Surface Current Measurements in the Northeast Chukchi Sea Using Shore-Based High-Frequency Radar

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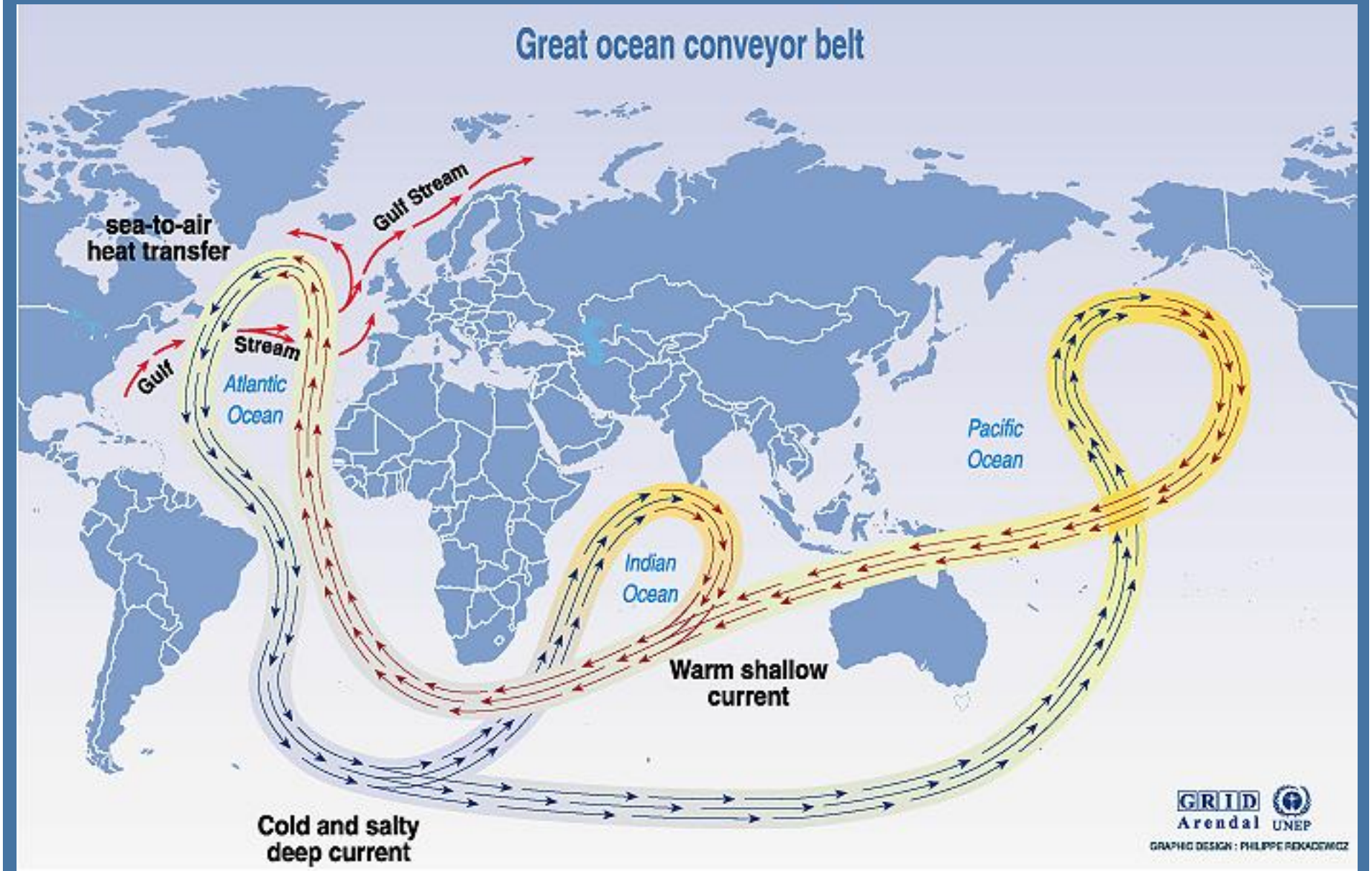
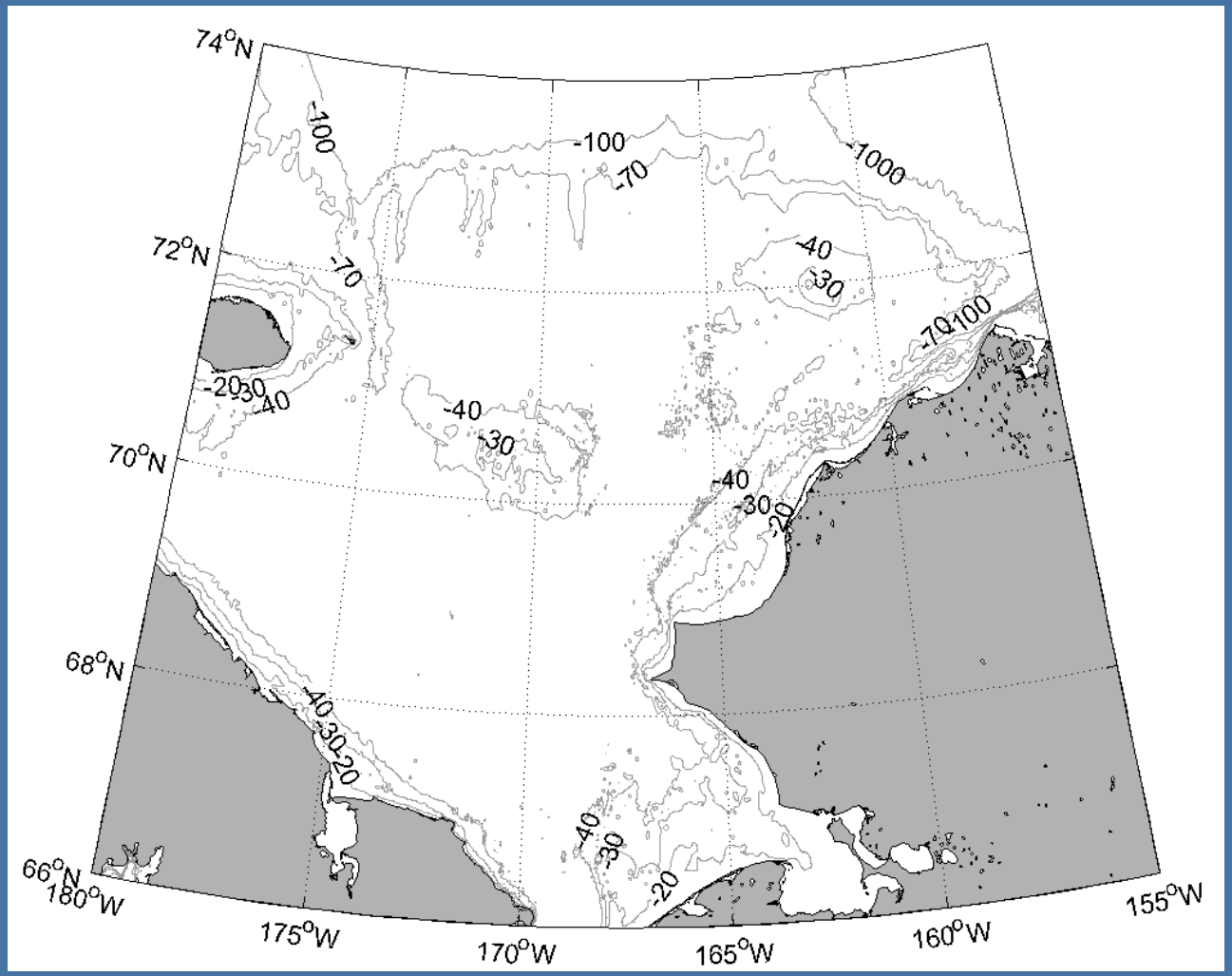


Source: Broecker, 1991, in Climate change 1995, Impacts, adaptations and mitigation of climate change: scientific-technical analyses, contribution of working group 2 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge press university, 1996.

