

# Arctic Regional Climate Centre

**Review of 2019/20 Winter Sea-Ice Outlook  
Present the 2020 Summer Sea-Ice Outlook**

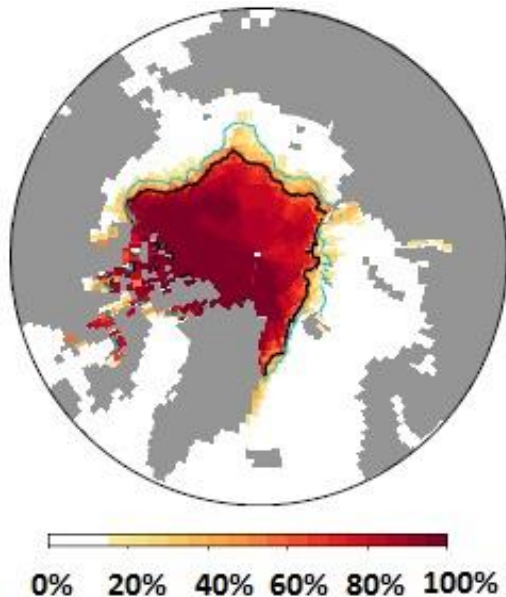
Scott Weese and Katherine Wilson  
Canadian Ice Service



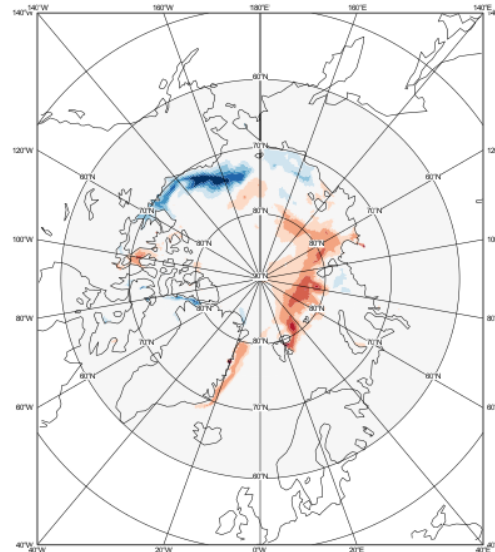
# Models used for the ArcRCC Sea-Ice Outlooks

- **Based on 4 experimental forecasts from 4 WMO Global Producing Centers Output:** France - ECMWF, United States- NOAA/CPC, Canada - ECCC/CCCMA and the UKMetOffice, 3 shown below)
- **Experts at the ArcRCC compare these models, so you don't have to, and develop products for users.**

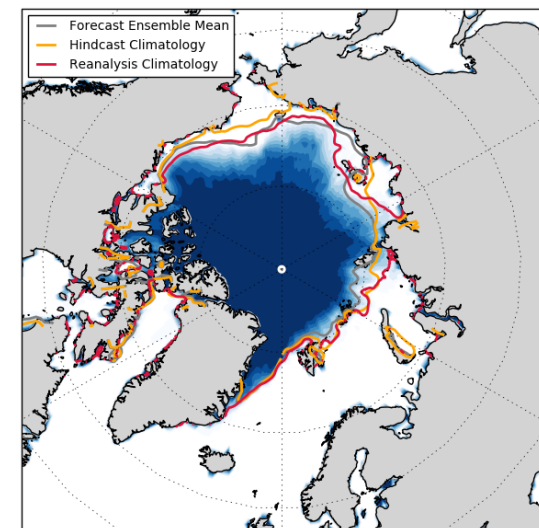
Probability of Sea Ice > 15%  
September 2018  
ECCC (CanCM3+CanCM4)



Sea Ice Concentration Anomaly  
September 2019  
ECMWF (SEAS5)



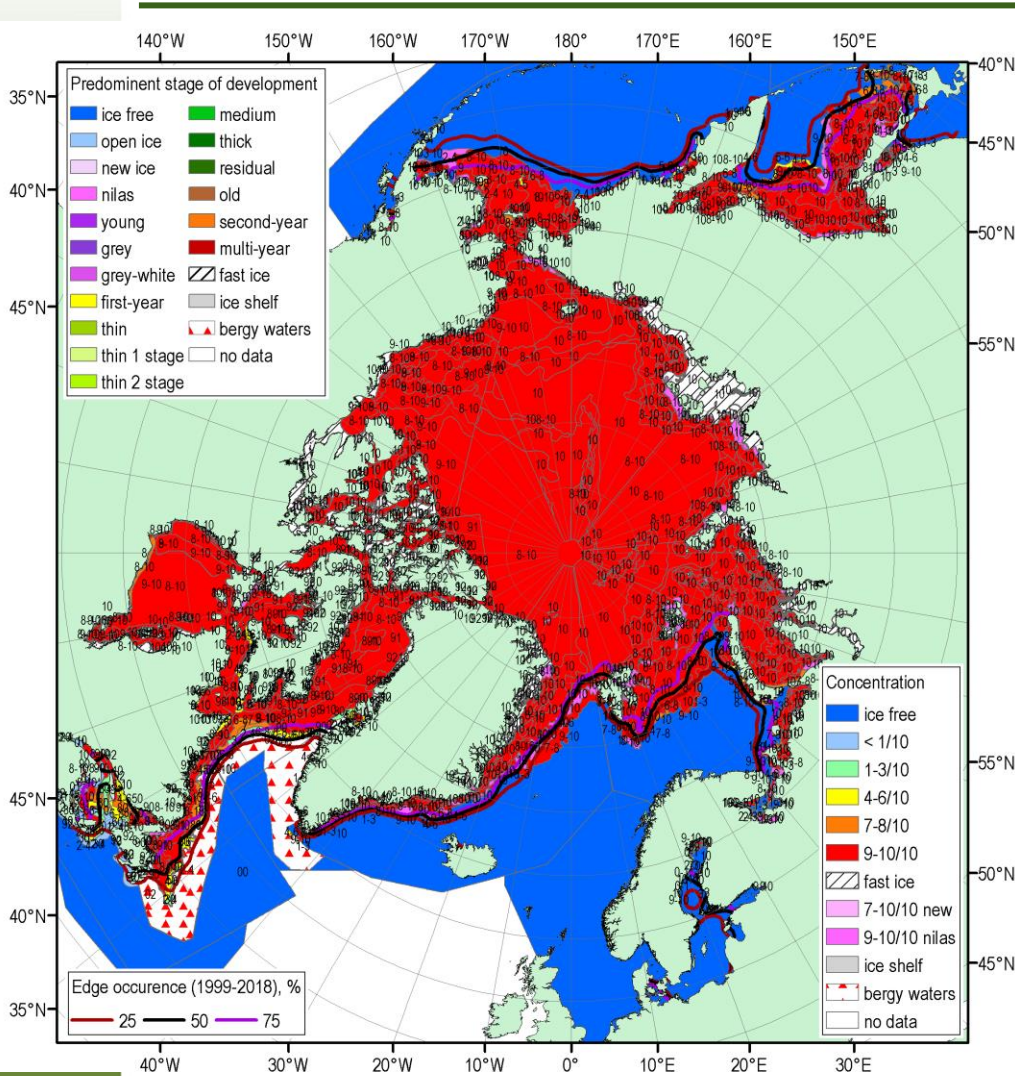
Probability of Sea Ice > 15%  
September 2019  
UK Met Office (GloSea5)



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**Review of 2019/20 Winter  
Arctic sea-ice conditions**

