihood conditions	Outlook	Impacts associated
Wildfires	Warmer temperatures Normal precipitation Sea ice conditions variable	Near normal
Infrastructure, Coastal Erosion		Slight increased risk for permafrost melt in eastern Kivalliq and Qikiqtaaluk regions of Nunavut, Baffin Bay, Northern Nunavik and Nunatsiavut with warmer temperatures (moderate to low model confidence) and increased precipitation (low confidence).
Wildlife		
Sea ice early summer subsistence hunting		Northern Baffin island and western Hudson Bay sea-ice conditions look reasonable, all other areas risk of reduced sea ice hunting season

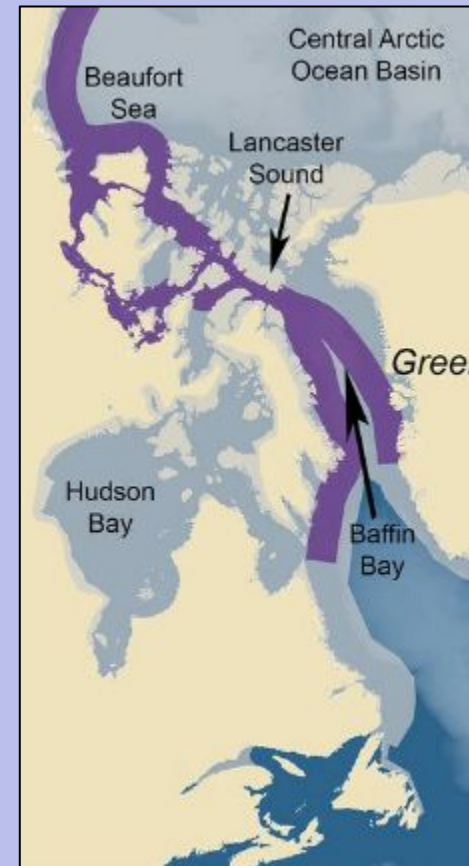
# Shipping: Possible Impacts

SUMMER 2021

**Northwest Passage (NWP):** Break-up earlier than normal. Fast ice breakup already ahead of normal in Barrow Strait. Mobile old ice in the Canadian Arctic Archipelago could drift into the NWP, but initial concentrations remain near normal in Larsen Sound and Victoria Strait.

**Eastern Hudson Bay/Strait:** Earlier than normal break-up is underway. Signals of this early breakup in the eastern section are emerging as sea ice concentration is anomalously low for spring.

**Baffin Bay:** Early break-up due to lower than normal ice extents in the region and forecasted warmer than normal temperatures. Nares Strait ice bridge warrants monitoring as breakup has been much earlier than normal in recent years. Frobisher Bay ice concentrations are elevated and may present shipping issues later in season into Iqaluit.







**ACF**

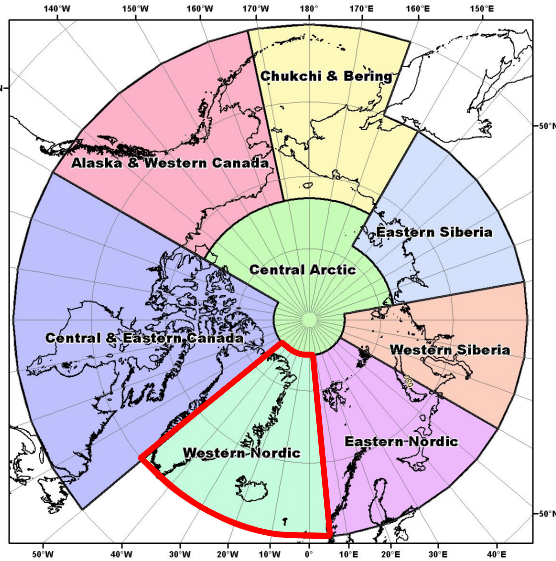
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# Northern European Node