Bathymetry Steers Currents



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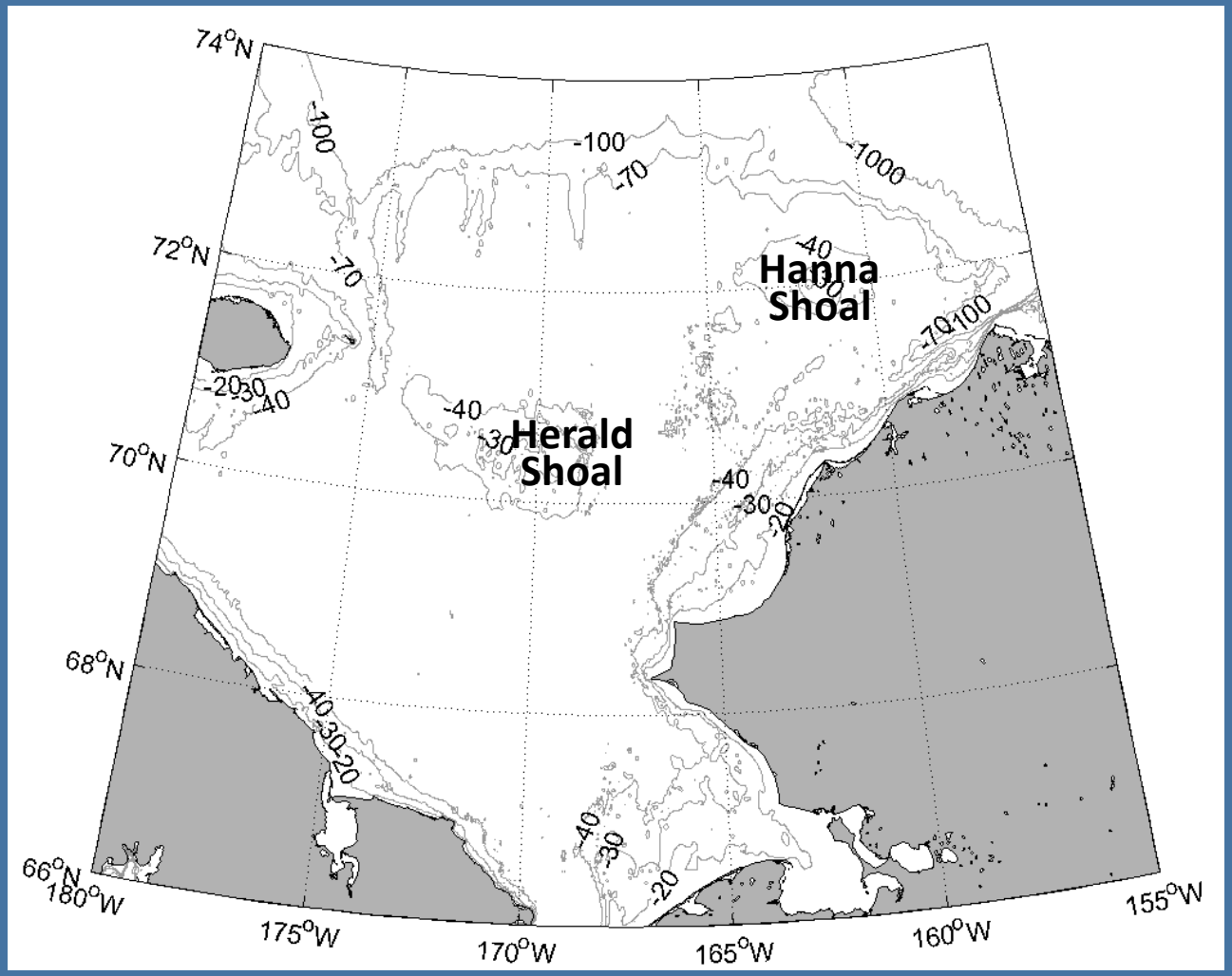
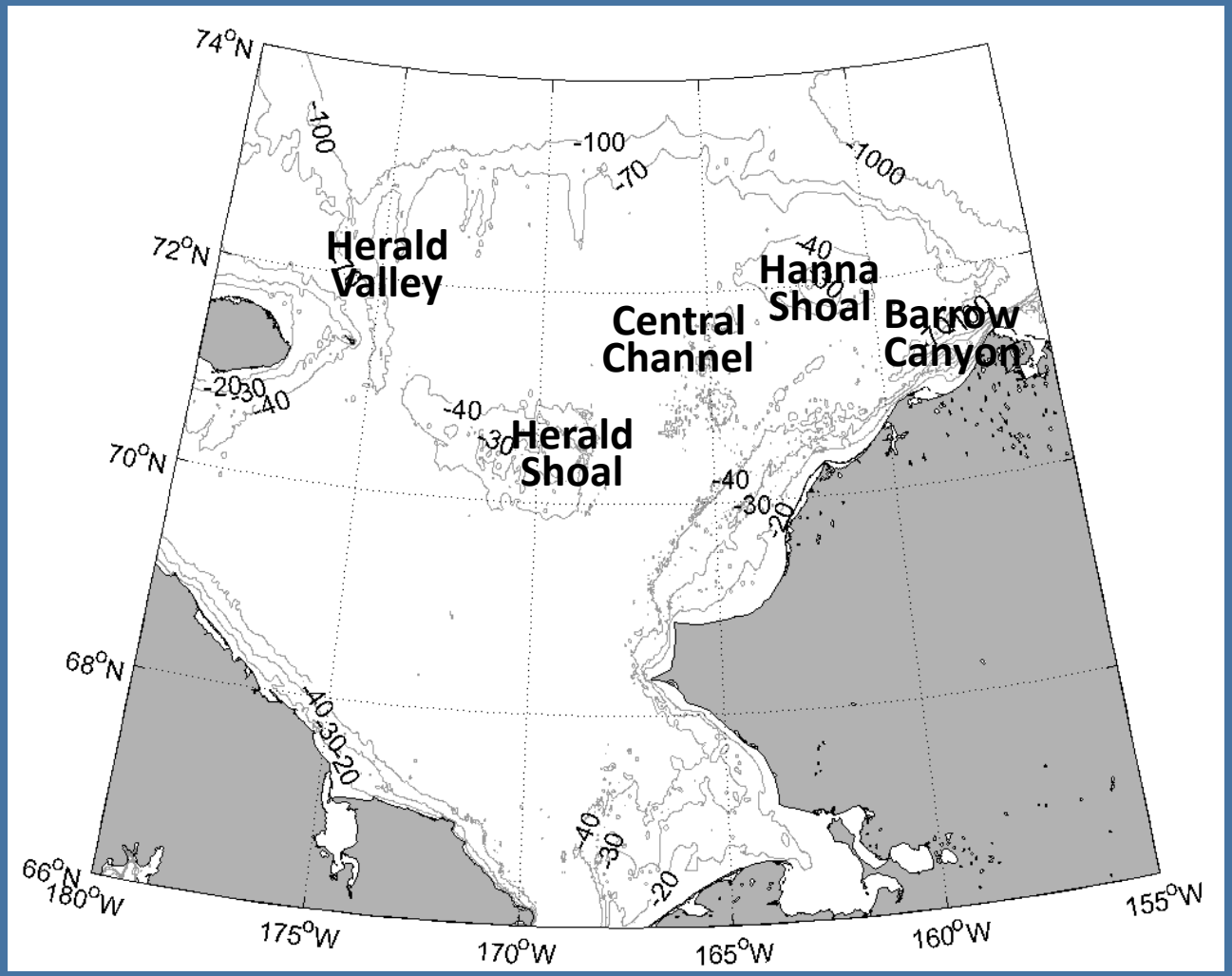