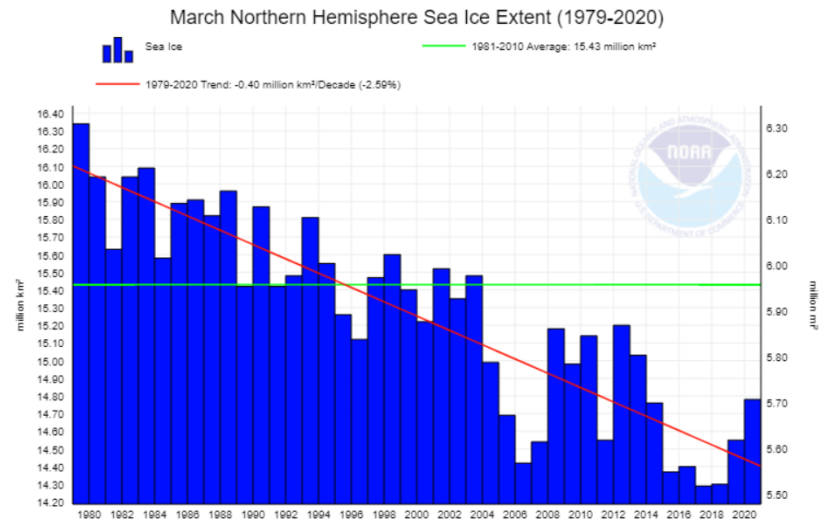
# Actual March 2020 Maximum Sea-Ice Extent



Source: Arctic and Antarctic Research Institute

Left: Blended weekly ice charts for mid-March 2020

Below: March Northern Hemisphere sea ice extent



Source: National Snow and Ice Data Center (NSIDC)

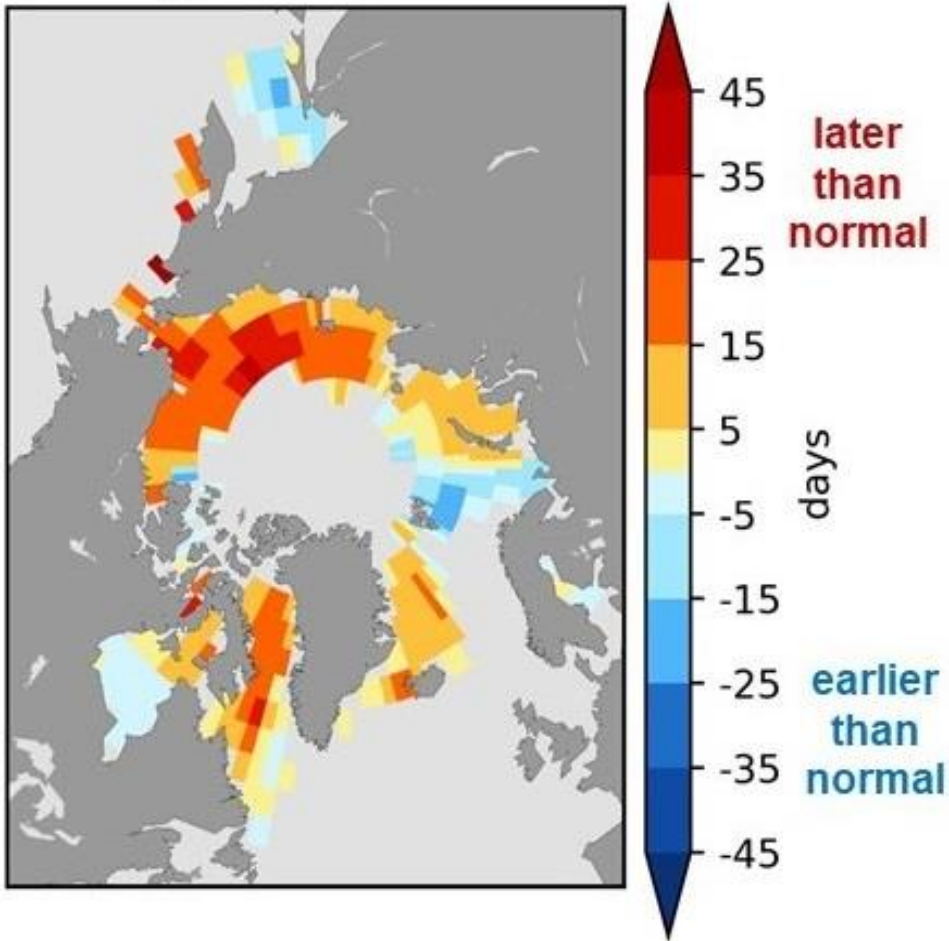
Source: National Snow and Ice Data Center

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**Comparison: Actual Winter 2019/20 Conditions  
with  
ArcRCC Sea-Ice Winter 2019/20 Outlook**

# A. ArcRCC Sea-Ice Freeze-up Outlook 2019 Categories

**Freeze-up Date Anomaly**  
Climatology Period 2009-2017



## **What is Normal freeze-up?**

- The average date when the ice concentration rises above 50%
- based on climatological period (2009-2017)

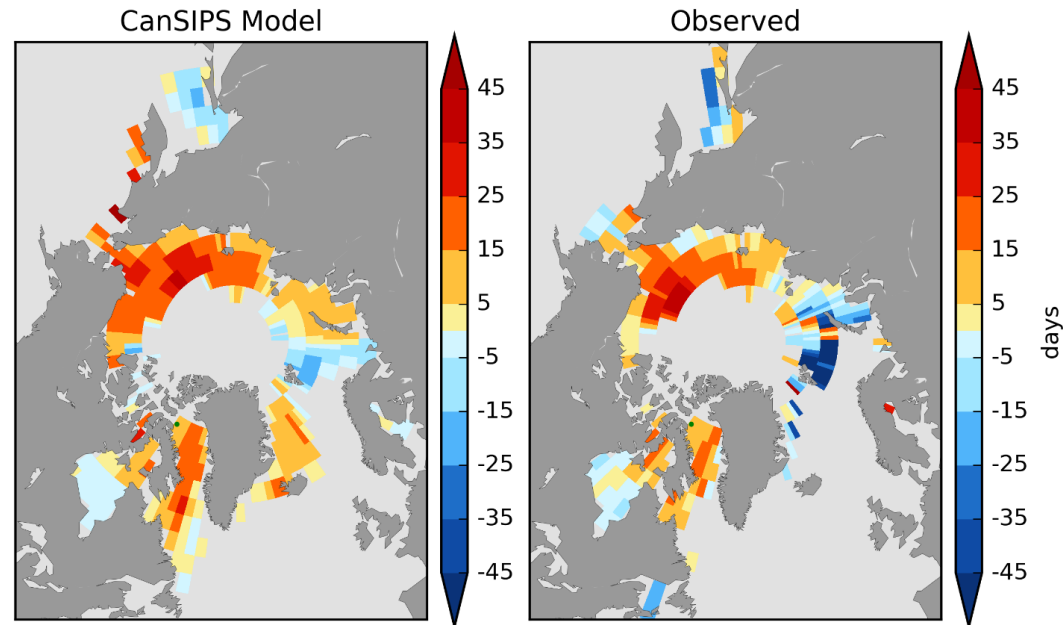
## **Freeze-Up Categories:**

- Late freeze-up
- Near normal freeze-up
- Early freeze-up
- Only regions where the model has historical skill are included in the outlook The freeze-up outlook has three confidence categories; low, moderate and high

# A. ArcRCC Sea-Ice Freeze-up Outlook 2019/20

## Actual vs. Outlook

Regions	CanSIPS Sea-Ice Forecast Confidence	CanSIPS Sea-Ice Forecast	Observed Freeze-up	CanSIPS Sea-Ice Forecast Accuracy
Hudson Bay	moderate to high	near normal	late freeze-up	low
Baffin Bay/Labrador Sea	moderate to high	late freeze-up	late freeze-up	high
Greenland Sea	moderate	late freeze-up	near normal to early freeze-up	low
Barents Sea	moderate	early freeze-up	early freeze-up	high
East Siberian/Laptev Seas	moderate to high			
Kara Sea	moderate			
Chukchi Sea	high			
Beaufort Sea	high			
Sea of Okhotsk	low			
Bering Sea	low			



