Subpolar Gyre, Arctic Ocean Circulation and Eastern Boundary Currents

C. Chen

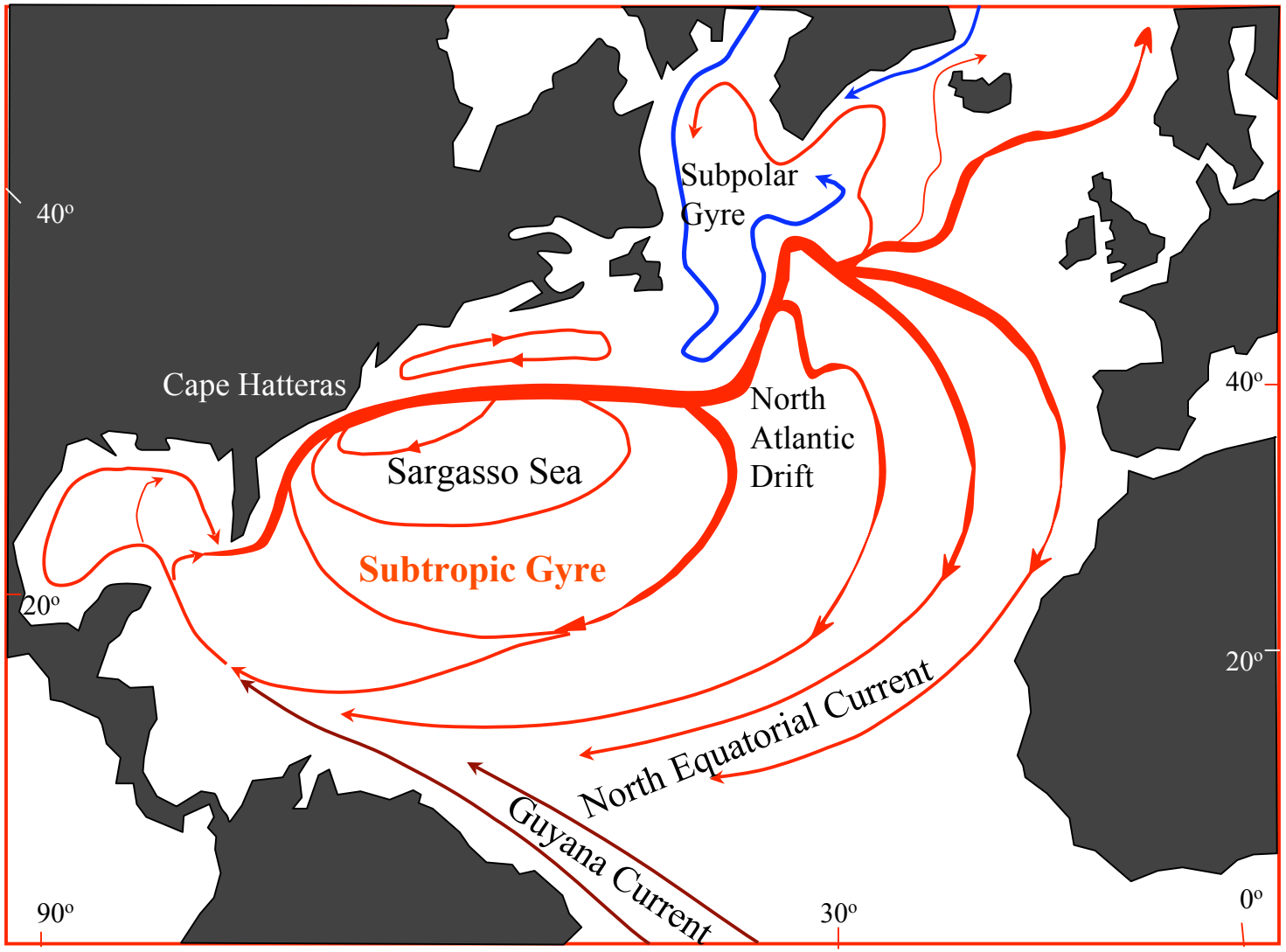
General Physical Oceanography

MAR 555

School for Marine Sciences and Technology

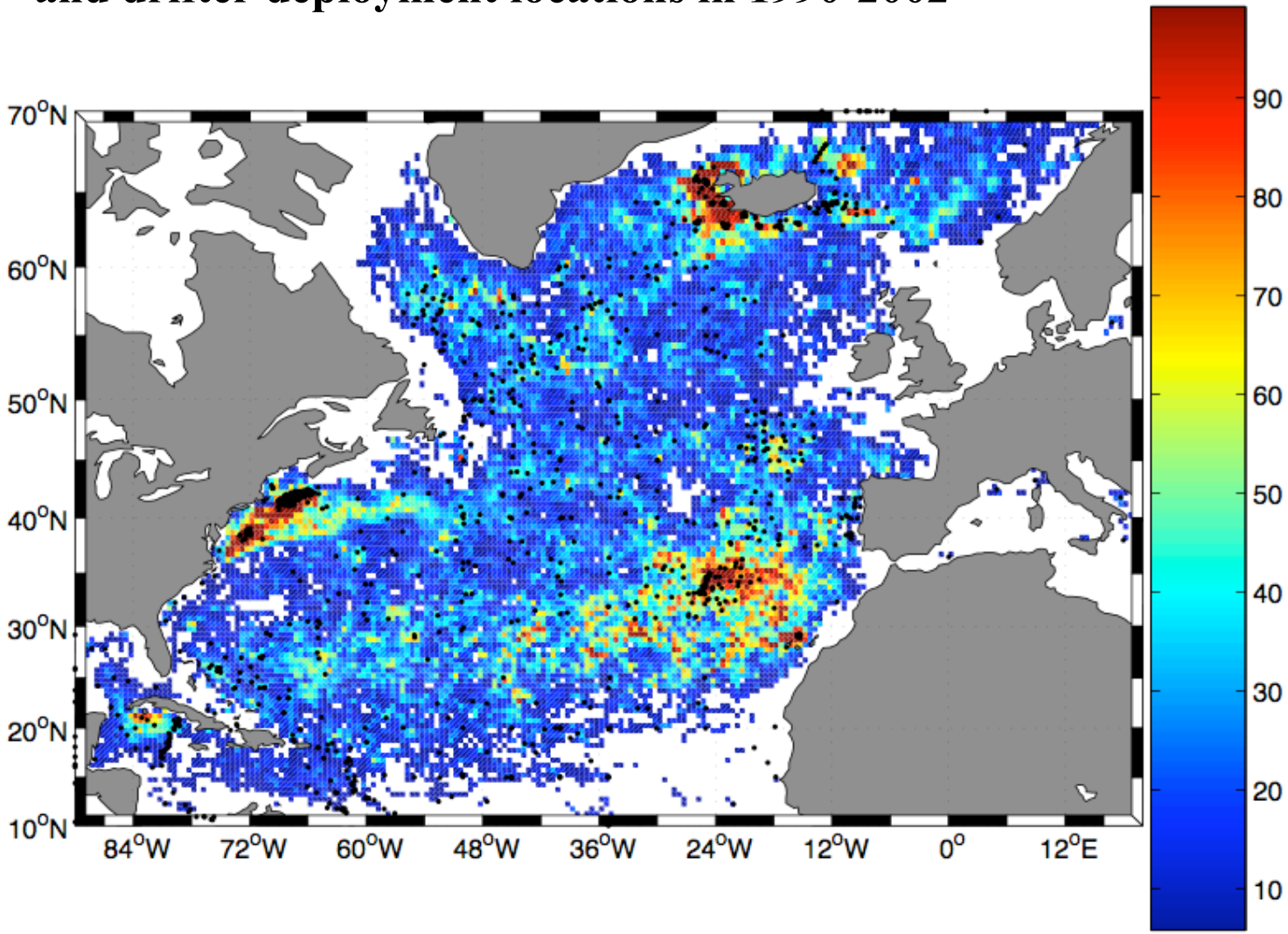
Umass-Dartmouth

MAR555 Lecture 6: Subpolar Gyre, Arctic Ocean Circulation and Eastern Boundary Currents



