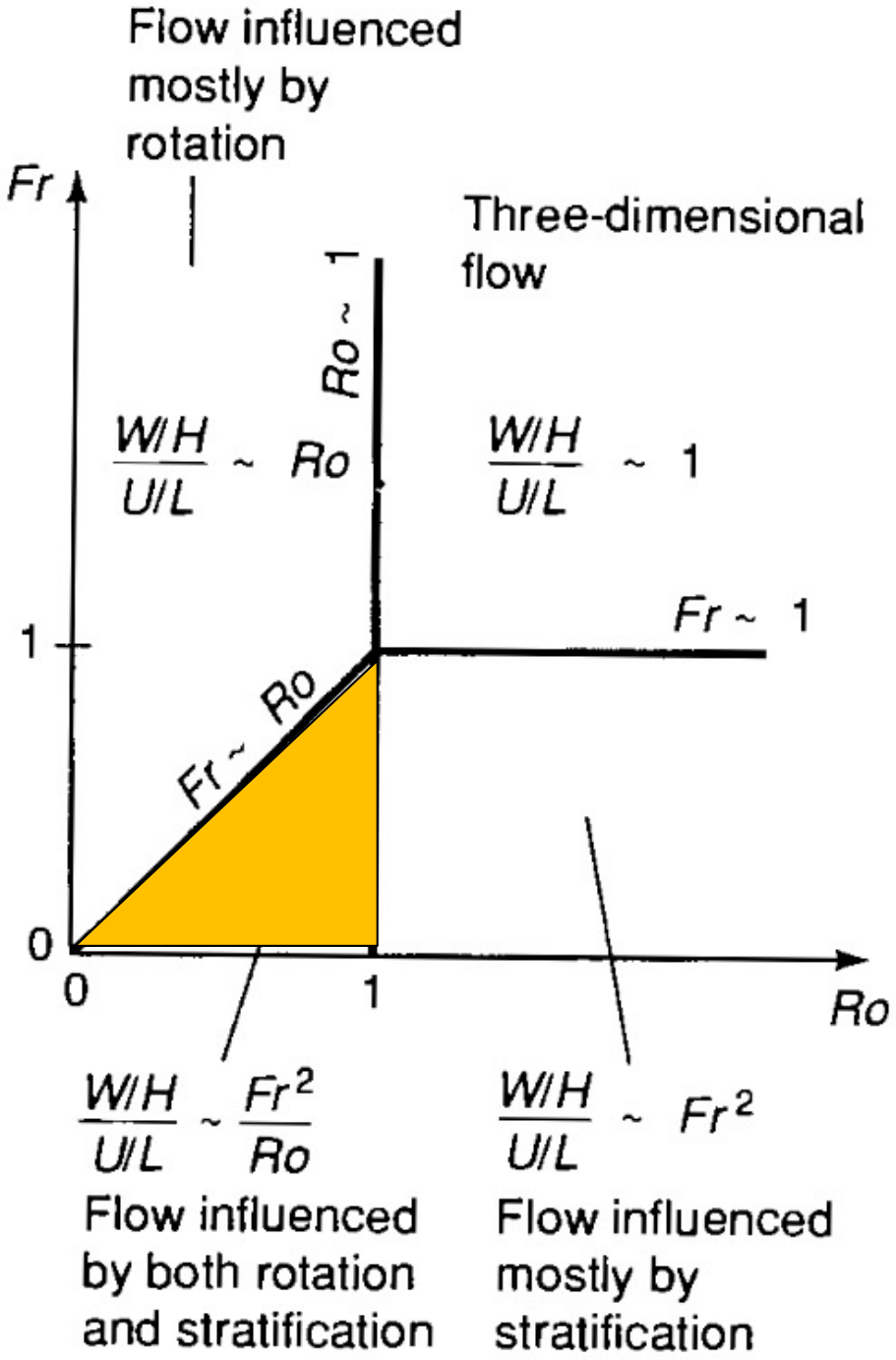
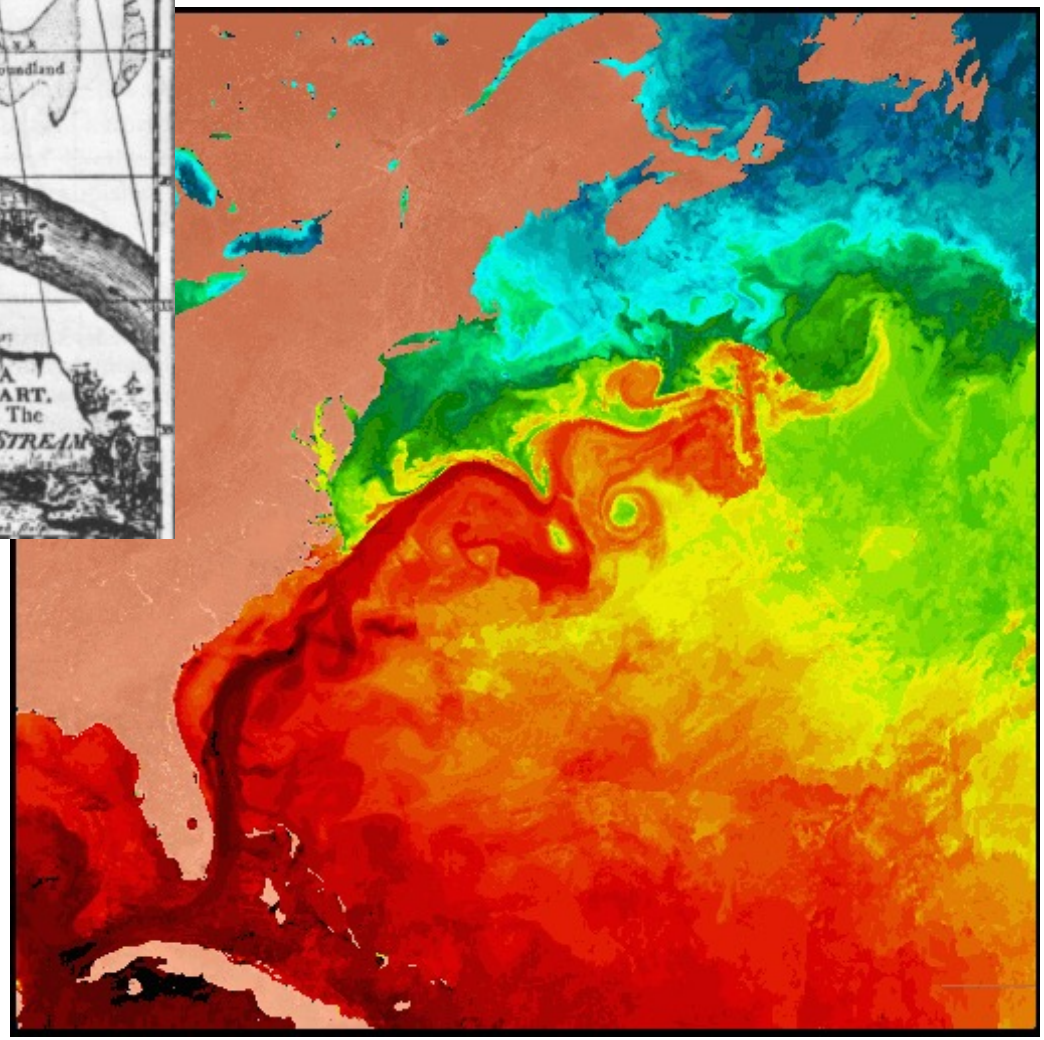


Figure 9-3 Recapitulation of the various scalings of the ratio of vertical convergence (divergence) to horizontal divergence (convergence), $(W/H)/(U/L)$, as a function of the Rossby and Froude numbers, $Ro = U/\Omega L$ and $Fr = U/NH$.

Cushman-Roisin (1994)

