Future abrupt reductions in the summer Arctic sea ice

Marika M. Holland, Cecilia M. Bitz, and Bruno Tremblay

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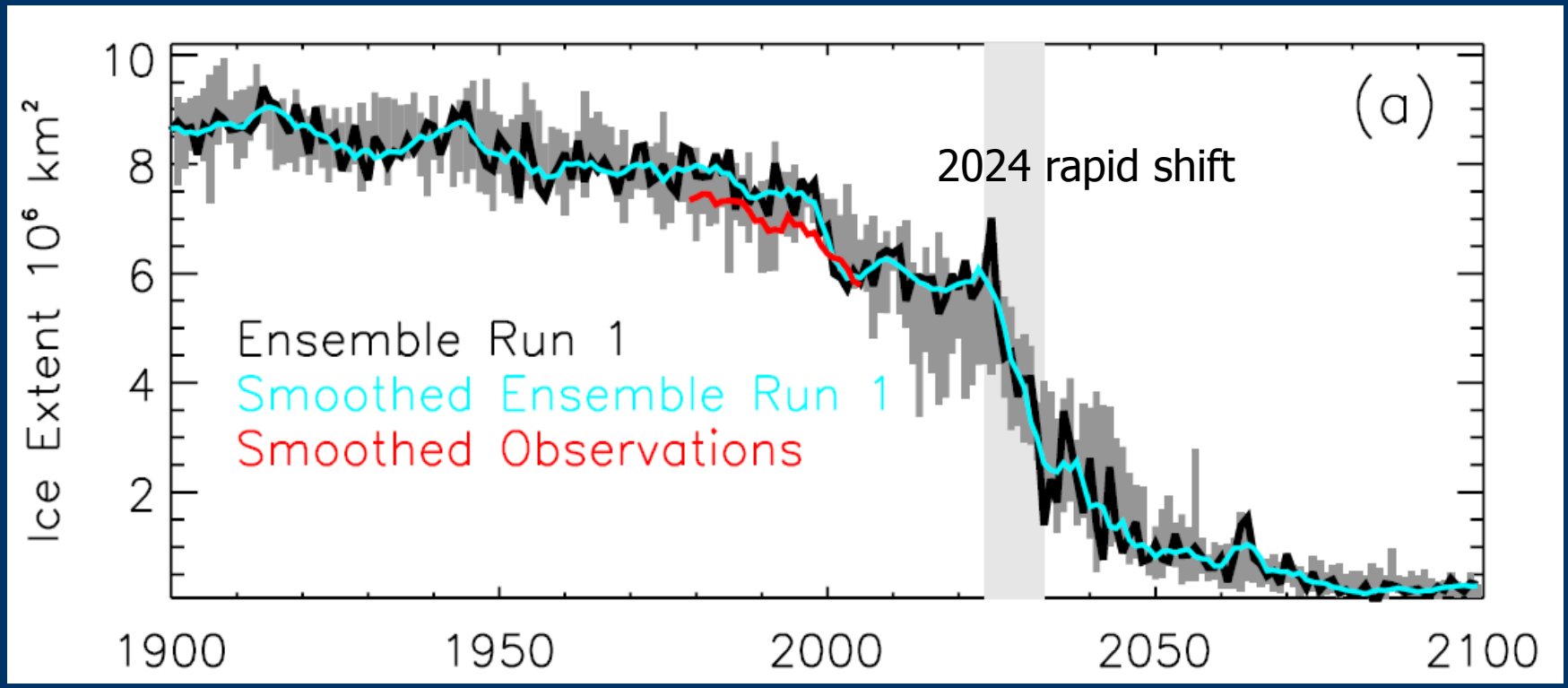


- Recent simulations show that abrupt retreat of sea ice is possible
- Near ice-free Septembers in 2040-2060 - system responds in a non-linear way

