

Arctic Regional Climate Centre

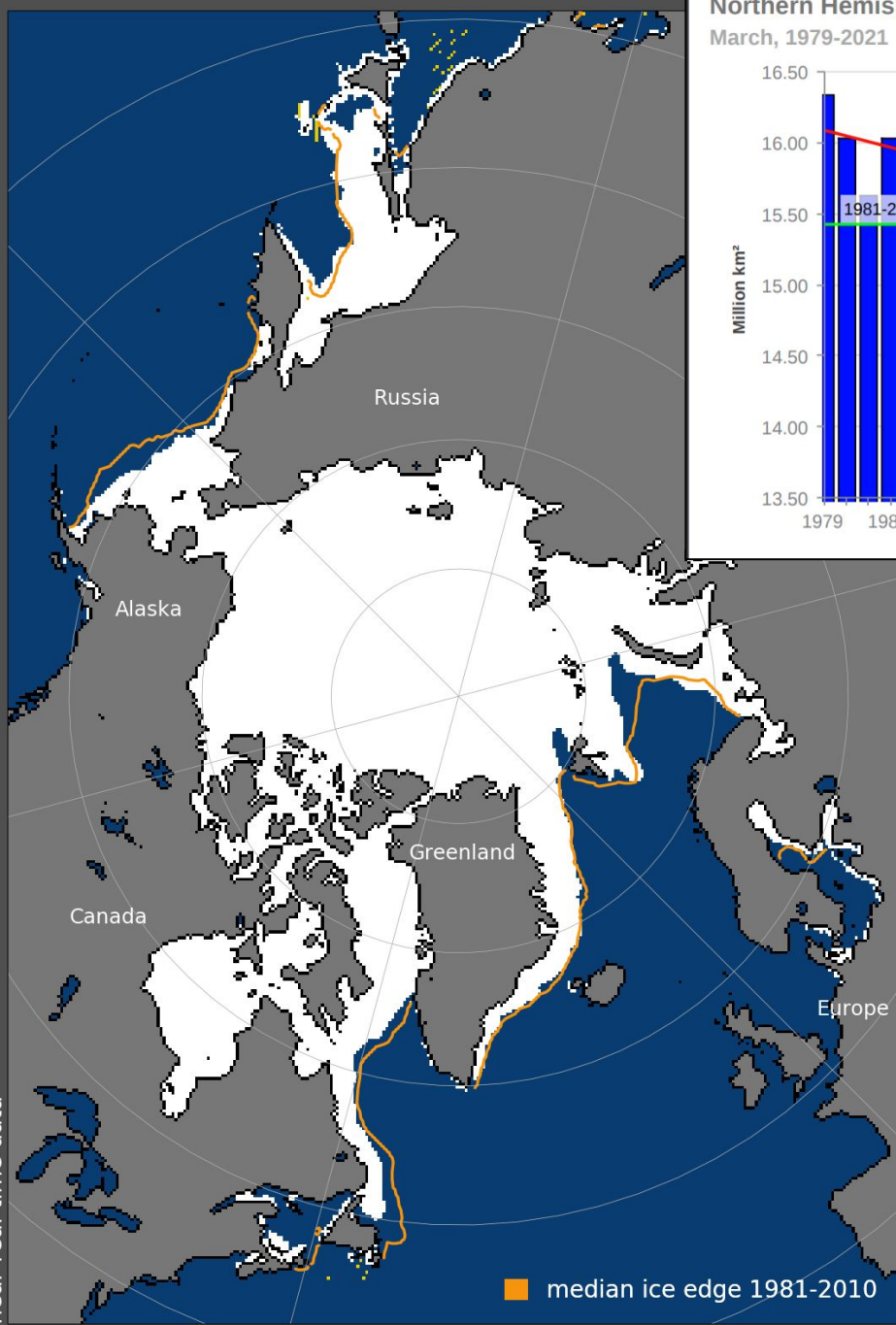
Review of 2020/21 Winter Sea-Ice Outlook Present the 2021 Summer Sea-Ice Outlook

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Canadian Ice Service**



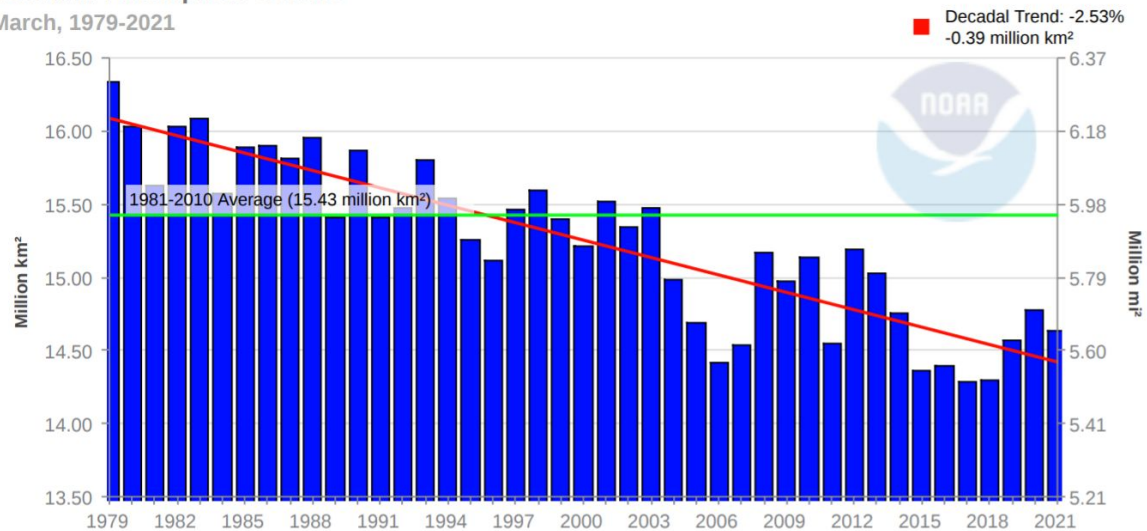
Review of 2020/21 Winter Arctic sea-ice conditions