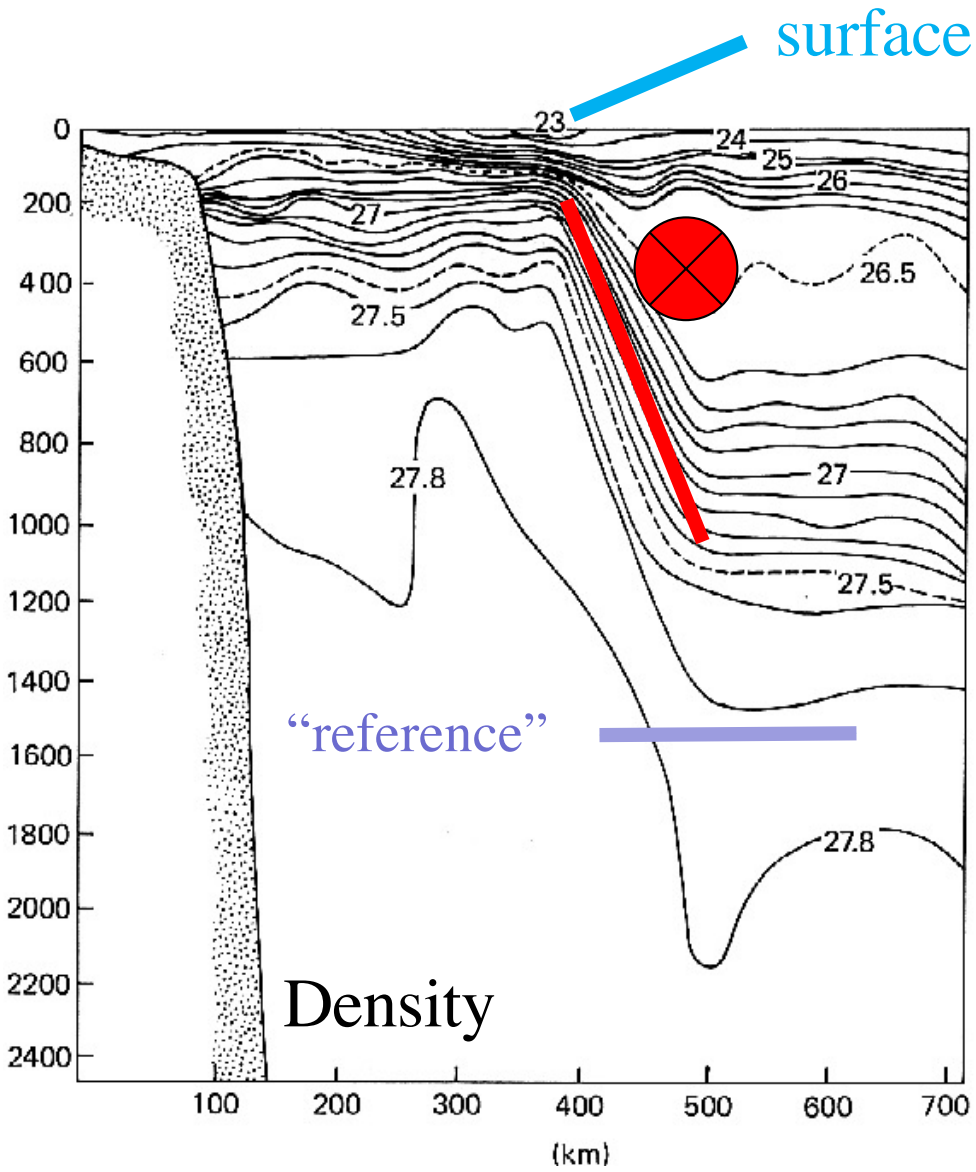
Gulf Stream

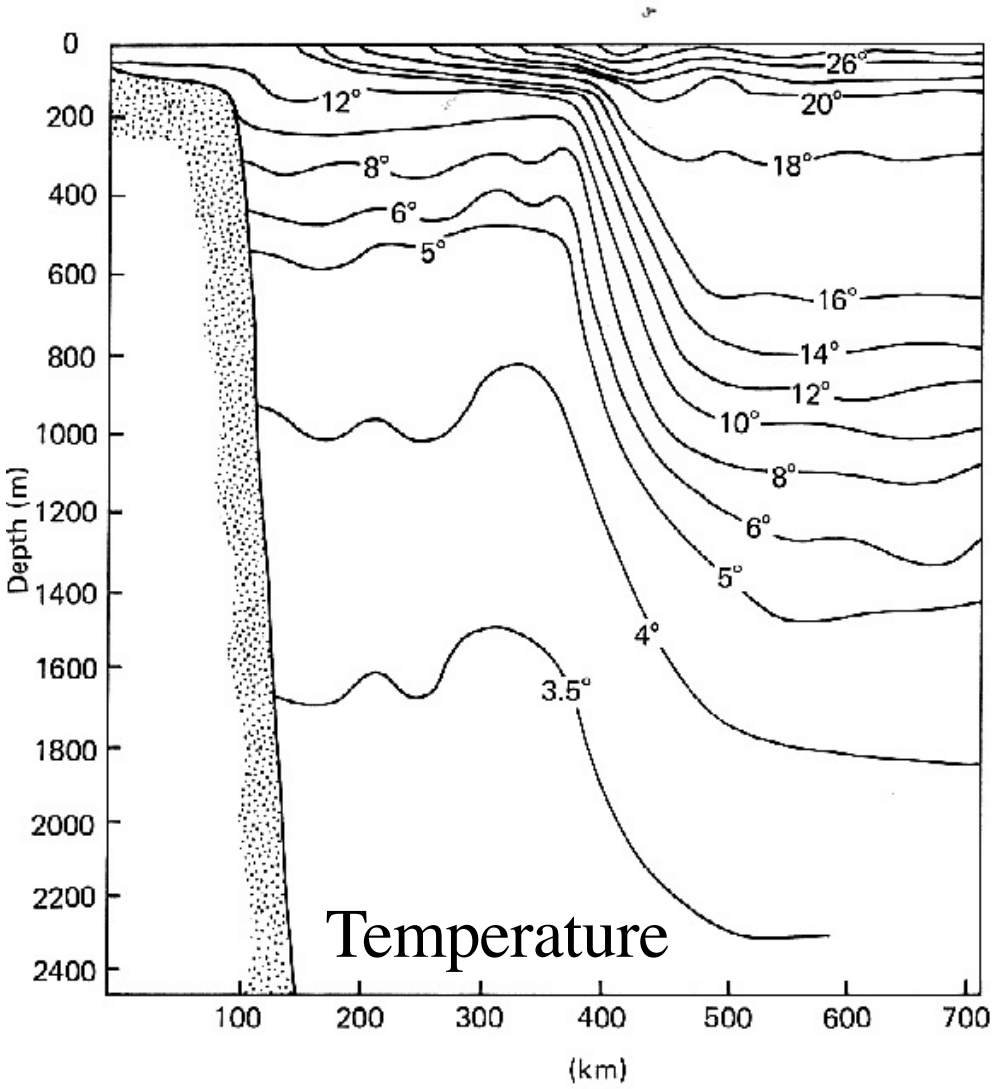
Franklin & Folgers (1768)



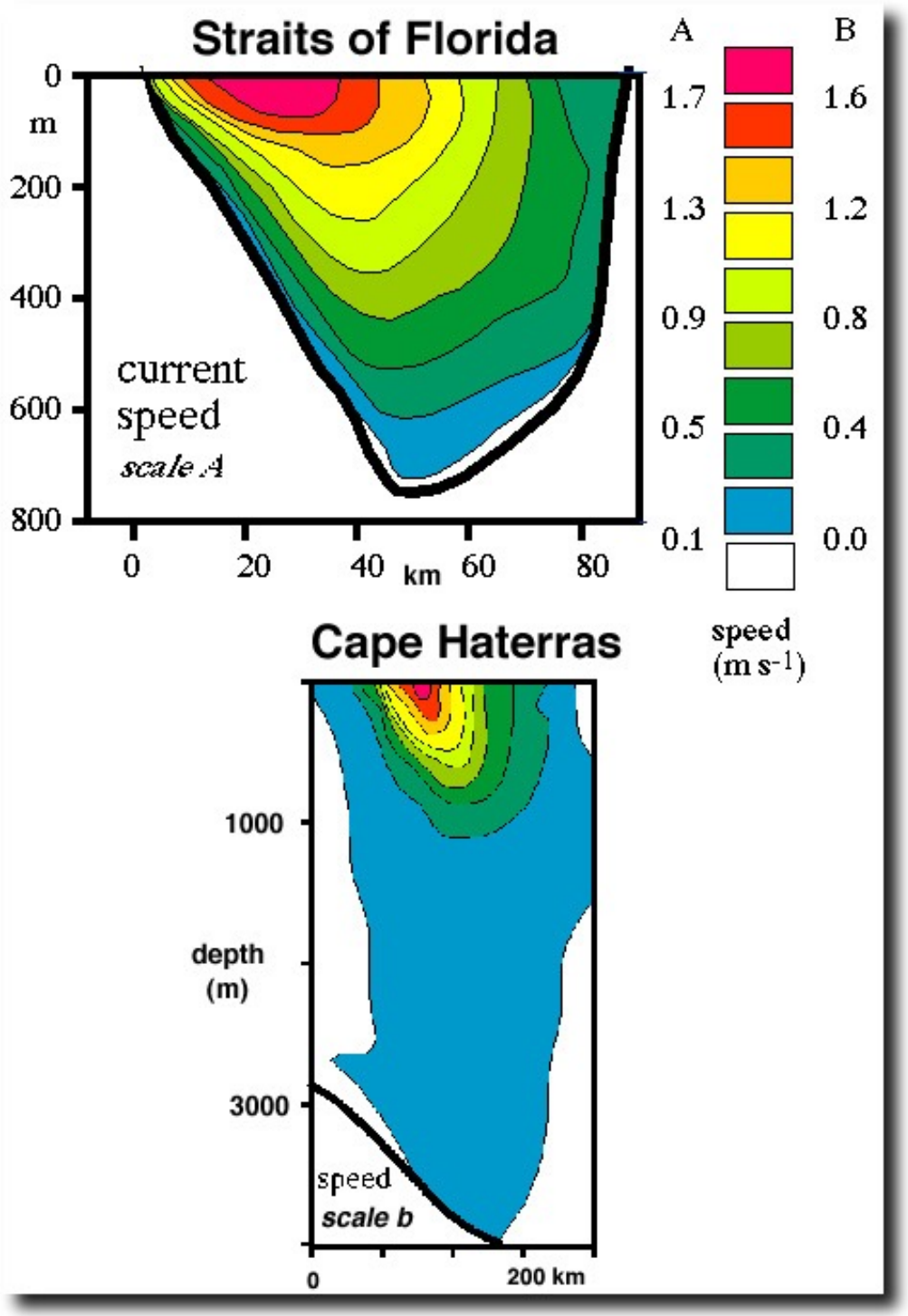
Brown et al. (1988)