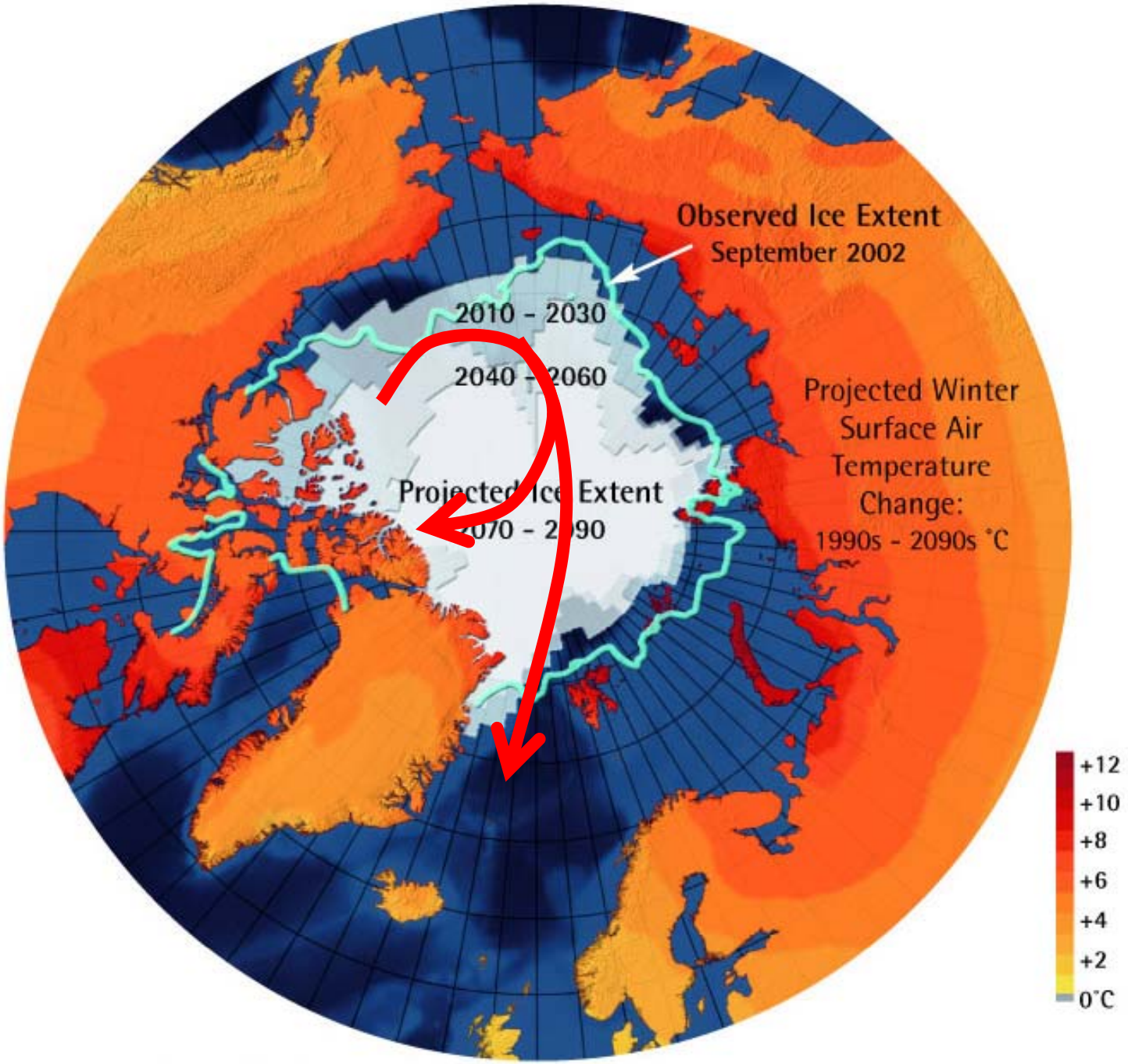
Potential Arctic Transit Routes

Northern Sea Route

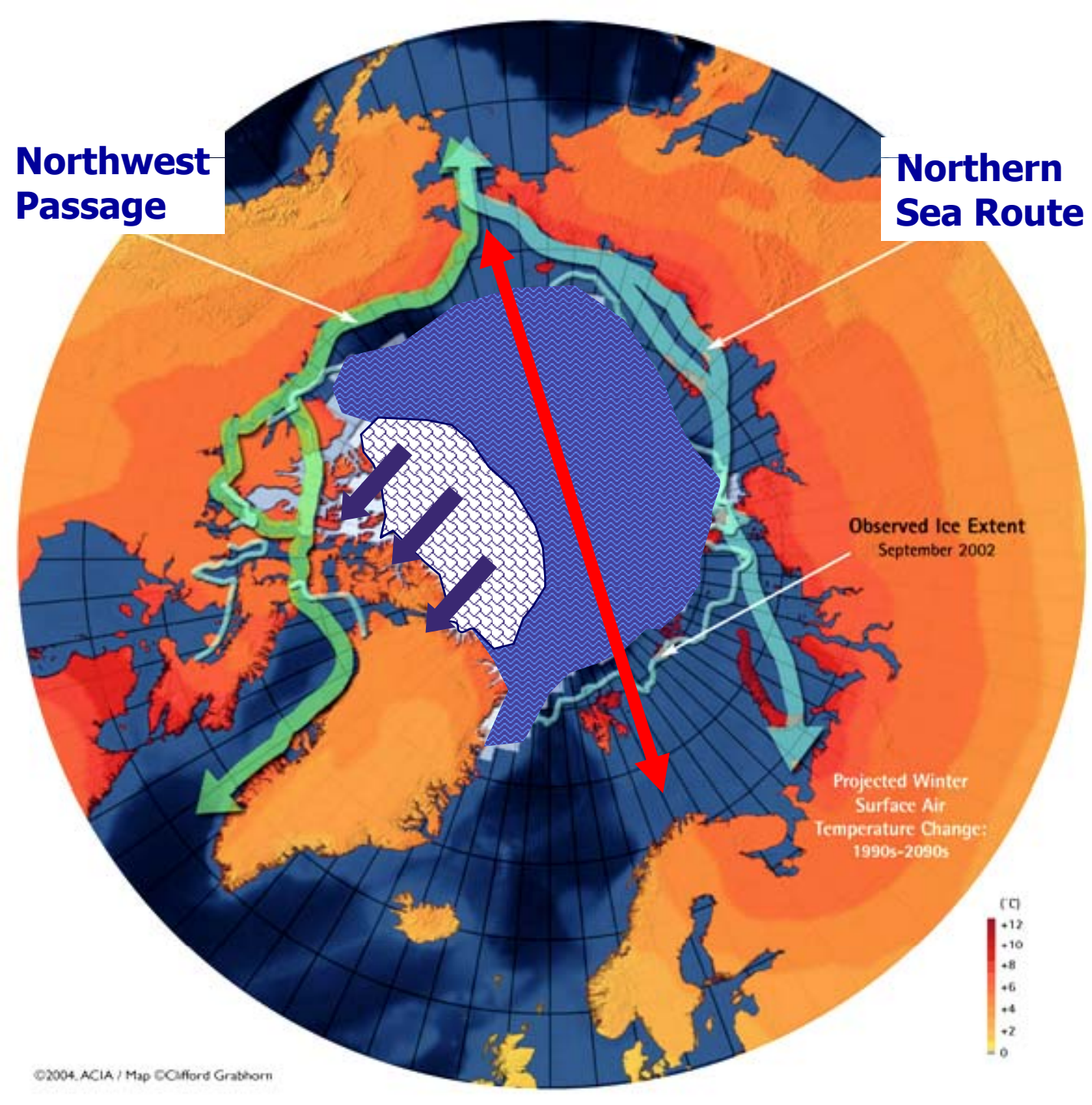
Northwest Passage

TransPolar Route

All routes represents significant reductions in distance between European and Asian destinations