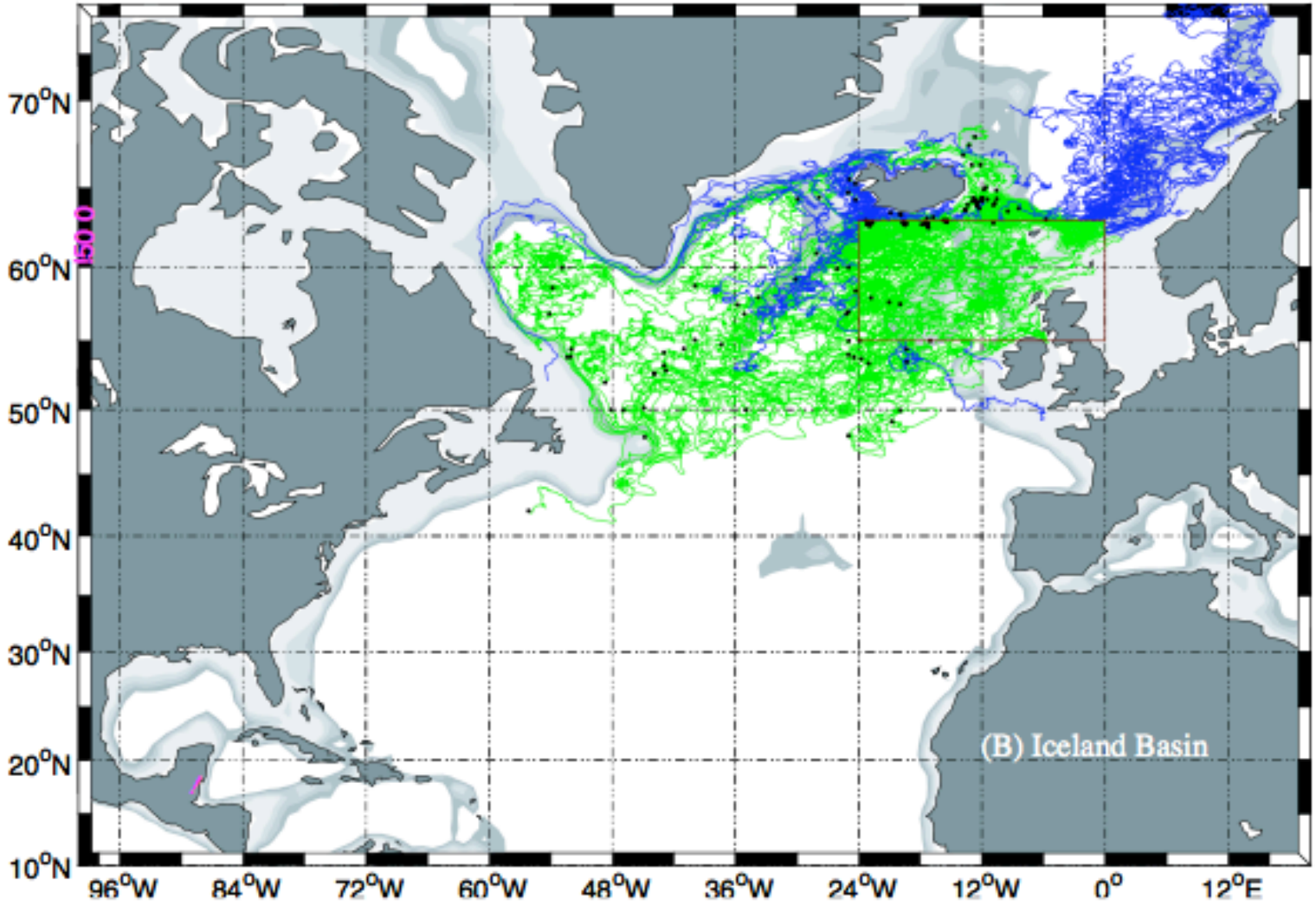
Schematic of Subpolar Gyre and Deep Water Currents

Drifter density [buoy-days (>5 days] in 0.5° squares (colors) and drifter deployment locations in 1990-2002



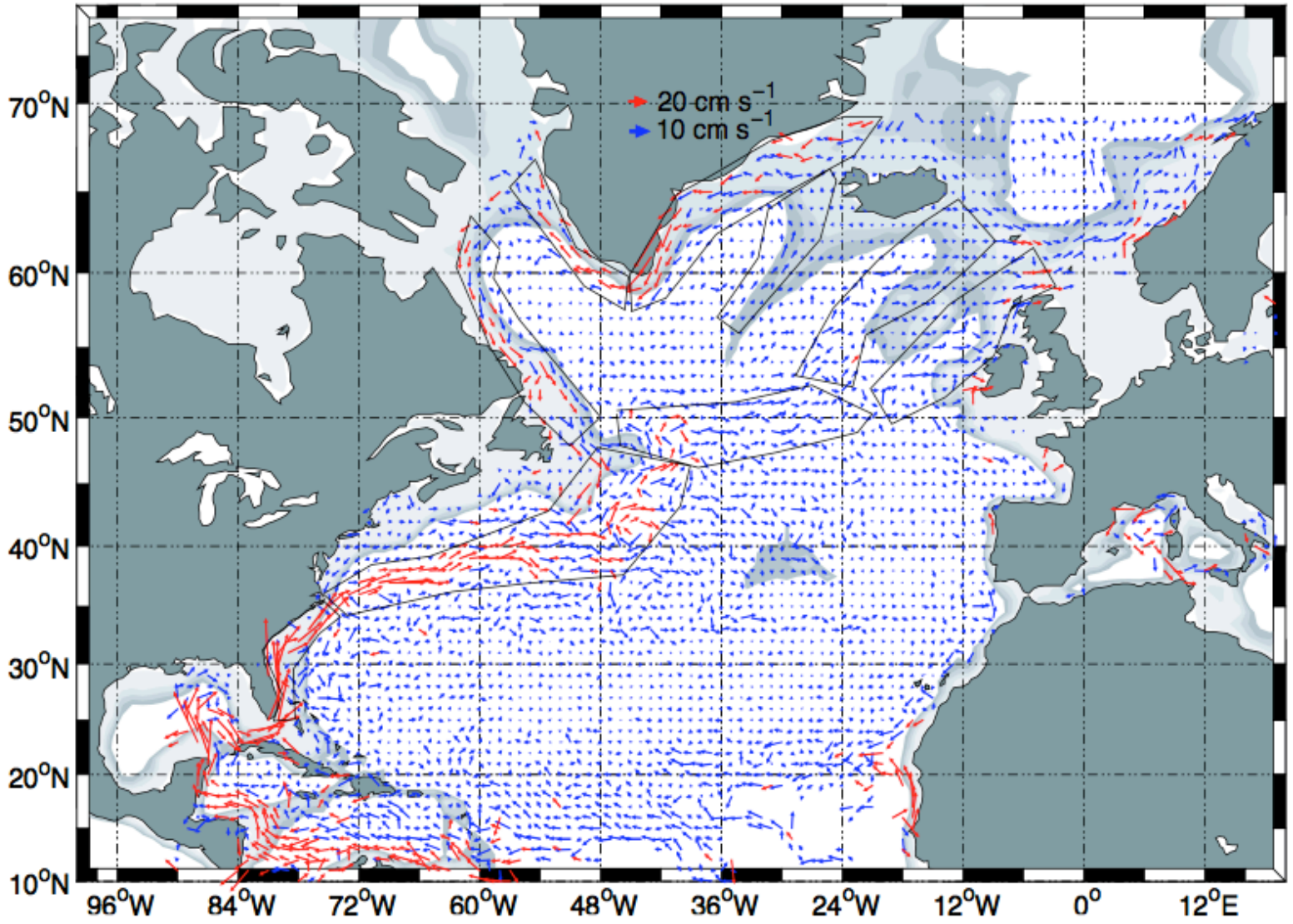
From E. Brambilla's Ph.D. Thesis (2006) at Scripps