# B. ArcRCC Sea-Ice Extent Outlook Winter 2020

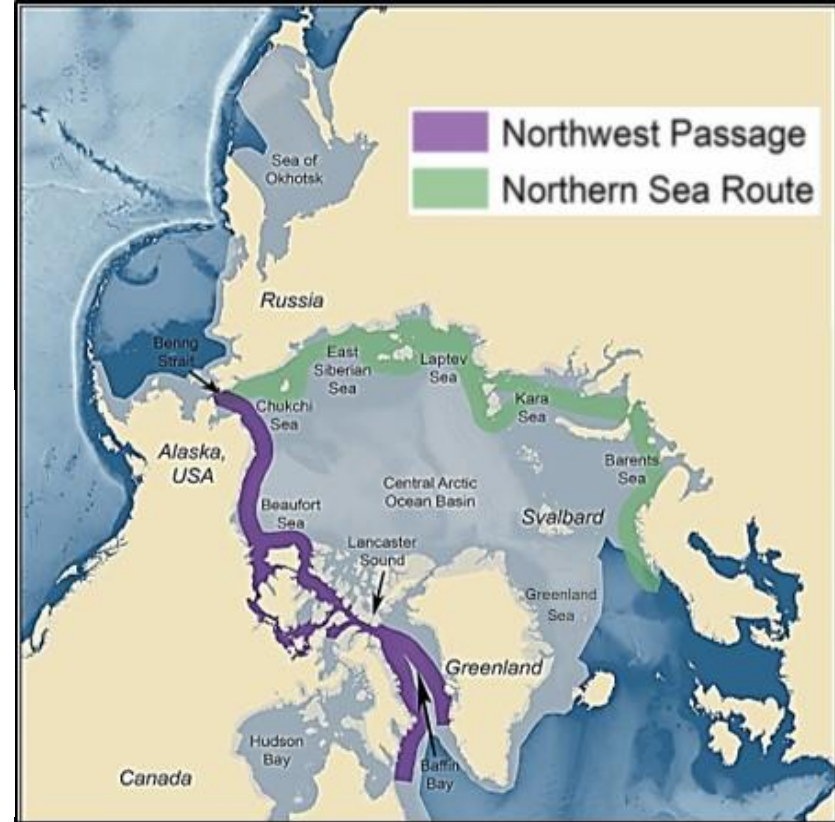
Actual vs. Outlook  
Maximum = March (Winter)

### Forecast Categories:

- Above normal ice extent
- Near normal ice extent
- Below normal ice extent

### Outlook Confidence Categories

- low agreement between the models
- moderate agreement between models
- high agreement between models



Regions	CanSIPS Sea-Ice Forecast Confidence	CanSIPS Sea-Ice Forecast (2009-2017 climate normal)	Observed Ice Extent (2009-2017 climate normal)	CanSIPS Sea-Ice Forecast Accuracy
Bering Strait	low	below normal	normal	low
Sea of Okhotsk	low	below to near normal	below to near normal	high
Barents Sea	low	near normal	below normal	low
Greenland Sea	high	near normal	below to near normal	moderate
Gulf of St. Lawrence	low	below normal	below to near normal	high
Labrador Sea	moderate	below normal	below to near normal	moderate