Sea Ice Extent, 21 Mar 2021



Northern Hemisphere Sea Ice

March, 1979-2021



Left: March 2021 northern hemisphere maximum sea ice extent map

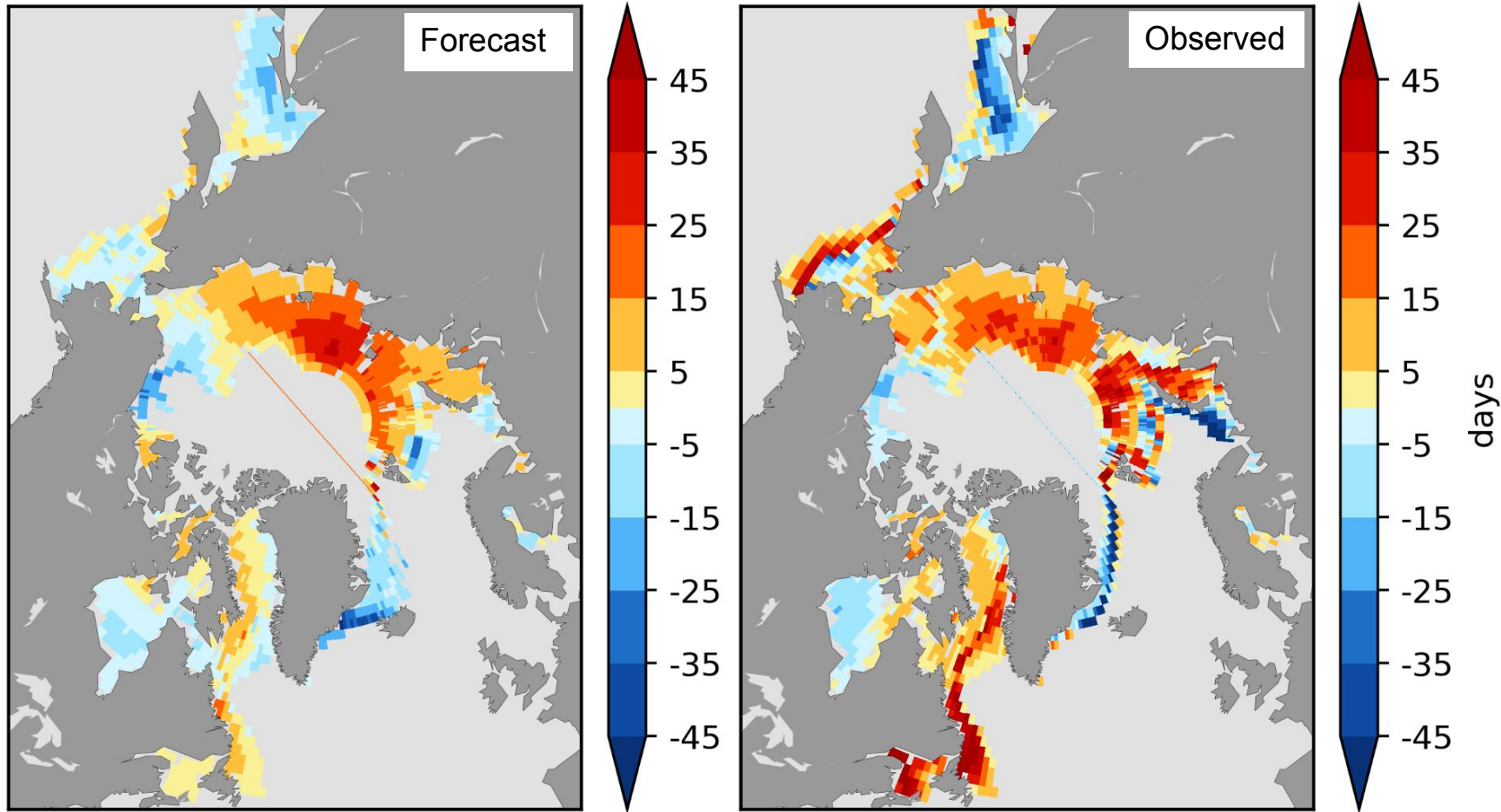
Above: March 2021 northern hemisphere maximum sea ice extent graph

Sources: National Snow and Ice Data Center, NOAA

**Comparison: Actual Winter 2020/21 Conditions
with
ArcRCC Sea-Ice Winter 2020/21 Outlook**

A. ArcRCC Sea-Ice Winter 2020/21

Freeze-up Outlook



What is Normal freeze-up?

- The average date when the ice concentration rises above 50%.
- Based on climatological period (2009-2017)
- Three categories: late, near normal and early

A. ArcRCC Sea-Ice Freeze-up Outlook 2020/21

Actual vs. Outlook

Regions	CanSIPS Sea-Ice Forecast Freeze-up Confidence	CanSIPS Sea-Ice Freeze-up Forecast	Observed Freeze-up	CanSIPS Sea-Ice Forecast Accuracy
Baffin Bay	Moderate	Late	Late	High
Barents Sea	High	Near normal	Early	Moderate
Beaufort Sea	High	Near normal to early	Near normal	High
Bering Sea	Low	Near normal to early	Late	Low
Chukchi Sea	Moderate	Near normal	Near normal	Moderate
East Siberian	High	Late	Late	High
Greenland Sea	High	Near normal to early	Early	Moderate
Hudson Bay	Moderate	Early to near normal	Early to near normal	High
Kara Sea	High	Late	Late	High
Labrador Sea	Moderate	Late	Very late	Moderate

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



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

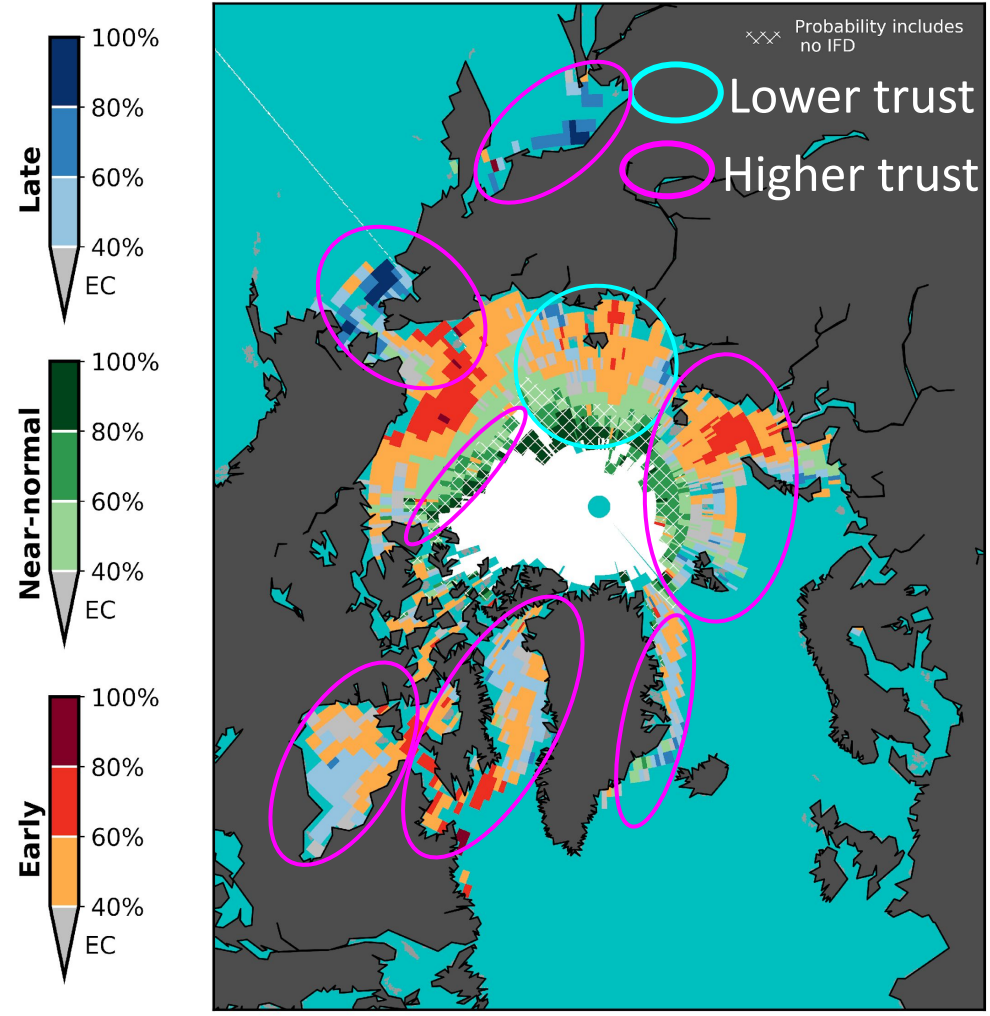
A vertical green gradient bar on the left side of the slide, transitioning from a lighter green at the top to a darker green at the bottom.

