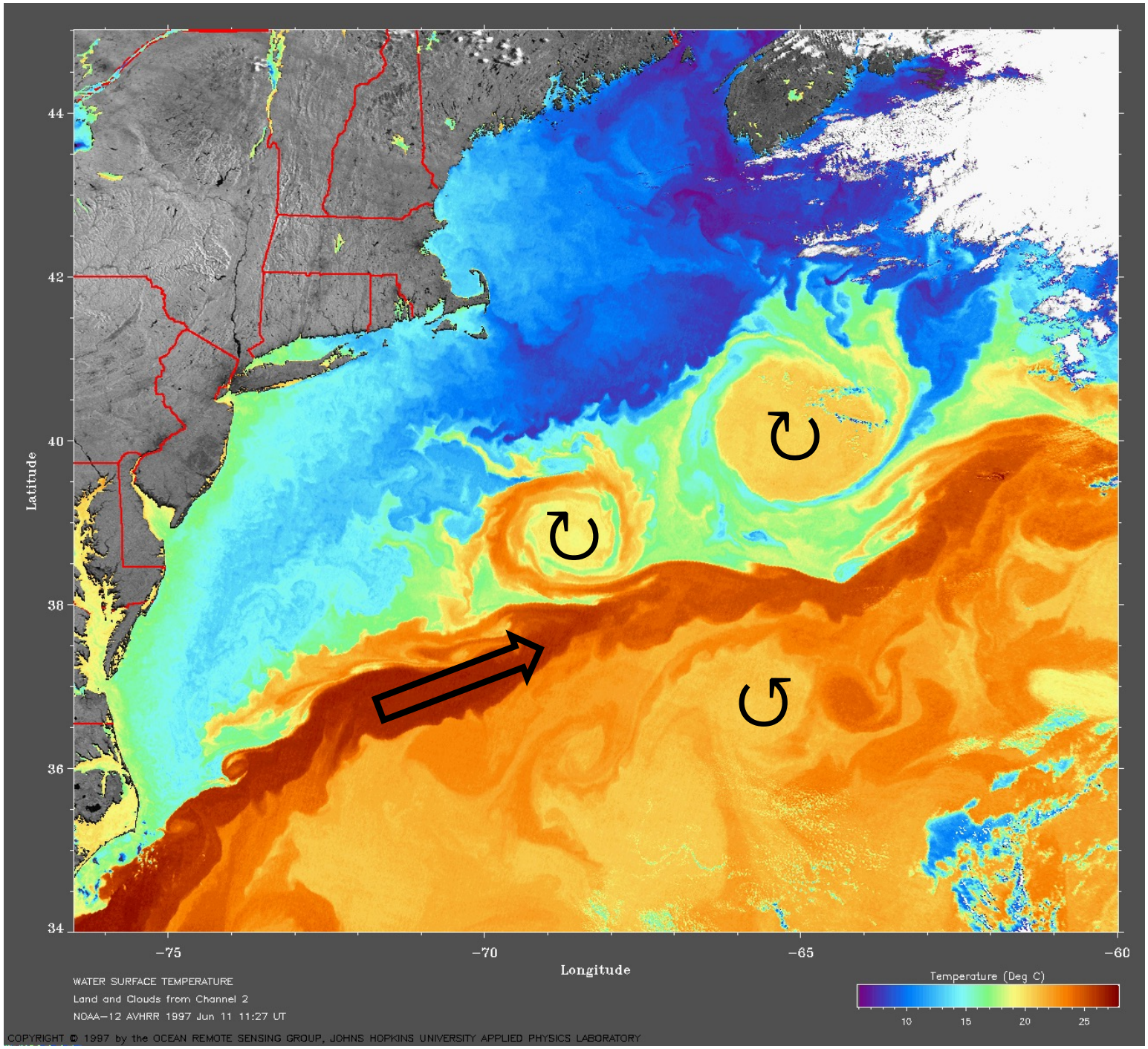
Sea Surface Temperature: Gulf Stream Eddies 1997