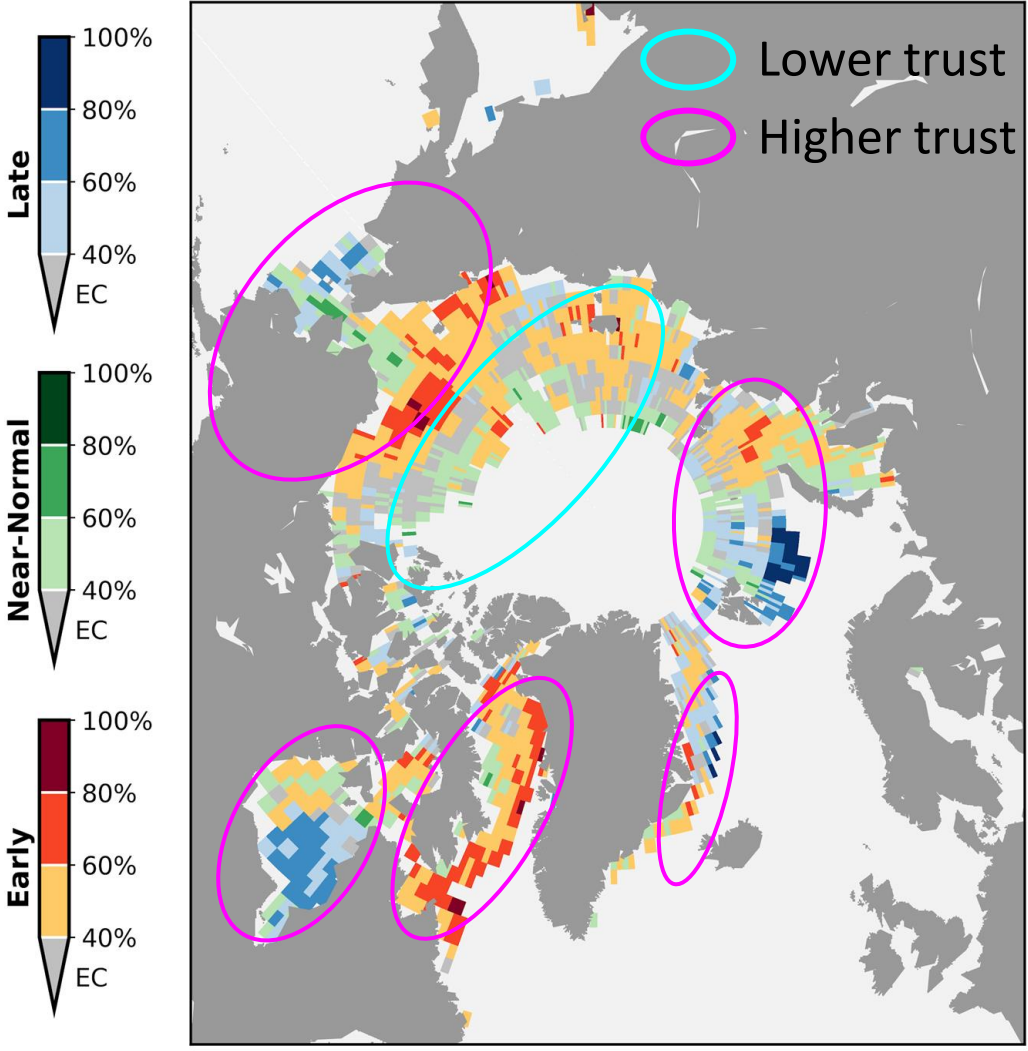


# **ArcRCC Sea-Ice Outlook**

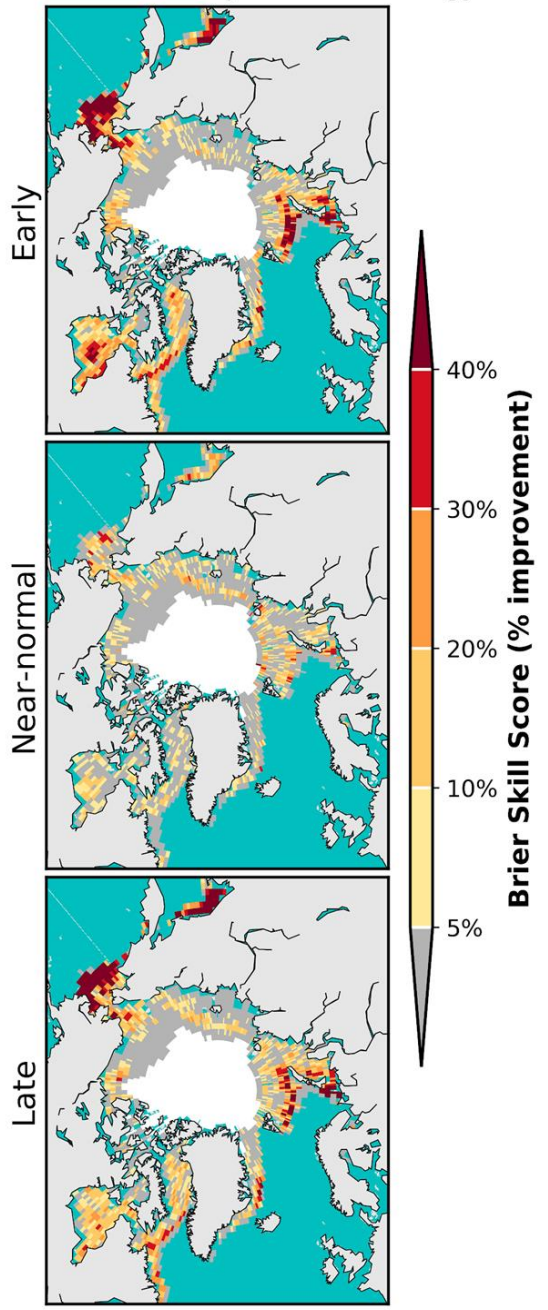
## **Summer 2020**

# C. ECCC Ice-Free Date Probability Forecast Summer 2020 (Experimental)

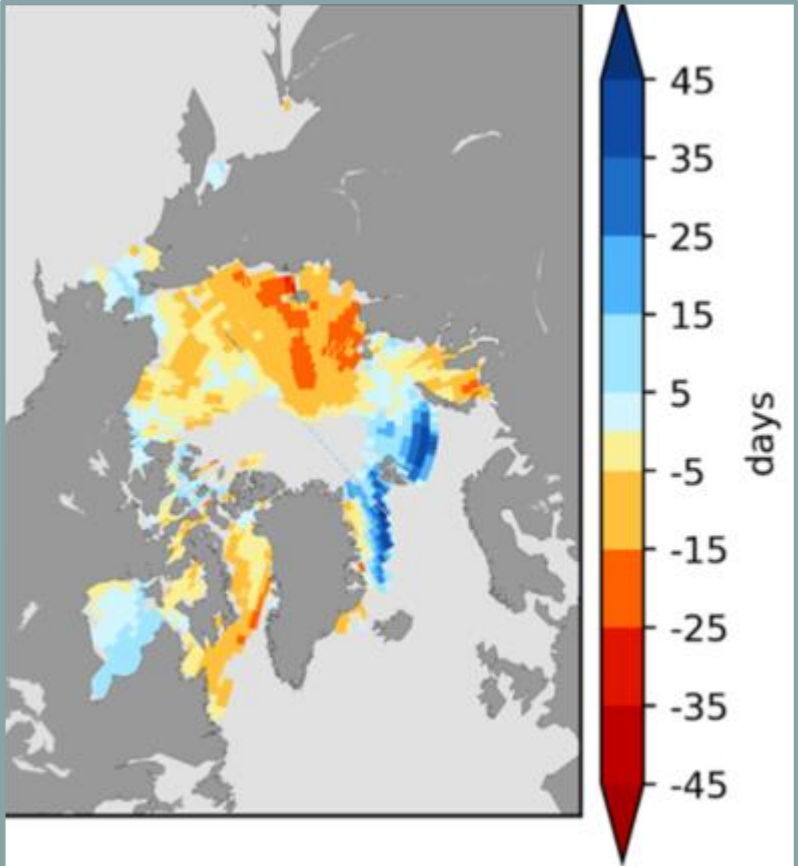
Probability for Early, Near-Normal, or Late Break Up From May 1, 2020 (cf 2011-2019)



Historical Skill (1990-2019)  
r.t. trend-adjusted climatology



# C. ArcRCC Sea-Ice Break-up Outlook 2020



Forecast for the 2020 spring/summer break-up expressed as an anomaly (difference from normal) where break-up is defined as the first day in a 10-day interval where ice concentration falls below 50%.  
 Source: CanSIPS (ECCC)

**What is Normal break-up?**

- The date when the ice concentration goes above 50%
- based on climatological period (2009-2017)

**Break-Up Categories:**

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

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

# D. ArcRCC Sea-Ice Extent Outlook Summer 2020

Minimum = September

## What is Normal ?

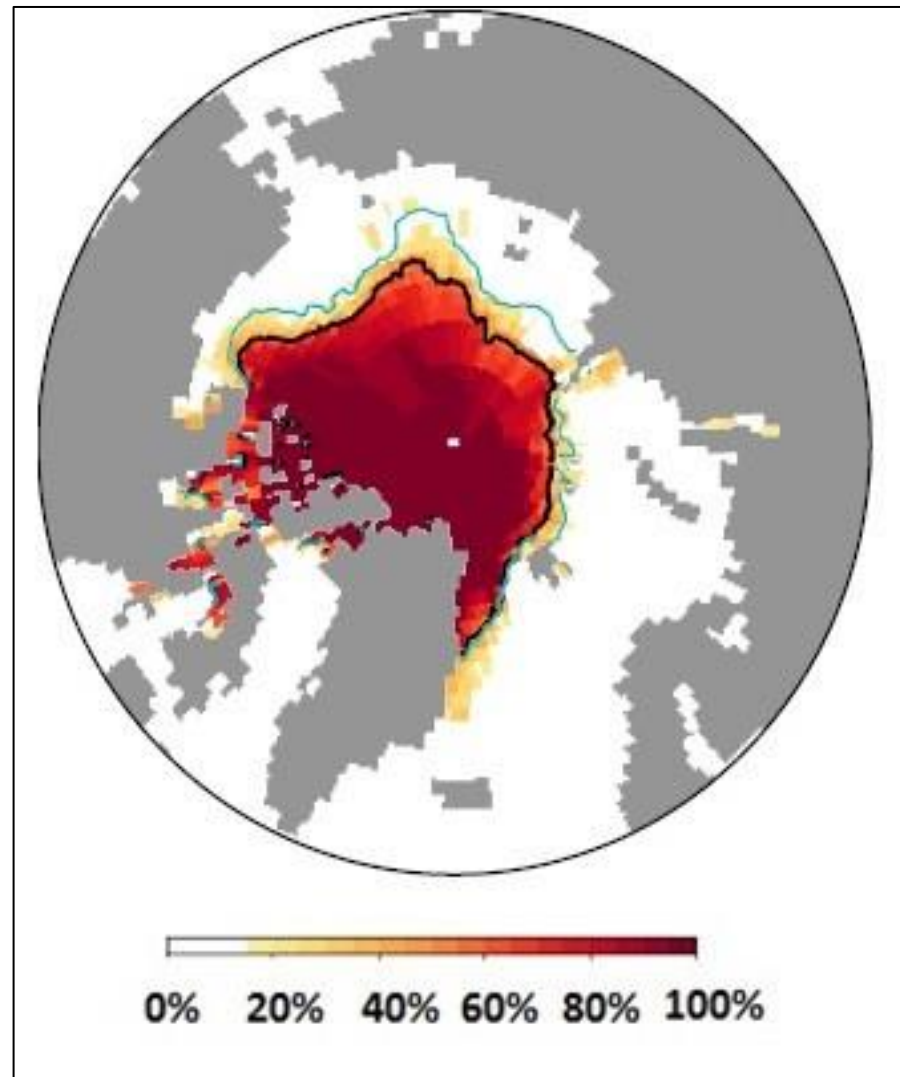
Average ice extent based on conditions from 2009-2017.

