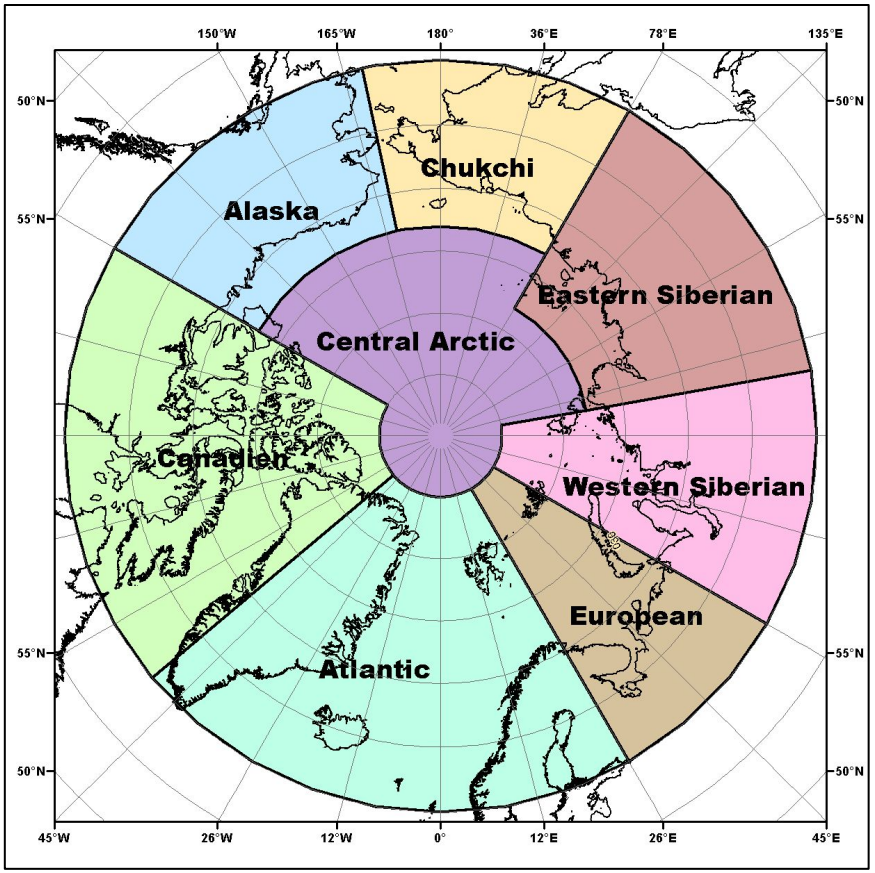
Arctic Climate Forum
October 2019

ACF
Arctic Climate Forum

Non-Technical Review: Summary of Summer 2019 and Outlook for Winter 2019/20

Arctic Regional Climate Center

Presentation Overview



<u>North America Node</u>

- Alaska
- Canadian

<u>European Node</u>

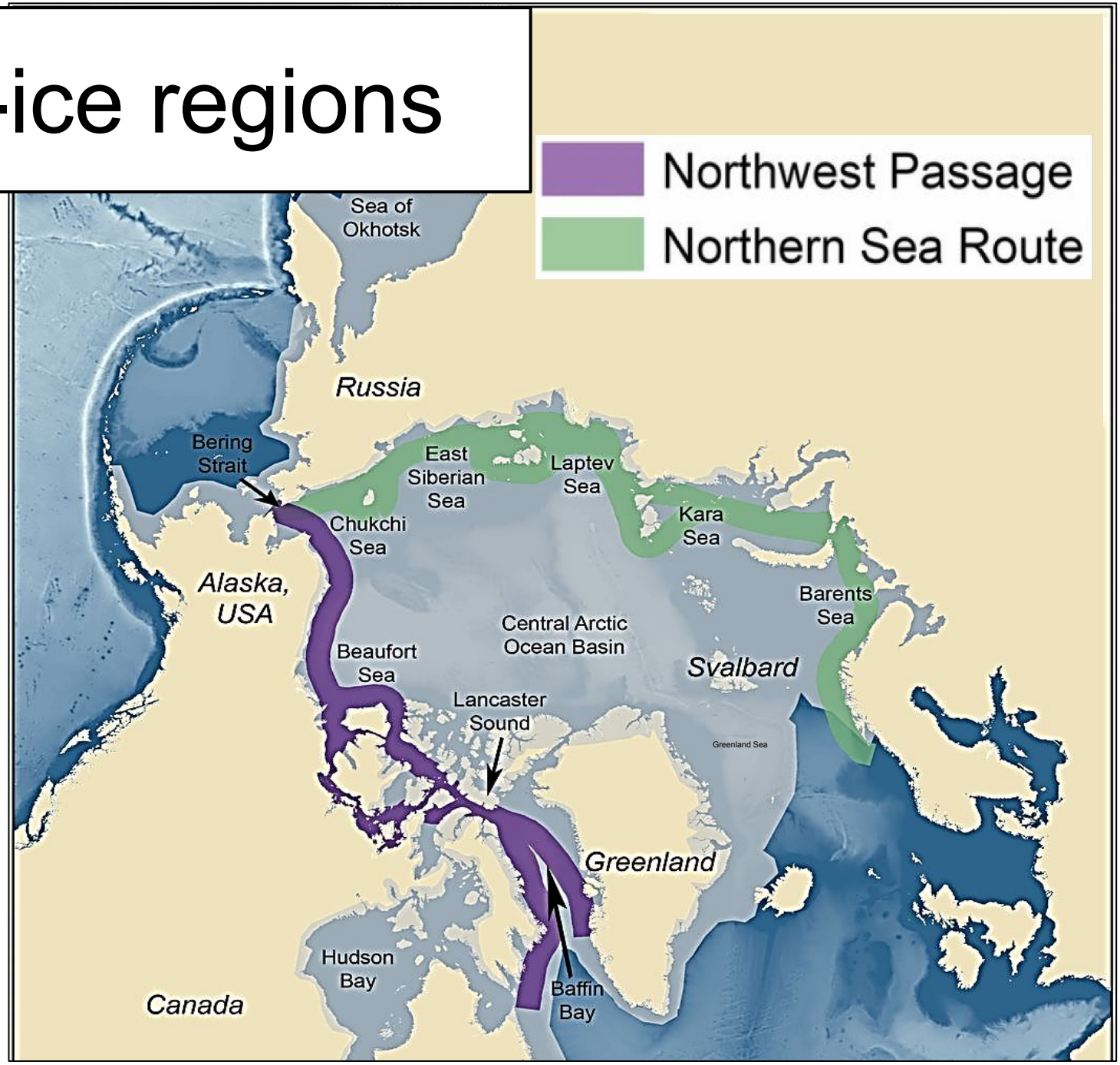
- Atlantic
- European

<u>Eurasian Node</u>

- Western Siberian
- Eastern Siberian
- Chukchi

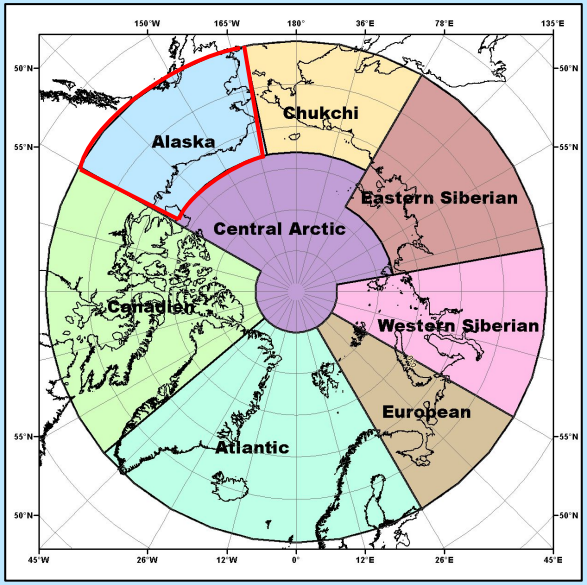
Central Arctic

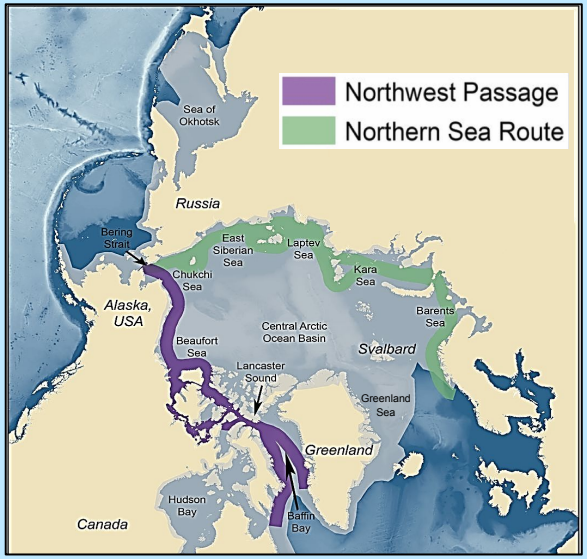
Sea-ice regions



North American Node

Alaska





Seasonal Summary: Spring & Summer 2019

Observations above (+) and below (-) normal

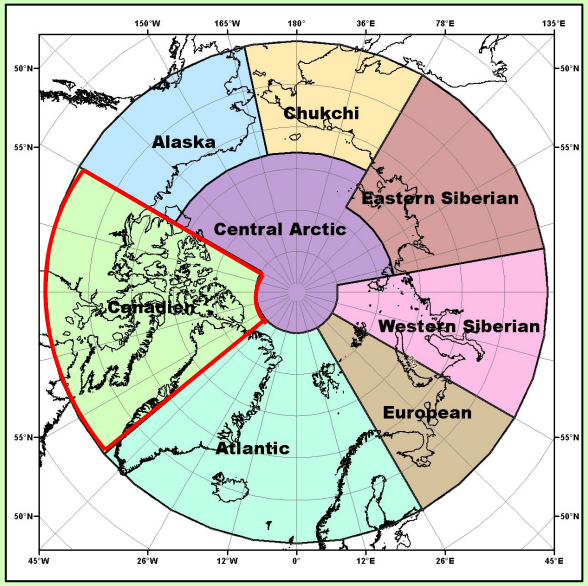
Temperature Normal 1961-1990	+1.9˚C	2nd warmest year on record	Warmest year was 2004 (+2.9˚C)	Coldest years were 1945 & 1955 (-1.3˚C)
Precipitation Normal 1961-1990	+13.1%	Drier in the Aleutian islands, wetter in the north, rest of Alaska relatively normal	Wettest year was 1951 (+65 %)	Driest year was 1968 (-46 %)