Trajectories of drifters in the Subpolar gyre area and adjacent regions



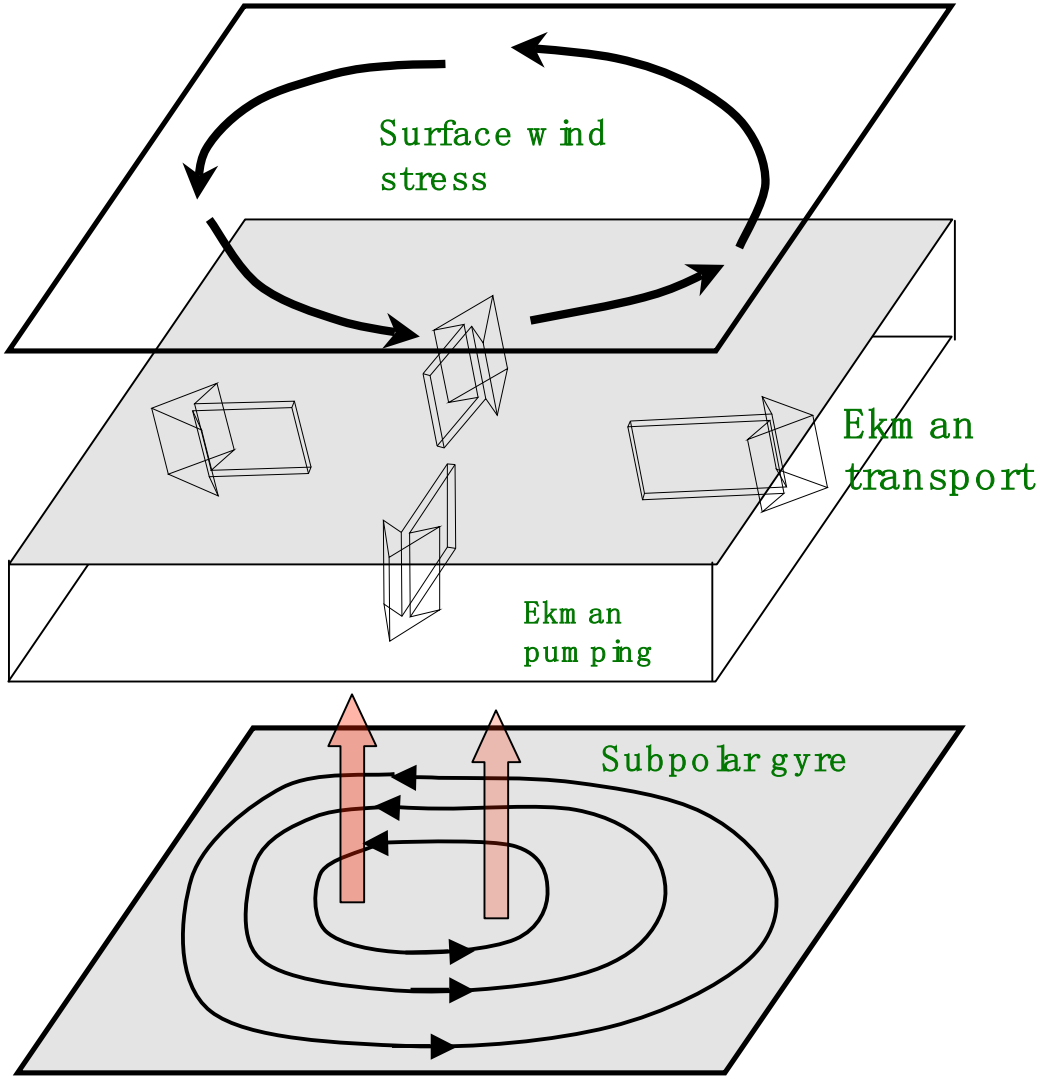
From E. Brambilla's Ph.D. Thesis (2006) at Scripps

Box-averaged ($1^o \times 1^o$) water currents



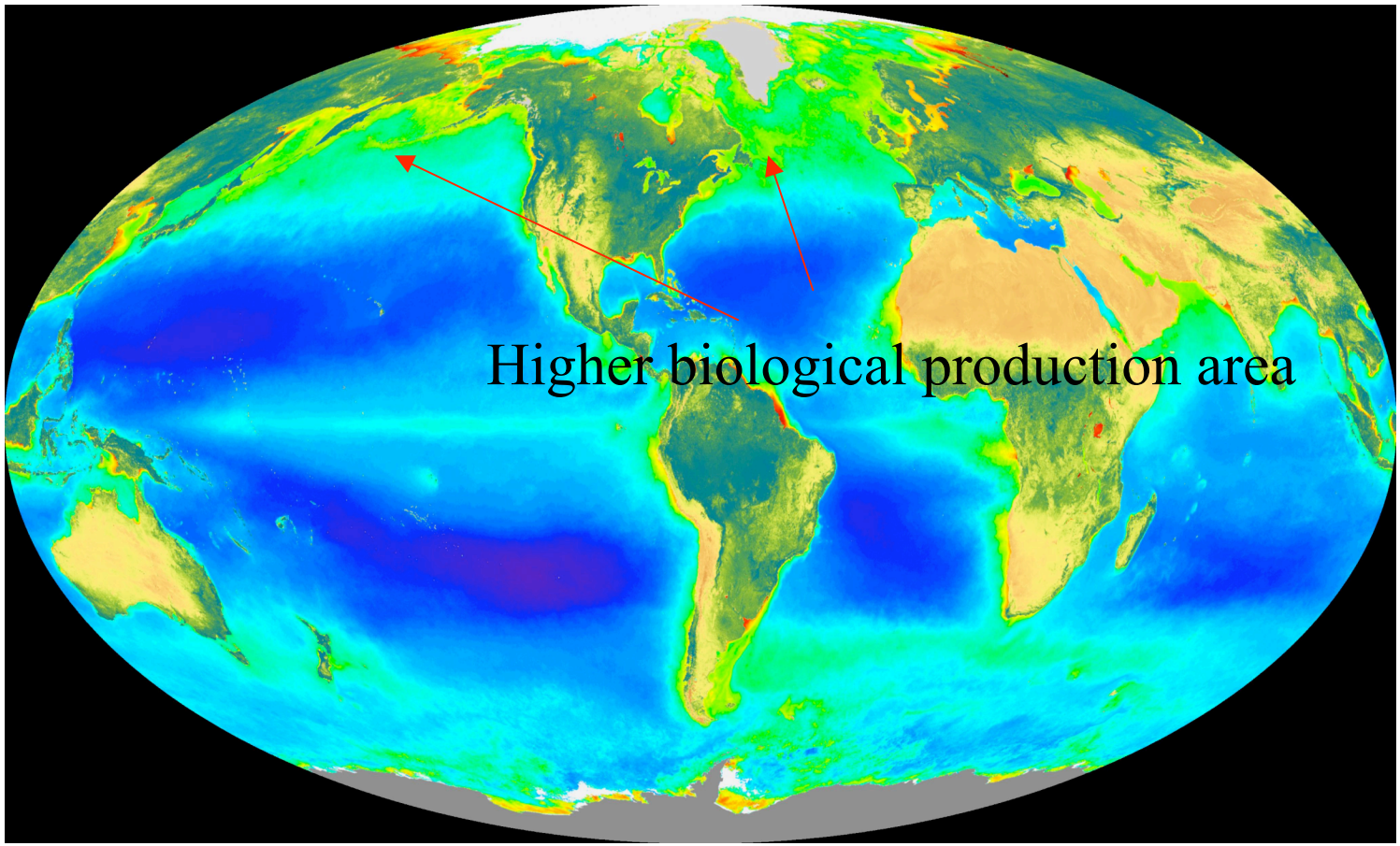
From E. Brambilla's Ph.D. Thesis (2006) at Scripps

Upwelling in Subpolar Gyre



Active upwelling-leading nutrient flux from the deep ocean to the euphotic layer

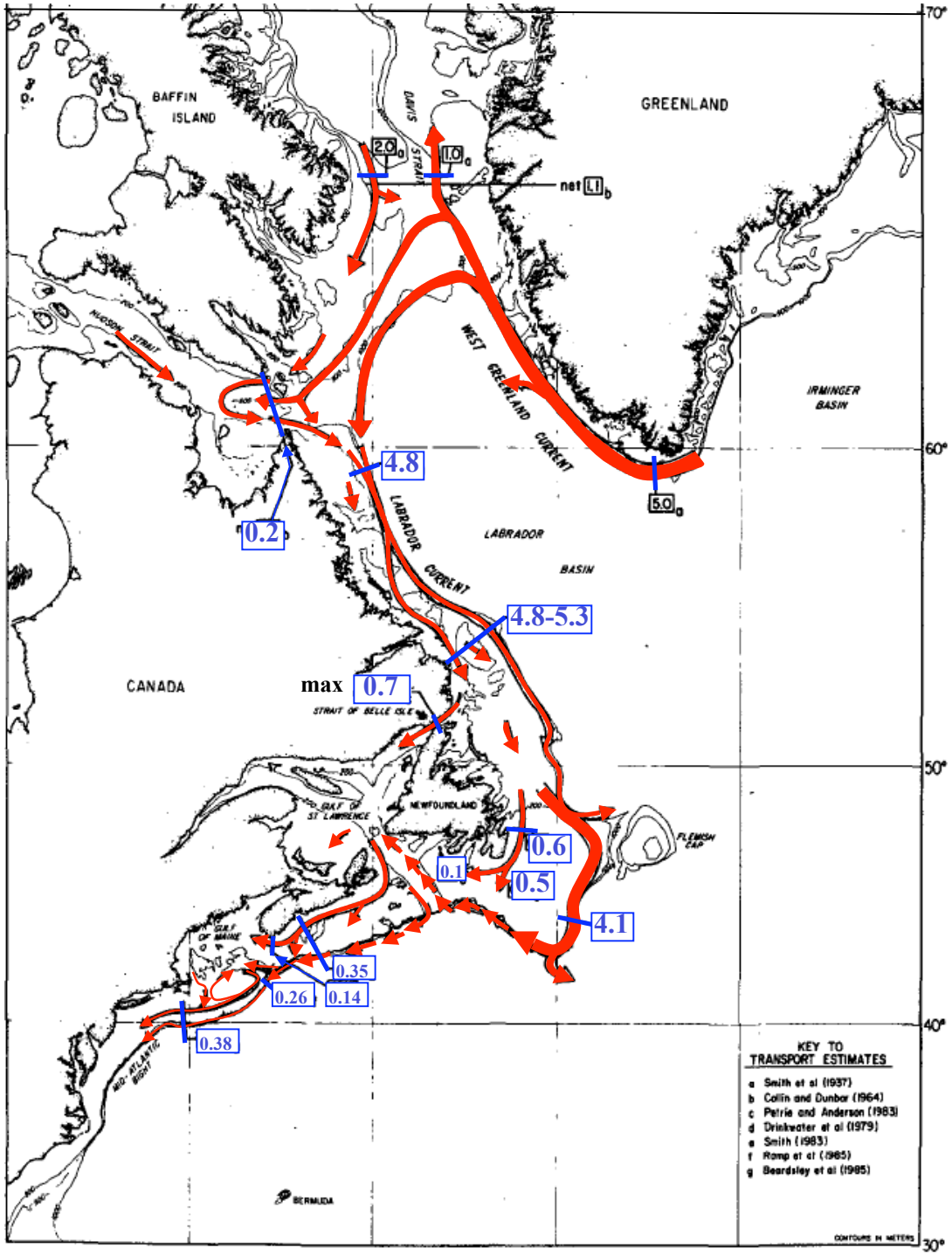
Global Distribution of Chl-a Concentration