## Forecast Categories:

- Above normal ice extent
- Near normal ice extent
- Below normal ice extent

## Outlook Confidence

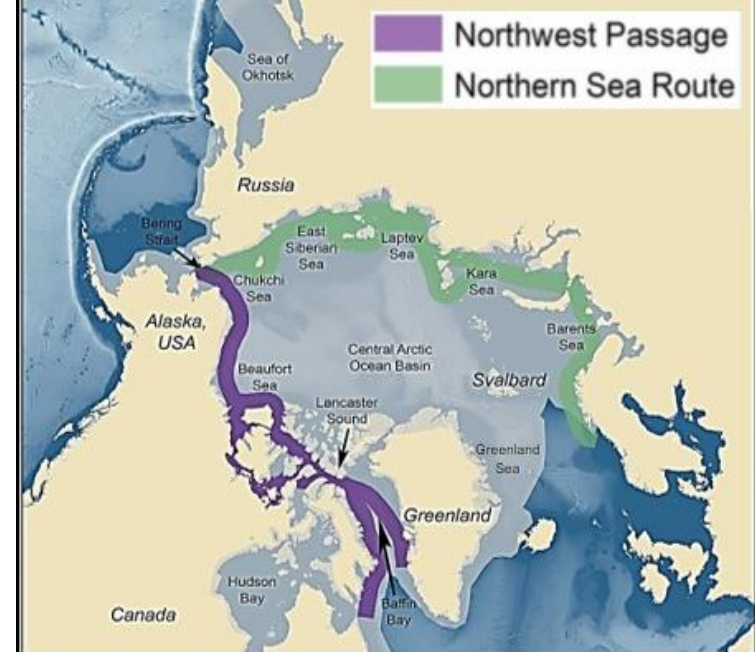
- low agreement between the models
- moderate agreement between models
- high agreement between models



Source: CanSIPS (ECCC)

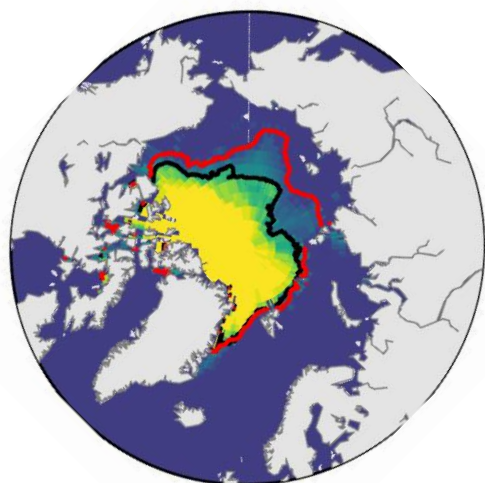
# D. ArcRCC Sea-Ice Extent Outlook Summer 2020

## Minimum = September



September 2020 sea ice probability of ice concentration > 15%

— observed mean ice edge (2011-2019)  
 — forecast median ice edge

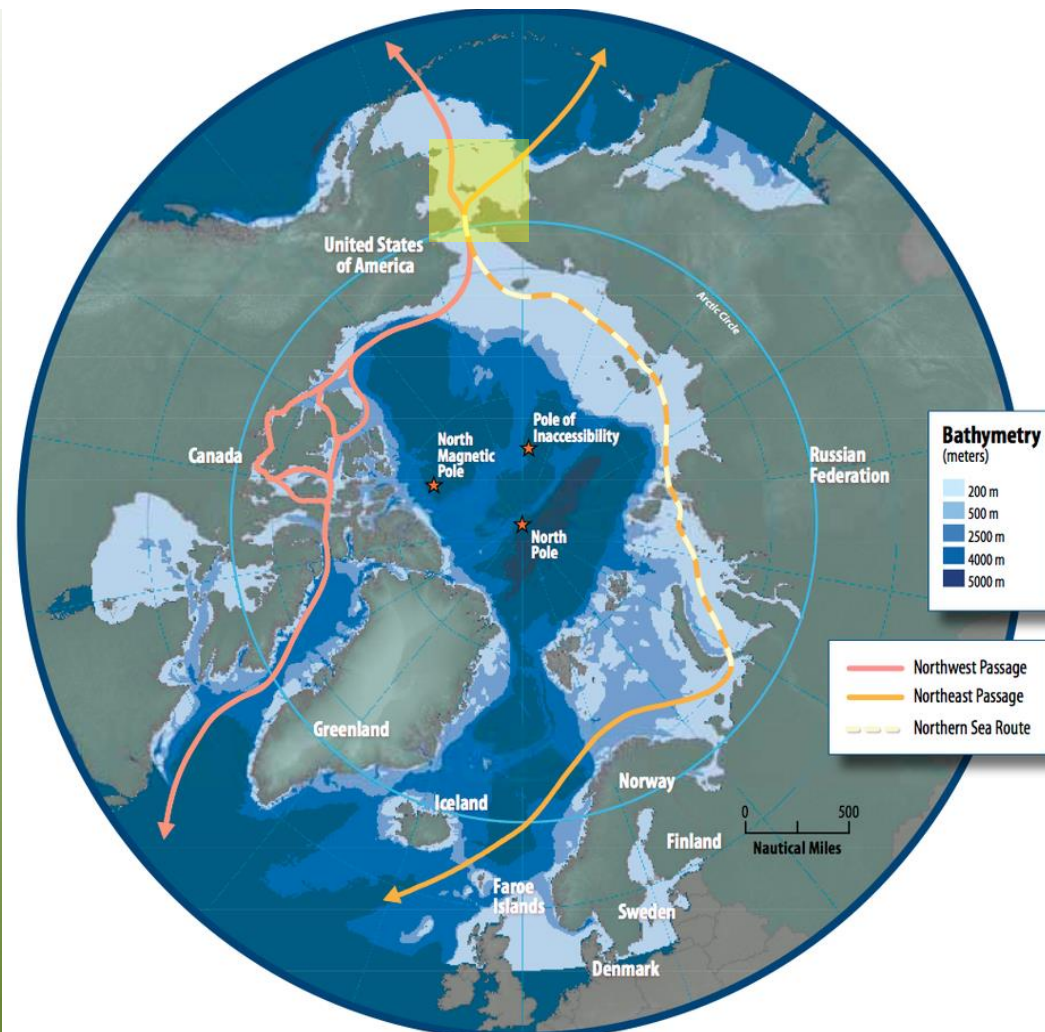


Regions	CanSIPS Sea-Ice Forecast Confidence	CanSIPS Sea-Ice Forecast
Barents Sea	Low	Above normal (northern section)
Beaufort Sea	Moderate	Below normal
Canadian Arctic Archipelago	Moderate	Below normal
Chukchi Sea	High	Below normal
Eastern Siberian Sea	Moderate	Below normal
Greenland Sea	High	Above normal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

September 2020 probability of sea ice at concentrations greater than 15% from CanSIPsv2 (ECCC). Forecast median ice extent from CanSIPsv2 (black) and observed mean ice edge 2011-2019 (red).

## E. 2020 Summer Ice Conditions in Key Shipping Areas

Produced by the National Ice Services (forecaster experience and statistical methods)



### Bering Sea

Bering Sea ice extent has been below 1981-2010 average since early March and is currently at about 75% of the 30-year median for this date.

There will be limited ice remaining in the Bering Sea by the end of May 2020

Figure from Arctic Council - Arctic marine shipping assessment

## Coastal Beaufort Sea

Break-up of sea ice is expected to be earlier than normal throughout the Northwest Passage this summer, and areas of consolidated ice will become mobile earlier in the season than normal.

Anomalous concentrations of old ice are a potential hazard for the northern route and the western portion of the passage, as higher than normal amounts of old sea ice are present in these areas.