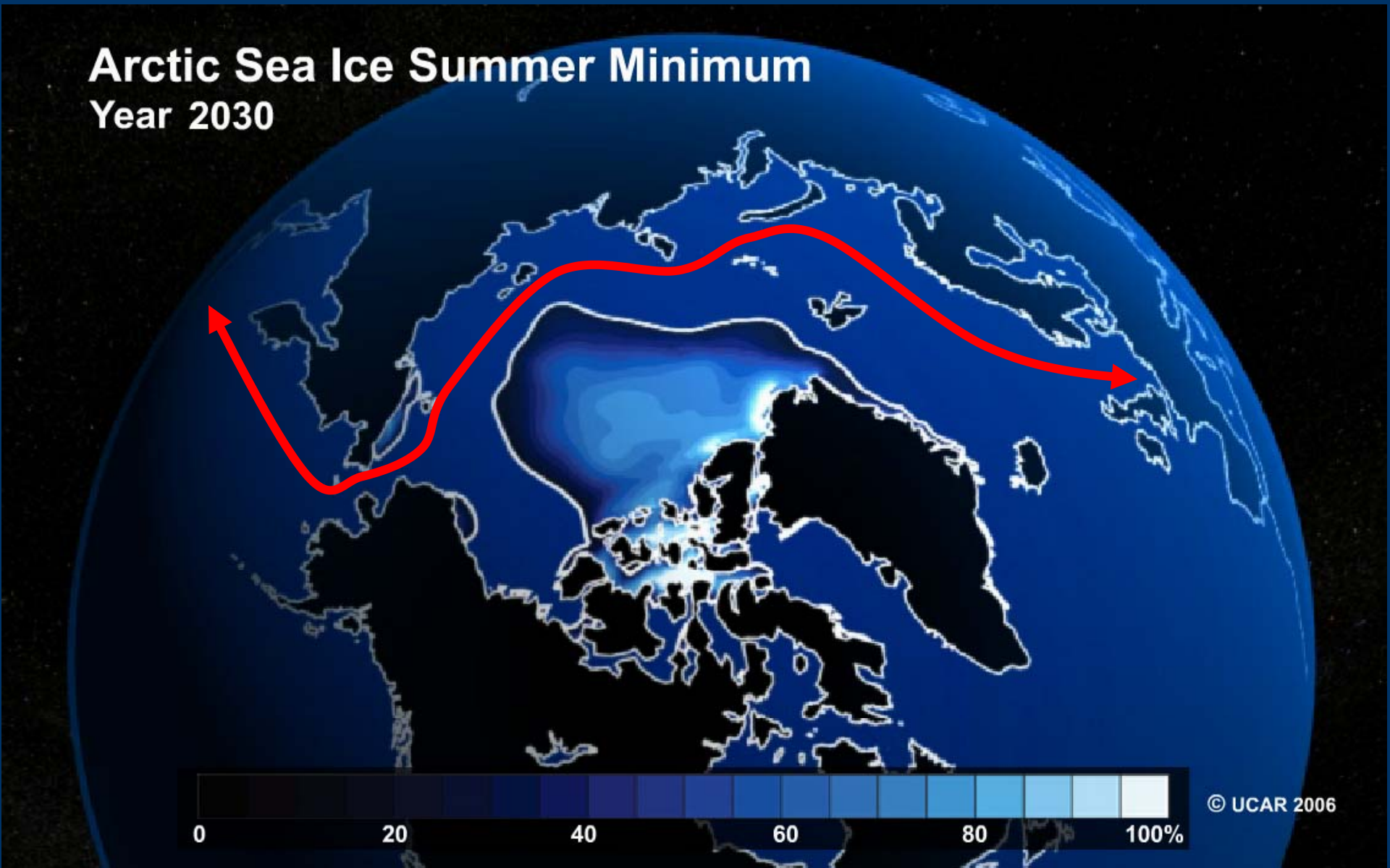
Climate Model projections of ice extent



Opening of the Arctic Ocean is driven by prevailing circulation opening direct trans-polar route