Snow Cover Normal 1981-2010	Duration: normal, eastern areas below normal		Depth: below normal	
Sea-Ice Since 1979	September minimum sea-ice extent: Beaufort sea below normal and Chukchi sea below to near normal.			

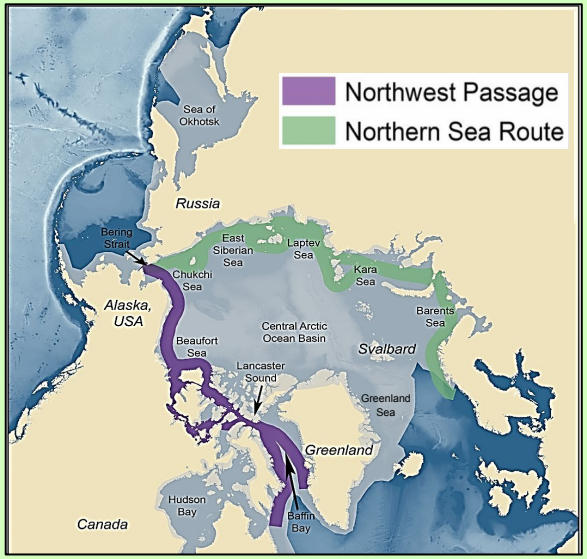
Outlook: November, December, January 2019/20				**Multi Model Agreement**		
Forecast				**High**	**Moderate**	**Low**
Temp	Bering, Chukchi & Beaufort seas		Above normal	✓		
	Northern coastal Alaska			✓		
	Western coastal and interior Alaska					✓
	Southern Alaska					✓
Precip	Chukchi and Beaufort seas		Above normal	✓		
	Bering sea				✓	
	Continental Alaska					✓
Sea-Ice	**Freeze-up**	Chukchi Sea	Later than normal	✓		
		Beaufort Sea		✓		
		Bering Sea				✓
	Maximum Ice Extent March 2020	Bering Sea	Below normal			✓

Impacts:

- Lack of sea ice and increasing storminess likely to result in coastal erosion and flooding
- Increase rate of thawing permafrost may result in faster coastal erosion
- All marine mammals with habitat on sea ice may be more difficult to harvest
- Crabbing for coastal communities may be impacted owing to lack of stable ice nearshore

Canadian





Seasonal Summary: Spring & Summer 2019

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	+1.7˚C	5th warmest year on record with the exception of colder conditions in the Northwestern territories	Warmest year was 2012 (+2.3˚C)	Coldest year was 1972(-1.6˚C)
Precipitation Normal 1961-1990	+11.6%	Wetter conditions except in Southern Baffin Island and Hudson Strait were below normal	Wettest year was 2005 (+23.5 %)	Driest year was 1977 (-25 %)
Snow Cover Normal 1981-2010	Duration: slightly above normal in the Northwest territories and slightly below normal in the Yukon and Nunavut		Depth: below normal	
Sea-Ice Since 1979	September minimum sea-ice extent: Beaufort Sea near normal			