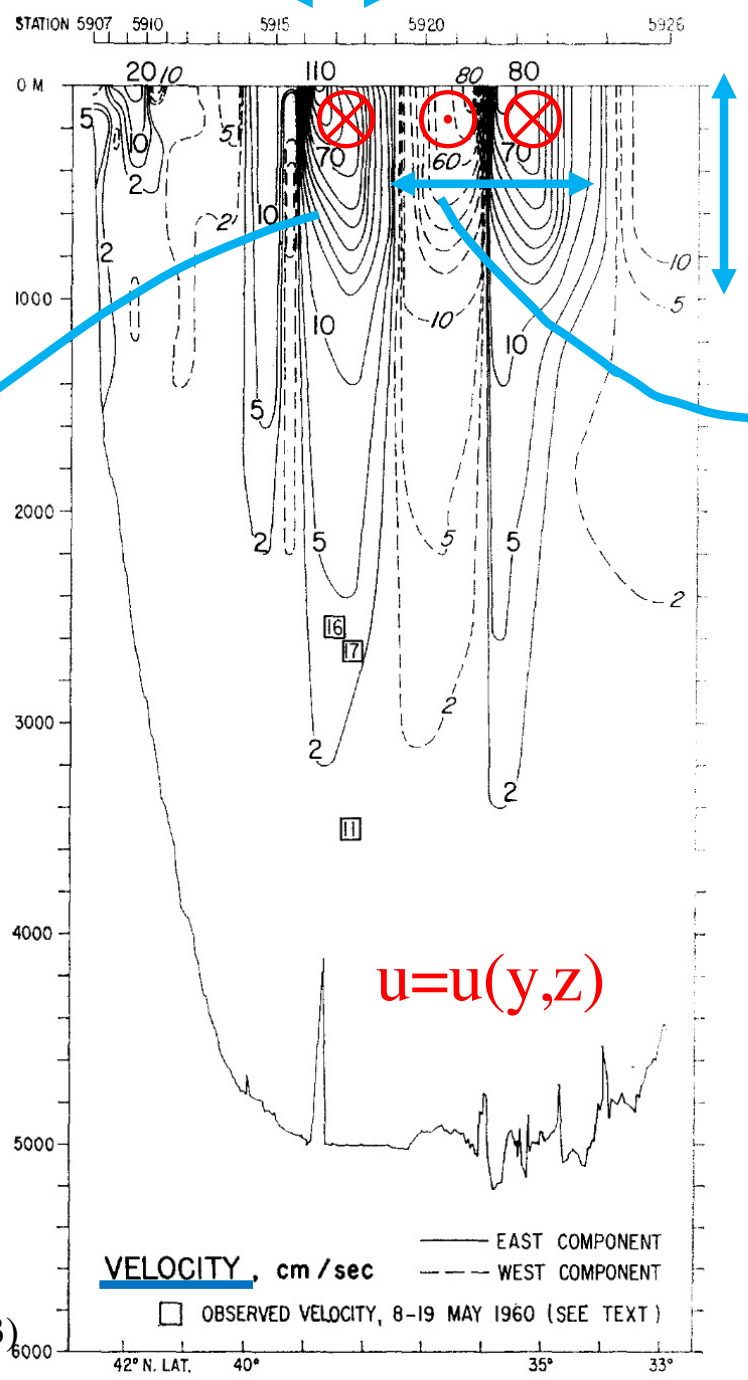
↺ cyclonic

↻ anti-cyclonic

L ~ 200 km

L ~ 200 km
U ~ 1 m/s
L/U ~ 50 hrs
Ro = (U/L)/ Ω
~ 0.1

GFD



Here L is oceanic mesoscale ~ 100 km

$U \sim 0.5$ m/s

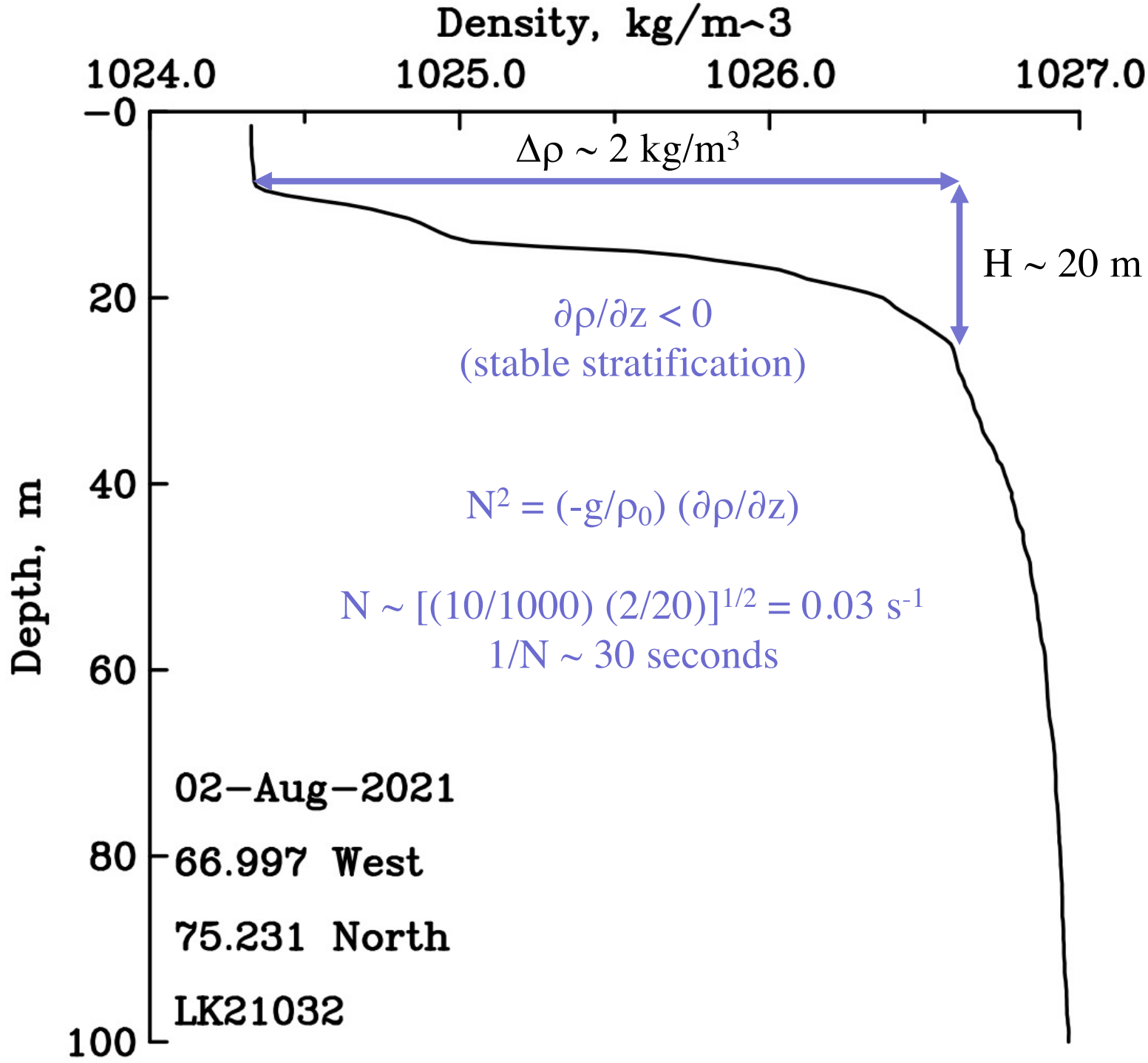
$\partial U/\partial z \sim U/H \sim 0.5 \times 10^{-3}$ s^{-1}

0.5 hrs

$\partial U/\partial y \sim U/L \sim 0.5 \times 10^{-5}$ s^{-1}