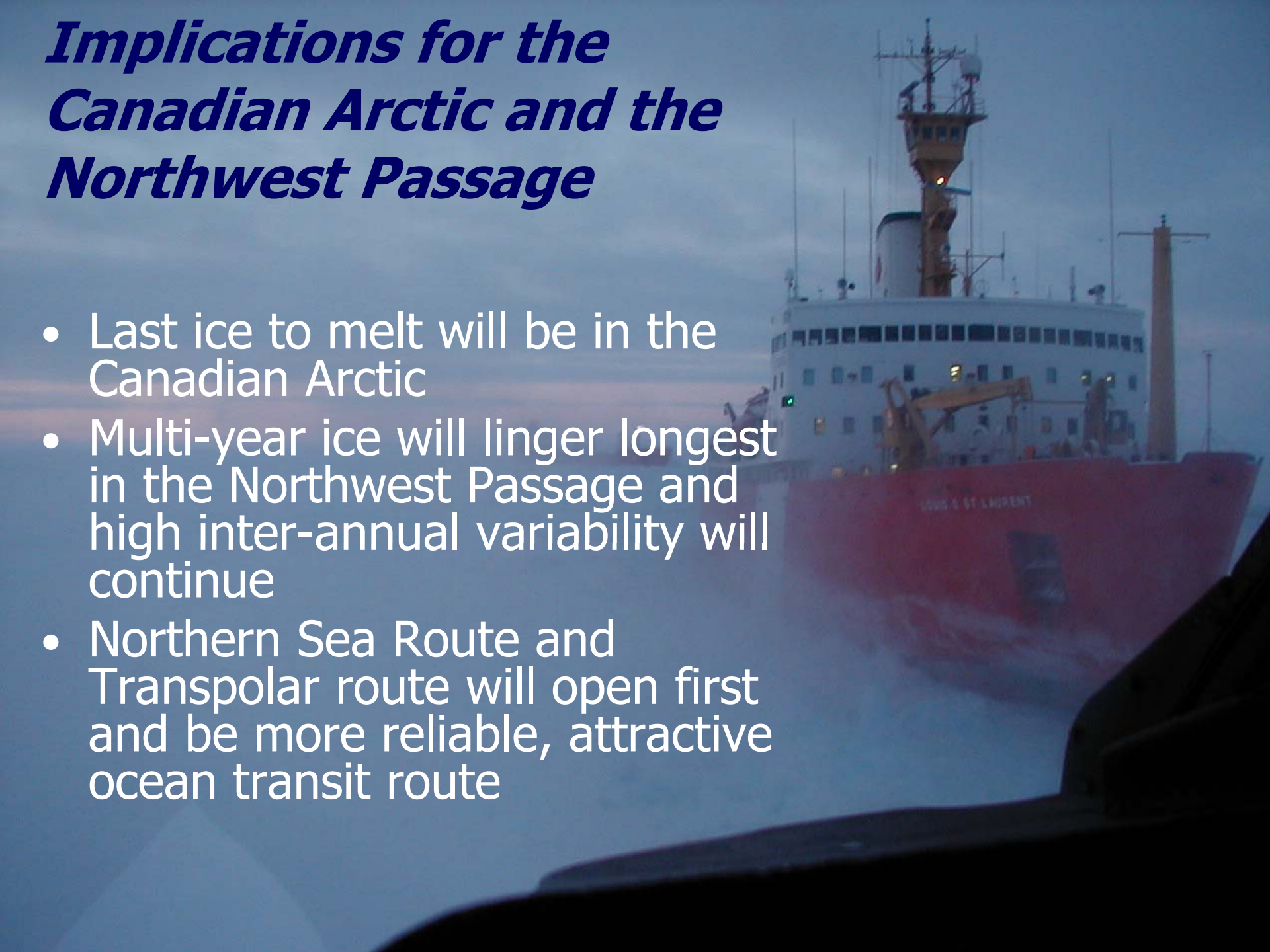
Arctic Ocean ice is forced through the Archipelago to the NW Passage