Gulf Stream Section





http://kingfish.coastal.edu/marine/gulfstream/p2a.htm



Gulf stream
Velocity sections

Thermal Wind: Stratified Geostrophic Dynamics

$$\partial v / \partial z = -g/(\rho_0 f)\, \partial \rho / \partial x$$

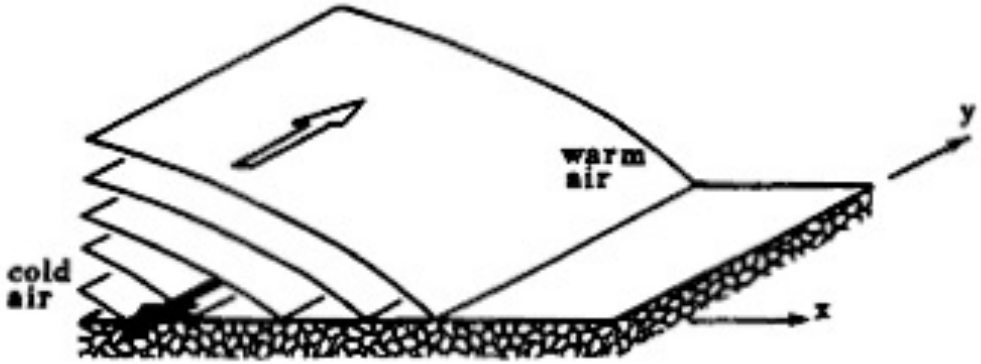


Figure 13-1 Vertical velocity shear in the presence of a horizontal density gradient. The change of velocity with height is called the thermal wind.

$$\frac{\Delta v}{\Delta z} = -\frac{g}{\rho_0 f}\,\frac{\Delta \rho}{\Delta x},$$

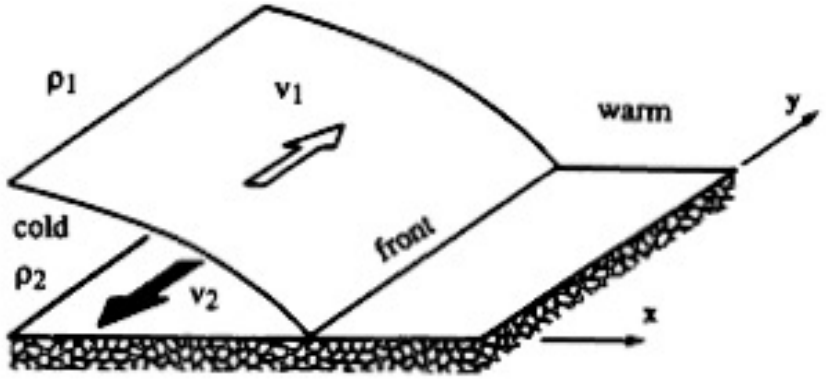


Figure 13-2 The layered version of Figure 13-1, which leads to the Margules relation.

Cushman-Roisin (1994)

Fronts resulting from Geostrophic Adjustments

Mid-shelf fronts

Outer shelf fronts

Eddies

Tidal mixing fronts

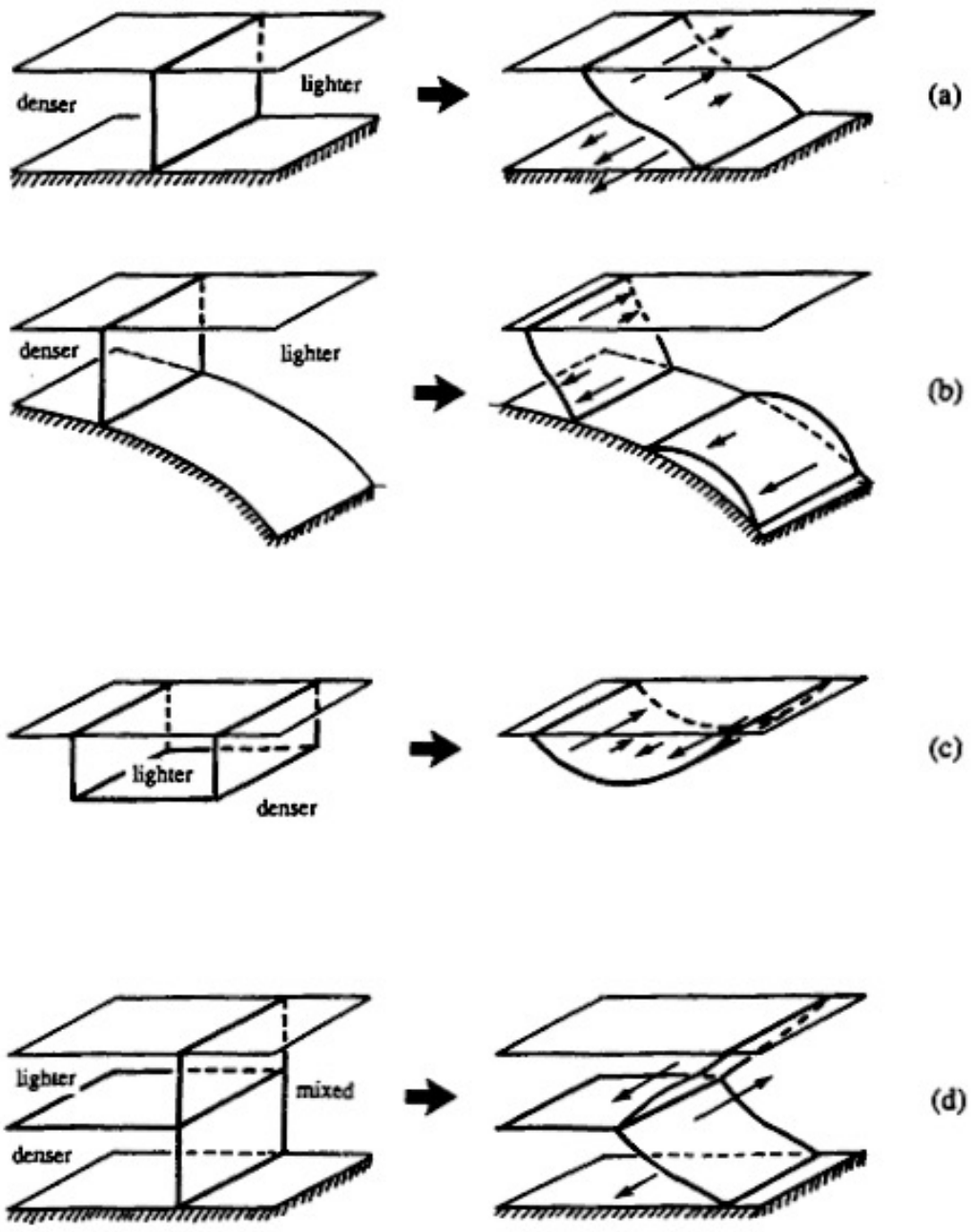
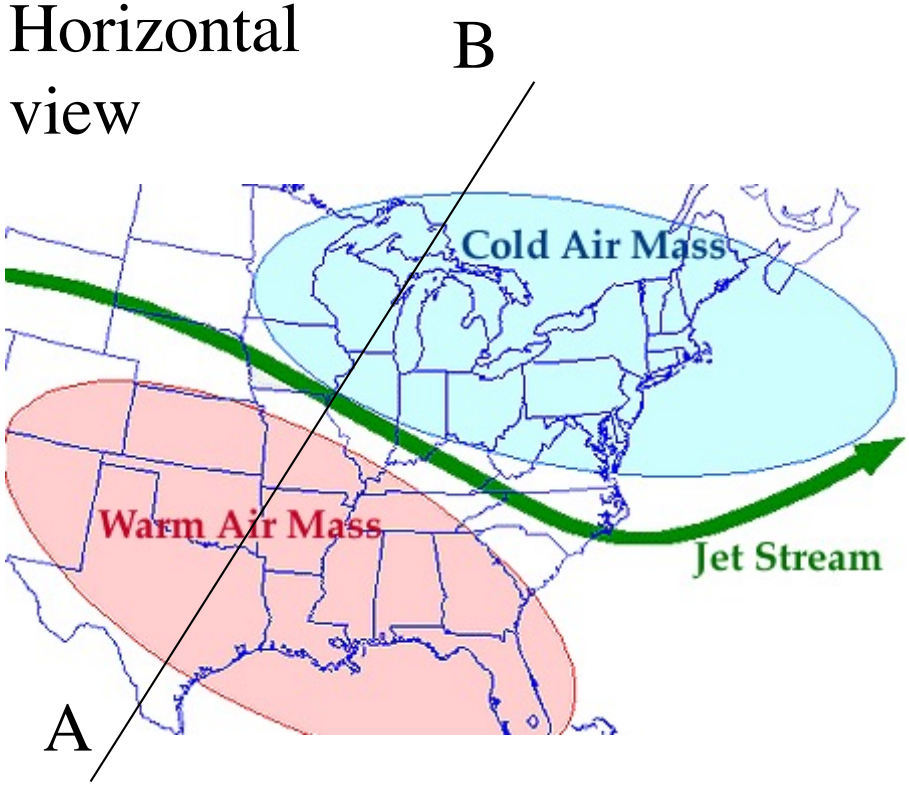