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# Western Nordic



## Seasonal Summary: Winter 2020 & Spring 2021

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

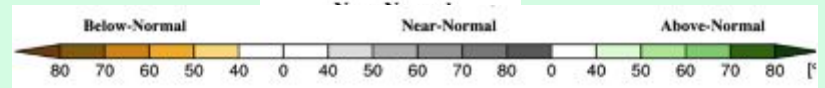
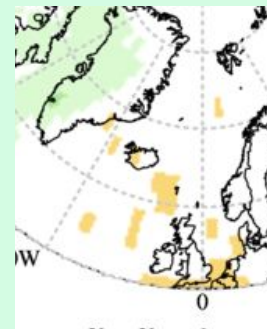
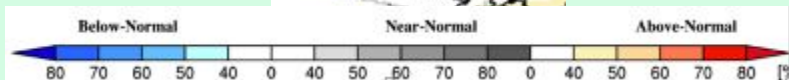
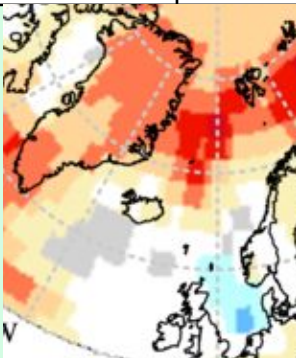
<b>Temperature</b> Normal 1961-1990	2.5 deg above normal for region 4.7 deg above normal in N Greenland and Norwegian Seas 0.9 deg above normal in Iceland	Warmest year was 2003 (+1.9°C)	Coldest year was 1965 (-0.7°C)
<b>Precipitation</b> Normal 1961-1990	Slightly drier than normal (-4%) Winter wetter than normal in N&E Iceland (+20%) early on, but late winter and spring dry esp. In S&W	Wettest year was 1964 (+20.5%)	Driest year was 1968 (-24.9%)
<b>Sea-Ice</b> Since 1979	March maximum sea ice extent Close to normal for Greenland Sea		

## OBSERVED EXTREME CLIMATE EVENTS WINTER 2020

Category	Duration	Rarity	Impacts associated with event
Rain in E – Iceland	24 -120 hours	All time records broken	Serious landslides major damage
Air pressure in Iceland during Jan to Apr	4 months	All time record (~ 160 years)	Dry conditions, fire hazard warning issued

# Western Nordic

Outlook: Summer 2021			Multi Model Agreement		
Forecast			High	Moderate	Low
Temp	Northern, southern and continental Greenland		No model agreement		
	Iceland		Warmer	✓	
	North Atlantic		Normal		✓
	Greenland seas		Warmer	✓	
Precip	Western Greenland		Wetter	✓	
	Western Iceland		Dryer	✓	
	Other parts of Greenland, Iceland, Northern Atlantic		No model agreement		
Sea-Ice	Break up	Greenland Sea	Early in S later in N	✓	
	Min Ice Extent Sep 2021		Late retreat up the coast	✓	



# Eastern Nordic

## Seasonal Summary: Winter 2020 & Spring 2021

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

<b>Temperature</b>	0.6 deg warmer on continent	Warmest year was	Coldest year was
Normal 1961-1990	2.8 deg warmer on Barents Sea	1937 (+6.5°C)	1979 (-4.4°C)
<b>Precipitation</b>	Wetter than normal this winter	Wettest year was	Driest year was
Normal 1961-1990		1981 (+28 %)	1980 (-32 %)
<b>Sea-Ice</b>	March 2021 max sea-ice extent:		
Since 1979	Near normal for Barents Sea, below normal around Svalbard (see figure)		
	Normal ice extent for Baltic sea		

## OBSERVED EXTREME CLIMATE EVENTS WINTER 2020 & SPRING 2021

### Category

### Description

#### Temperature

Sudden stratospheric warming after New Years is remarkable. Resulted in a number of longer cold periods.  
New Swedish record for max temp on February; 17 deg. In Kalmar Sweden on February 25th