Outlook: November, December, January 2019/20

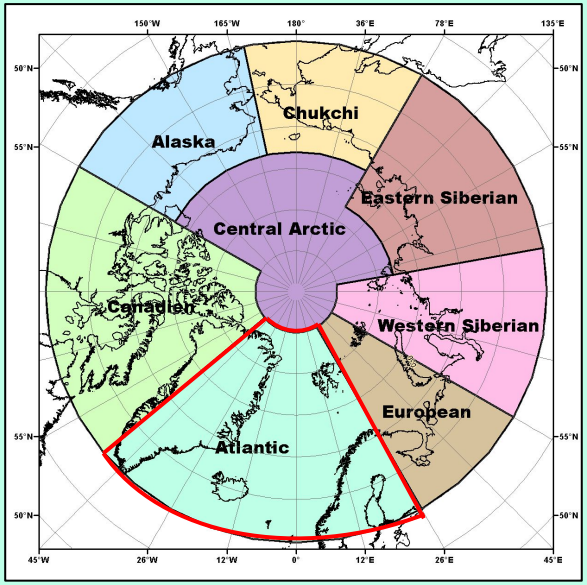
	Forecast			Multi Model Agreement: High	Moderate	Low
Temp	Beaufort Sea, Foxe Basin, Baffin Bay		Above normal	✓		
	Canadian Arctic Archipelago, northern Yukon, Hudson Bay and sub-Arctic				✓	
	Canadian sub-arctic and southern Yukon					✓
Precip	Beaufort Sea and Baffin Bay		Above normal		✓	
	Remaining areas					✓
Sea-Ice	**Freeze-up**	Beaufort Sea	Later than normal	✓		
		Baffin Bay/Labrador Sea			✓	
		Hudson Bay	Near normal		✓	
	Maximum Ice Extent March 2020	Labrador Sea:	Below normal		✓	
		Gulf of St. Lawrence:				✓

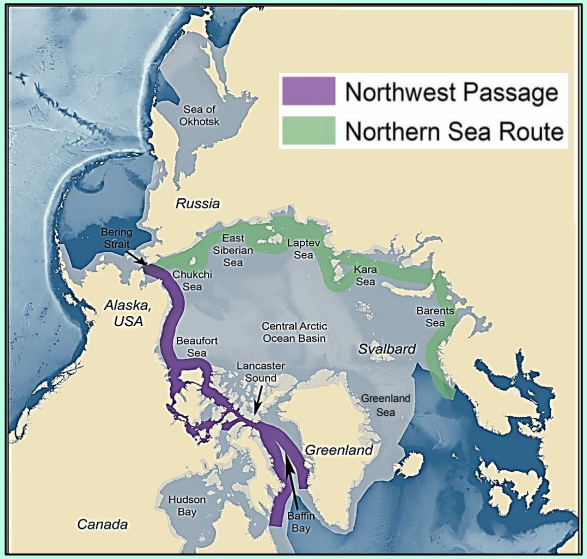
Impacts:

- In the Gulf of St. Lawrence, ice extent is likely to be higher, and there may be regions with thicker ice than the last 4 winter seasons. These conditions may cause difficulties with shipping through the centre of the region and to individual ports.
- Labrador coast: ice conditions are expected to be near normal and similar to the last 4 years.

Nordic Node

Atlantic





Seasonal Summary: Spring & Summer 2019

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	+1.5˚C	3rd warmest year on record	Warmest year was 2003 (+1.9˚C)	Coldest year was 1965 (-0.7˚C)
Precipitation Normal 1961-1990	-2%	Drier than normal, especially in southern Greenland	Wettest year was 1964 (+20.5%)	Driest year was 1968 (-24.9%)
Snow Cover Normal 1981-2010	Duration: normal		Depth: normal	
Sea-Ice Since 1979	September minimum sea-ice extent: Greenland sea below normal			

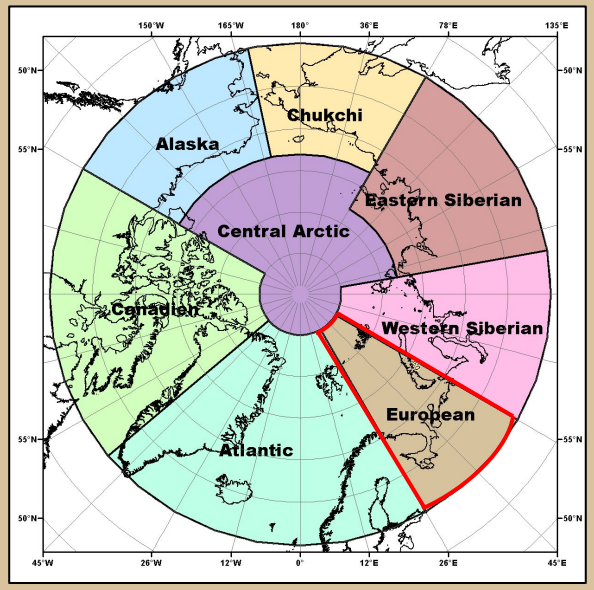
Outlook: November, December, January 2019/20