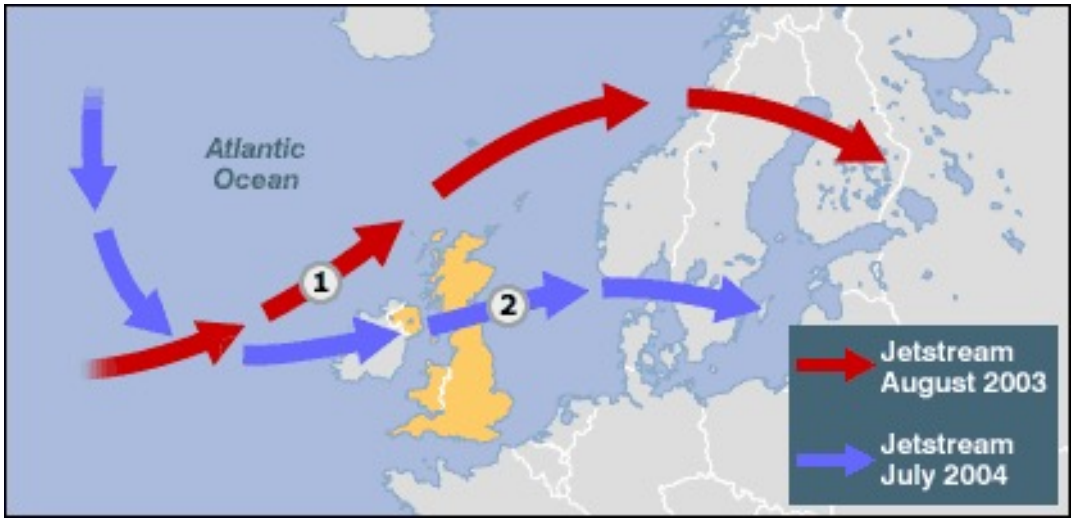
Figure 13-4 Various examples of geostrophic adjustment.

Cushman-Roisin (1994)

Thermal Wind: Atmospheric Jet Stream

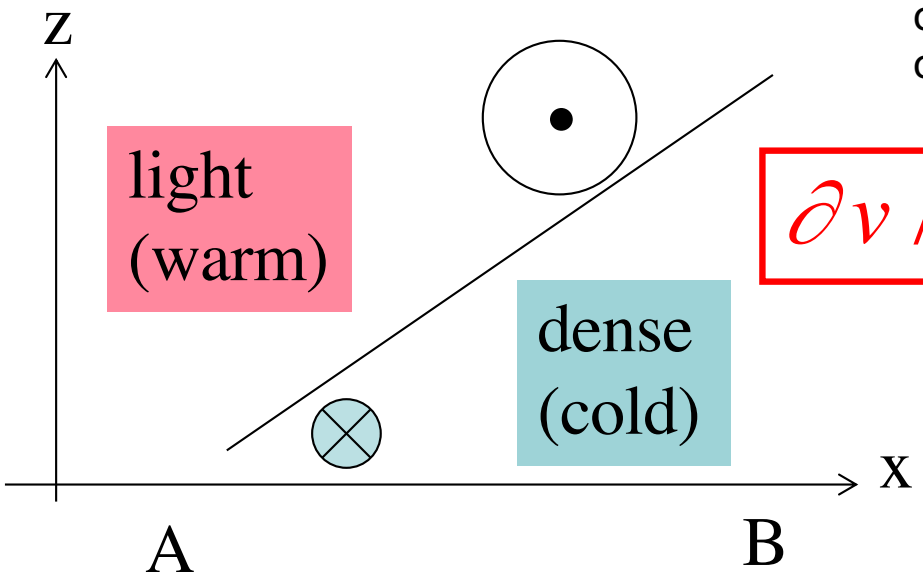
Horizontal view





1 Jetstream passing north of the UK bringing settled, dry and warm weather
2 Jetstream passing further south, causing weather that is unsettled and cool for the time of year

Vertical view

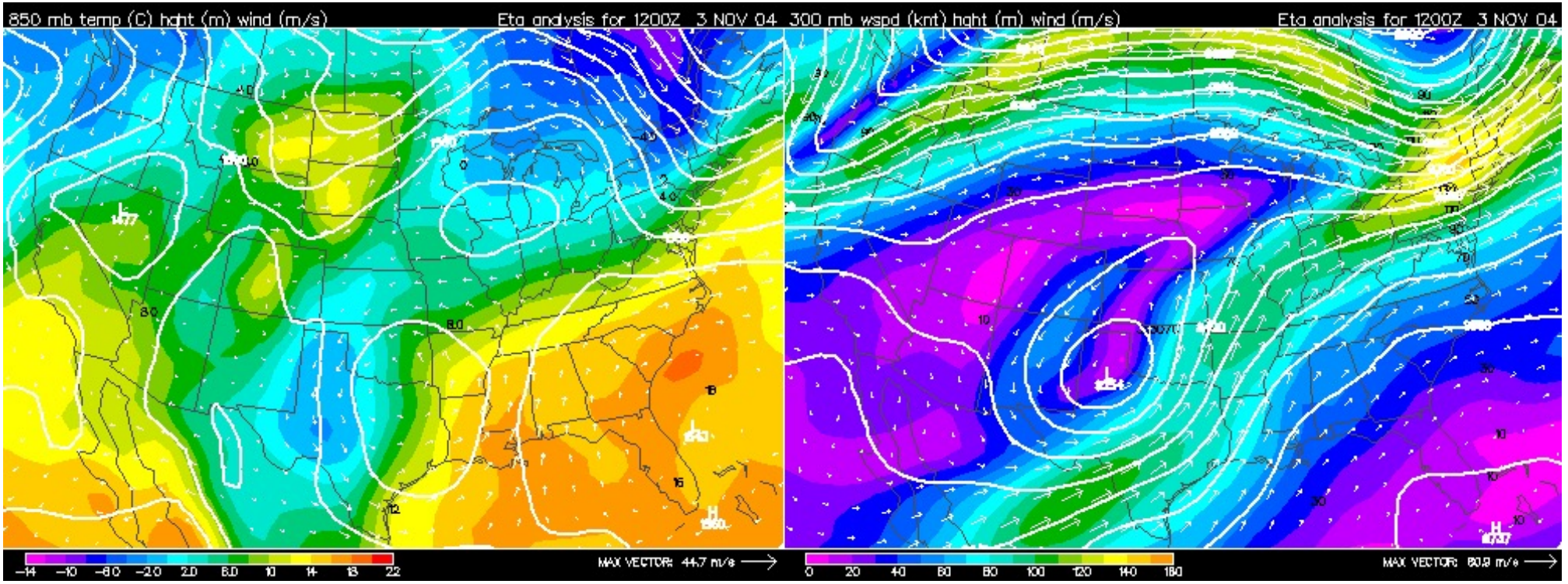


$$\partial v / \partial z = -g/(\rho_0 f)\, \partial \rho / \partial x$$

Thermal Wind: Jet Stream on Nov.-3, 2004

$$\partial v / \partial z = -g/(\rho_0 f)\, \partial \rho / \partial x$$

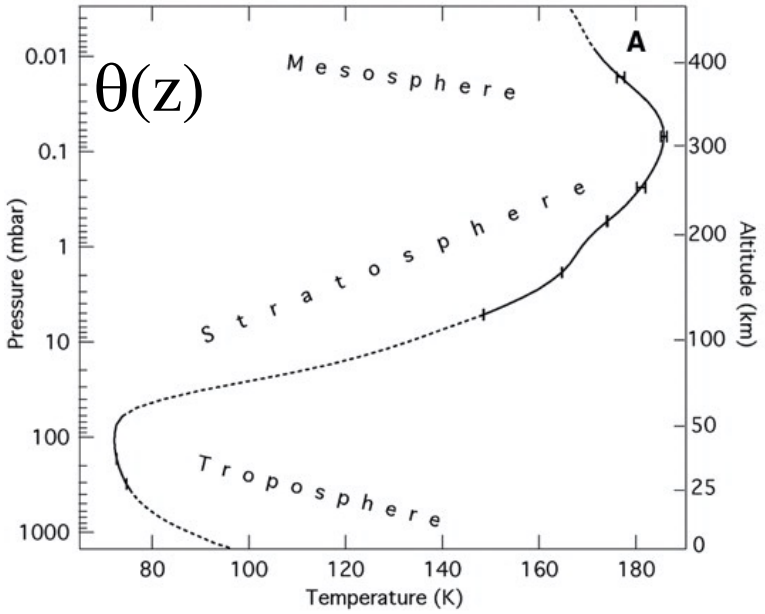
850-mb (near surface) 300-mb (aloft)