Subpolar gyre: 15-150 mg/m^2

In the divergence zone near the equator: 15-30 mg/m^2

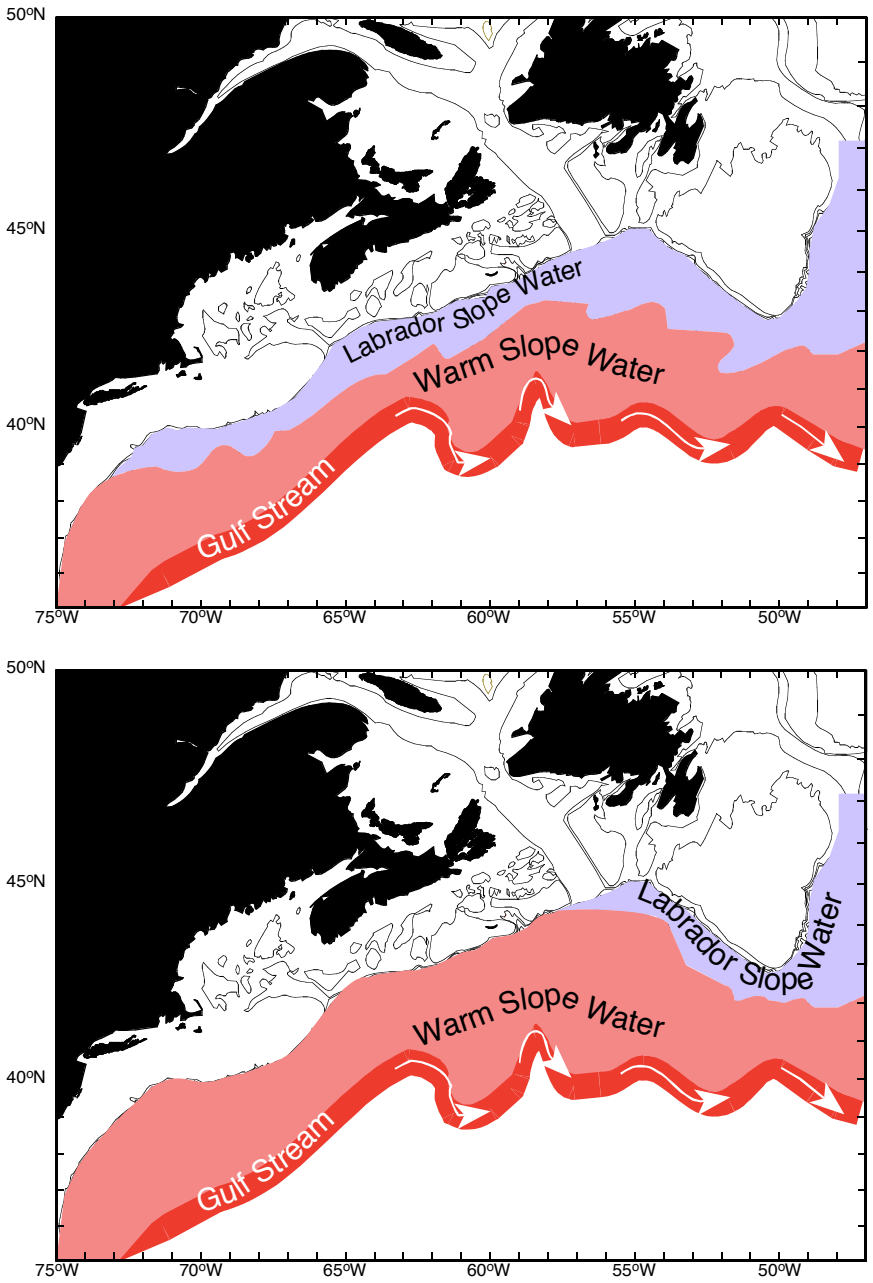
Subtropic gyre: 5-25 mg/m^2



Impacts of the Labrador Sea Currents on the downstream area of the Gulf of Maine and Mid-Atlantic Bight.

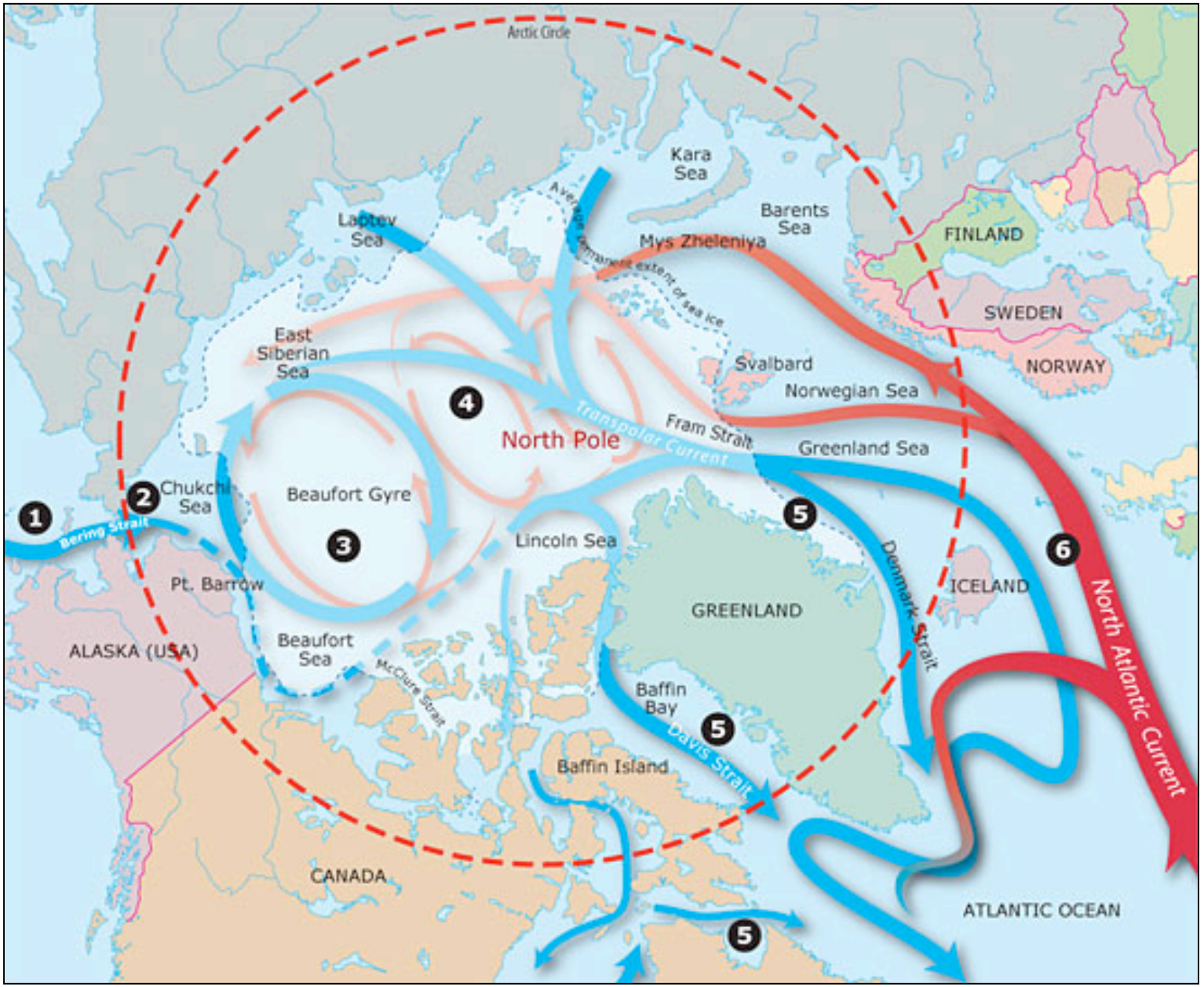
Chapman and Beardsley (1989), Journal of Physical Oceanography