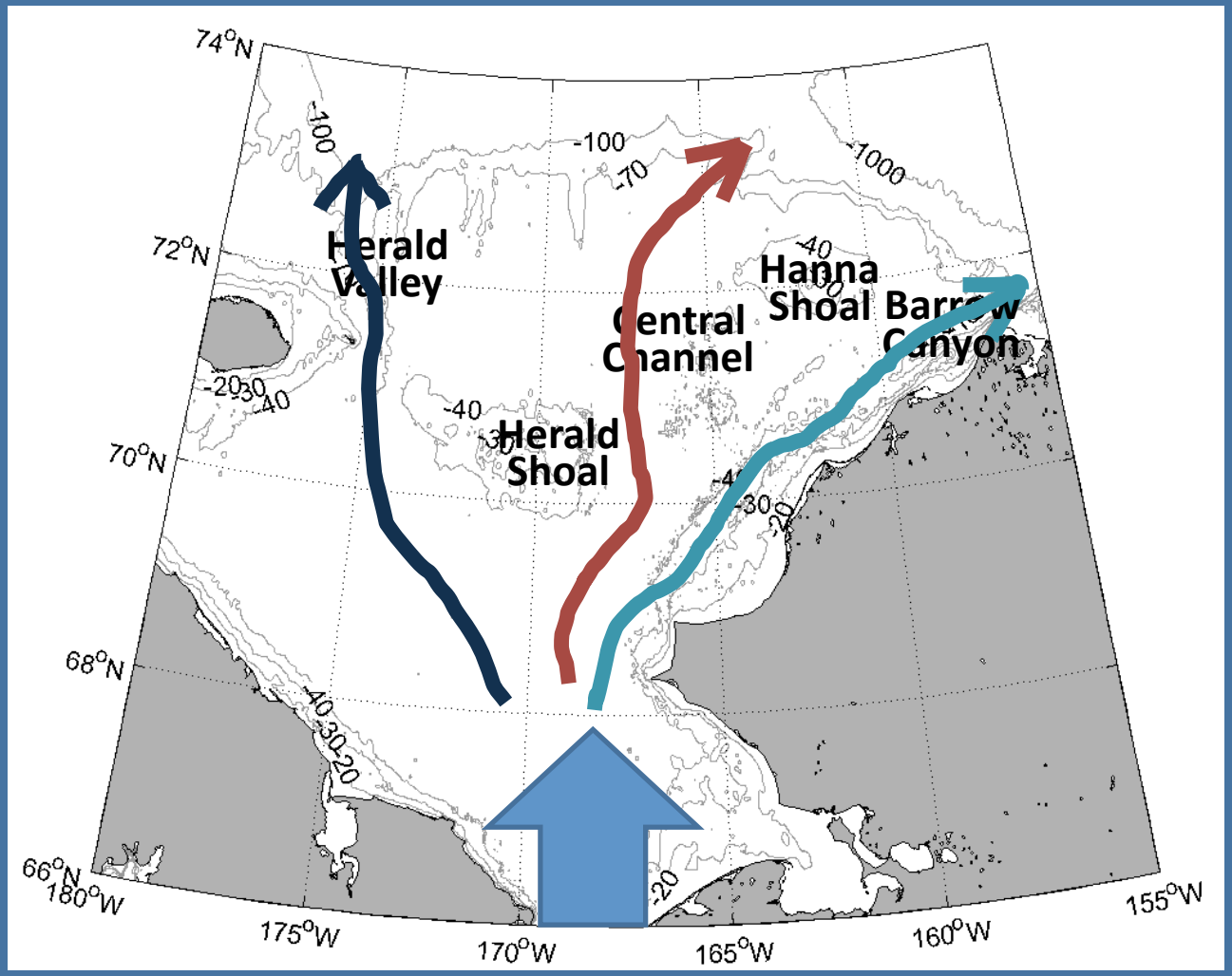
- Shallow Shoals

Bathymetry Steers Currents



- Shallow Shoals
- Deeper Canyons and Channels

Study Background



- Shallow Shoals
- Deeper Canyons and Channels
- Mean northward flow due to pressure gradient from Pacific to Arctic
- Flow field follows the deeper areas

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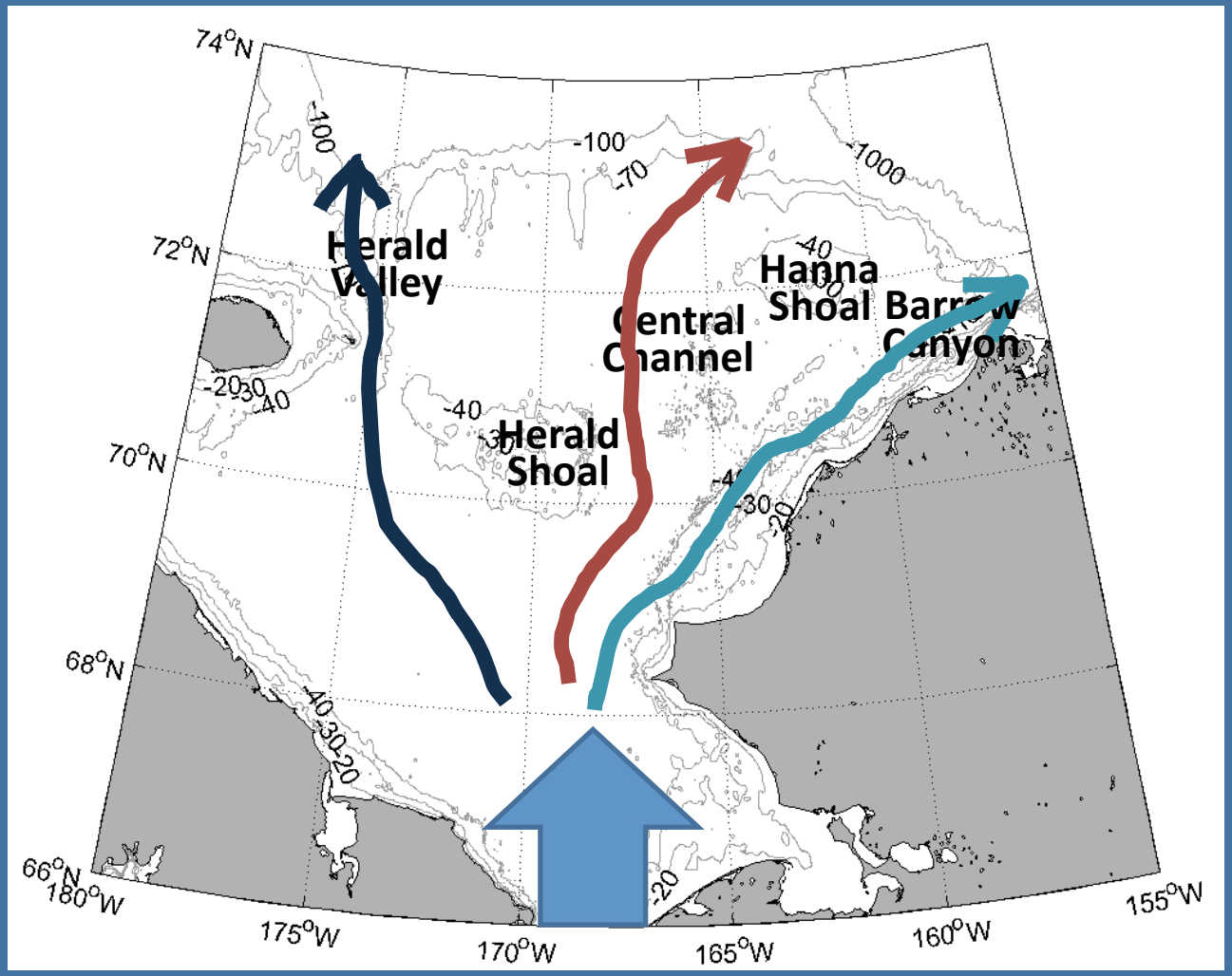