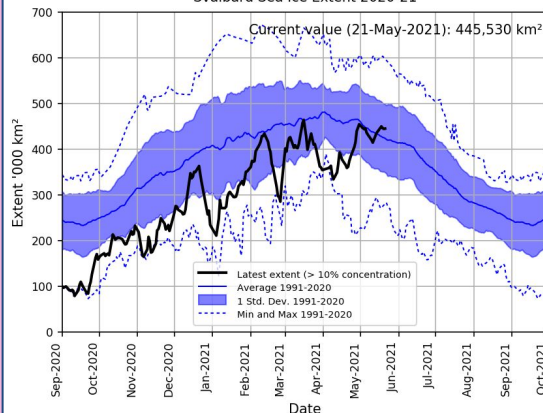
#### Baltic Sea ice

Normal ice extent this winter. However reports of poor ice quality, although ice is thick. This has been more frequent recent years.



### Ice Charts

#### Svalbard Sea Ice Extent 2020-21





# Eastern Nordic



## LOCAL COMMUNITIES FEEDBACK WINTER 2020 & SPRING 2021

“

Good winter for reindeer graze, not that much snow before december (Vemdalen, Sweden)

Not stable weather this winter, cold and thawing now and then. Has been like this the last ~10 years. Experiencing more windy conditions the last years (Vindeln, Sweden)

Wet, heavy snow has given bad graze conditions in late winter; and wind conditions were unfavourable (North Sweden)

Good grazing conditions. However late spring and cold conditions forced herds toward summer fields (Kautokeino, Norway)

Not much snow and not much low temperatures nor much wind. However snow still late arriving around May 20th. (Varanger, Norway)

“

# Eastern Nordic

Outlook: Summer 2021				Multi Model Agreement		
Forecast				High	Moderate	Low
Temp	Svalbard, Barents Sea		Warmer	✓		
	Murmansk/White Sea/Continent		Warmer		✓	
	Nordic Sea, Scandinavia		Near normal			✓
Precip	Svalbard, Northern Barent Sea		No agreement		✓	
	Southern Barents Sea, Scandinavia, Murmansk region		No agreement			✓
Sea-Ice	Break-up	Barents sea	Near normal	✓		
	Min Ice Extent September 2021		Below normal	✓		

Economy sector/ Livelihood conditions	Possible risk	Impacts associated
Not strong signal for particularly hot summer in Scandinavia - good for wildfire risk		
Occurence of blue-green algae should be relatively low in Baltic sea		



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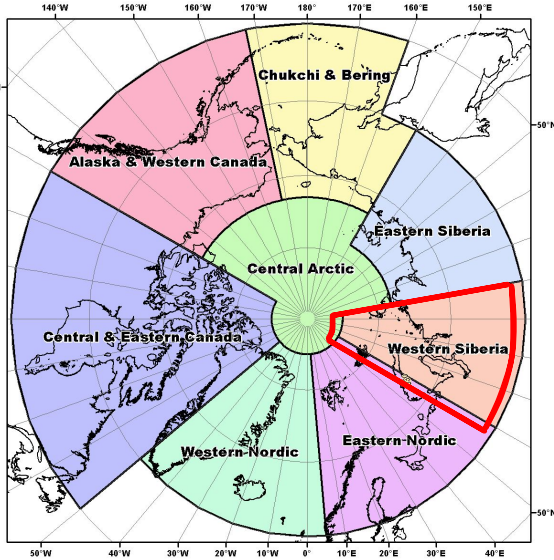
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# Eurasian Node



