

The Future of Arctic Navigation

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Three route options:

- **Transpolar Sea Route**
 - Not currently commercially viable
 - Central Arctic is too risky with thick, multi-year ice
 - Unpredictable conditions
 - Lack of infrastructure
- **Northwest Passage**
 - Historically significant
 - Not yet a major commercial shipping corridor
 - Areas of thick, multi-year ice
 - Lack of deep-water ports
 - Shallow passages
 - Legal & regulatory complexity
- **Northern Sea Route**
 - Considered the most advanced Arctic route at this time
 - Existing infrastructure
 - Extensive icebreaker fleet
 - Deep-water ports
 - Still limited search-and-rescue & emergency support
 - High costs



Different ways to transit through ice:

- Ordinary cargo vessel
 - Requires icebreaker escort
- Ice-strengthened vessel
 - Extra hull plating, stronger framing, and built to handle some level of ice contact
 - Limited independent navigation
- Icebreaker
 - Special hull design that allows the ship to break the ice and lead convoys
 - Self-reliant

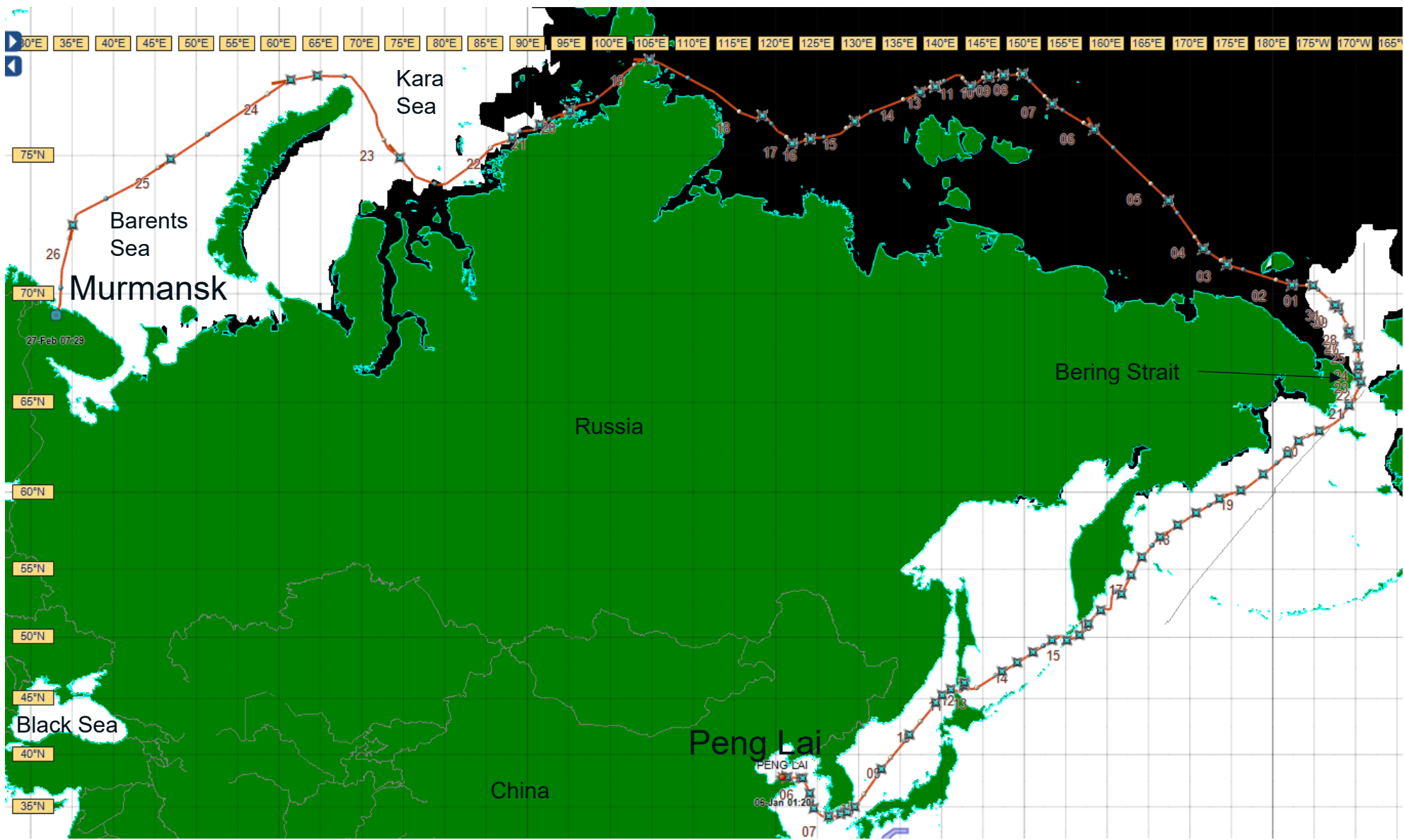


Flying Focus and Arctia Ltd.