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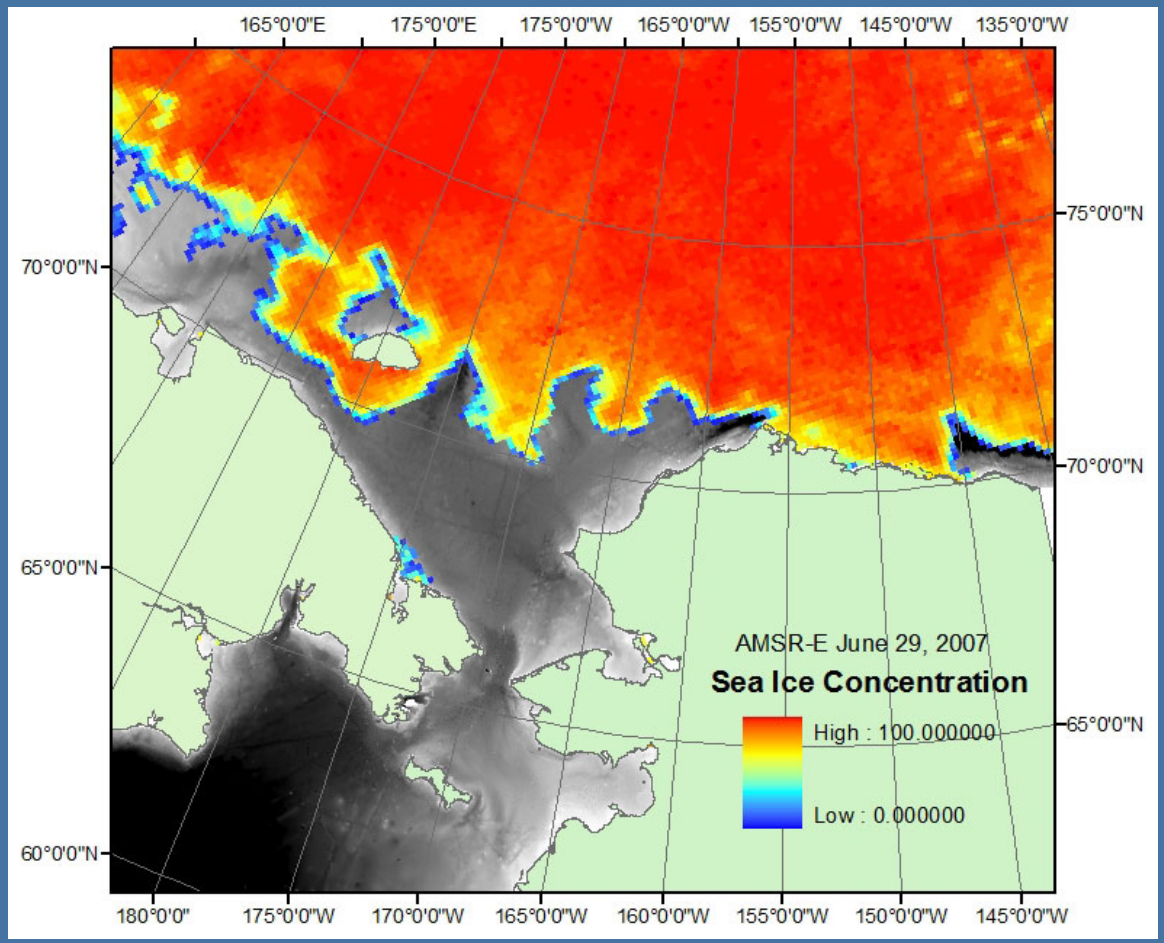
Currents Affect Ice Retreat



- Ice retreats earliest in channels and latest over shoals

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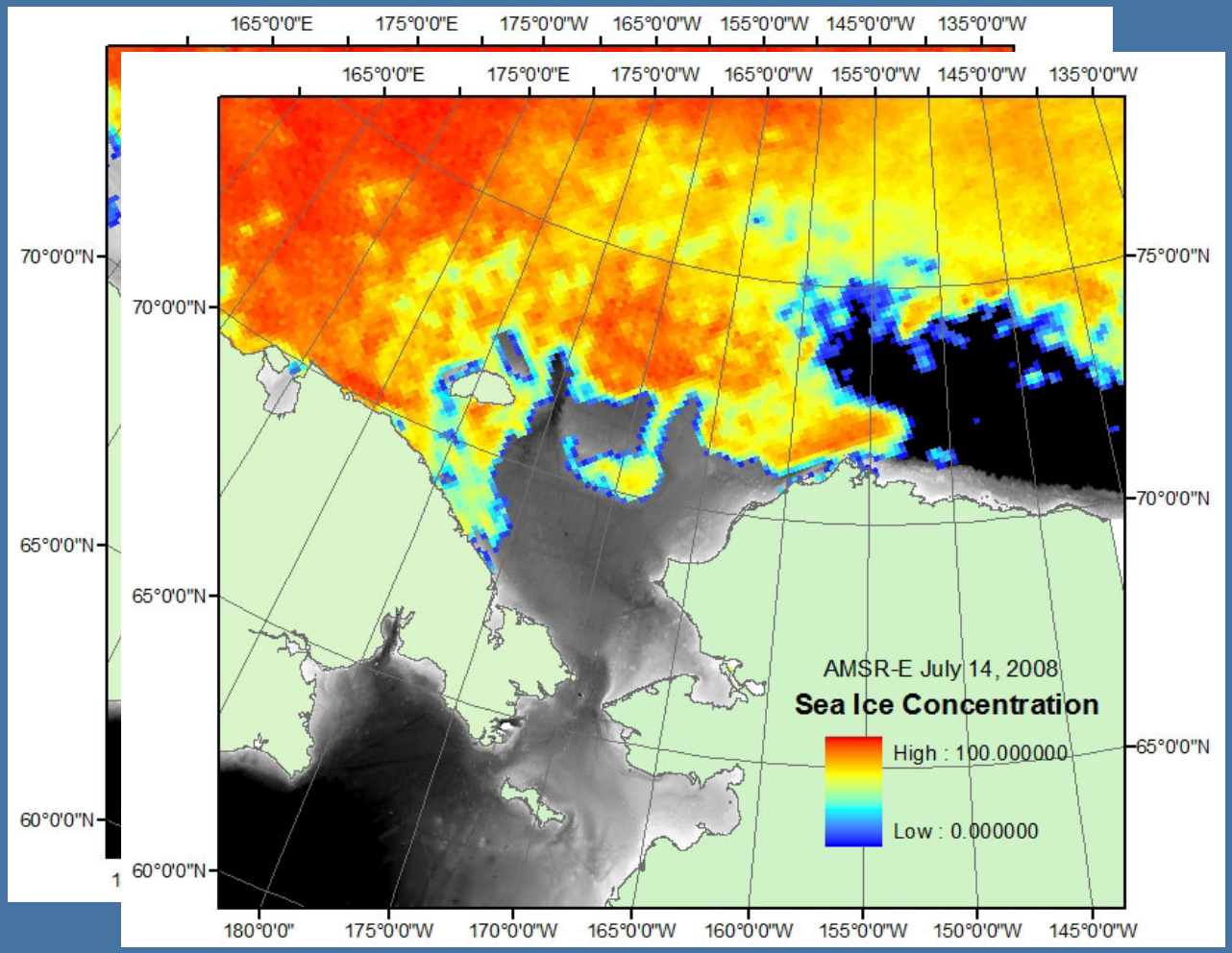