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# Western Siberia



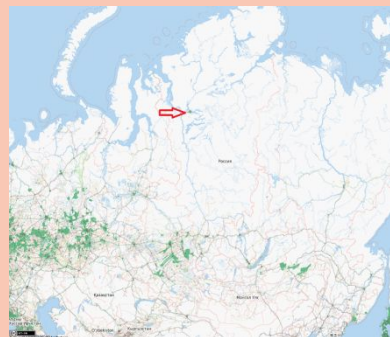
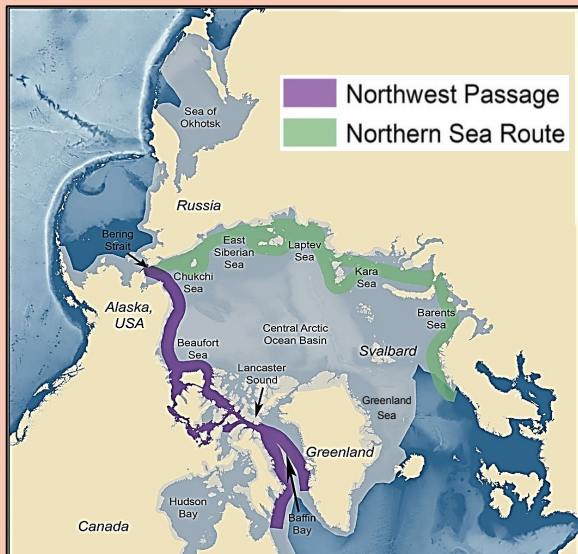
## Seasonal Summary: Winter 2021

Observations above (+) and below (-) normal

<b>Temperature</b>	+0,3°C	36	Warmest year was 2012,2016 (+7,6°C)	Coldest year was 1969 (-5.6°C)
Normal 1961-1990				
<b>Sea-Ice</b>	March maximum sea-ice extent: Kara Sea, ice covered			
Since 1979				

## OBSERVED EXTREME CLIMATE EVENTS WINTER 2021

Category	Duration	Rarity	Impacts associated with event
Warm weather and liquid precipitation on Yamal Peninsula	December 2020	Unusual	The abnormally warm weather on the Yamal Peninsula caused the formation of an ice crust (glaze) on the deer pastures; the deer could not eat natural food. The crust was about 10 cm thick. According to various sources, from 60 to 80 thousand deer died of hunger. Similar situation was observed in 2014.





# Western Siberia

Outlook: June, July August (JJA) 2021				Multi Model Agreement		
Forecast				High	Moderate	Low
Temp	Western Kara Sea		Above normal		✓	
	Continent				✓	
	Eastern Kara Sea				✓	
Precip	Continent		No signal			
	Barents sea, Kara sea		No signal			
Sea-Ice	Break-up	Kara Sea	Early	✓		
	Min Ice Extent September 2021	Barents Sea	Near normal		✓	

Economy sector/ Livelihood conditions	Possible risk	Impacts associated
Livelihood conditions		Bioclimatic thermal conditions are favorable
Forestry		There are possibility of forest fires
Navigation		Shipping in the Northwest Passage from west to east is expected to start earlier than normal with safe and easy ice conditions for independent navigation of large-capacity tankers, gas carriers and bulk vessels. However, above normal temperatures may increase the number of icebergs due to glacier calving in the Islands Novaya Zemlya and Severnaya Zemlya, creating navigation hazards.
Wildlife/Hunting		The reduction in the sea-ice extent and permafrost degradation in tundra may create difficulties for “keystone” species, e.g. polar bears, caribou, whales etc.

# Eastern Siberia



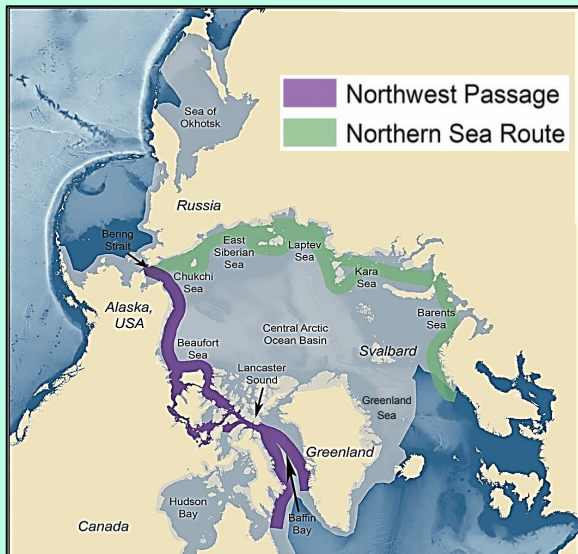
## Seasonal Summary: Winter 2021

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

<b>Temperature</b> Normal 1961-1990	+0,2°C	25	Warmest year was 2016 (+4,6°C)	Coldest year was 1966 (-4,5°C)
<b>Sea-Ice</b> Since 1979	March maximum sea-ice extent: Laptev sea, ice covered			