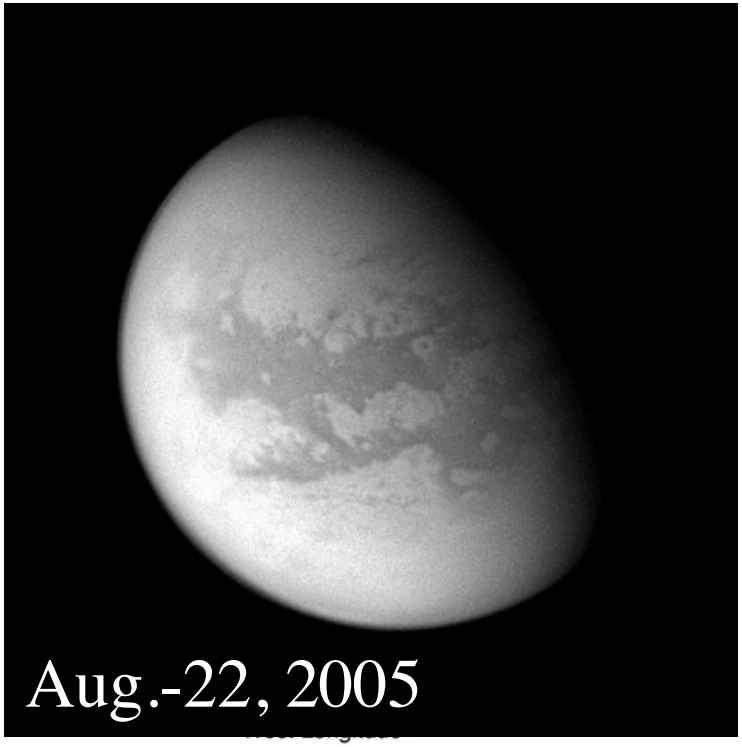


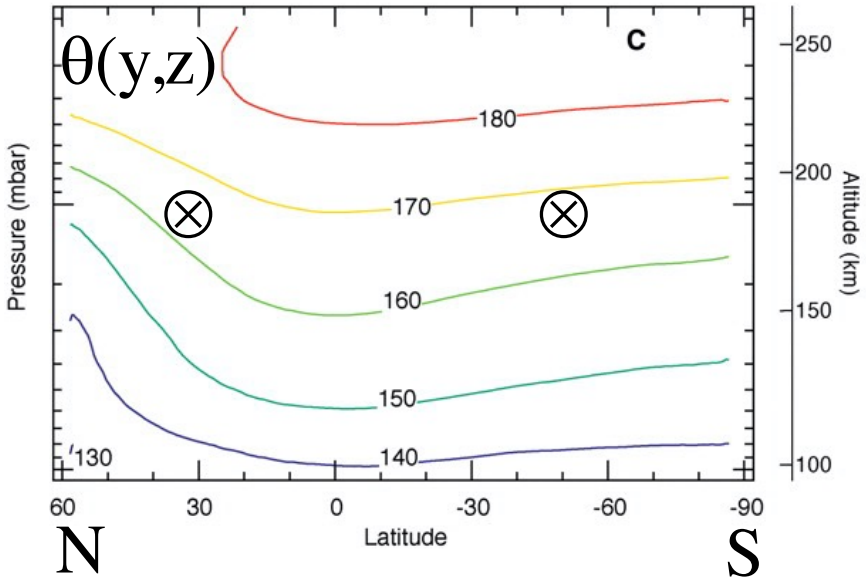
Temperature (color)
Height of pressure surface (lines)
Winds (arrows)

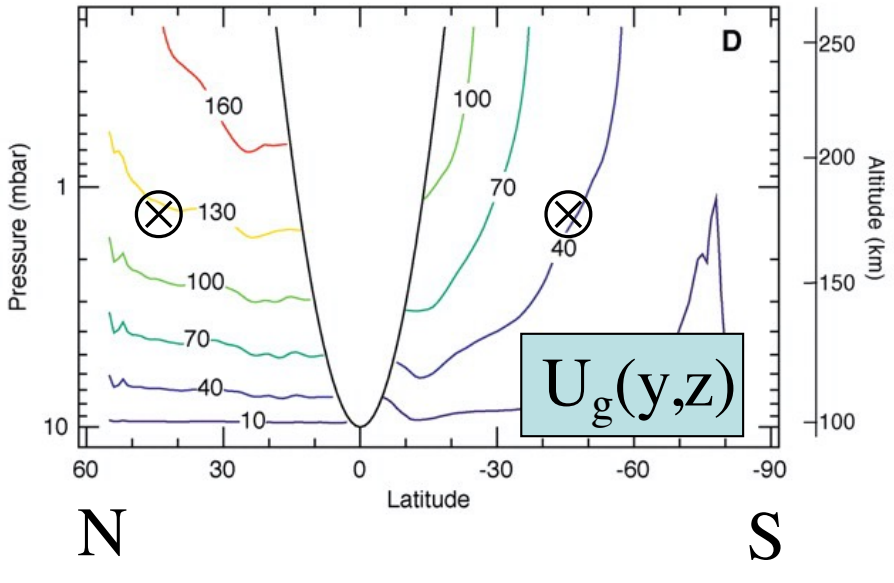
http://opwx.db.erau.edu/~mullerb/Therm_wind.html