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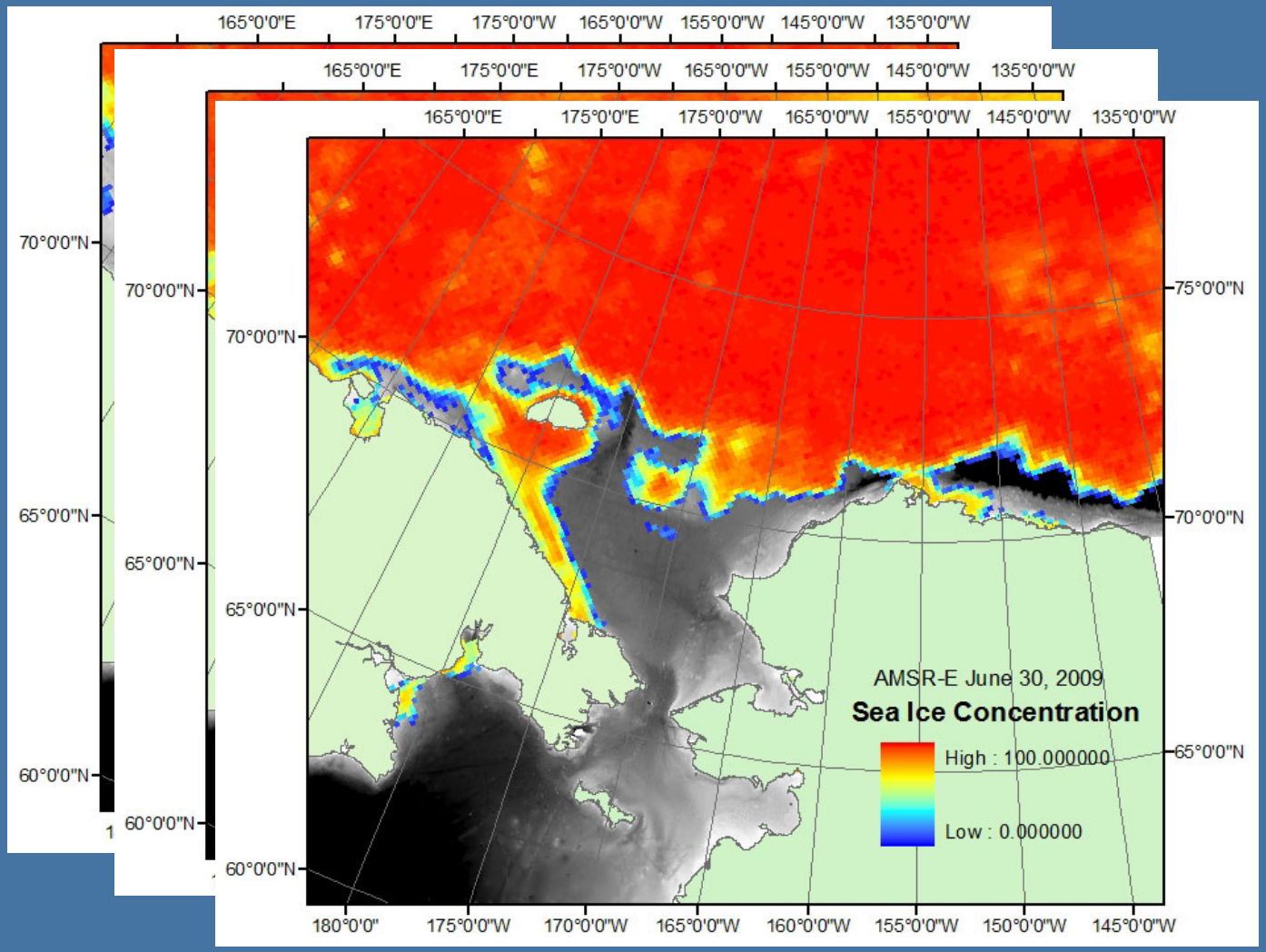