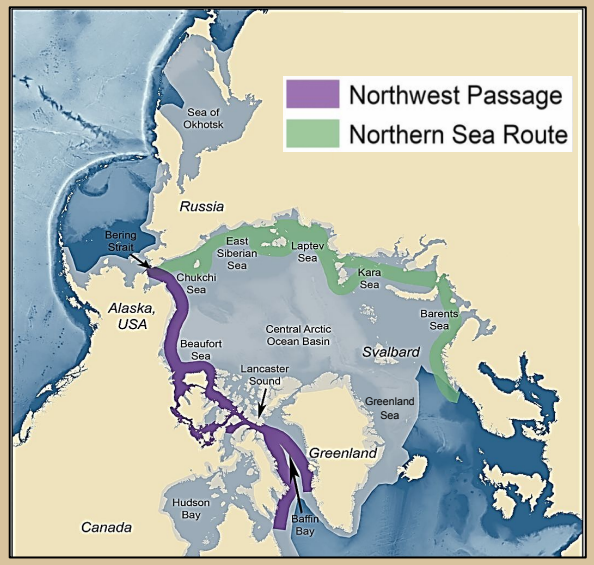
	Forecast			Multi Model Agreement		
				High	Moderate	Low
Temp	Greenland and Norwegian seas		Above normal	✓		
	Svalbard and along the coast of northern Greenland and the Baltic sea				✓	
	Iceland, Scandinavia					✓
	North Atlantic		Below Normal	✓		
	Continental Greenland		No Forecast	No Agreement		
Precip	Scandinavia		Above normal			✓
	Norwegian and Barents seas, North Atlantic and southern continental Greenland		Below Normal			✓
	Continental Greenland, Iceland		No Forecast	No Agreement		
Sea-Ice	**Freeze-up**	Greenland Sea	Later than normal		✓	
	Maximum Ice Extent March 2020	Greenland Sea	Near normal	✓		

Impacts:

- N/A

European





Seasonal Summary: Spring & Summer 2019

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	0˚C	Average conditions, but cooler temperature over the continent	Warmest year was 2013 (+2.8˚C)	Coldest year was 1969 (-1.6˚C)
Precipitation Normal 1961-1990	+4.8%	Slightly more rain along the Murmansk coast	Wettest year was 1981 (+28 %)	Driest year was 1980 (-32 %)
Snow Cover Normal 1981-2010	Duration: normal		Depth: normal	
Sea-Ice Since 1979	September minimum sea-ice extent: Barents sea near to above normal			

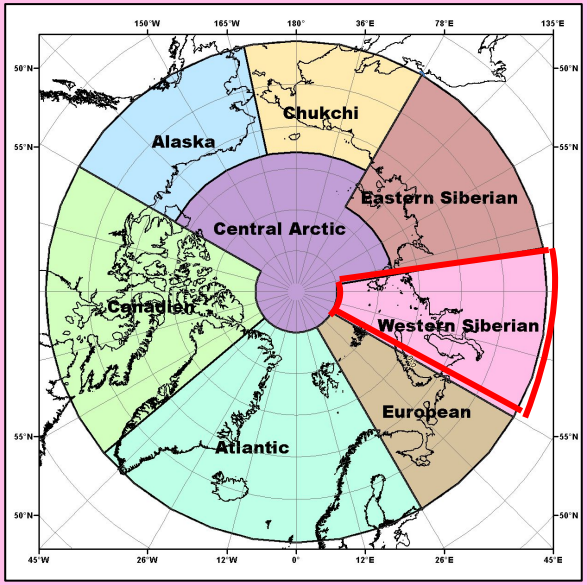
Outlook: November, December, January 2019/20				**Multi Model Agreement**		
Forecast				**High**	**Moderate**	**Low**
Temp	Barents Sea		Above normal	✓		
	Murmansk/White Sea		Above normal		✓	
	Continent		Above normal			✓
Precip	Murmansk Coast		Below normal			✓
	Continent		No forecast	No agreement		
Sea-Ice	**Freeze-up**	Barents sea	Earlier than normal		✓	
	Maximum Ice Extent March 2020	Barents sea	Near normal			✓