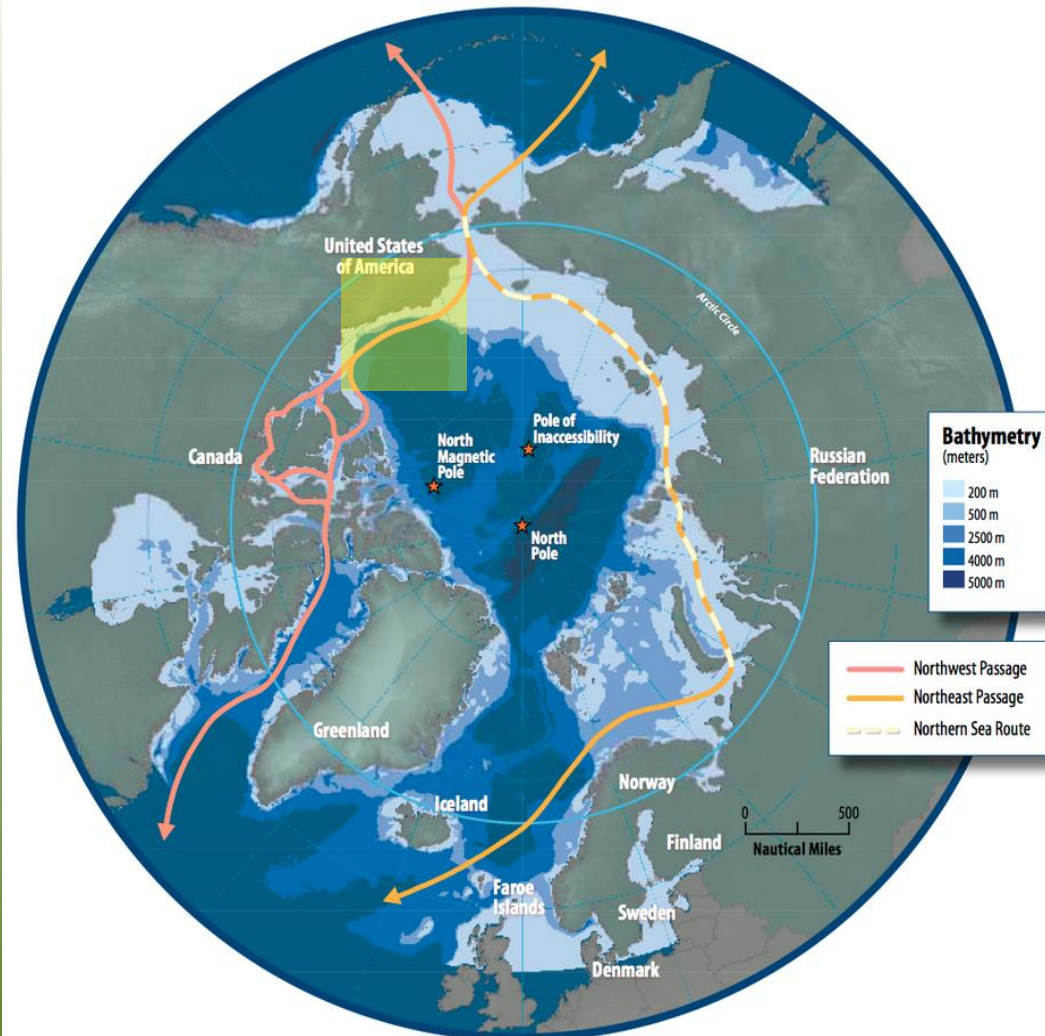
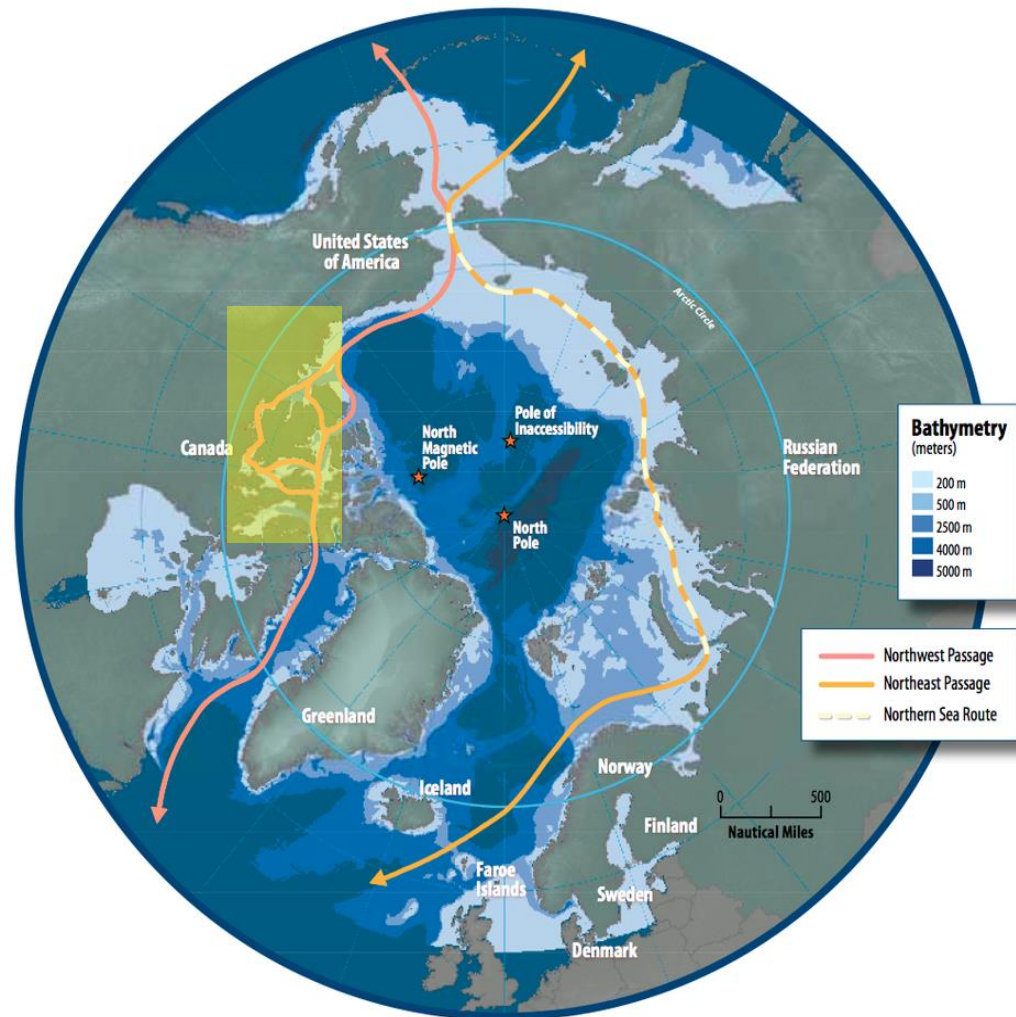


Figure from Arctic Council - Arctic marine shipping assessment



## Northwest Passage

Break-up of sea ice is expected to be earlier than normal throughout the Northwest Passage this summer, and areas of consolidated ice will become mobile earlier in the season than normal.

Ice conditions will be light in the southern route of the Northwest Passage in August with lessening ice conditions following in northern route by early September.

Enhanced mobility of sea ice in the Canadian Arctic Archipelago could maintain elevated old ice concentrations in the aforementioned sectors throughout the summer 2020 period.

Figure from Arctic Council - Arctic marine shipping assessment



## Baffin Bay

Early than normal sea ice break-up is forecasted for Baffin Bay this summer, due to current lower than normal ice extents in the region and predicted warmer than normal temperatures in the area of interest.

Old ice concentrations in the bay are in line with climatological normals and no specific hazards are anticipated. The presence of an ice bridge in Nares Strait well into this spring has cut off the inflow of old ice from the Arctic Ocean into northern Baffin Bay, thereby maintaining a limited influx of old ice into the region.