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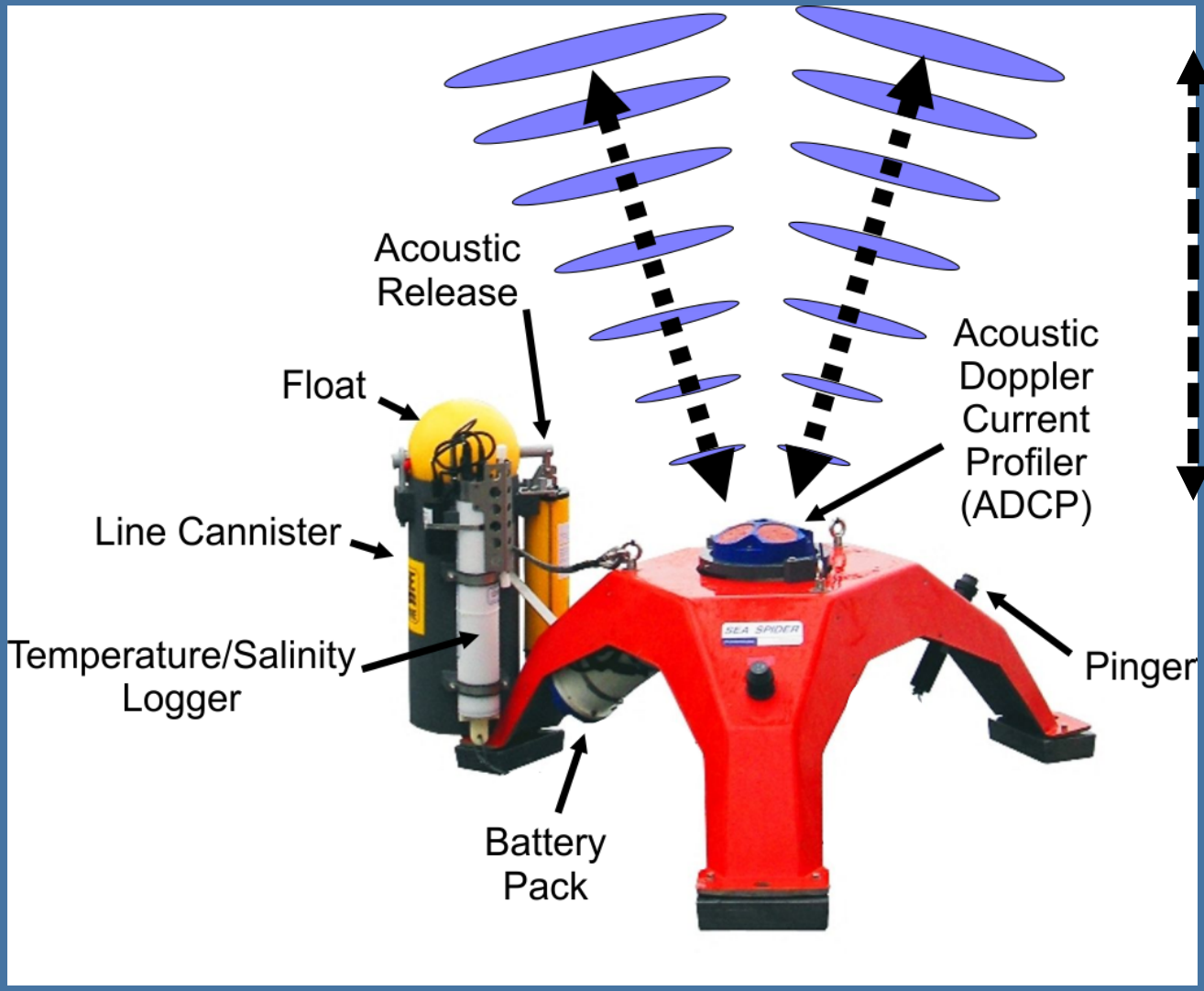
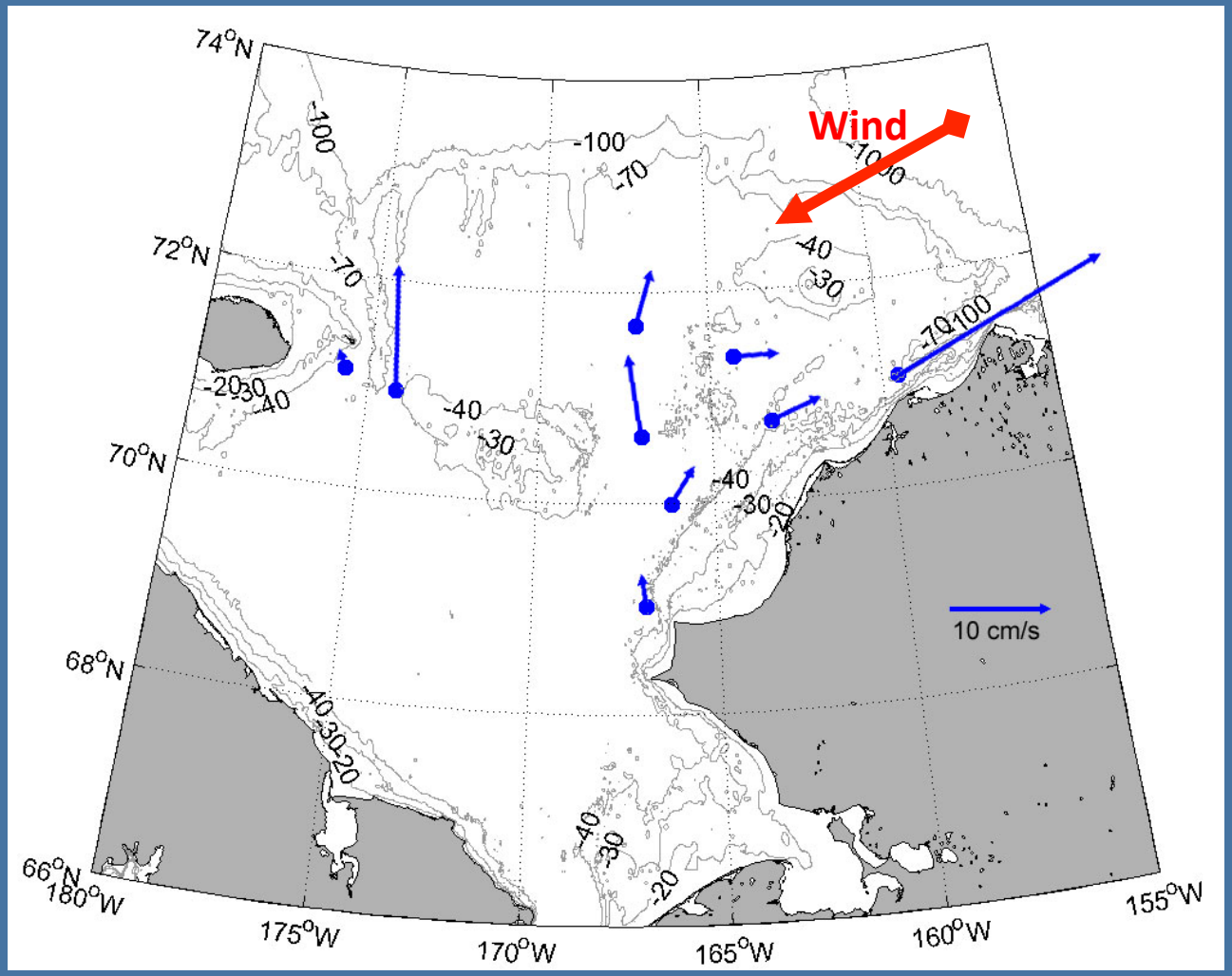
Bottom-lander tripod current meter mooring



Instruments record every 30-60 minutes

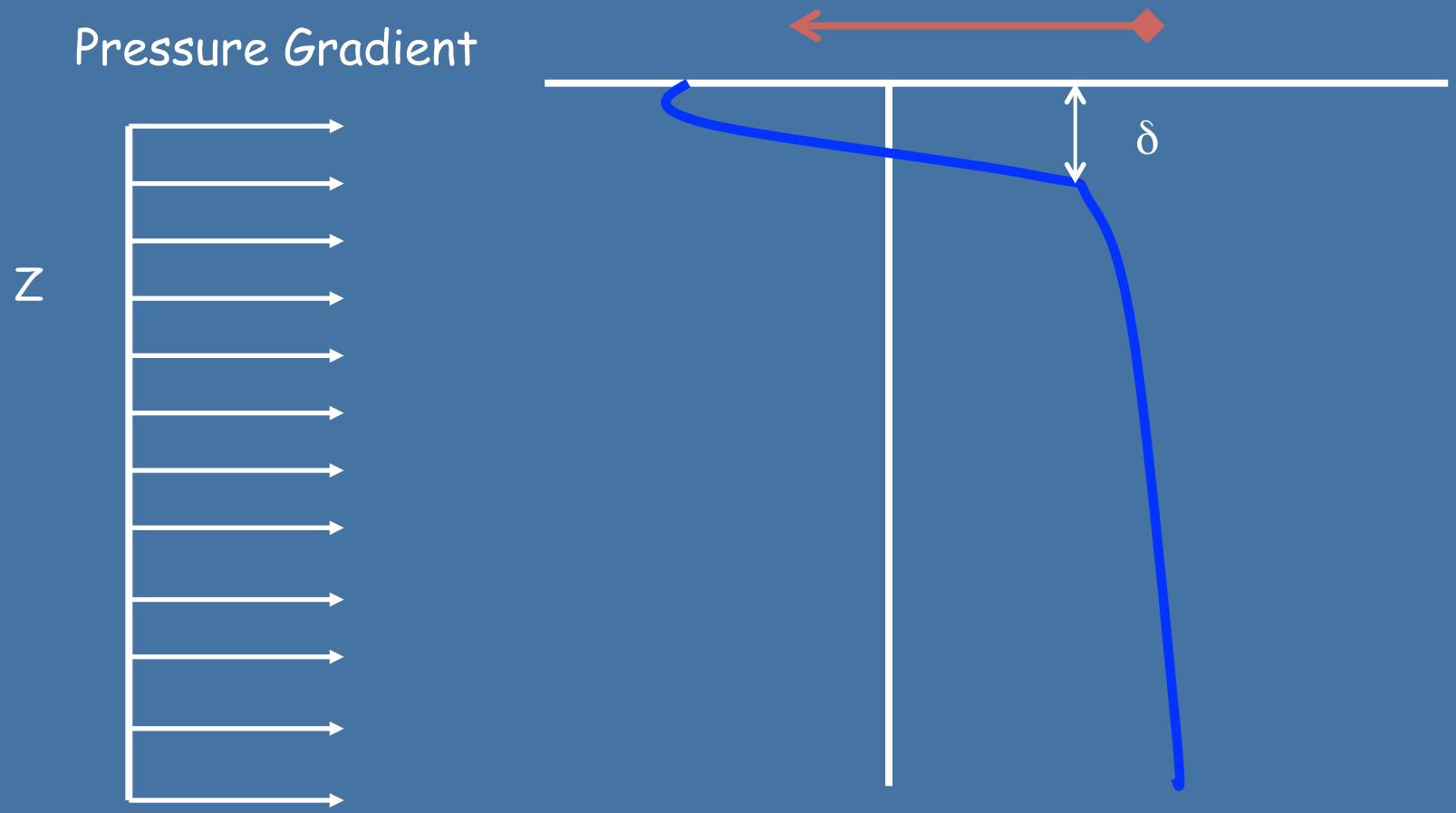
Sub-Surface Currents



- Mooring data collected from 1990 to 1995
- Oppose mean winds
- Swiftest in canyons/channels and weakest in shallow regions
- Strongest in summer and weakest in winter