Peng Lai to Murmansk

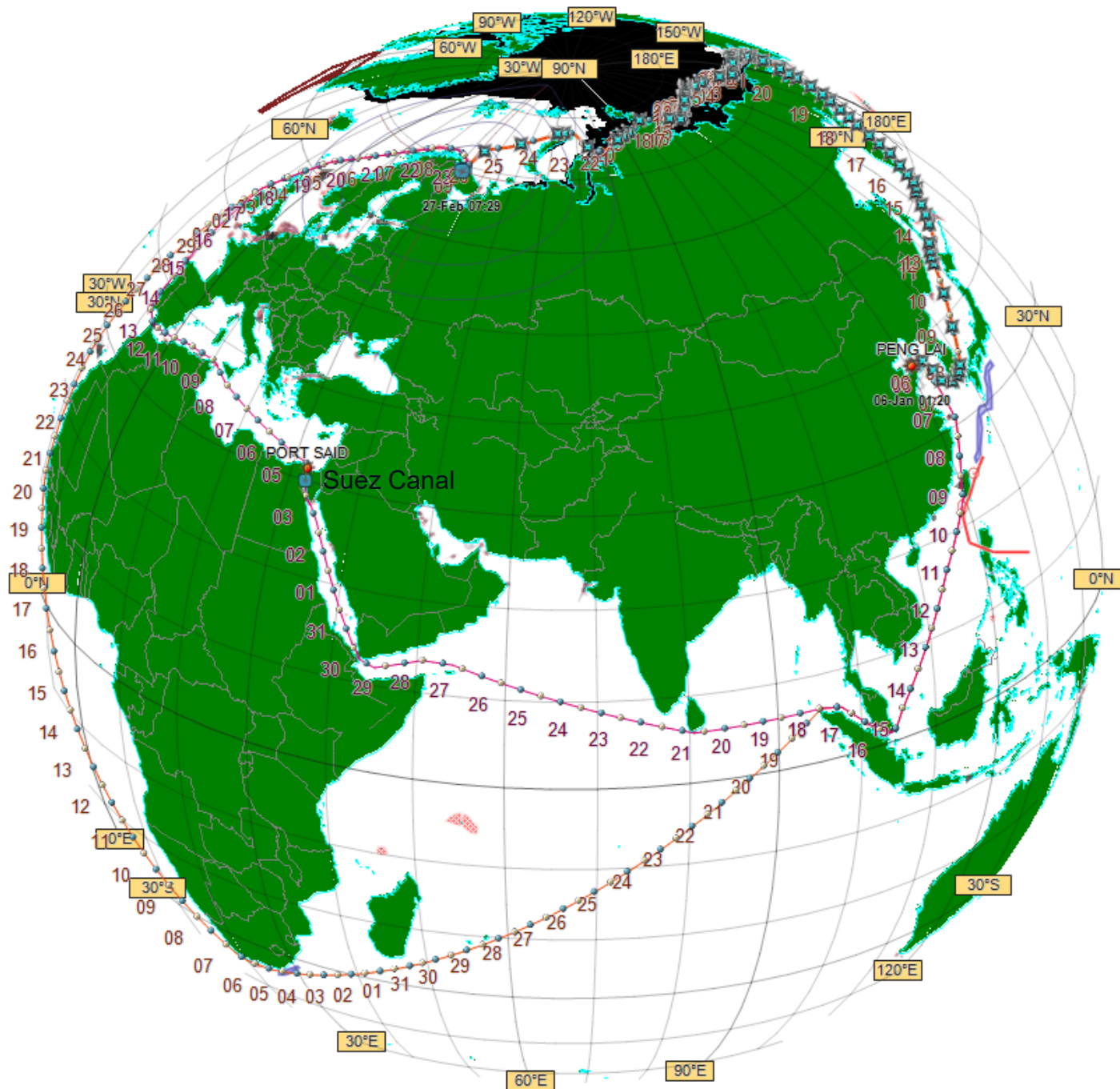
The vessel sailed ~11kts from Peng Lai to Bering Strait & in ice-free waters of Kara Sea and Barents Sea

And ~3kts through the ice



Total distance and time

- Northern Sea Route
 - 7,050nm
 - 7 weeks and 3 days
- Via Suez Canal
 - 12,450nm
 - 6 weeks and 6 days
- Around Africa
 - 15,930nm
 - 9 weeks





Climate Change

The Arctic is warming faster than the global average

- Less ice = less light reflected into space
- Heat transport northward
- Diminishing multi-year ice
- Water vapor as a greenhouse gas

Future Projections

- First 'ice-free' summer within the next three decades
 - Ice-free meaning less than 1 million km² of ice
- No more multi-year ice within the next two decades