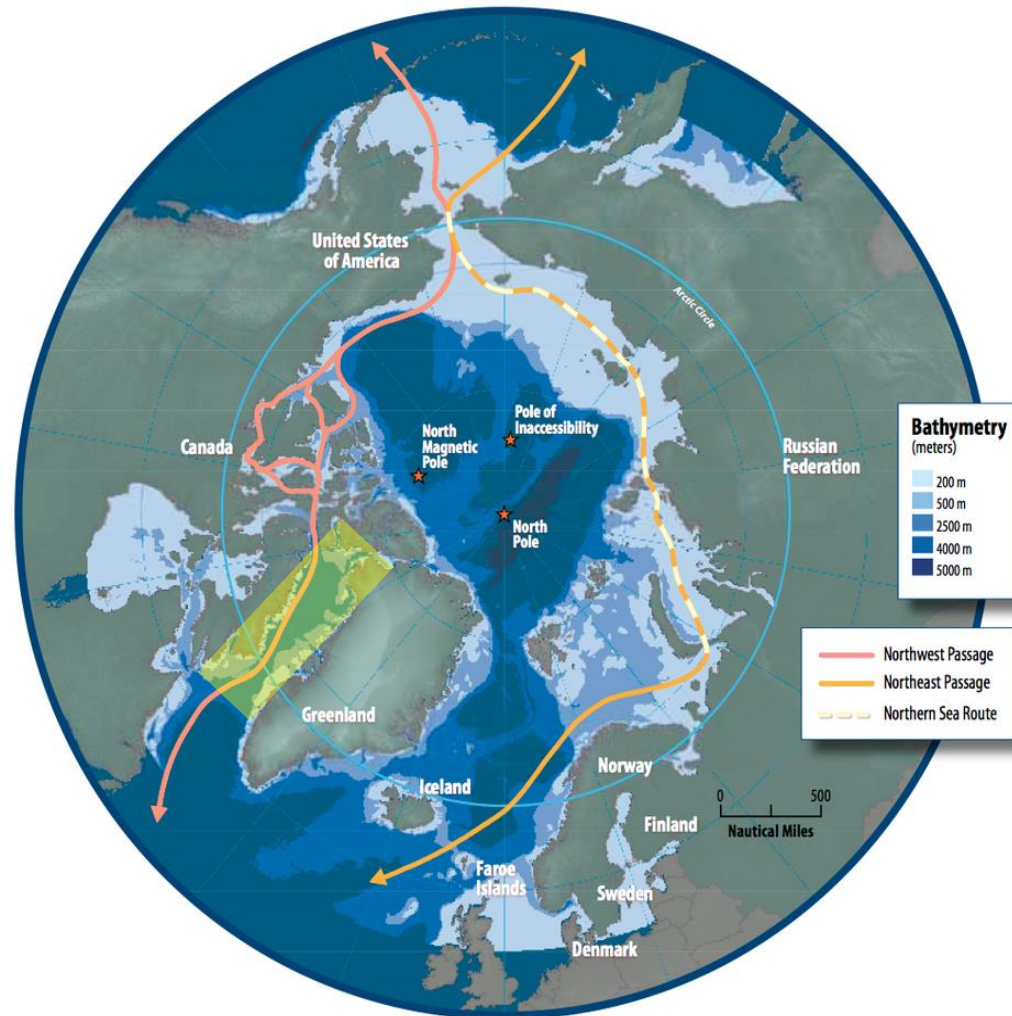
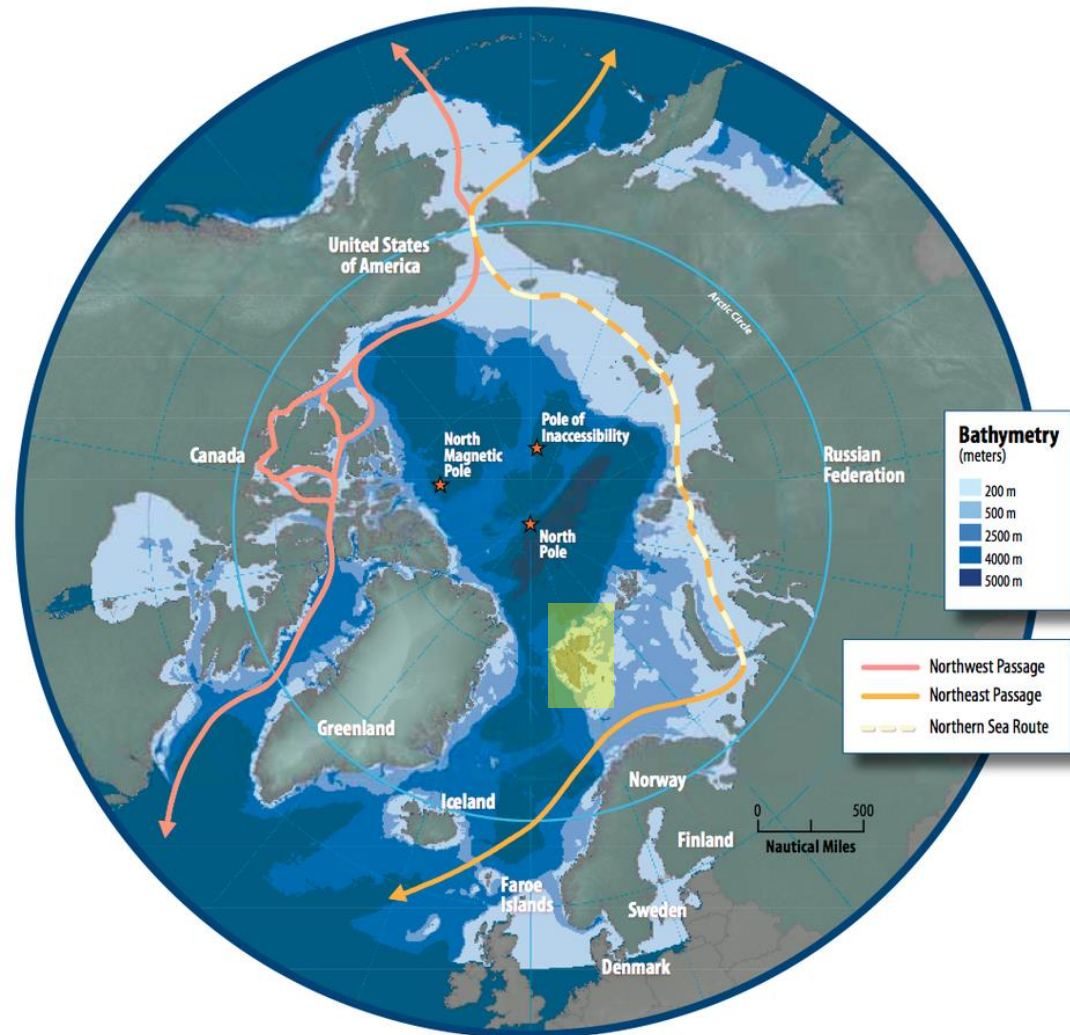