ArcRCC Sea-Ice Outlook

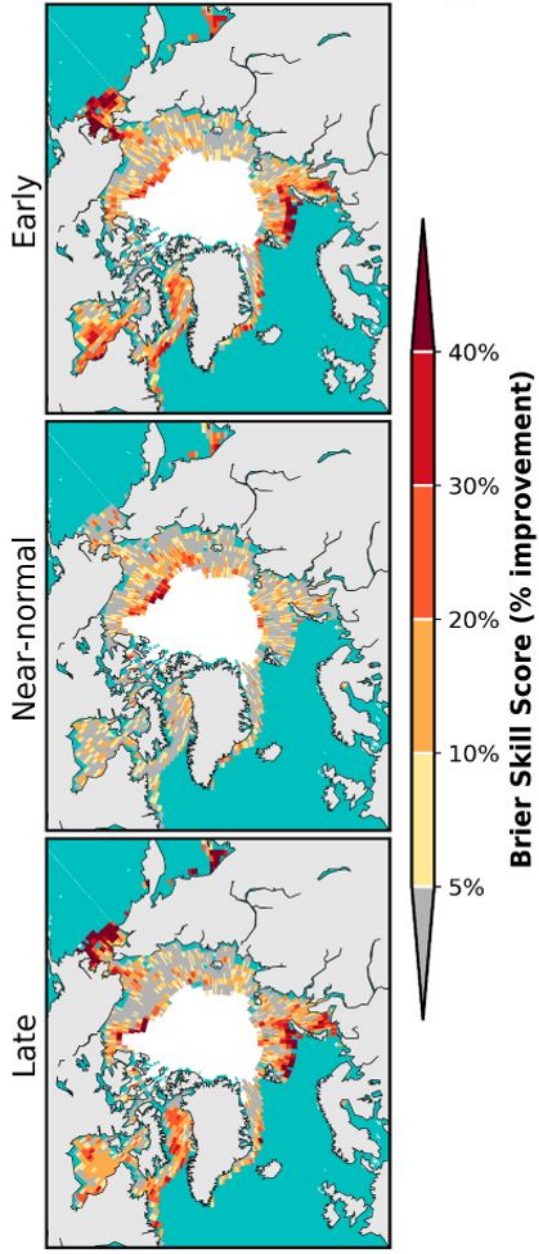
Summer 2021

C. ECCC Ice-Free Date Probability Forecast Summer 2021 (Experimental)

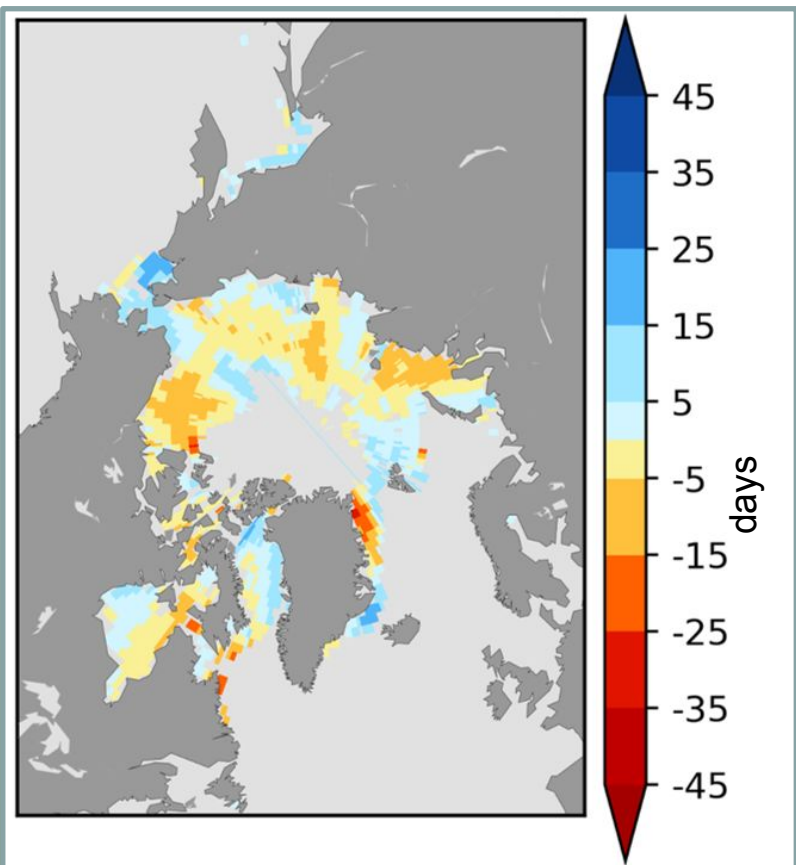
Probability for Early, Near-normal, or Late Retreat
From May 1, 2021 (cf 2012-2020)



Historical Skill (2000-2020)
r.t. trend-adjusted climatology



C. ArcRCC Sea-Ice Break-up Outlook 2021



Forecast for the 2021 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: CanSIPsv2 (ECCC)

What is Normal break-up?

- The date when the ice concentration goes below 50%
- based on climatological period (2012-2020)

Break-Up Categories:

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

Regions	CanSIPsv2 Sea-Ice Forecast Confidence	CanSIPsv2 Sea-Ice Break-up Forecast
Baffin Bay	High	Early
Barents Sea	High	Near normal (needs input)
Beaufort Sea	High	Late in the west, Early in the east
Bering Sea	High	Late (but talk to Rick)
Chukchi Sea	Moderate	Early
East Siberian	Low	Early
Greenland Sea	High	Early
Hudson Bay	High	Near normal
Kara Sea	High	Early
Labrador Sea	High	Early
Laptev Sea	Low	Early

D. ArcRCC Sea-Ice Extent Outlook Summer 2021

Minimum = September

What is Normal ?

Average ice extent based on conditions from 2012-2020.

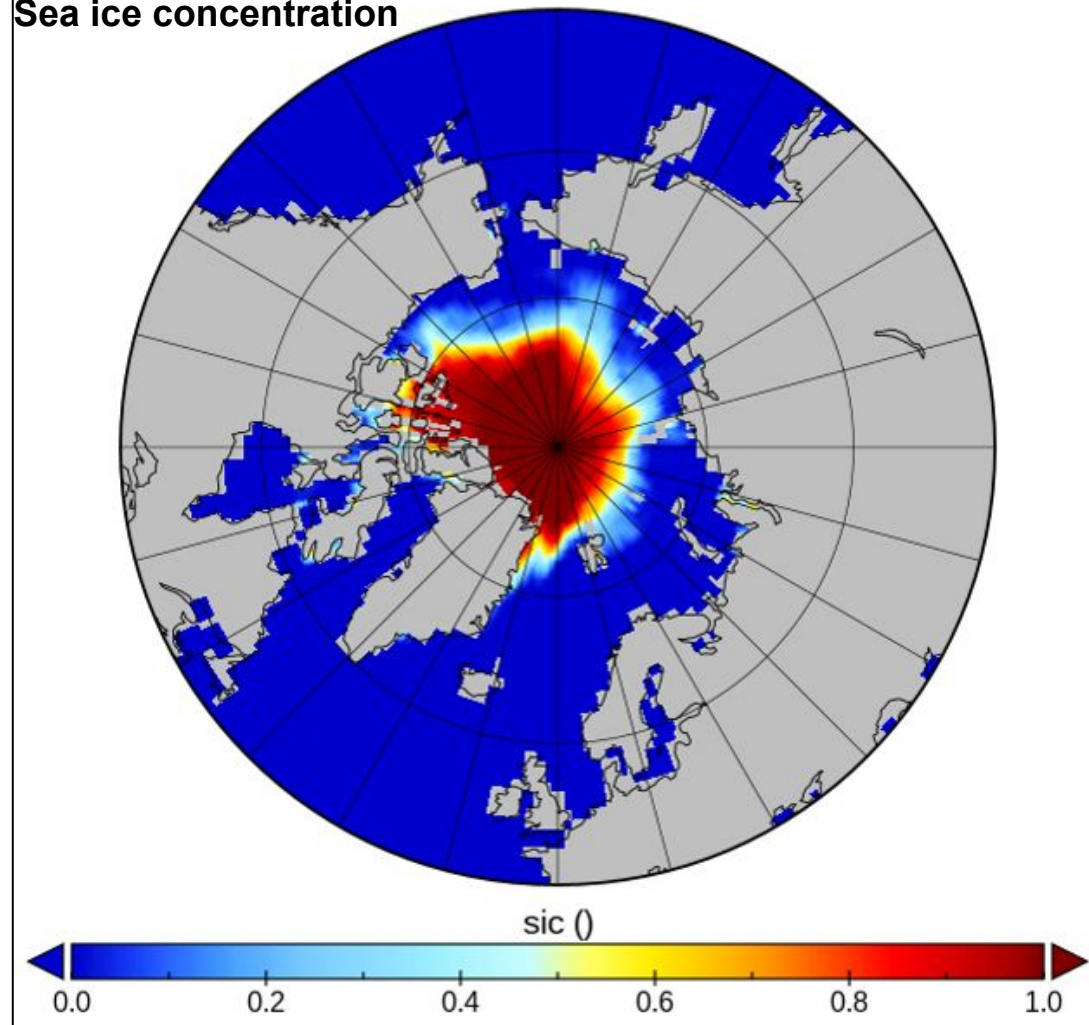
Forecast Categories:

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

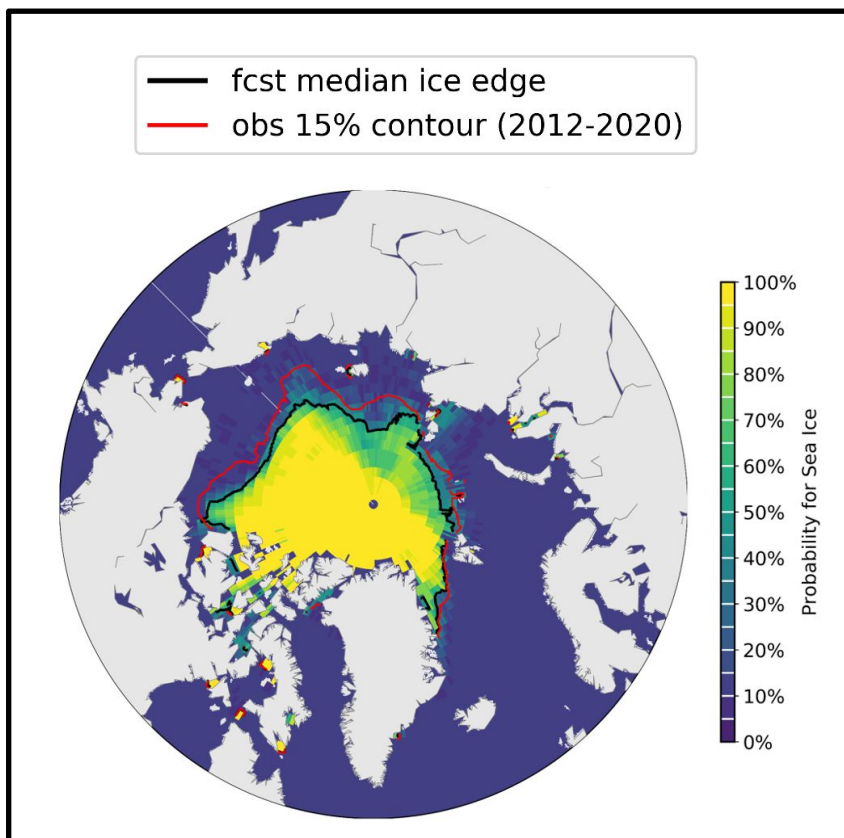
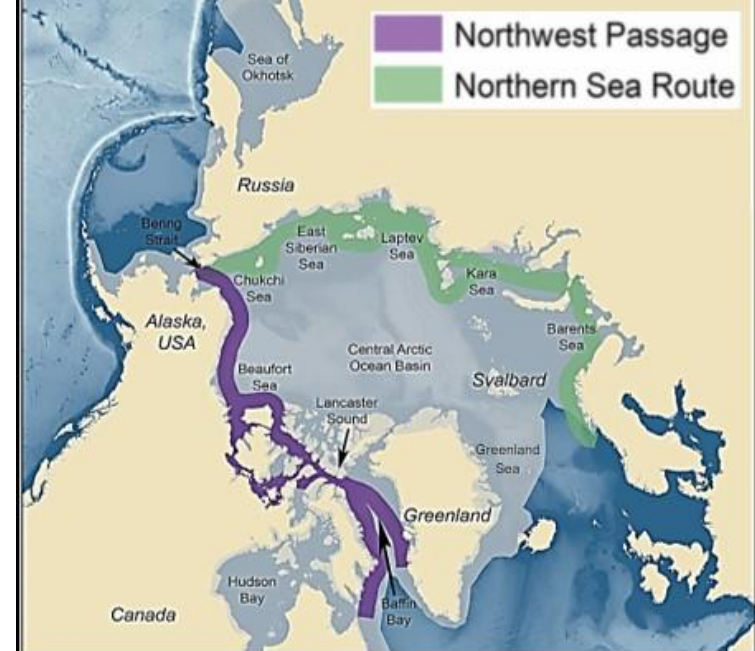
Sea ice concentration