Increased vessel traffic through the Arctic

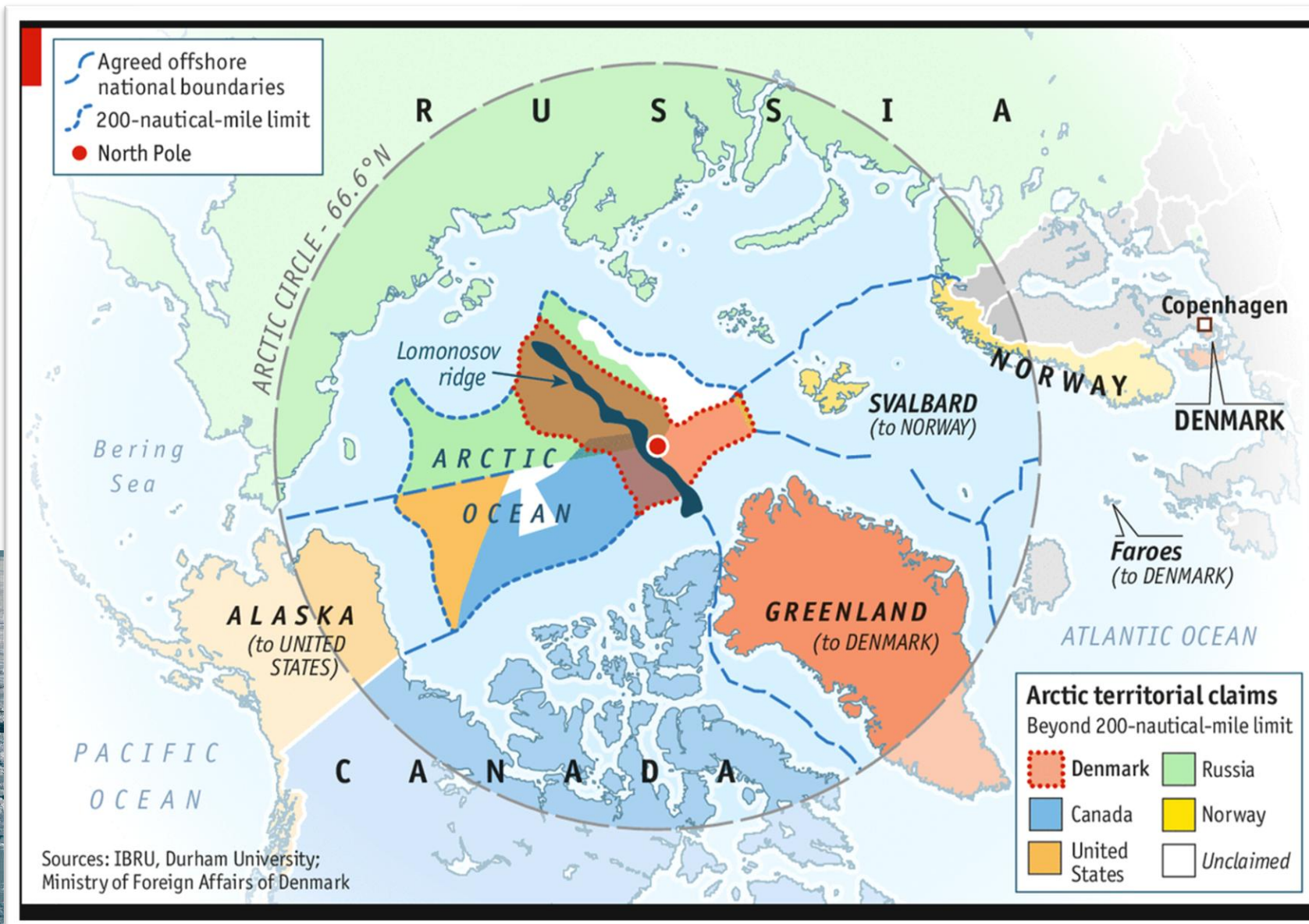
Challenges to Arctic Navigation

- Shifting ice
 - Winds and currents can close channels or push ice floes into narrow straits, trapping or slowing ships
- Icebergs
 - Unpredictable
 - Can drift into open waters and are dangerous
 - Extend deep below the surface
- More wave activity
 - Less ice = more & larger waves
- Vessel icing
 - Strong winds + subfreezing air causes ice to form on ships
 - Uneven weight can cause capsizing
 - Can disable ship equipment
- Lack of forecasting & satellite data
 - Fast-forming polar lows are difficult to forecast
- Low visibility, long nights
- Lack of emergency support
- Environmental concerns



Geopolitical Issues

- Arctic navigation is not solely physical or climatic
- Must consider national boundaries and global conflicts as well





Thank You

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