## OBSERVED EXTREME CLIMATE EVENTS WINTER 2021

Category	Duration	Rarity	Impacts associated with event
Cold wave	23-29 DEC 2020	Unusual	Severe frosts were observed in the Evenki municipal district of the Krasnoyarsk Territory, the air temperature dropped below -55°C. There were power failures, cold water supply, domestic fires, and cases of frostbite in people.

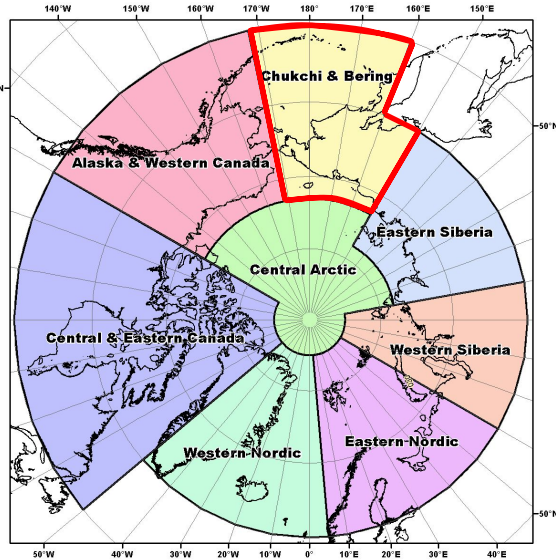


# Eastern Siberia

Outlook: June, July August (JJA) 2021				Multi Model Agreement		
Forecast				High	Moderate	Low
Temp	Laptev sea and continental regions		Above normal		✓	
Precip	Laptev Sea		No signal			
	Continental regions		No signal			
Sea-Ice	Break-up	Laptev sea ice covered, no ice edge for extent	Early	✓		
	Min Ice Extent September 2021		Near normal		✓	

Economy sector/ Livelihood conditions	Possible risk	Impacts associated
Livelihood conditions	Thermal comfort is not under risk	Bioclimatic thermal conditions are favorable
Forestry		Possibility of forest fires
Hunting		Favorable
Shipping		Shipping across the Northern Sea Route is expected to be start earlier than normal with safe and easy ice conditions for the independent navigation of large-capacity tankers, gas carriers and bulk vessels. Cargo navigation for all vessel classes to the Chukchi sea from the Pacific Ocean will start earlier.

# Chukchi & Bering



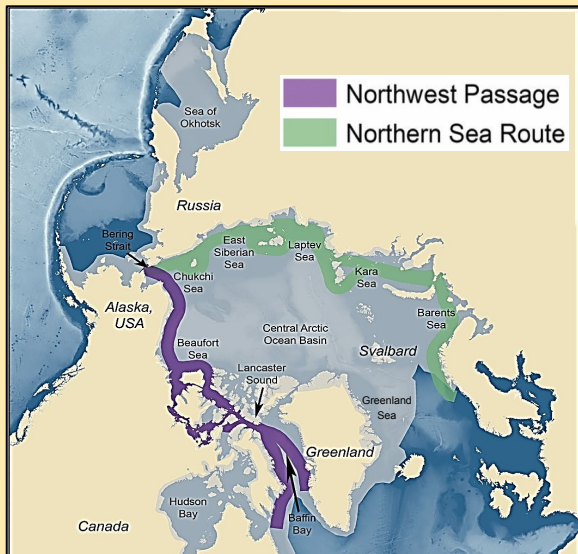
## Seasonal Summary: Winter 2021

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

<b>Temperature</b> Normal 1961-1990	+1.2°C	19	Warmest year was 2018 (+6,7°C)	Coldest year was 2002 (-2,3°C)
<b>Snow Cover</b> Normal 1981-2010	Above normal			
<b>Sea-Ice</b> Since 1979	March maximum sea-ice extent: Sea of Okhotsk – Below to near normal Chukchi sea, ice covered			