Titan's Atmospheric Temperature θ and Thermal Winds U_g



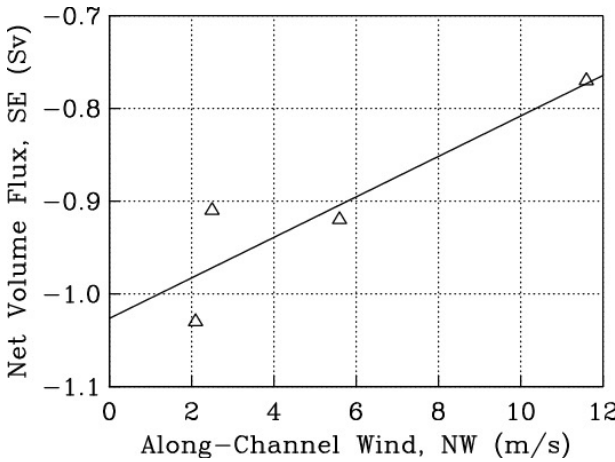


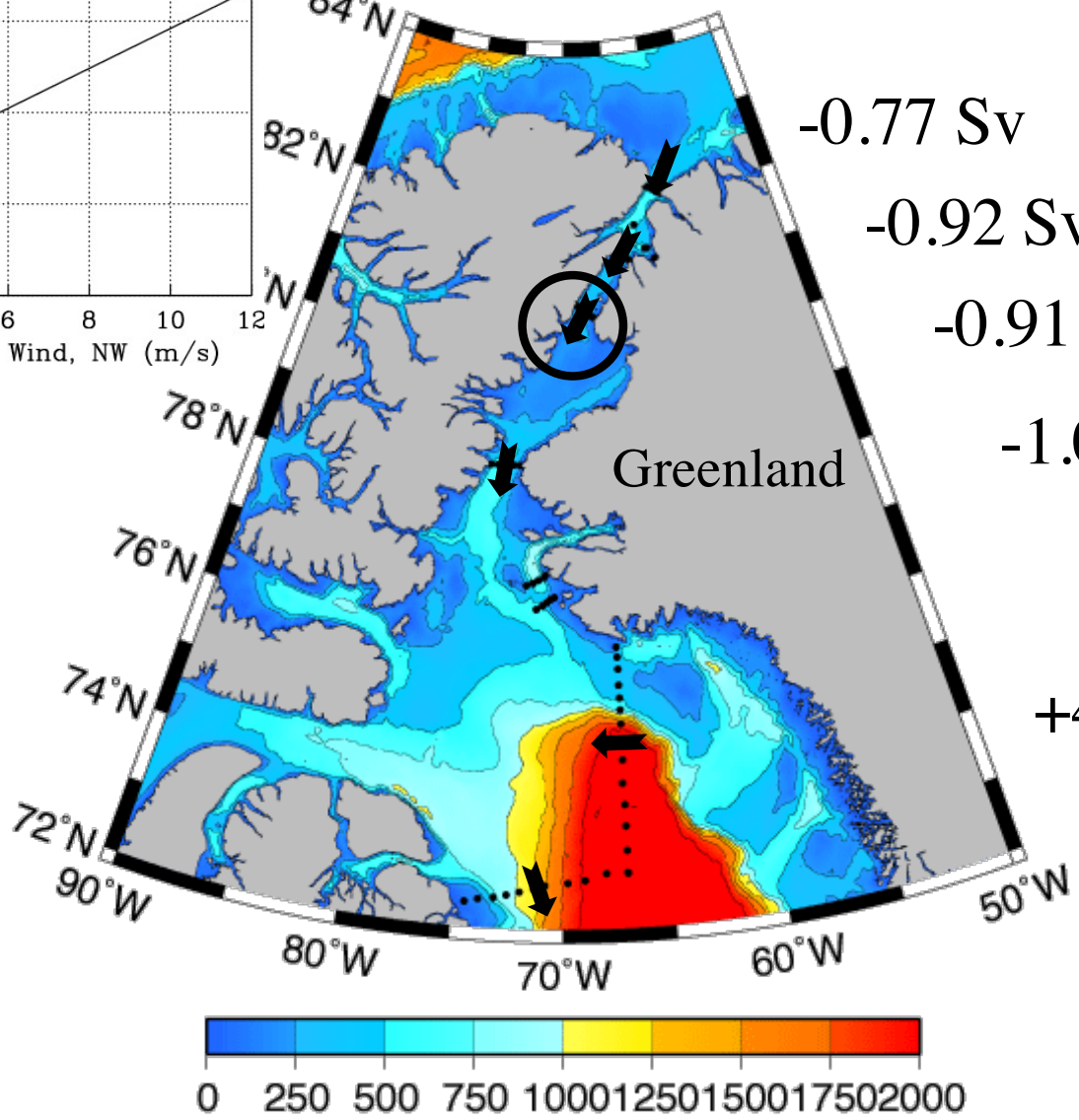




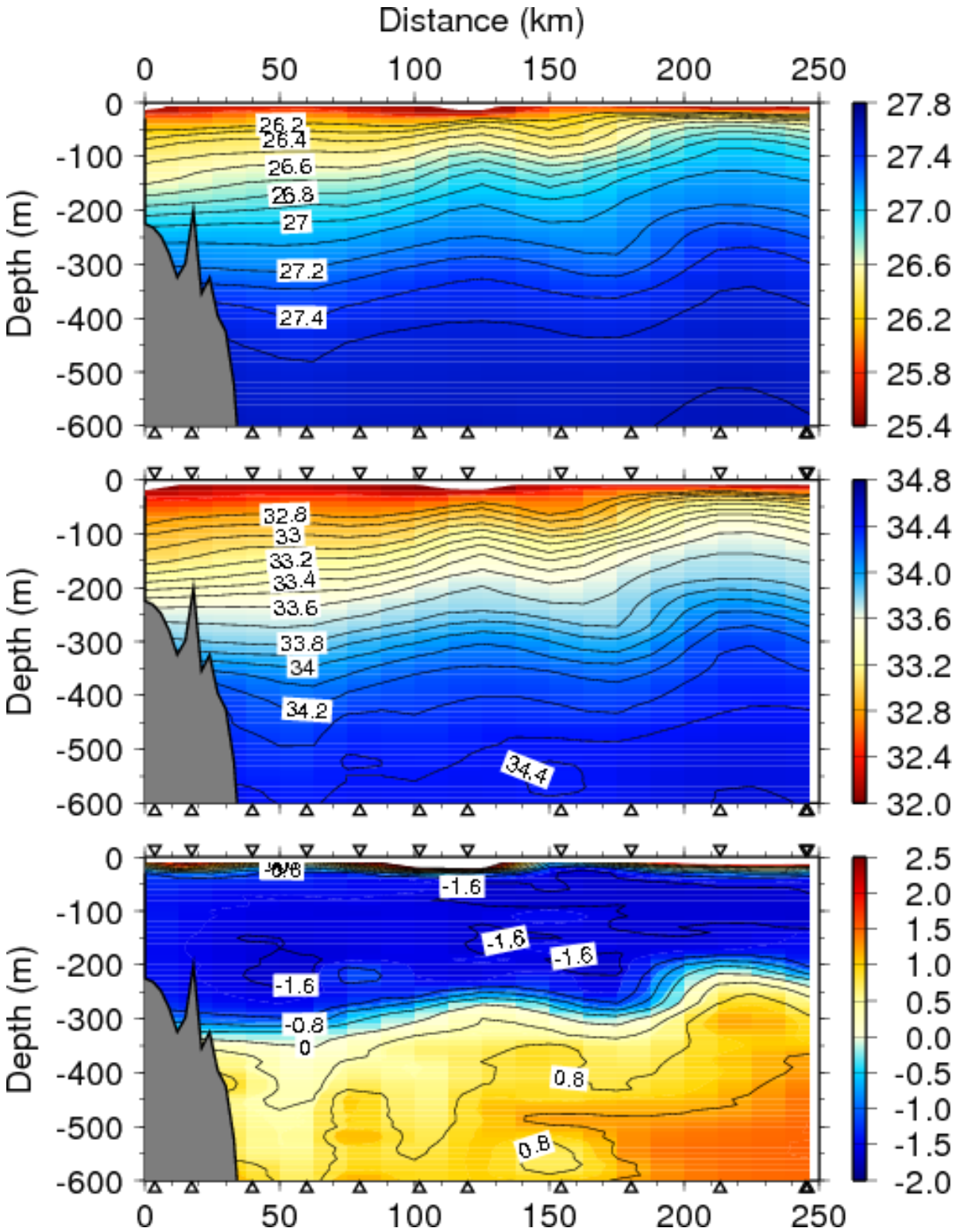
Flasar et al. (2005)