Variability of the Labrador Slope Water Transport

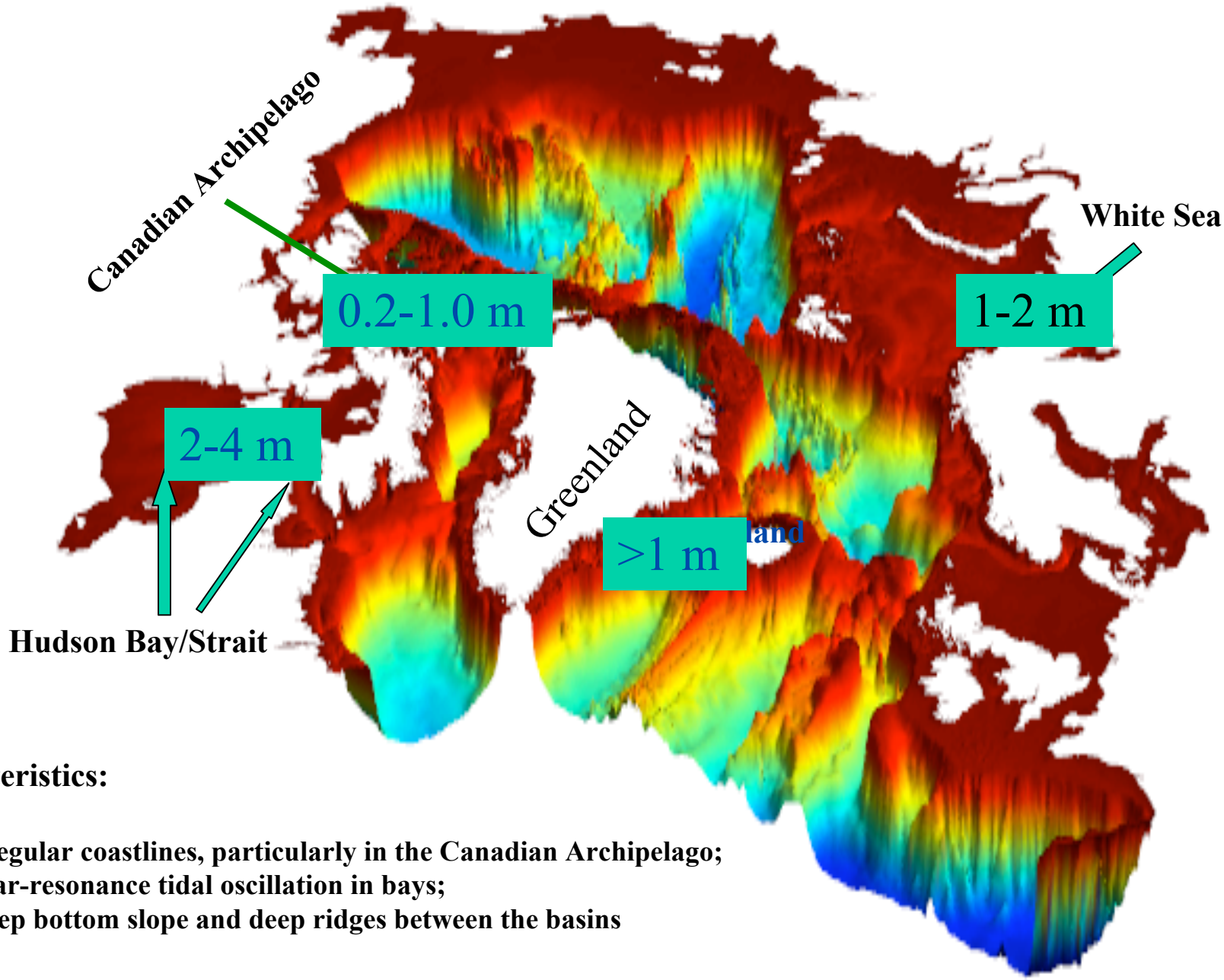


A schematic diagram showing the position of the Labrador Sea Slope Water and Warm Slope Water at approximately 200 m under high (upper) and low (lower) deep Labrador Current transport

From Drinkwater et al.-manuscript submitted to JGR-Oceans



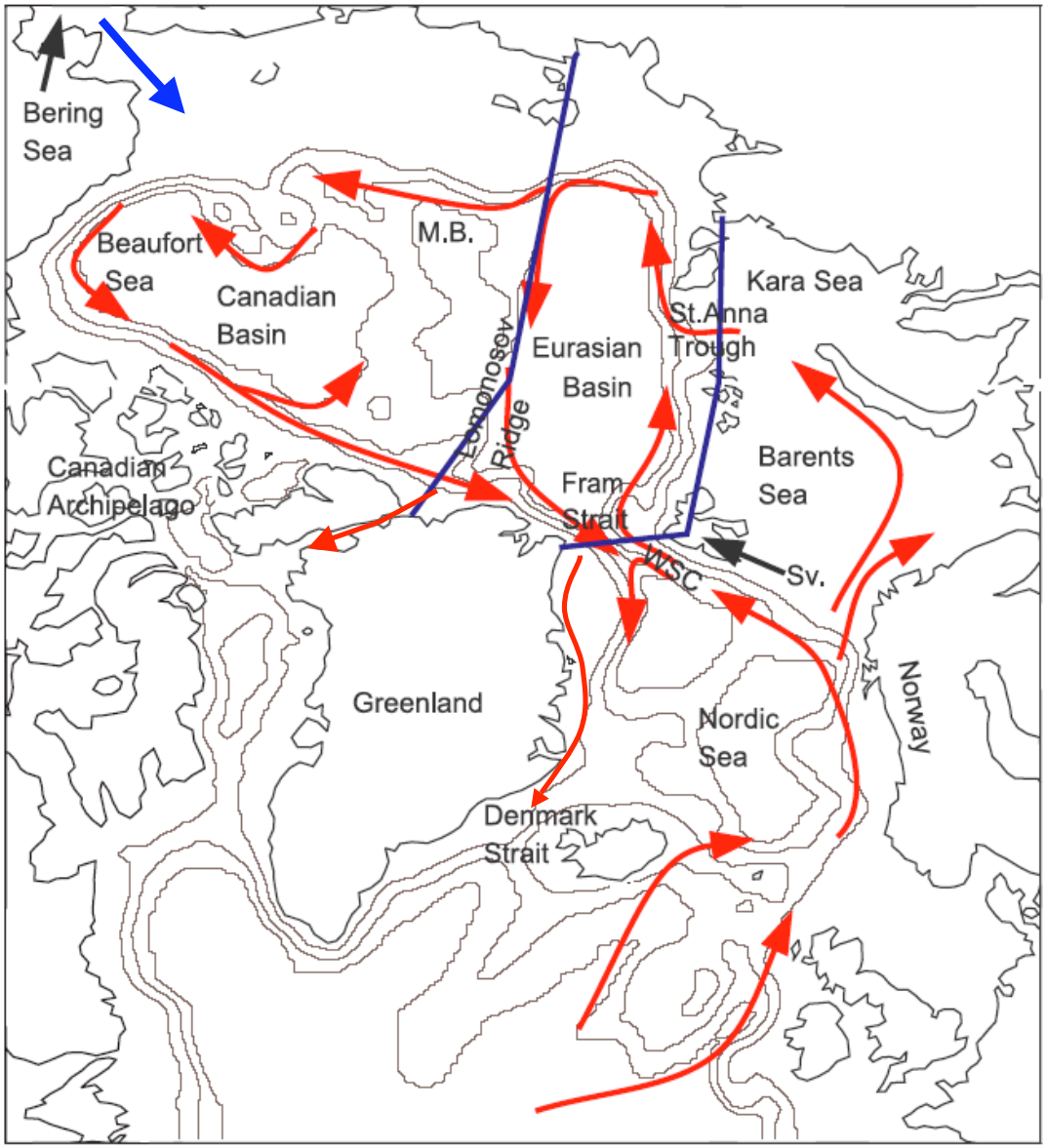
Graphics from Woods Hole Oceanographic Institution