## OBSERVED EXTREME CLIMATE EVENTS WINTER 2021

Category	Duration	Rarity	Impacts associated with event
Heavy snowfall and wind	3-5 March 2021	Unusual	In the Anadyr region of the Chukotka Autonomous Okrug due to a strong wind (27-32 m / s, on the coast up to 44 m / s), traffic stopped, there were interruptions in electricity and heat supply to Anadyr





# Chukchi & Bering

Outlook: June, July August (JJA) 2021				Multi Model Agreement		
Forecast				High	Moderate	Low
Temp	Bering sea		Above normal		✓	
	Eastern and Southern continental regions				✓	
	Eastern Siberian Sea, Chukchi sea, Northern coastal regions				✓	
Pre cip	Bering Sea and continental regions		Above normal			✓
	Eastern Siberian Sea, Chukchi sea		Above normal	✓		
Se a-ice	Break-up	Chukchi Sea	Early		✓	
		Bering Sea	Late			✓
	Min Ice Extent September 2021	Bering Sea	Near normal	✓		

Economy sector/  
Livelihood  
conditions

Possible risk

Impacts associated

Seal fishing

Hunting

Floods

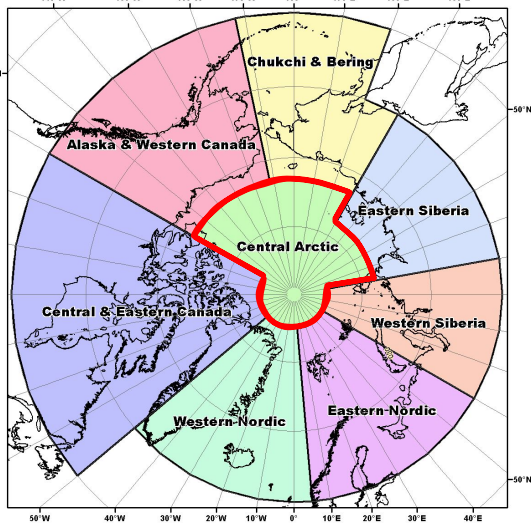
Mining and industry

Warm weather may causes a large number of midges (midges, mosquitoes) to clog the respiratory organs of the deer and lead to suffocation;  
Warm weather may shorten the distance for fish spawning on the Lena River - in August the fish will not reach villages in the middle reaches of the river

Above normal precipitation may increase the threat of river flooding in Indigirka and the Kolyma

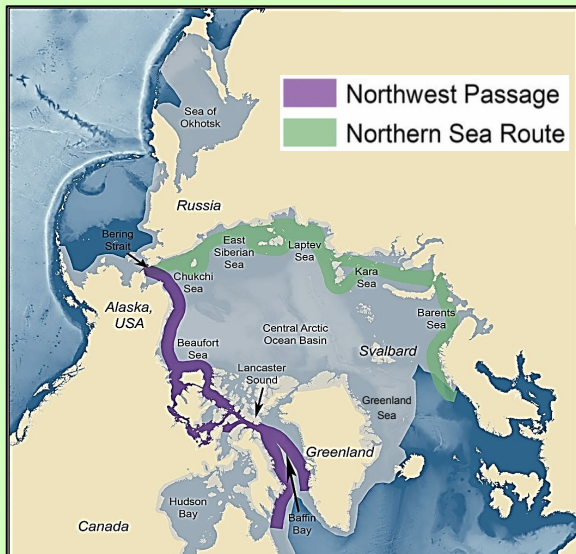
Stable production schedules of mining, oil and gas complexes for the shipment. Normal industrial activities (ship repair factories and fish processing enterprises) in Okhotsk Sea