D. ArcRCC Sea-Ice Extent Outlook Summer 2021

Minimum = September

September 2021 sea ice probability of ice concentration > 15%

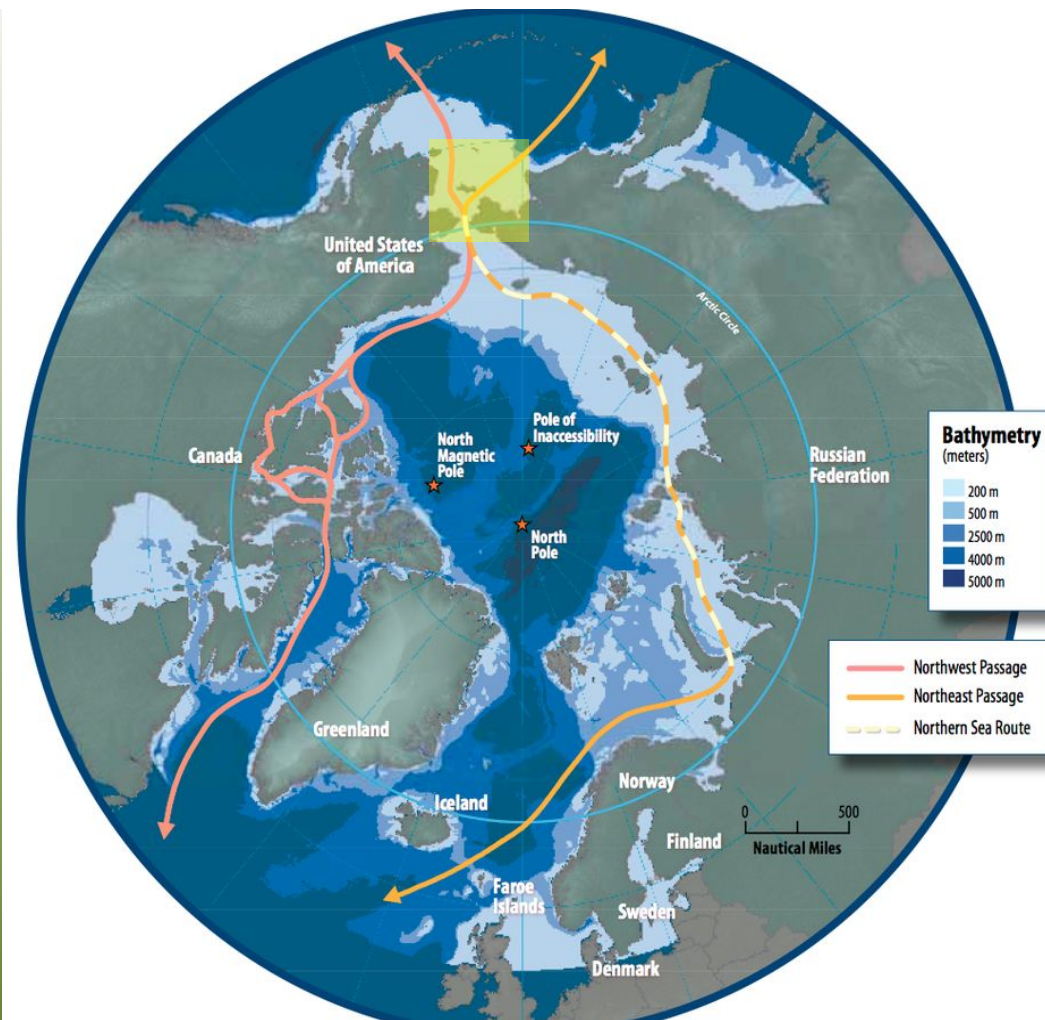


Regions	CanSIPsv2 Sea-Ice Forecast Confidence	CanSIPsv2 Sea-Ice Forecast
Barents Sea	High	Below normal
Beaufort Sea	High	Near normal
Canadian Arctic Archipelago	Moderate	Below normal
Chukchi Sea	High	Near normal
Eastern Siberian Sea	Moderate	Near normal
Greenland Sea	High	Near normal
Kara Sea	High	Below normal
Laptev Sea	High	Below normal

September 2021 probability of sea ice at concentrations greater than 15% from CanSIPsv2 (ECCC). Forecast median ice extent from CanSIPsv2 (black) and observed mean ice edge 2012-2020 (red).

E. 2021 Summer Ice Conditions in Key Shipping Areas

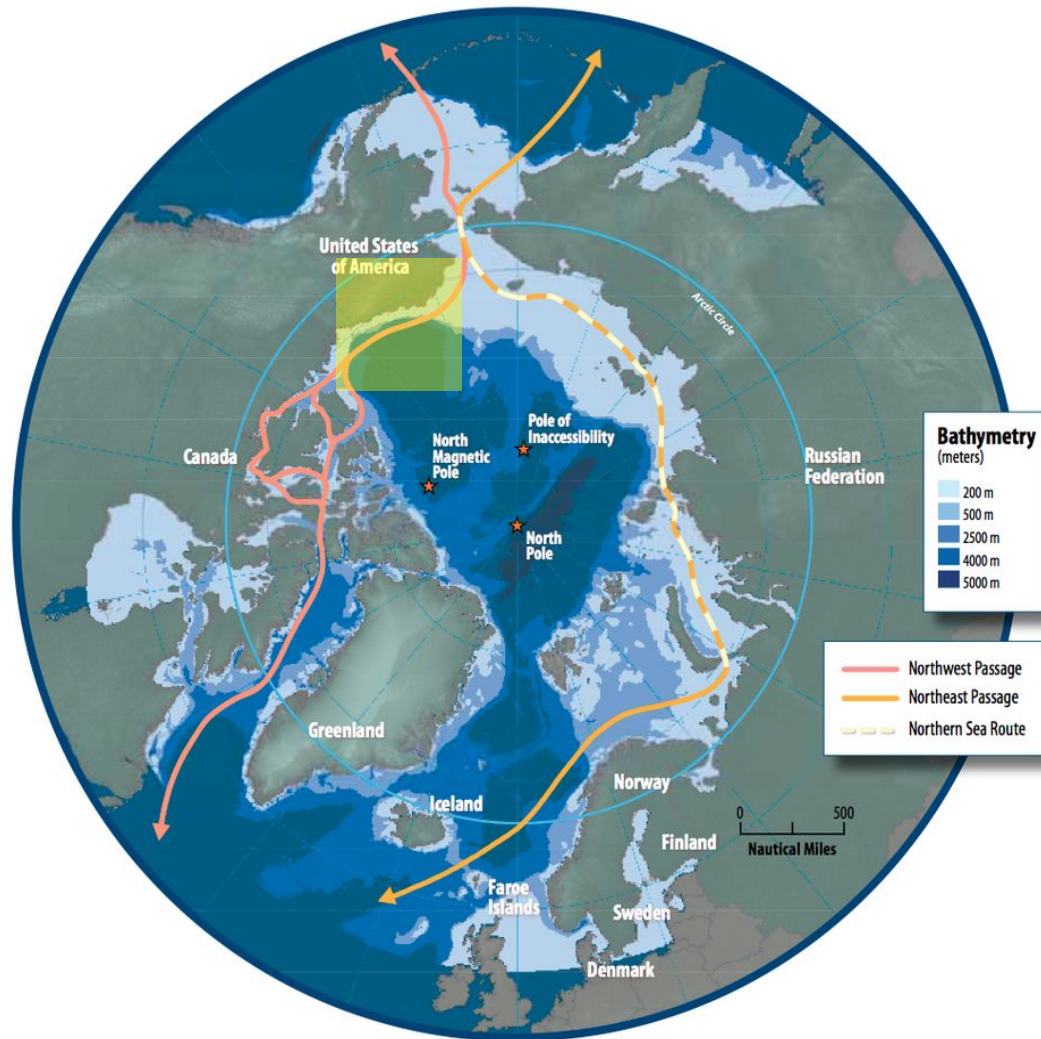
Produced by the National Ice Services (forecaster experience and statistical methods)



Bering Sea

Bering Sea ice was much more abundant in winter/spring 2020-2021 than most years in the last decade, but was still below the 1981-2010 average. Little ice will remain in the Bering Sea by the end of May 2021.