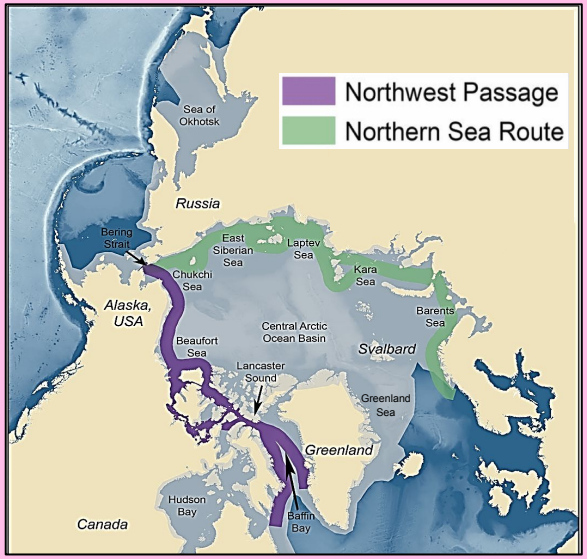
Impacts:

- N/A

Eurasian Node

Western Siberia





Seasonal Summary: Spring & Summer 2019

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	+1.4˚C	4th warmest year on record	Warmest year was 2016 (+3.6˚C)	Coldest year was 1968 (-1.6˚C)
Precipitation Normal 1961-1990	+12.3 %	Wettest region along the northern coast	Wettest year was 2002 (+ 22.6 %)	Driest year was 1946 (- 27.6 %)
Snow Cover Normal 1981-2010	Duration: normal		Depth: slightly above normal	
Sea-Ice Since 1979	September minimum sea-ice extent: Kara sea below normal			

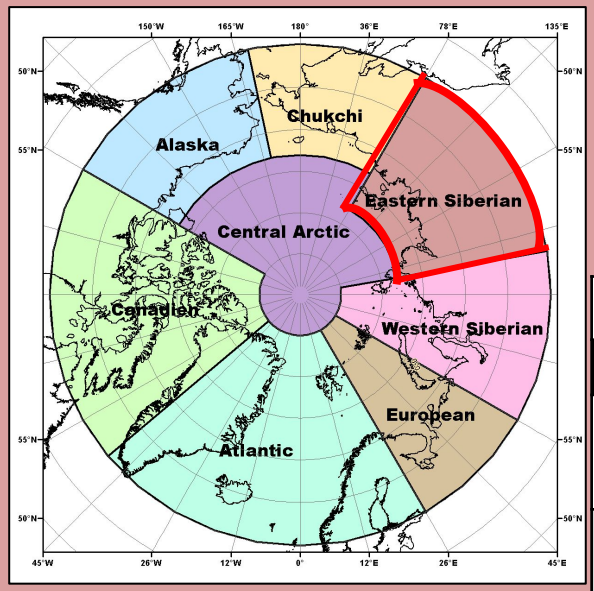
Outlook: November, December, January 2019/20

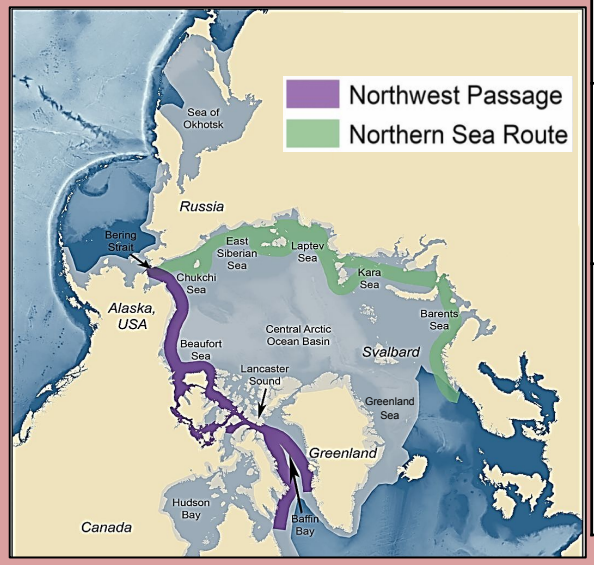
Forecast				Multi Model Agreement: High	Moderate	Low
Temp	Kara Sea		Above normal	✓		
	Northern continental regions		Above normal		✓	
	Southern continental regions		Above normal			✓
Precip	Murmansk coast		Below normal			✓
	Continent		No forecast	No agreement		
Sea-Ice	**Freeze-up**	Kara sea	Later than normal	✓		
	Maximum Ice Extent March 2020	Kara sea ice covered, no ice edge for extent				

Impacts:

- Climate conditions may be favorable for extending the duration of safe shipping conditions for the independent navigation of large-capacity tankers, gas carriers and bulk vessels for gas and oil exports in Northern Sea Route;
- May lead to energy savings for shipping with reduced need for icebreaking and escort support.
- May stabilize the production schedules of mining, oil and gas complexes for shipping and construction activities.
- Enhancing industrial and mining activities in Kara, Barents and Pechora seas.