# Central Arctic



Seasonal Summary: Winter 2021				
Observations above (+) and below (-) normal				
<b>Temperature</b> Normal 1961-1990	-2°C...+2°C	3	Warmest year was 2012 (+2.0°C)	Coldest year was 1963 (-0.7°C)
<b>Sea-Ice</b> Since 1979	March maximum sea-ice extent: region is fully covered ice volume the lowest from Oct 2020 to end of Jan 2021 for 2004-2020 with 2 <sup>nd</sup> in row in 2019, further till mid May 2021 the ice volume is 3 <sup>rd</sup> in row after 2017 and 2020			

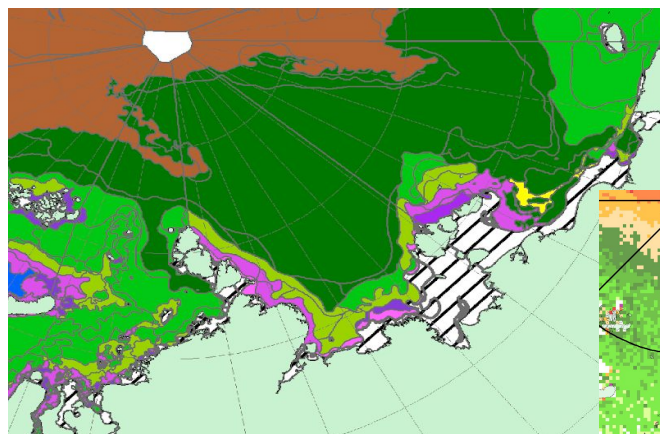
Outlook: June, July August (JJA) 2021			Multi Model Agreement		
Forecast			High	Moderate	Low
Temp	Near the Alaskan, Chukchi, Eastern and Western Siberian regions			✓	
	North pole, European and Atlantic regions			✓	
Precip	All regions		Near normal	✓	
Sea-Ice	Break-up	Ice covered, no forecast			



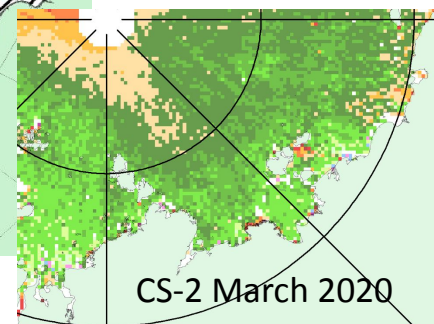
# Ice thickness

Most of polar stations measurements show decrease ice thickness in comparison to multiyear average values (observation series since 1930s-1940s) and to last 15 years average.

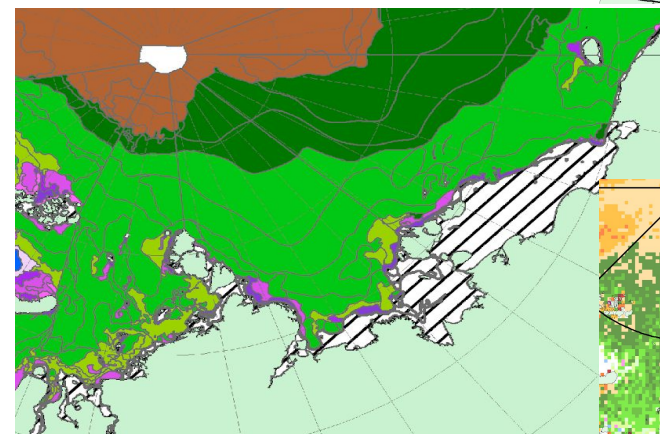
Ice thickness growth process was slower, transition to the sequential stages of ice development was observed about 1 month later (in some Eurasian Seas).