Wind Stress Effects on Water Column

δ= Depth over which wind stress modifies the velocity profile
- depends upon wind strength, stratification, ice cover



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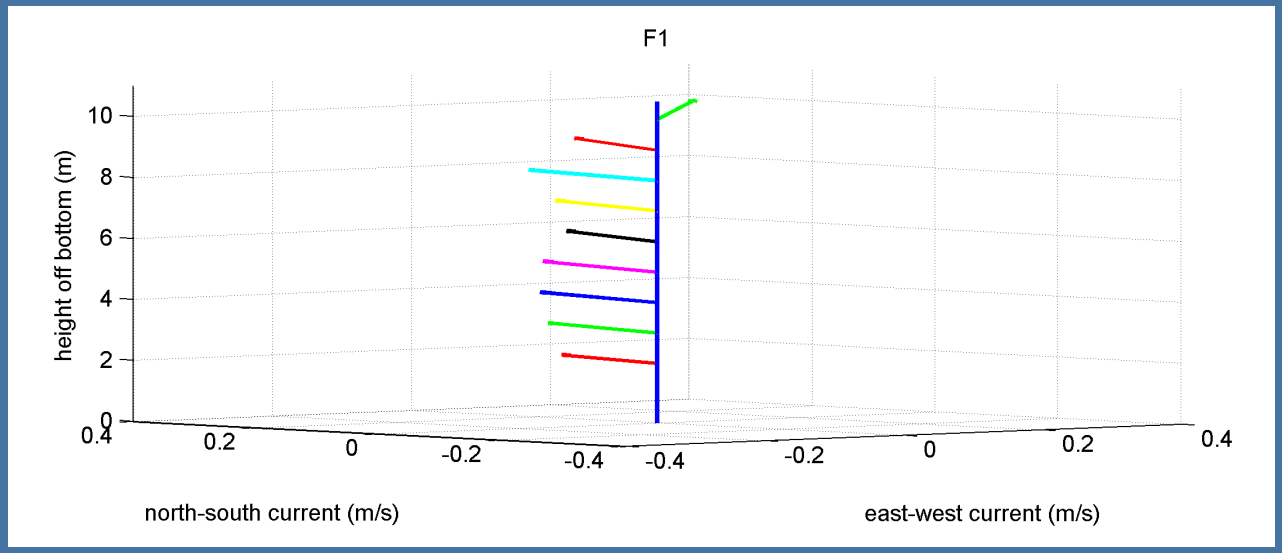
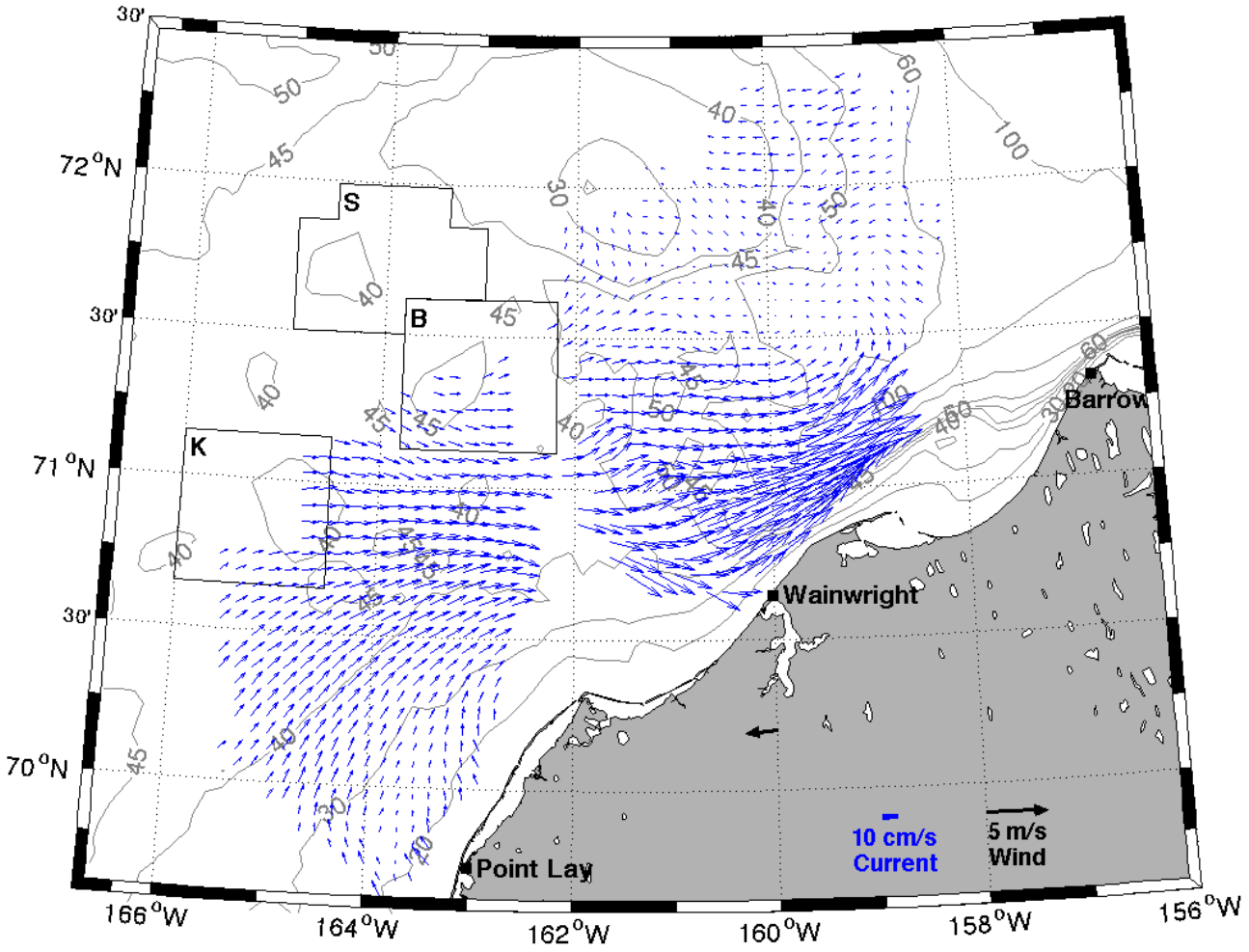