Beaufort Sea

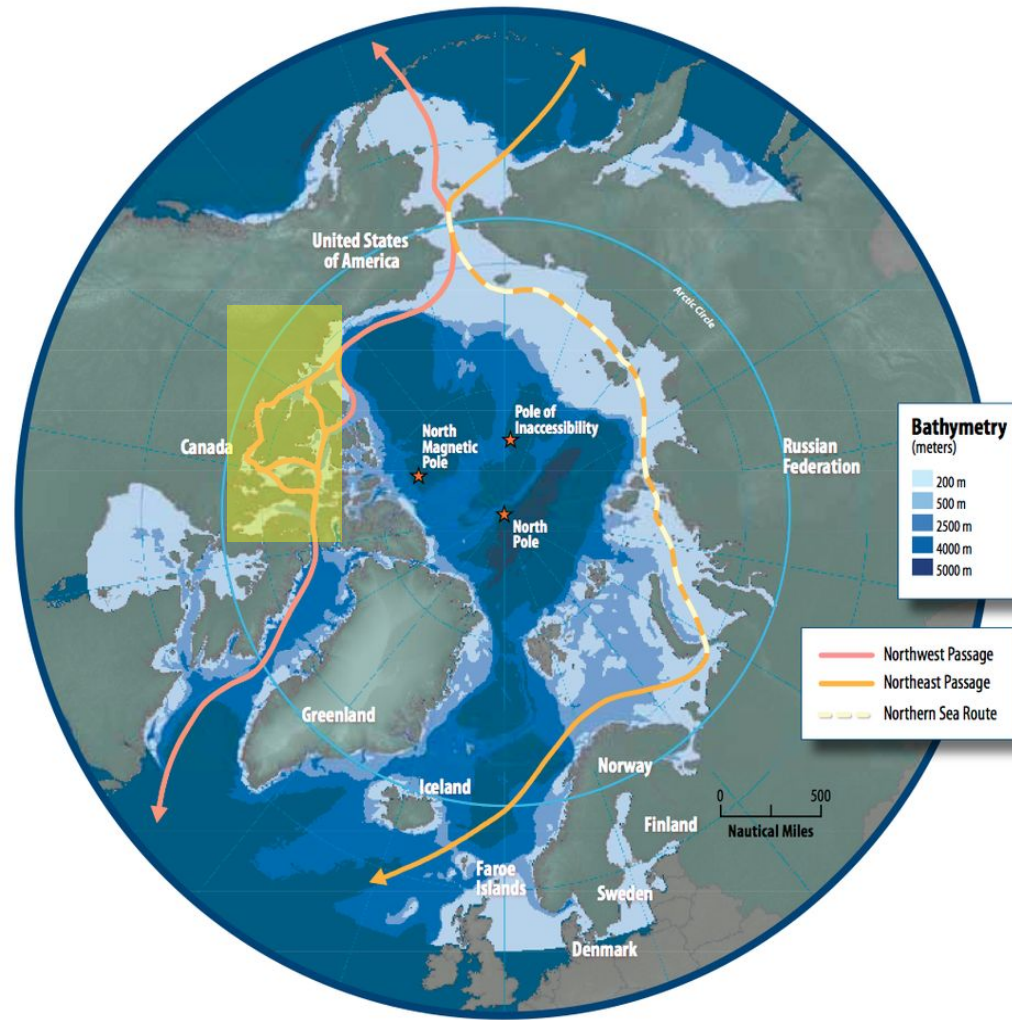


The break-up of sea ice in the western Beaufort is expected to be later than normal due to the presence of multi-year ice.

Recent observations show evidence of this early break-up as the pack ice in the Amundsen Gulf has begun to flush from the basin and observed lower than normal concentrations of sea ice are present in the southeastern Beaufort region. Break-up is expected to be earlier than normal for the eastern Beaufort Sea this summer.

Figure from Arctic Council - Arctic marine shipping assessment

Northwest Passage

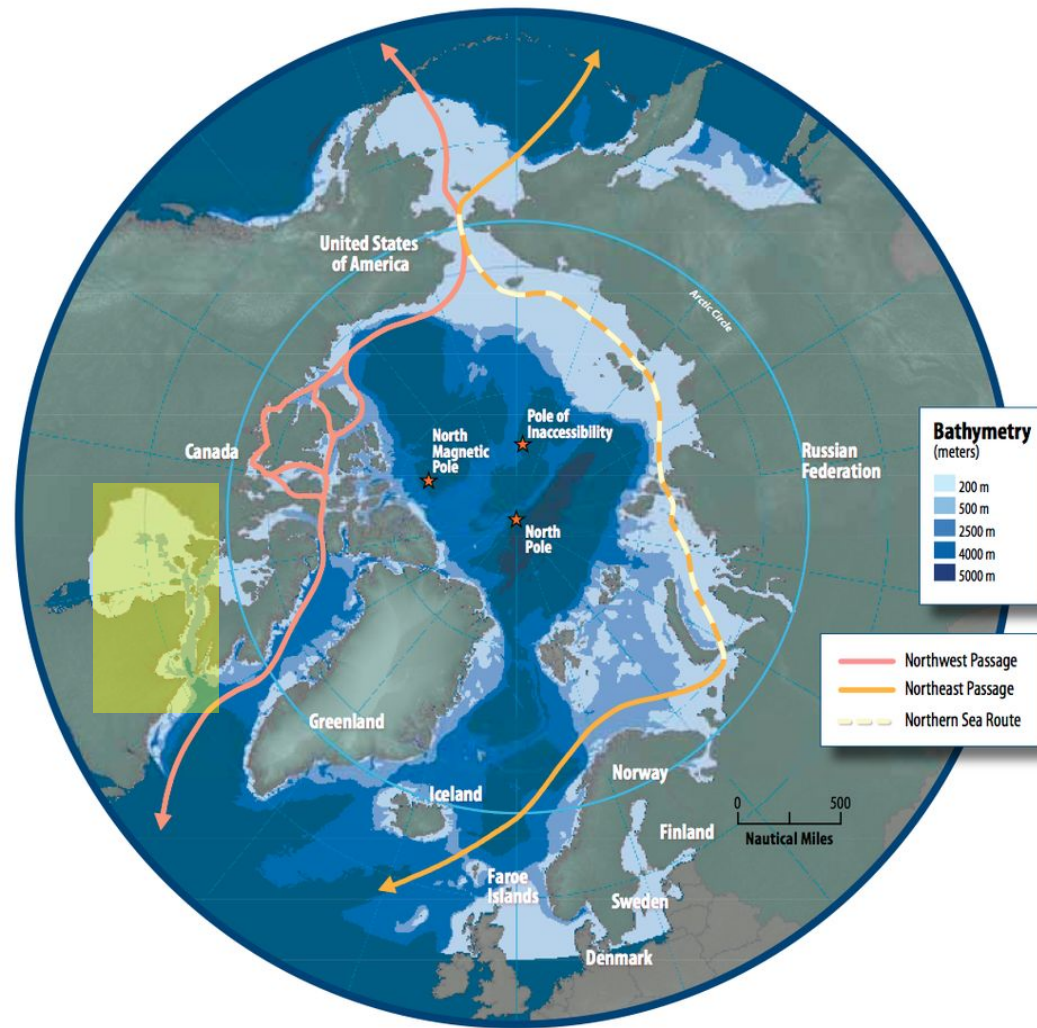


Break-up of sea ice is expected to be earlier than normal throughout the Northwest Passage (NWP) this summer, and areas of consolidated ice will become mobile earlier than normal in the season as has been the case in recent years. Fast ice breakup already ahead of climatological normal in Barrow Strait.

Enhanced mobility of sea ice in the Canadian Arctic Archipelago could maintain elevated old ice concentrations in the NWP, but initial concentrations remain near normal in important sectors such as Larsen Sound and Victoria Strait.

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 and Ungava Bay. Areas of open water are expanding in the northern portion of the strait this spring where thinner ice types predominate.

Near normal break-up is forecasted for the western portion of Hudson Bay and earlier than normal in the eastern section. Signals of this early breakup in the eastern section are emerging as sea ice concentration is anomalously low for spring.