Northern Sea Route



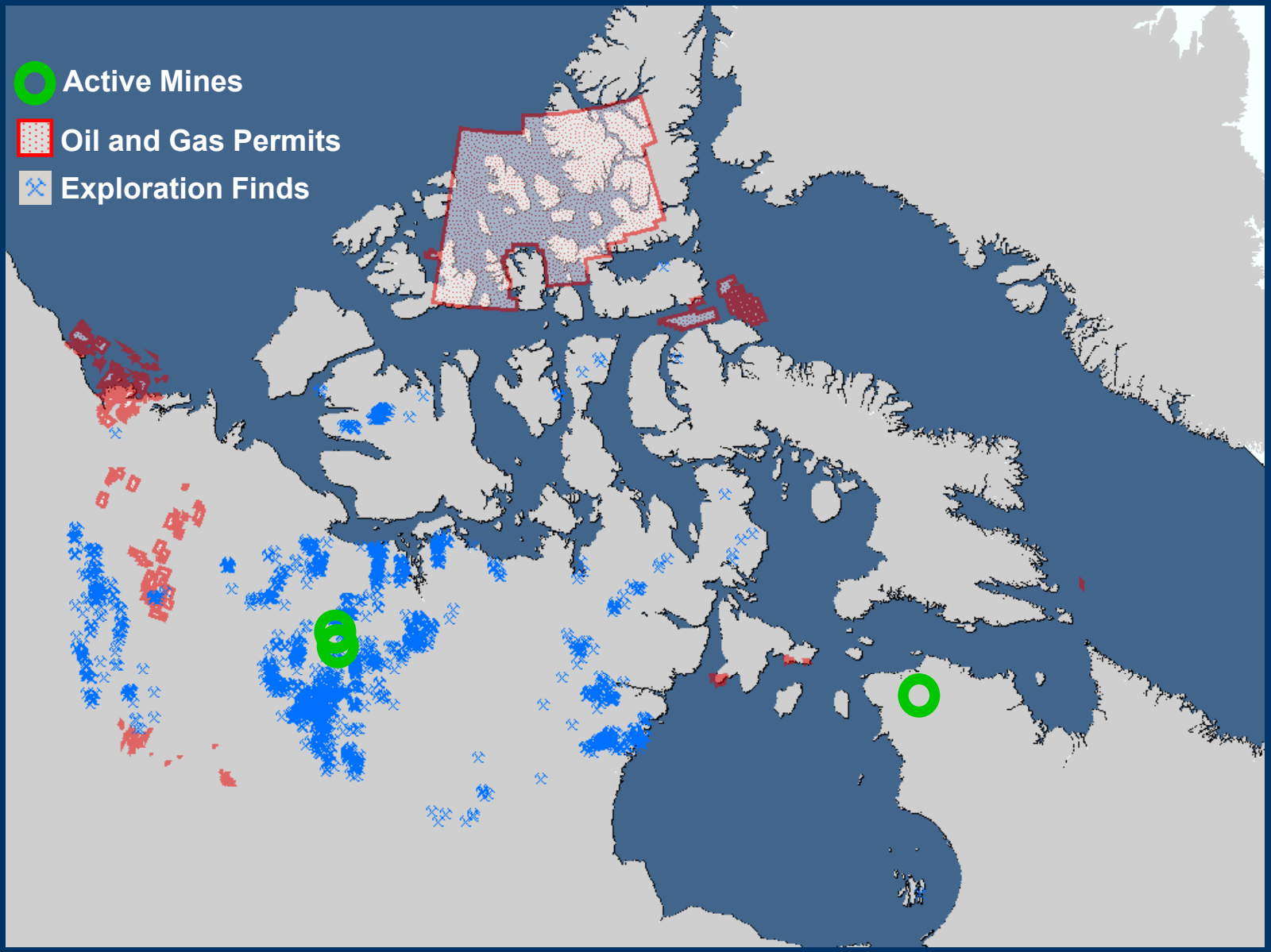
Transpolar Shipping Route

Implications for the Canadian Arctic and the Northwest Passage



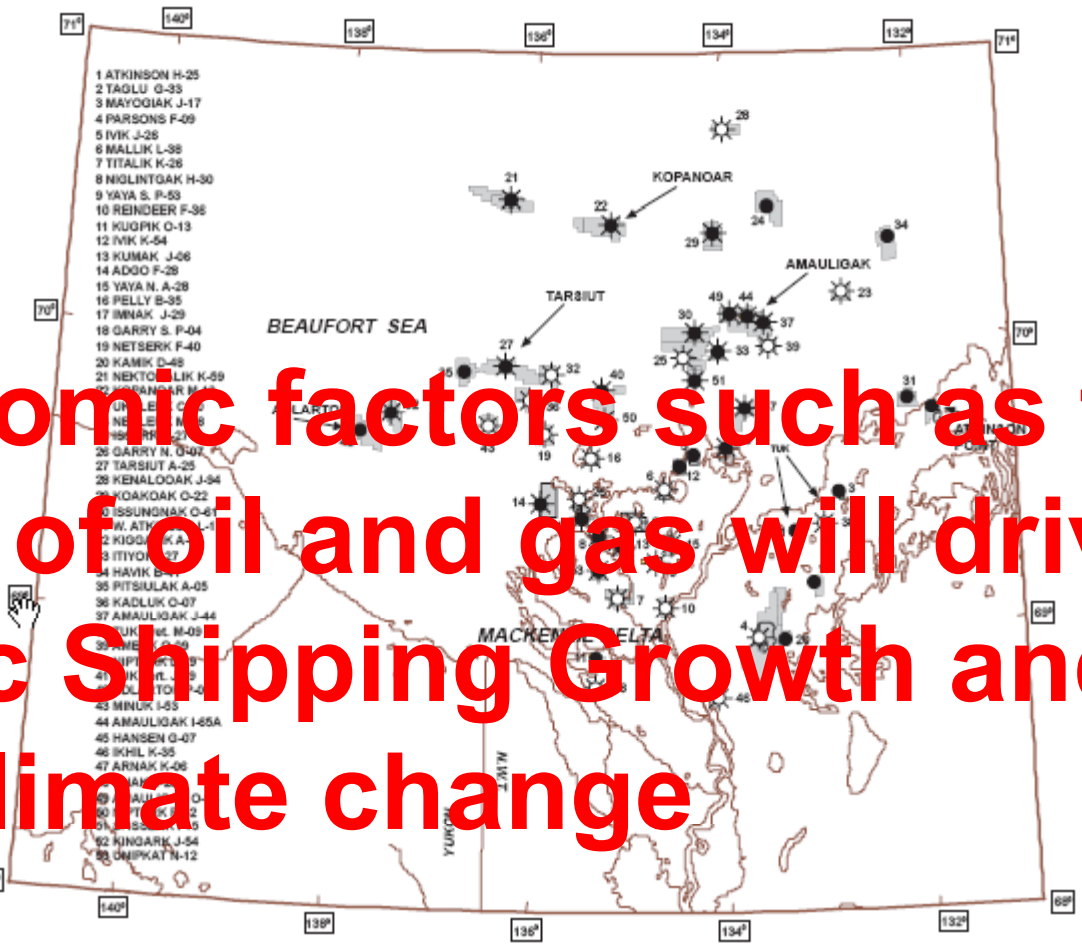
- Last ice to melt will be in the Canadian Arctic
- Multi-year ice will linger longest in the Northwest Passage and high inter-annual variability will continue
- Northern Sea Route and Transpolar route will open first and be more reliable, attractive ocean transit route

The Arctic contains vast mineral deposits, 10 per cent of Canada's remaining crude oil reserves, and 23 per cent our gas reserves



Increased shipping expected in the Beaufort Sea

Beaufort Sea - Mackenzie Delta Significant Discoveries



	Gas ☼	Oil ●	Oil and Gas ✷	Total
Oil and Gas Discoveries				
Beaufort Sea	8	4	14	26
Mackenzie Delta	12	9	6	27
Total	20	13	20	53

National Energy Board

Economic factors such as the price of oil and gas will drive Arctic Shipping Growth and not climate change

MODIS June 1

Cruise ship traffic is increasing steadily in Canada's Arctic

In Summary

- There has been a significant, continuing decrease in the extent of sea ice in the North and the Canadian Arctic
- “Shipping season” in the Canadian Arctic will lengthen by 3-4 months by the end of the century
- There will continue to be extreme inter-annual variability in ice conditions.
- Still considerable uncertainty when ice conditions in the Northwest Passage will permit regular passages
- The Russian Northern Sea Route will be the first to open
- There will be unanticipated impacts

Final Words

- As today, most of future shipping in Canada's Arctic will be destination not transit trips
- Ice regime in Hudson Bay could approximate current Gulf of St Lawrence conditions by mid-century – Port of Churchill could benefit
- Shipping will increase in Canada's Arctic in support of development of non-renewable resources
- Multi-year ice and inter-annual variability will continue to challenge shipping in Canada's Arctic