Figure courtesy of Li Erikson, USGS

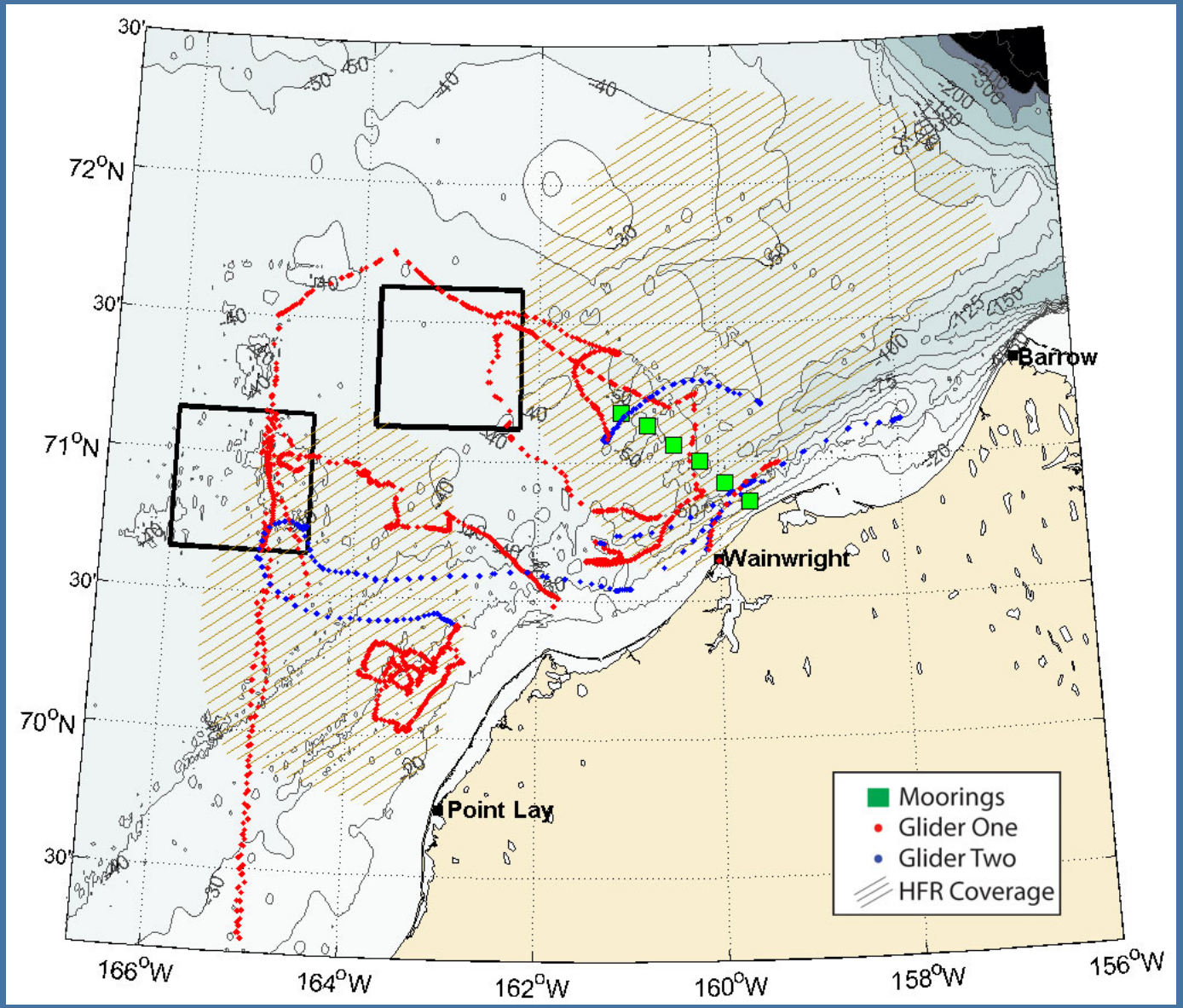
- USGS current meter data from September 2009, immediately offshore of Wainwright
- Surface waters are flowing in a different direction than those at depth

Coastal Current



- 2011 Data
- Bathymetrically Steered
- Moderately correlated with along-shore winds
- Correlation is stronger in summer than winter

Multiple Data Sets

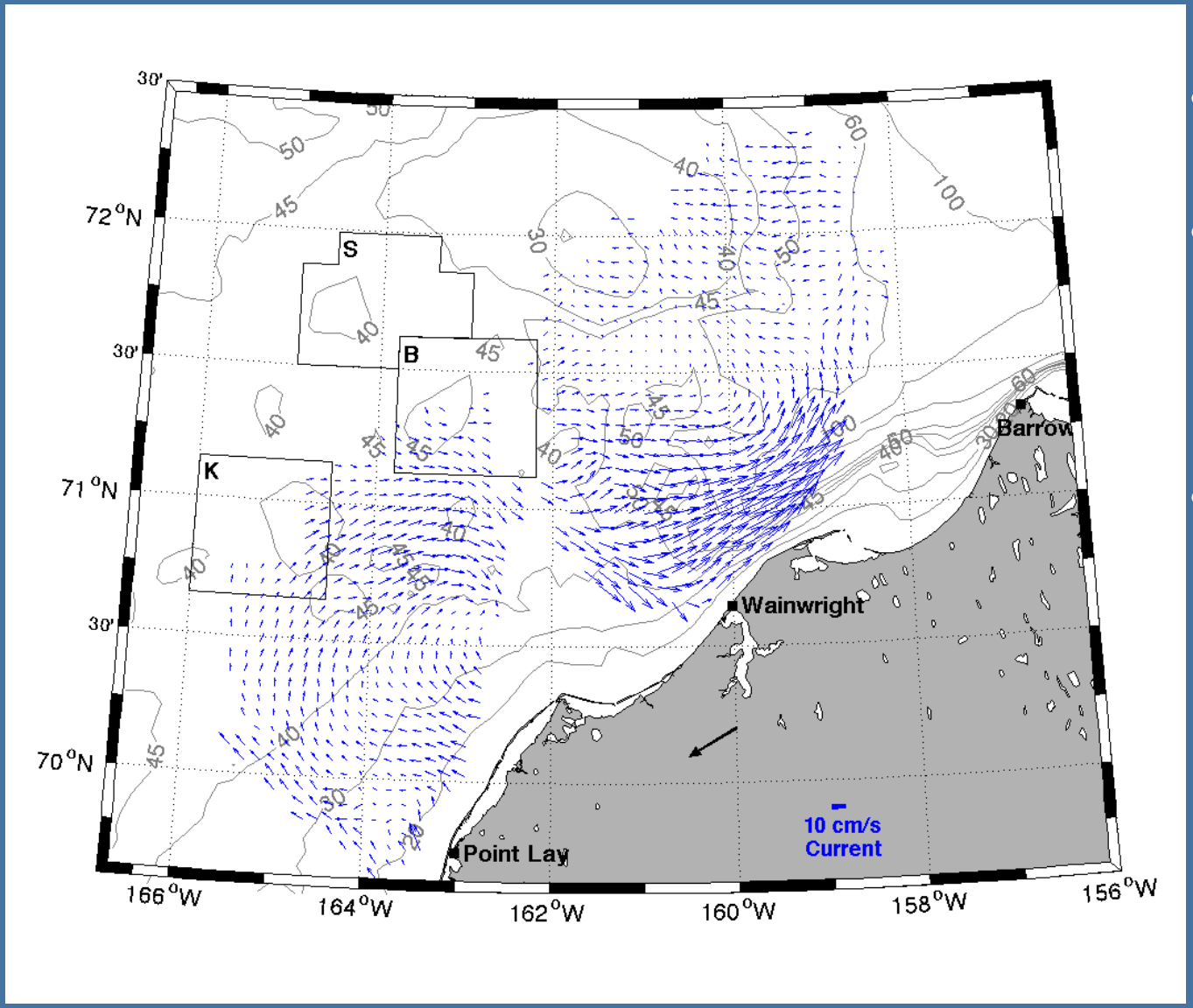


- 2009 – 2011
- HF Radar
- Moorings
- Gliders
- ~40% of Bering Strait waters exited through Barrow Canyon

High-Frequency Radar

- Measures surface currents top 2 m of water column
- 6 km resolution
- Hourly
- Up to 200 km offshore

Average Surface Flow



- NE winds < 6 m/s
- Eastward flow transports waters toward Barrow Canyon
- North of 71.5°N surface circulation is comparatively weak and more variable in direction

Thank you!

Any Questions?