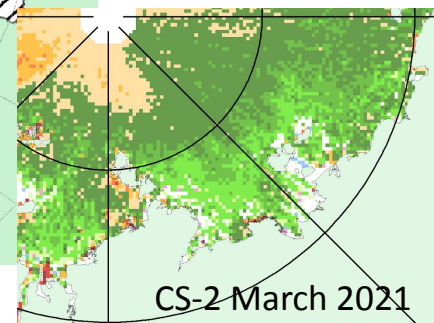
mid-March 2020



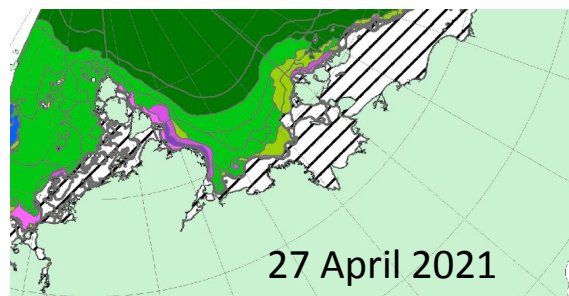
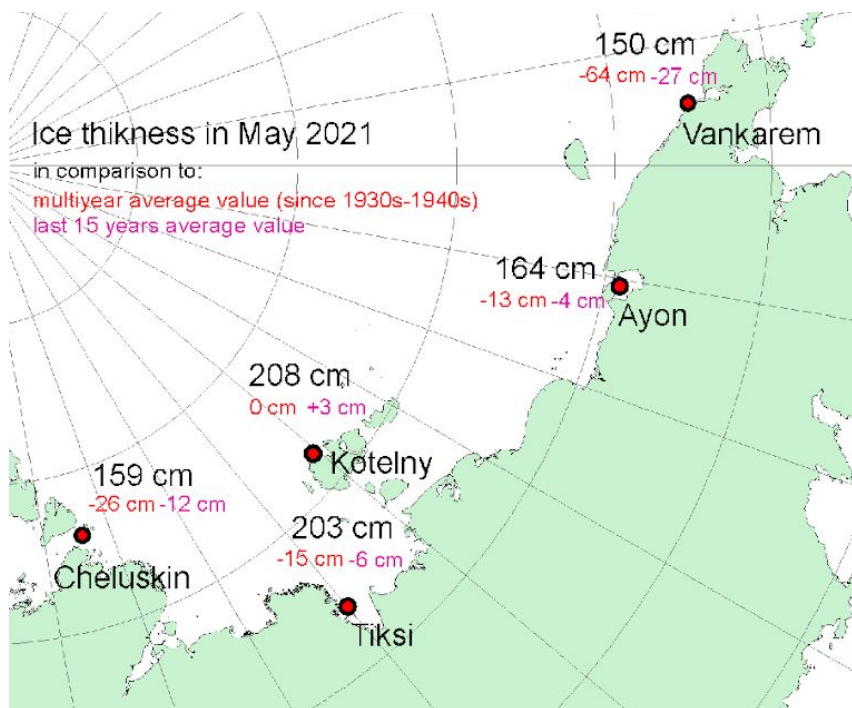
CS-2 March 2020



mid-March 2021



CS-2 March 2021



27 April 2021

Fast ice area formation in some Seas occurred later. But in April-May it takes area close to the multiyear norm.

# Other events in Eurasian and Central Arctic

- ❖ Ice tests of 2 vessels of ARC 7 ice class:



□ tanker for the transportation of gas condensate "Yuri Kuchiev" by the shipbuilding company Arctech Helsinki Shipyard.  
In April, in Kara Sea.

□ gas carrier the Yamalmax-type "Vladimir Voronin", by the South Korean shipbuilding company DSME.  
In May, in Kara Sea.

- ❖ The volume of cargo transportation on the Northern Sea Route (NSR) increase and reached a historic high in 2020 (33 million tons)
- ❖ Barneo-2021 ice camp in late March – April cancelled again due to COVID-2019





**ACF**

Arctic Climate Forum

Thank you for your attention!



Arctic Regional Climate Center  
Network