Eastern Siberia





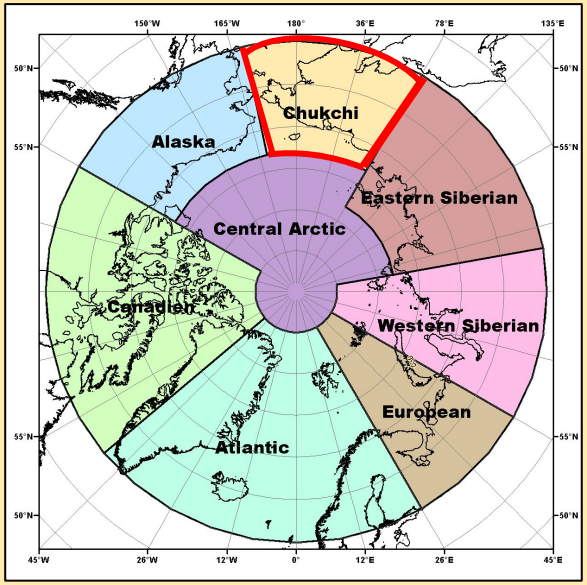
Seasonal Summary: Spring & Summer 2019				
Observations above (+) and below (-) normal				
Temperature Normal 1961-1990	+2.9˚C	Warmest year on record	Warmest year was 2019 (+2.9˚C)	Coldest year was 1989 (-1.2˚C)
Precipitation Normal 1961-1990	-18.3 %	Drier than normal except along the northern coast	Wettest year was 1988 (+25.2%)	Driest year as 1967 (-21.6%)
Snow Cover Normal 1981-2010	Duration: normal		Depth: slightly below normal	
Sea-Ice Since 1979	September minimum sea-ice extent: Laptev sea near to above normal			

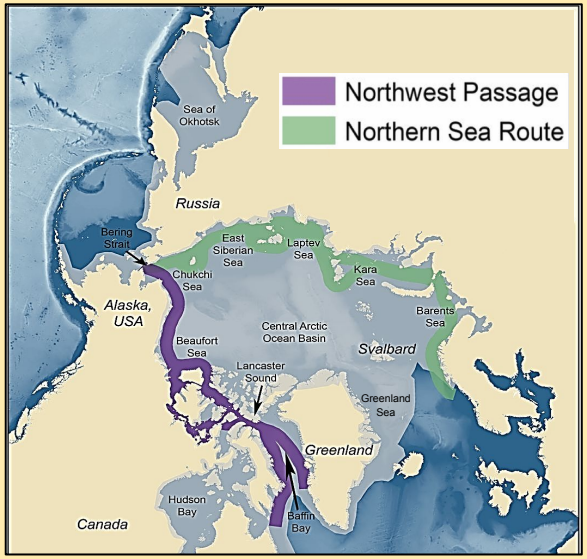
Outlook: November, December, January 2019/20				Multi Model Agreement		
	Forecast			High	Moderate	Low
Temp	Laptev Sea		Above normal	✓		
	Continental regions				✓	
Precip	Laptev Sea		Above normal	✓		
	Coastal regions				✓	
	Continental regions					✓
Sea-Ice	**Freeze-up**	Laptev Sea	Later than normal	✓		
	Maximum Ice Extent March 2020	Laptev sea ice covered, no ice edge for extent				

Impacts:

- May lead to energy savings for shipping with reduced need for icebreaking and escort support.
- May stabilize the production schedules of mining, oil and gas complexes for shipping and construction activities.
- Positive temperatures and above normal precipitation may lead to increased freezing rain and less snow which could impact hunting activities on the tundra in Eastern Siberia.