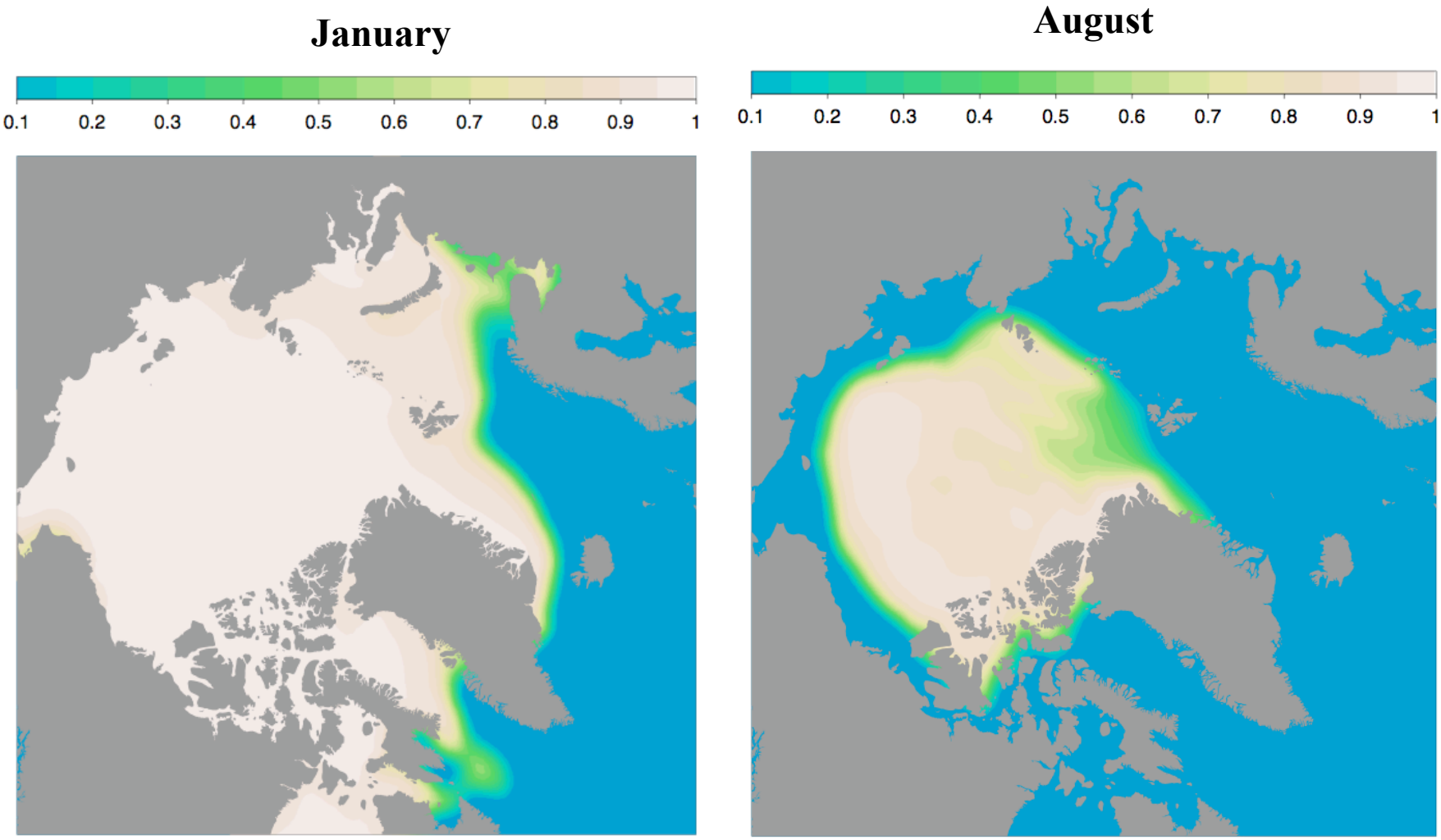
Characteristics:

1. **Irregular coastlines, particularly in the Canadian Archipelago;**
2. **Near-resonance tidal oscillation in bays;**
3. **Steep bottom slope and deep ridges between the basins**