Figure from Arctic Council - Arctic marine shipping assessment

Baffin Bay

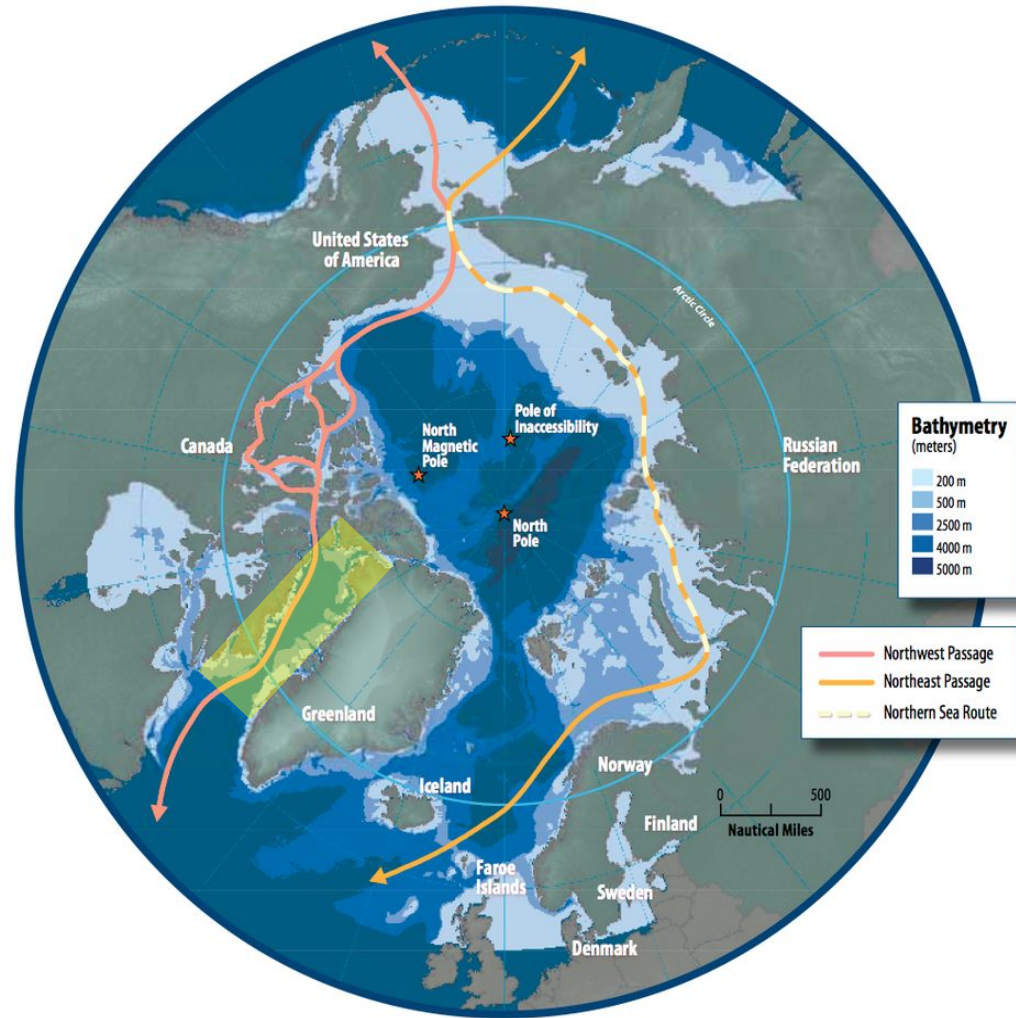
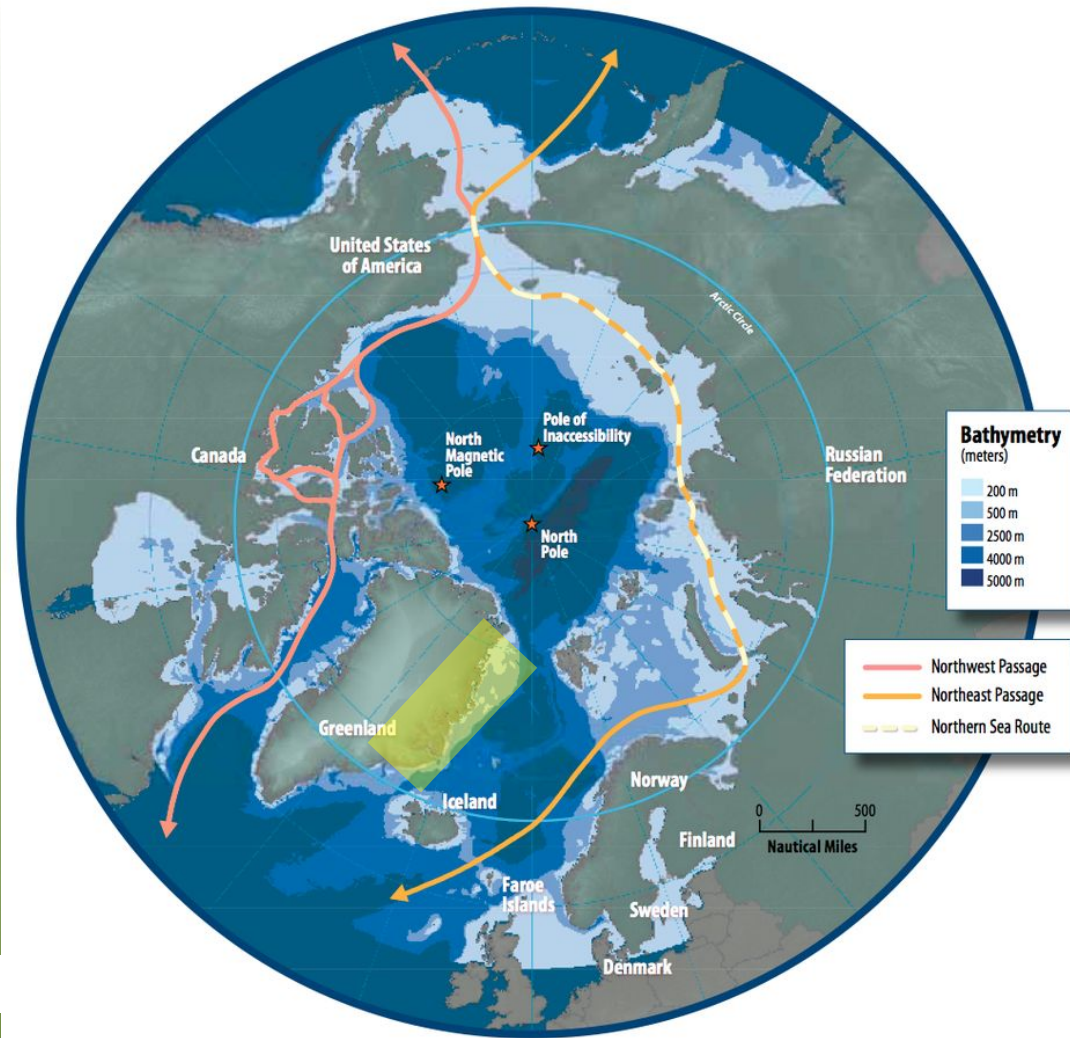


Figure from Arctic Council - Arctic marine shipping assessment

Earlier 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 forecasted warmer than normal temperatures in the area of interest.

Record low sea ice observed along the Labrador Coast this past winter, and this pattern extends northward with anomalously low extent along the marginal ice zone in Baffin Bay and Davis Strait. Nares Strait ice bridge warrants monitoring as breakup has been much earlier than normal in recent years. Frobisher Bay ice concentration elevated and may present shipping issues later in season.

East Greenland



Median sea ice edge was close to 1980-2010 average during winter.

Retreat of sea ice up the coast of East Greenland is likely to be late during summer 2021