Chukchi





Seasonal Summary: Spring & Summer 2019

Observations above (+) and below (-) normal

Temperature Normal 1961-1990	+2.7˚C	2nd warmest year on record	Warmest year was 2007 (+2.9˚C)	Coldest year was 1949 (-1.3˚C)
Precipitation Normal 1961-1990	-18.9 %	Driest region east of Chukotka and east Siberian sea. Wettest region sea of Okhotsk	Wettest year was 1954 (+39.6 %)	Driest year was 1982 (-39.8%)
Snow Cover Normal 1981-2010	Duration: Normal		Depth: Slightly below normal	
Sea-Ice Since 1979	September minimum sea-ice extent: East Siberian sea near normal and Chukchi below normal (lowest May-August sea ice extent on record)			

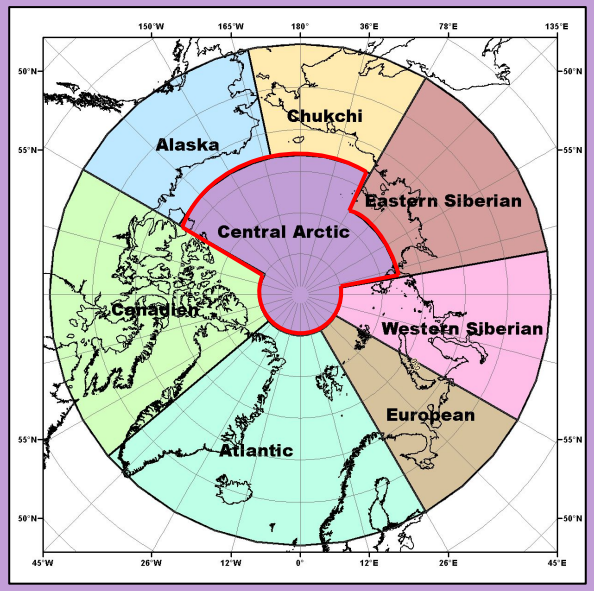
Outlook: November, December, January 2019/20

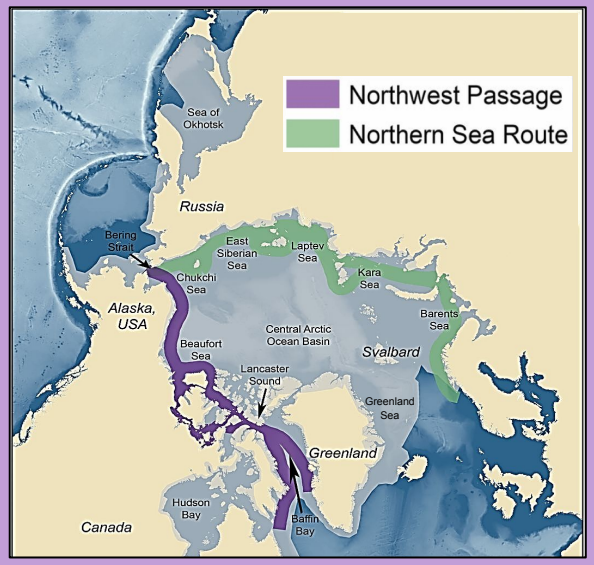
	Forecast			Multi Model Agreement: High	Moderate	Low
Temp	Eastern Siberian Chukchi and Bering seas and for the coastal regions		Above normal	✓		
	Northern continental regions				✓	
	Southern continental regions					✓
Precip	Chukchi Sea		Above normal	✓		
	Northern continental regions				✓	
	Southern continental regions					✓
Sea-Ice	**Freeze-up**	East Siberian and Chukchi Seas	Later than normal	✓		
		Bering Sea and Sea of Okhotsk				✓
	Maximum Ice Extent March 2020	Bering Sea below normal and Sea of Okhotsk below to near normal	Below normal			✓

Impacts:

- May lead to energy savings for shipping with reduced need for icebreaking and escort support.
- On-ice hunting is at risk with increased storm activity expected in early winter (NDJ).
- Warm conditions and increased storm activity could impact the stopover habitat period in the coastal area of Condor islands for migrating land birds.

Central Arctic





Seasonal Summary: Spring & Summer 2019				
Observations above (+) and below (-) normal				
Temperature Normal 1961-1990	+1.9˚C	2nd warmest year on record	Warmest year was 2012 (+2.0˚C)	Coldest year was 1963 (-0.7˚C)
Precipitation Normal 1961-1990	+3.2 %	Wettest region along the Alaska and West Siberia coast	Wettest year was 1989 (+27%)	Driest year was 1998 (-16%)
Sea-Ice Since 1979	N/A			

Outlook: November, December, January 2019/20			Multi Model Agreement		
	Forecast		High	Moderate	Low
Temp	Near the Alaskan, Chukchi, Eastern and Western Siberian regions	Above normal	✓		
	Near the European region			✓	
	Near the Atlantic region				✓
Precip	Near the Alaskan, Chukchi, Eastern and Western Siberian regions	Above normal	✓		
	Near the European regions			✓	
	Near the Atlantic region				✓
Sea-Ice	**Freeze-up**	Ice covered, no forecast			
	Maximum Ice Extent March 2020				

Impacts:

- N/A