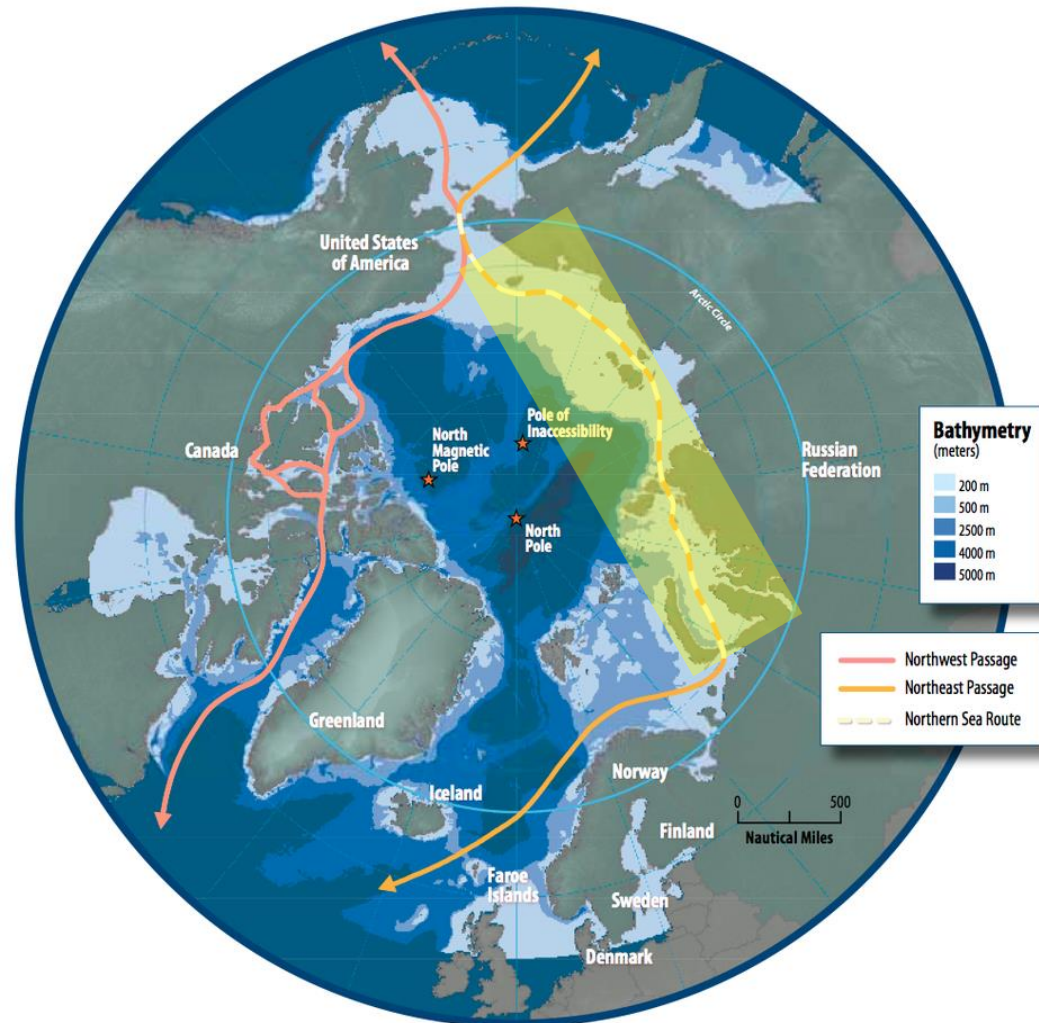
Figure from Arctic Council - Arctic marine shipping assessment



## Svalbard

Summer minimum sea ice extent is forecast somewhat above normal, but with low forecast confidence. Expecting near normal impacts from sea ice cover around Svalbard for the 2020 summer indicating normal shipping activities.

Figure from Arctic Council - Arctic marine shipping assessment



## Northern Sea Route

Ice conditions are not expected to be problematic for the whole of the NSR during the spring and summer seasons in 2020.

Currently observed below normal ice conditions, and projected above normal air temperatures and earlier than normal sea ice deterioration form the basis for this assessment.

Light ice conditions will prevail throughout the sector and areas of landfast ice will break-up earlier than normal. Significant incursions of old ice are not expected along the route this summer season.

Figure from Arctic Council - Arctic marine shipping assessment

## Hudson Bay and Hudson Strait

Faster than normal sea ice break-up is underway in Hudson Strait with areas of open water expanding in the northern portion of the strait this spring

Near normal break-up forecasted for the western portion of Hudson Bay and later than normal in the eastern section.

Ice thicknesses throughout Hudson Bay are thicker this spring than spring 2019, as predominantly thick first-year ice covers the western and central portions of the bay while in 2019 medium first-year ice comprised a significant fraction of the ice cover

Thicker ice coverage along with forecasted colder than normal surface air temperatures over Hudson Bay could lead to a more challenging navigation season, particularly in the eastern half of Hudson Bay

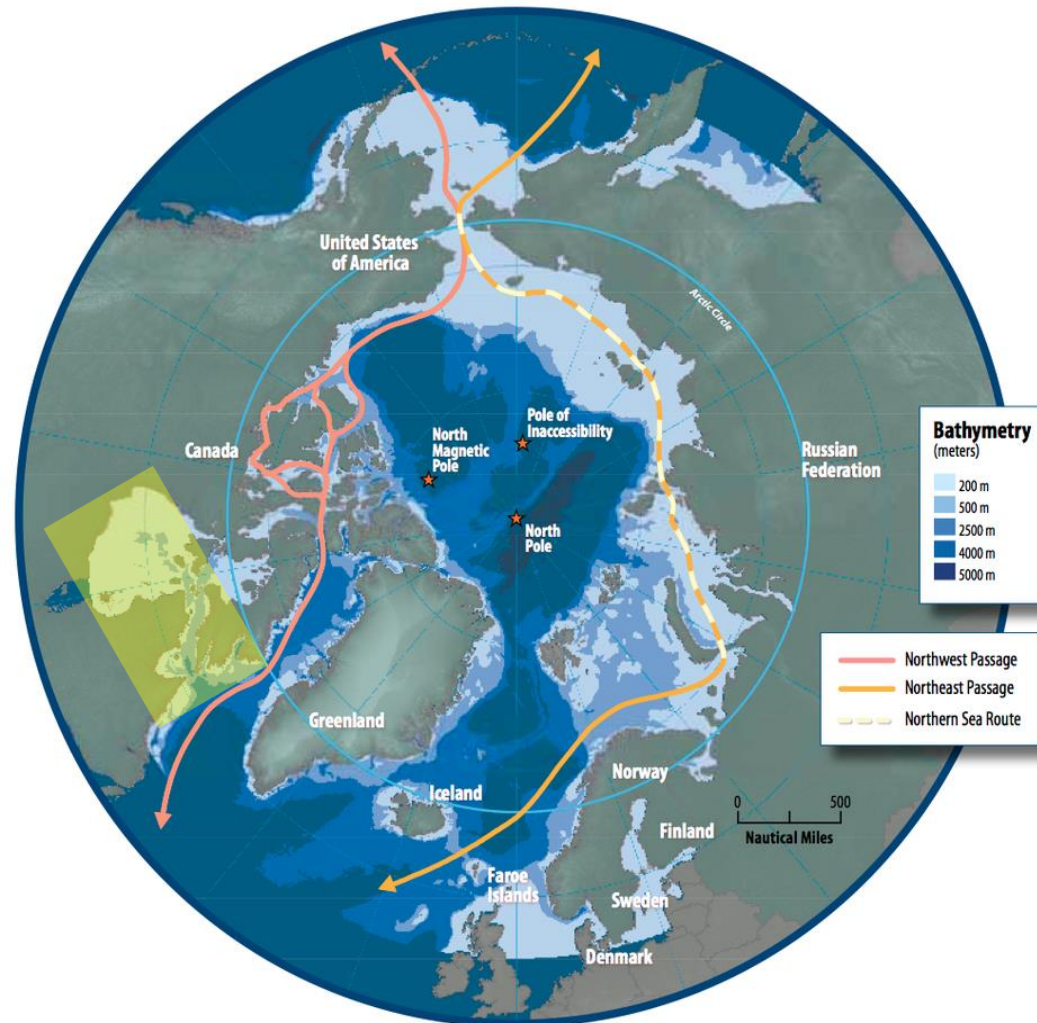


Figure from Arctic Council - Arctic marine shipping assessment

# Questions?

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