July/August 2003 ADCP Survey Volume Flux Summary





1 Sv=10^6 m^3/s
~5 Amazon
~1000 Delaware

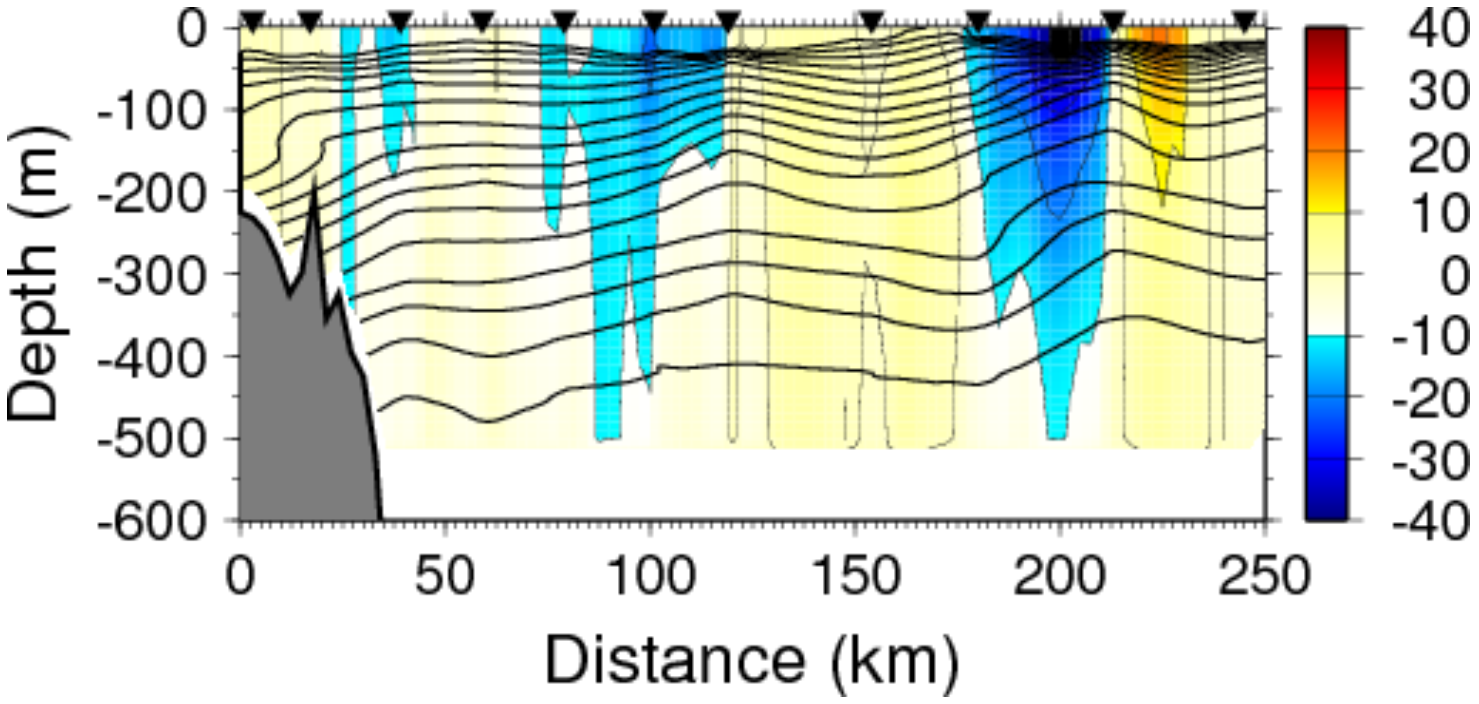


Density

Salinity

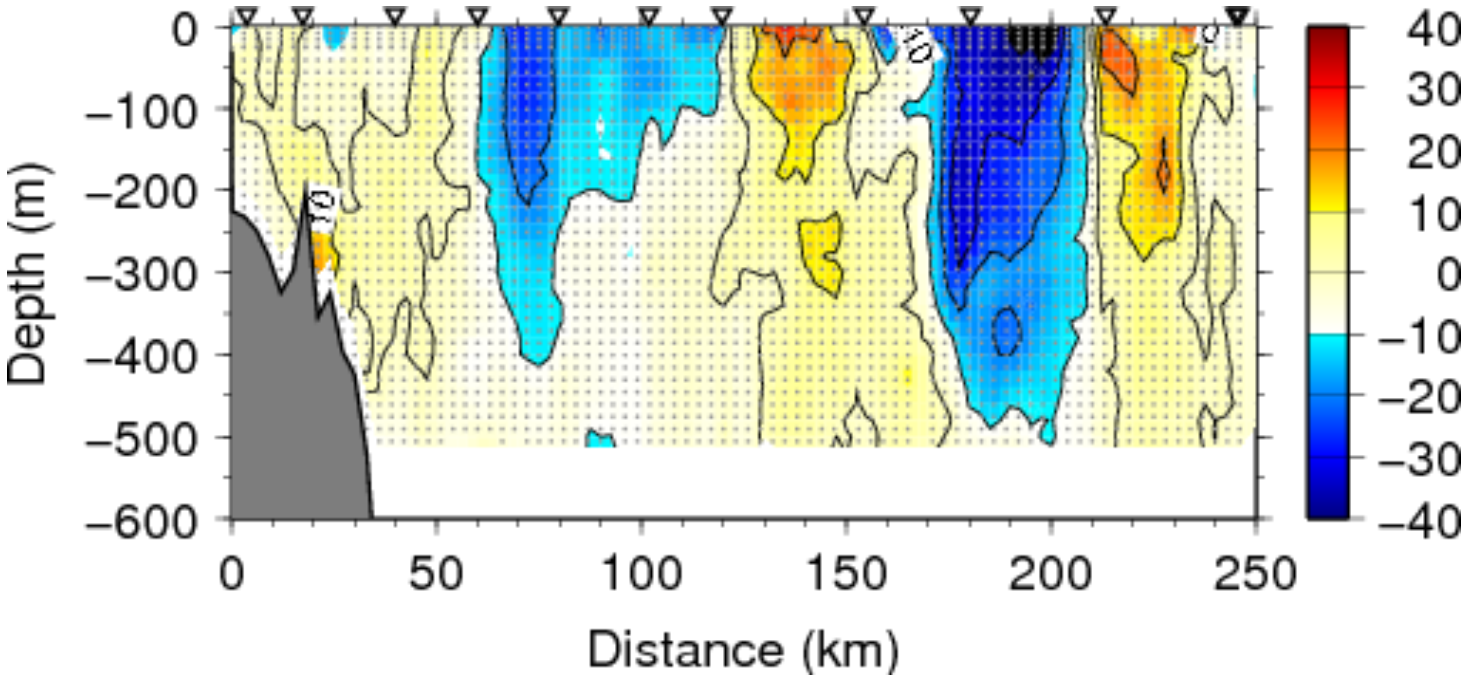
Temperature

Thermal Wind

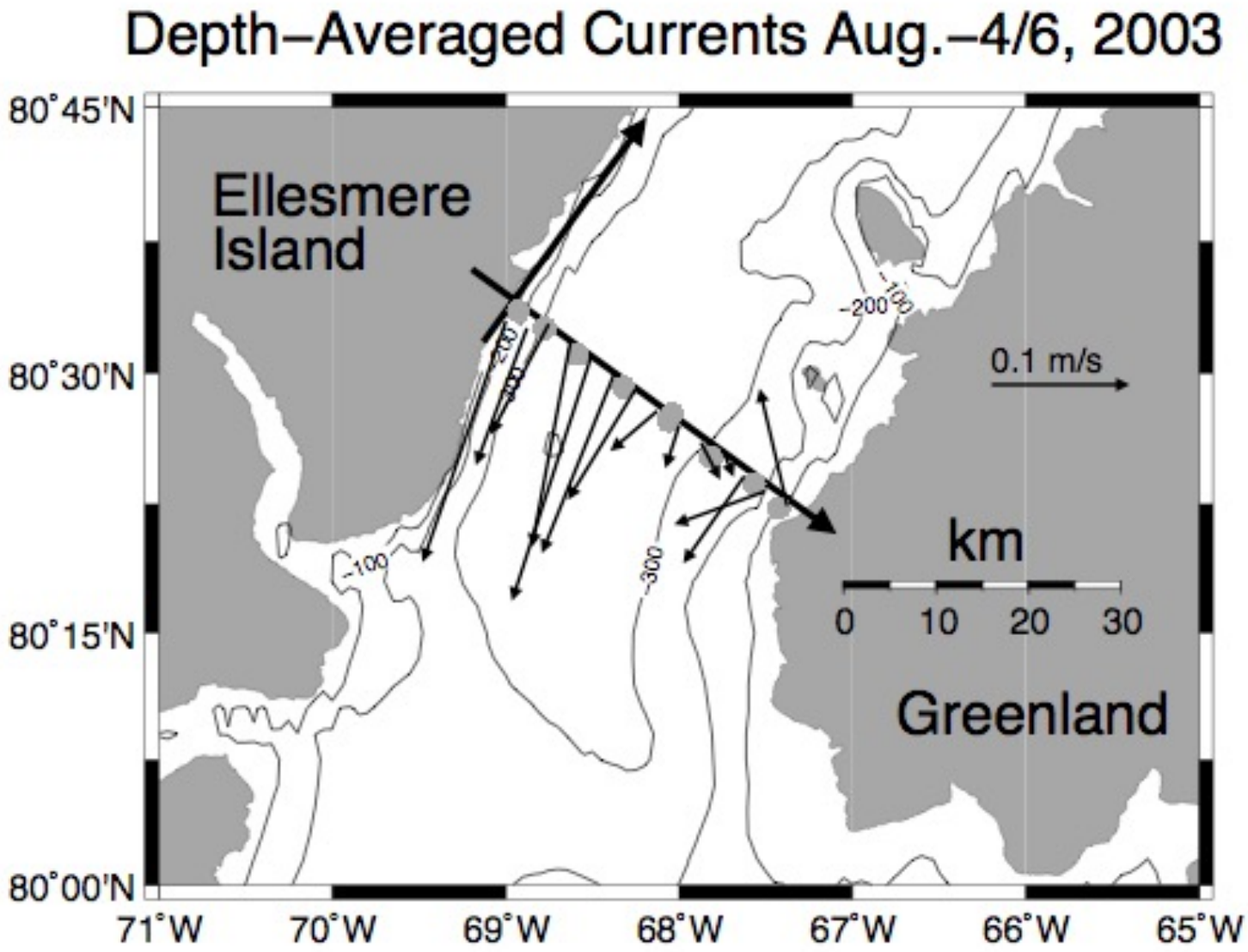


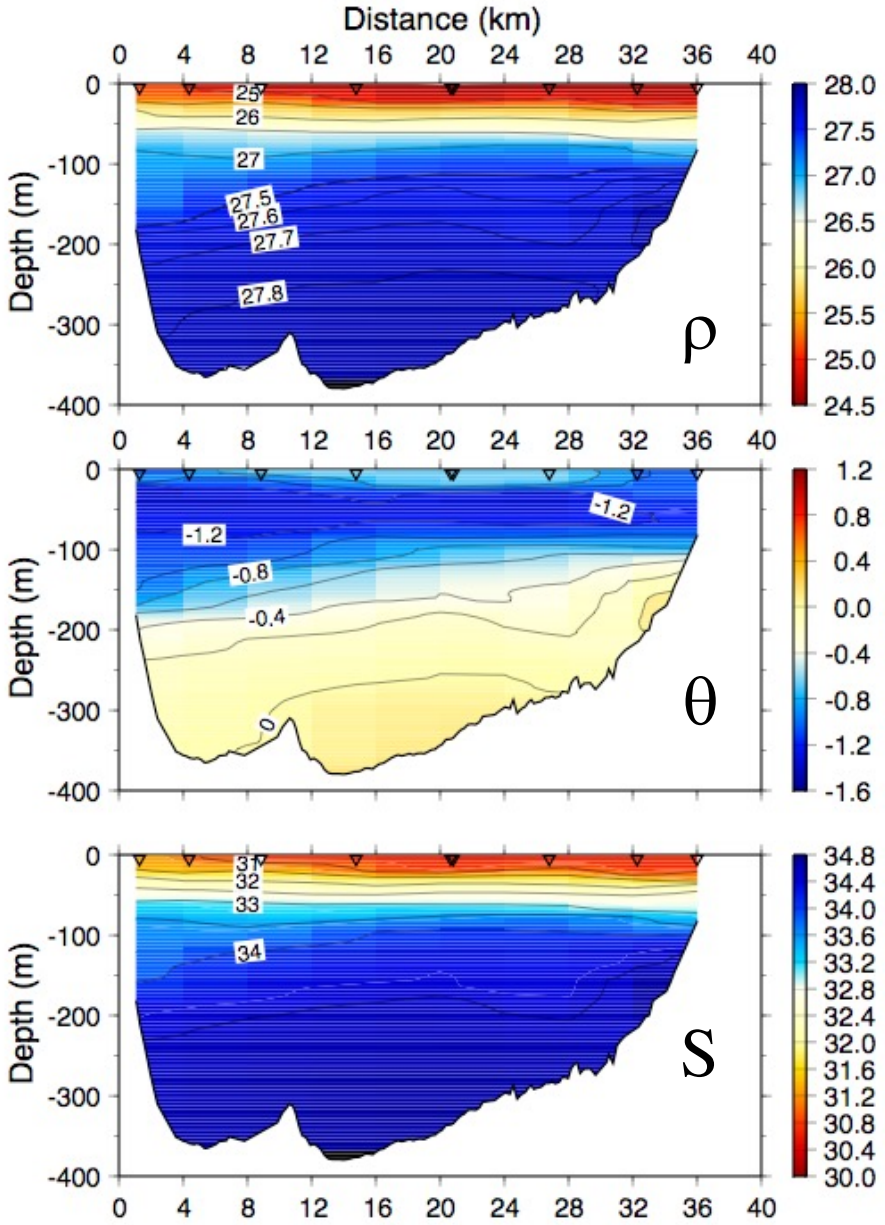
cm/s

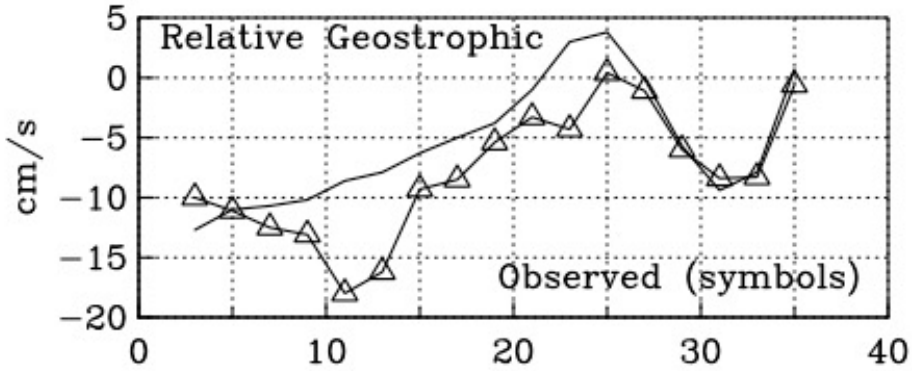
Observed:

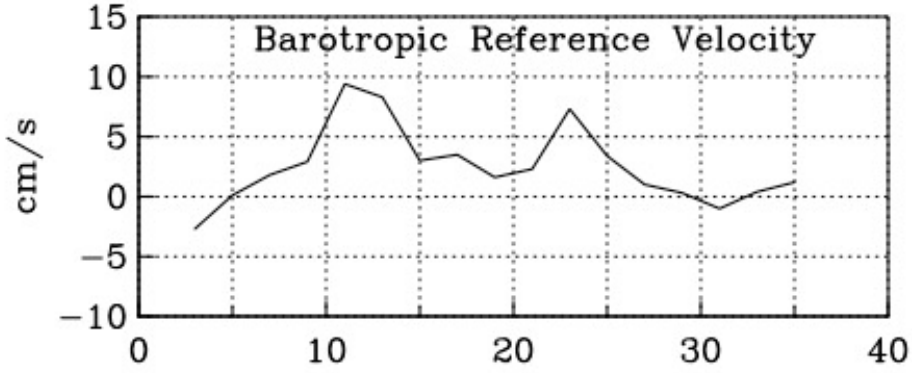


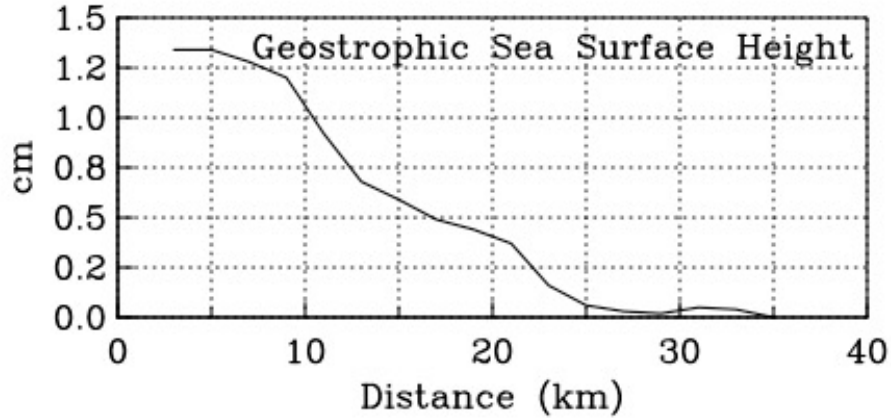
cm/s


Depth–Averaged Currents Aug.–4/6, 2003
80˚45'N
80˚30'N