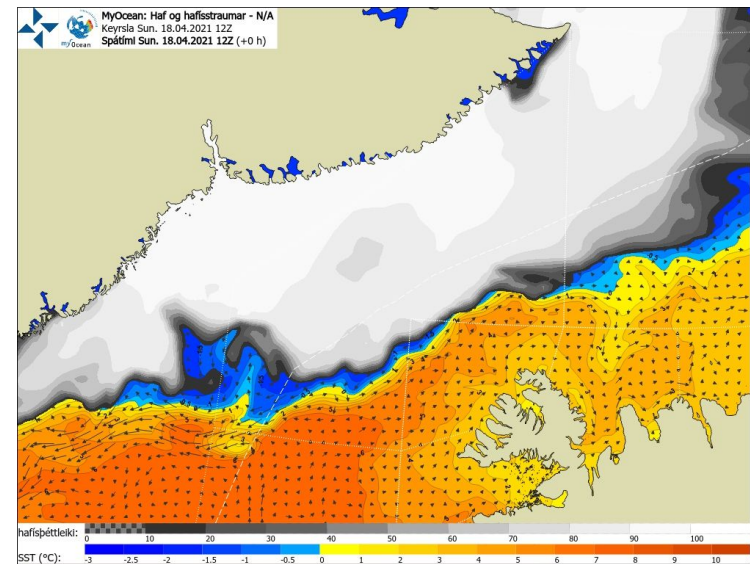
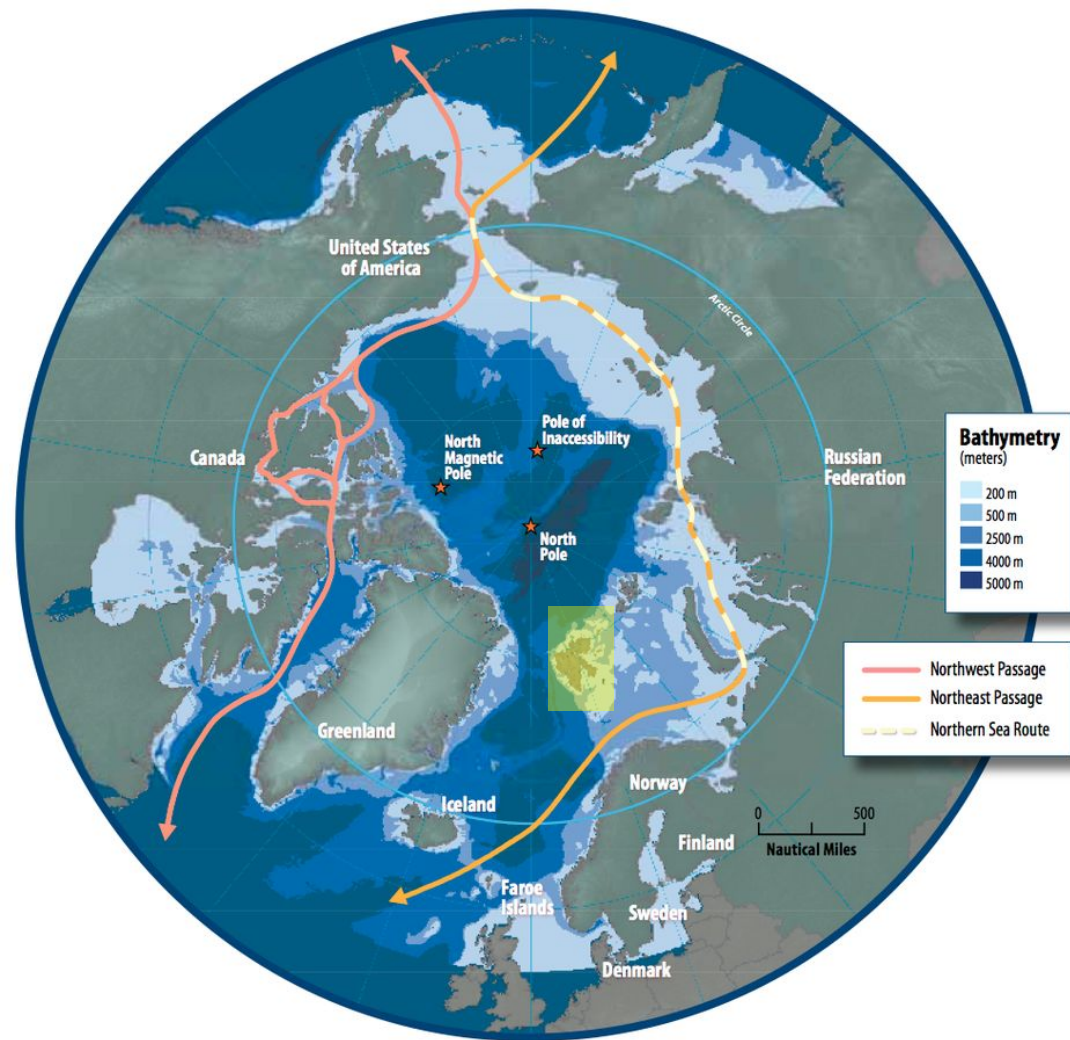


Figure from Arctic Council - Arctic marine shipping assessment

Svalbard



September minimum sea ice extent is forecast below normal, with a high forecast confidence. Expecting near normal shipping activities for the 2021 summer around Svalbard

Figure from Arctic Council - Arctic marine shipping assessment

Northern Sea Route

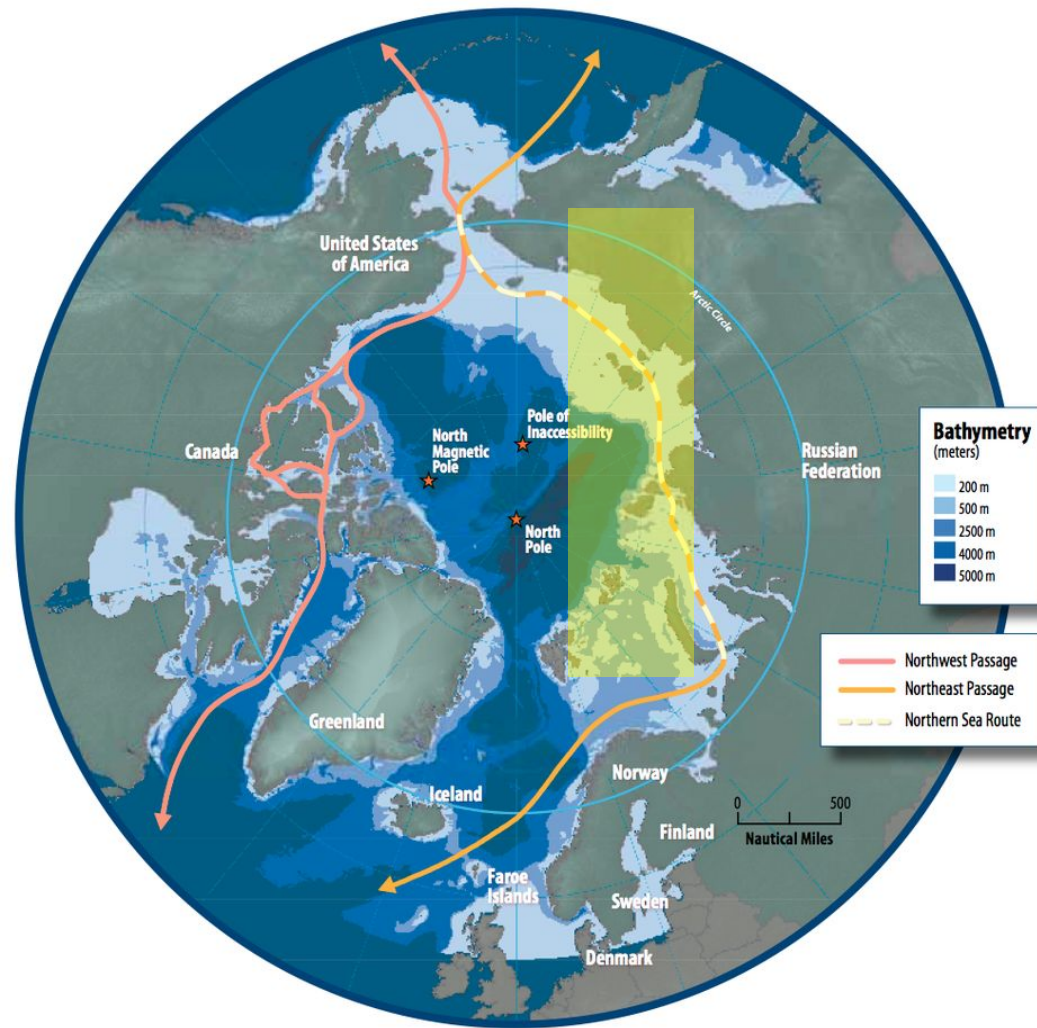


Figure from Arctic Council - Arctic marine shipping assessment

Current observations show below normal ice conditions, including stages of development. Projected above normal air temperature and ocean heat content is leading to earlier than normal sea ice deterioration.

Landfast ice will break-up earlier than normal by +5 to +15 days.

Light ice conditions are expected with areas of ice massifs lower than normal. Incursions of old ice are not expected, however the greater mobility of the sea ice cover may lead to unexpected ice occurrence and ice compacting.

Overall, ice navigation is not expected to be problematic this summer.

Questions?