The Influences of the steep bottom topography

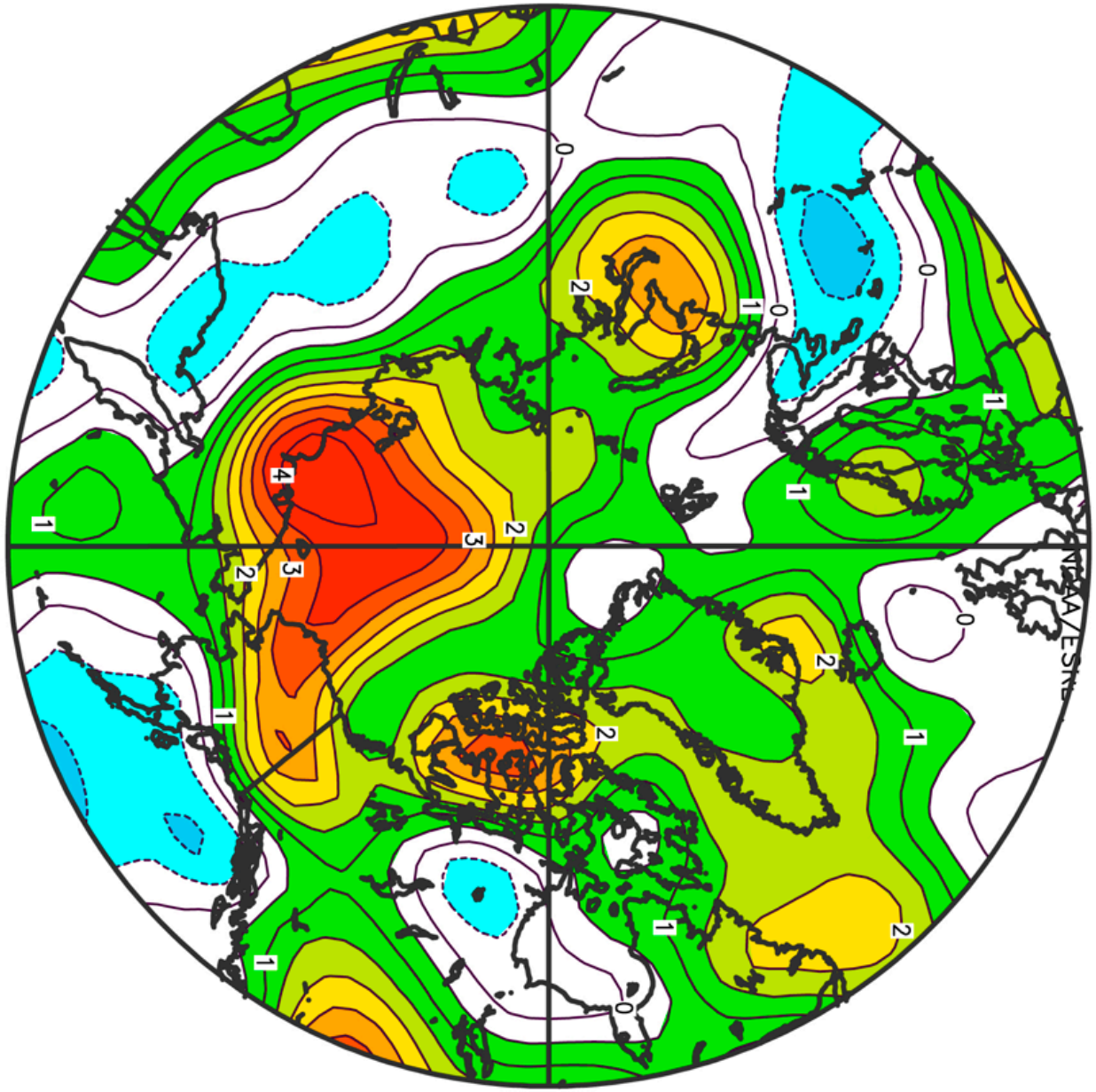


Schematic diagram showing ice coverage

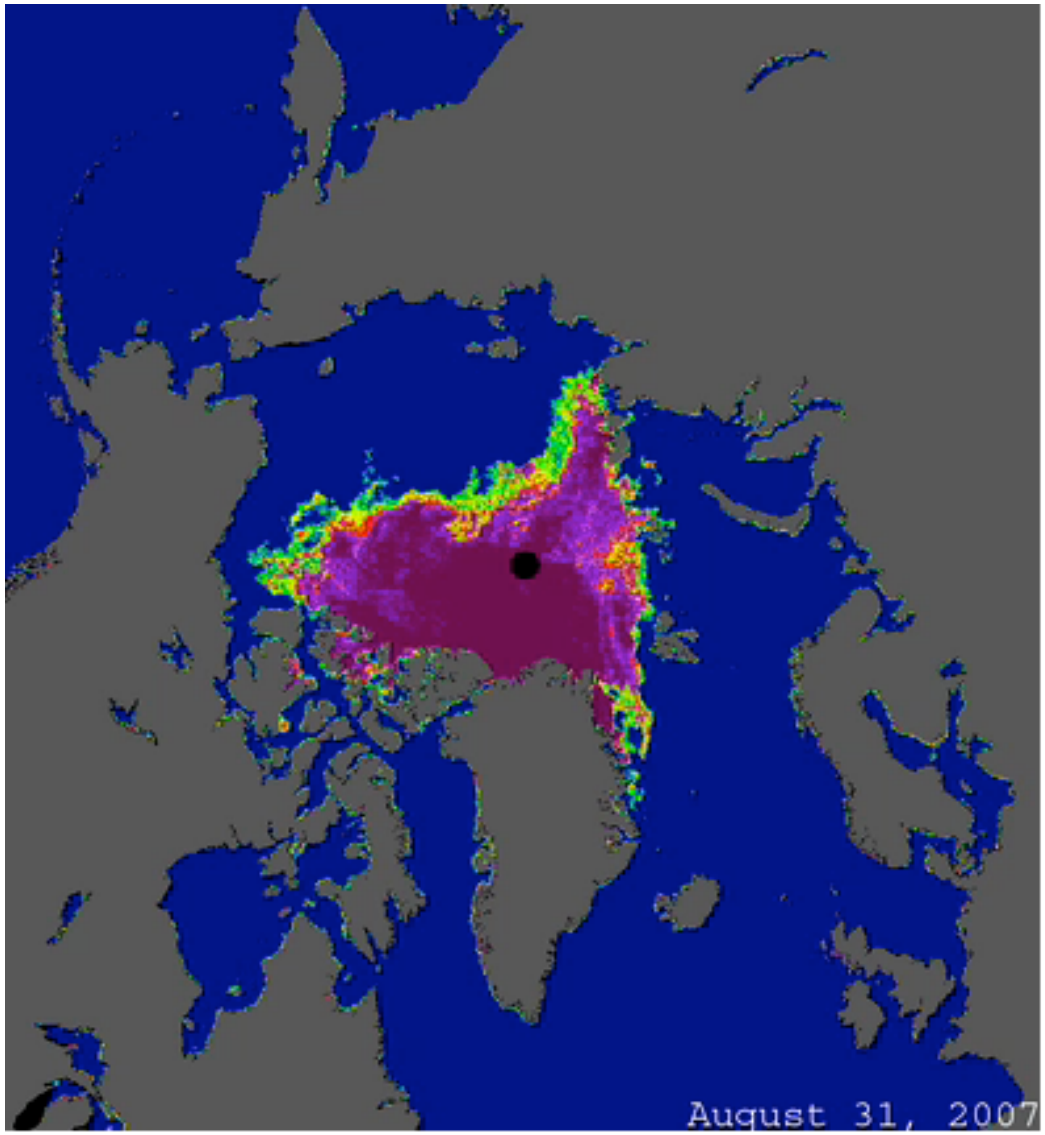


All areas with the ice thicker than 1.0 m is plotted with the same color as 1.0 m.

Arctic temperature anomalies-June to July 2007
(NECP/NCAR Reanalysis)

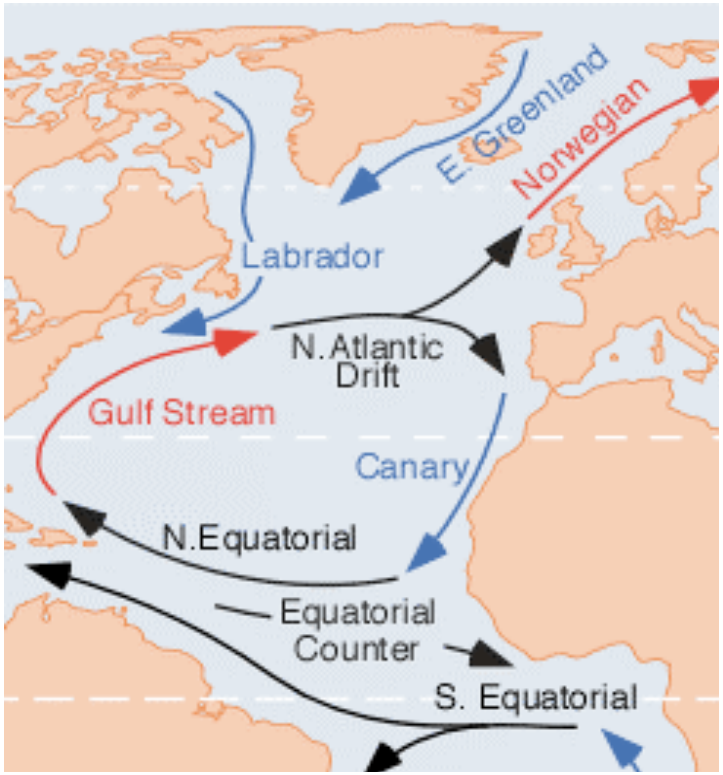


Arctic Sea ice in summer 2007, an animation downloaded from www.nsidc.org/

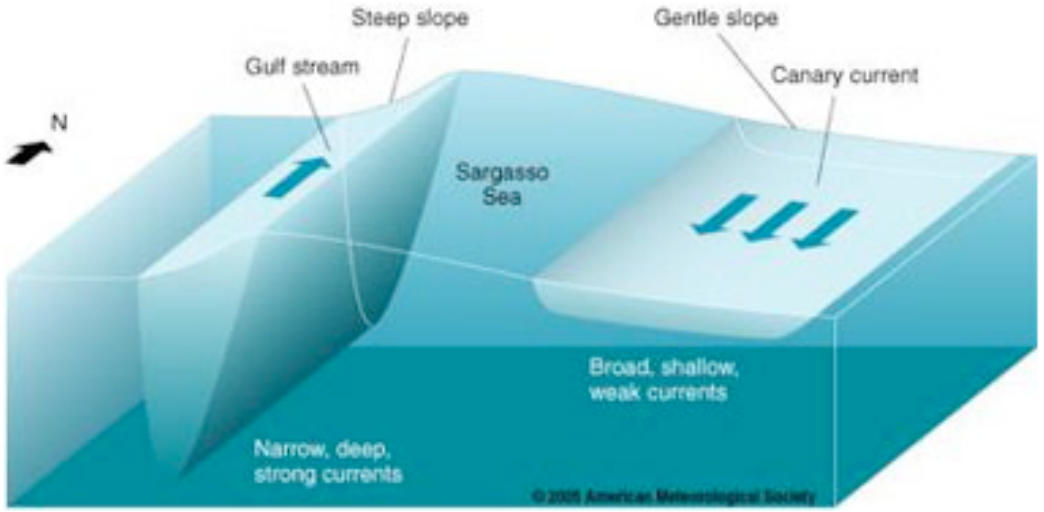


Images from NASA Earth Observing System Advanced Microave Scanning Radiometer- Institute of Environmental Physics at the University of Bremen,: National Snow and Ice Date Center.