80˚15'N
80˚00'N
71˚W
70˚W
69˚W
68˚W
67˚W
66˚W
65˚W
Ellesmere Island
Greenland
0.1 m/s
km
0
10
20
30
-100
-200
-300

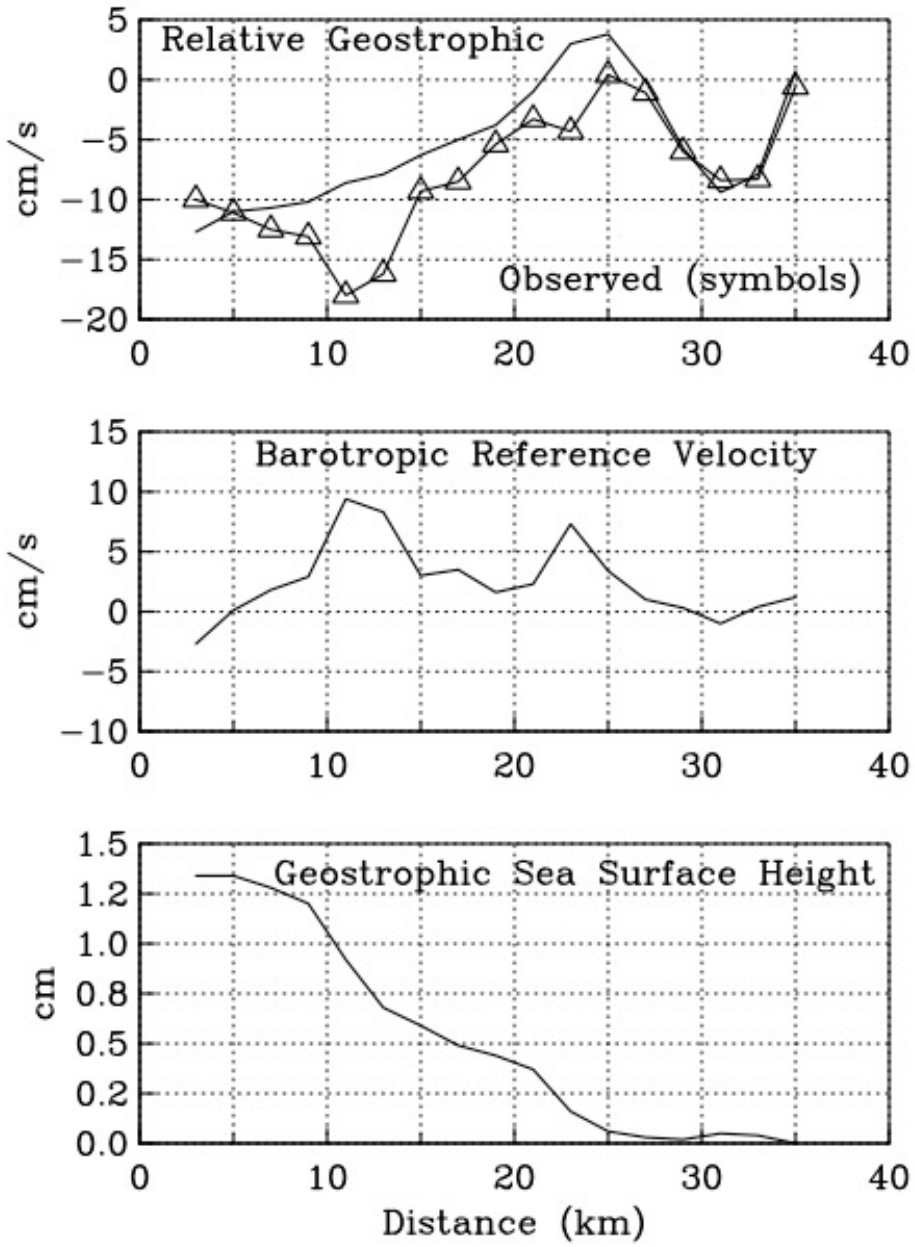

Distance (km)
Depth (m)
ρ
θ
S


Relative Geostrophic
Observed (symbols)
cm/s


Barotropic Reference Velocity
cm/s


Geostrophic Sea Surface Height
cm
Distance (km)

Estimating Absolute Geostrophic Transport:



Canada Greenland

V_g = relative geostrophic

V_{ADCP} = observed velocity

$V_0(x)=V_g-V_{ADCP}$

Across-channel integral of f/g times $V_0(x)$