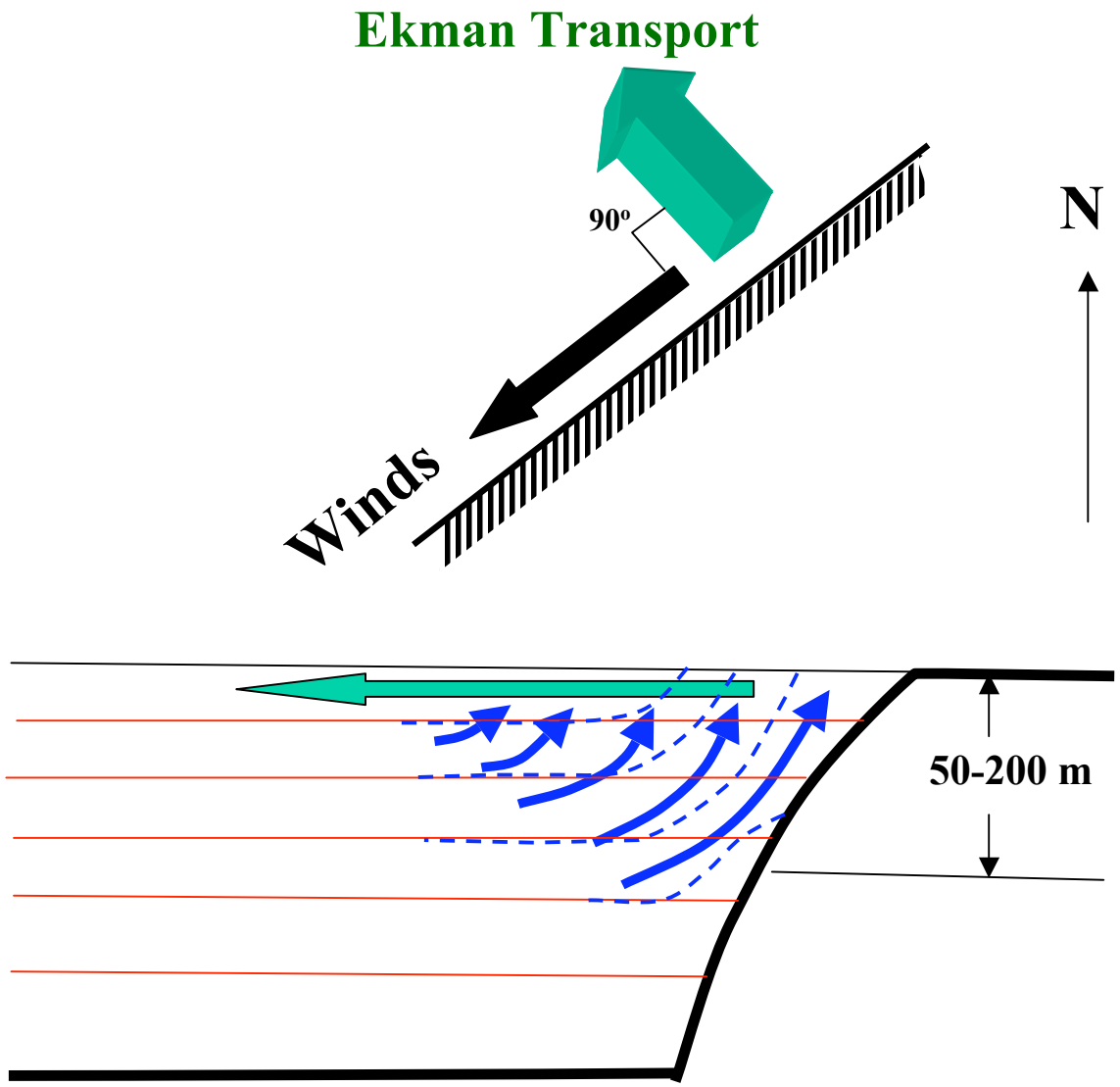
Eastern Boundary Currents

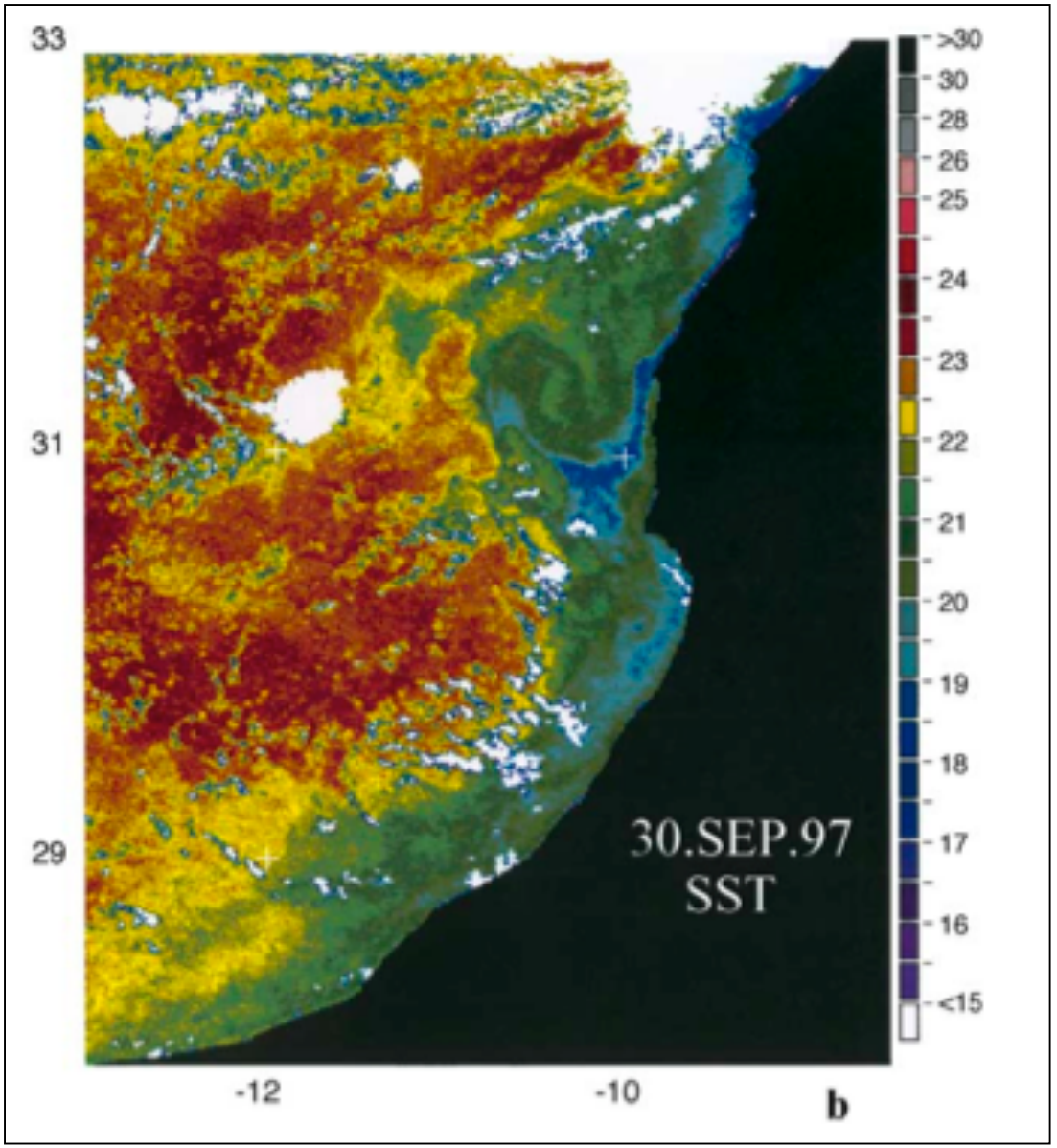


Slower, shallower, and wider



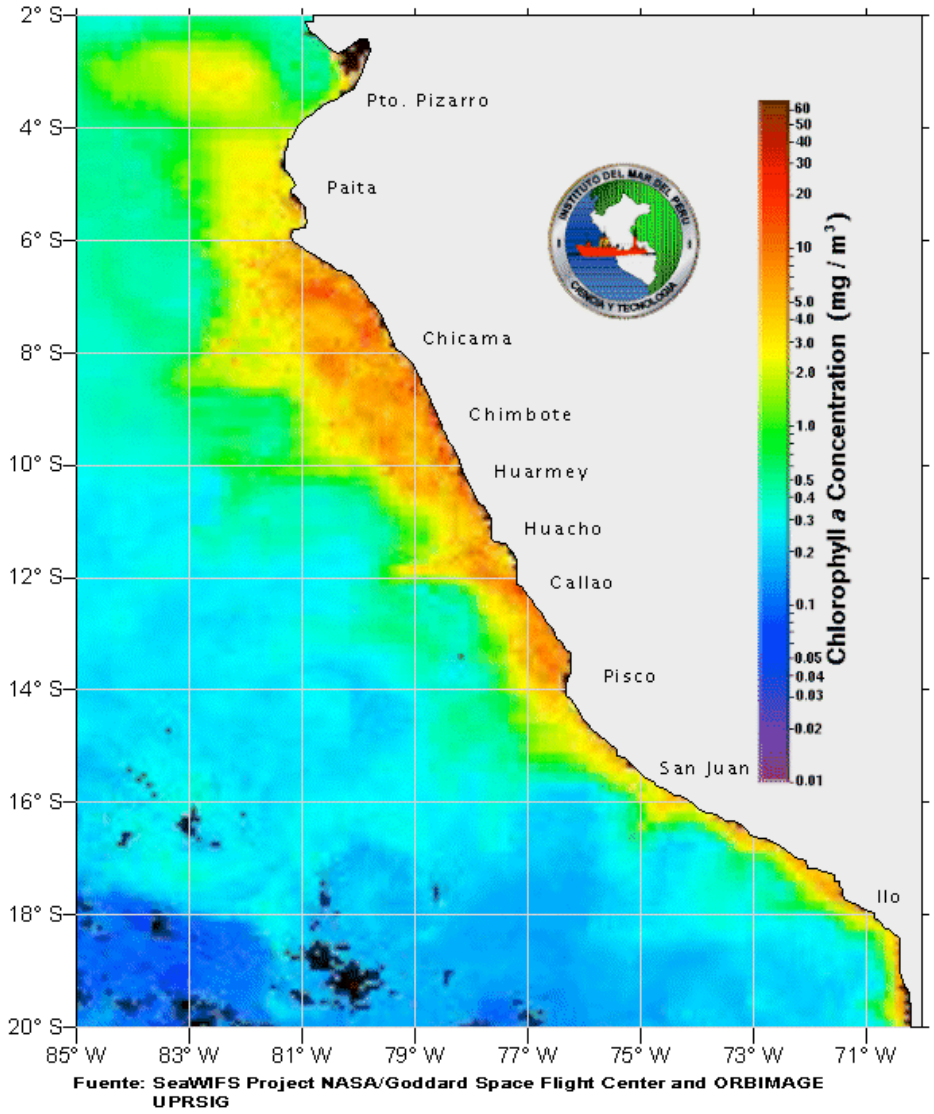
http://oceanmotion.org/html/background/western-boundary-currents.htm


Ekman Transport
90º
N
Winds
50-200 m



Pelegri et al., 2005. Journal of Marine System, 54, 39-63.

Chlorophyll 'a' - January 2002



Penven et al. workshop presentation (IRD)