55 hrs

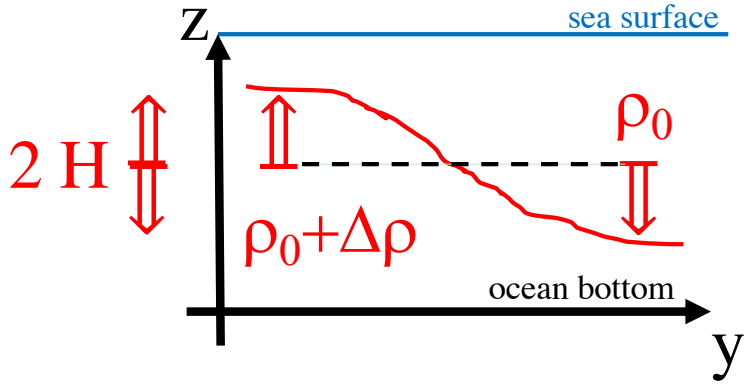
Fuglister (1963)


Density, kg/m~3
1024.0
1025.0
1026.0
1027.0
0
20
40
60
80
100
Depth, m
Δρ ~ 2 kg/m3
H ~ 20 m
∂ρ/∂z < 0
(stable stratification)
N2 = (-g/ρ0) (∂ρ/∂z)
N ~ [(10/1000) (2/20)]1/2 = 0.03 s-1
1/N ~ 30 seconds
02-Aug-2021
66.997 West
75.231 North
LK21032

Role of Density Stratification:

Density = Mass/Volume [kg/m^3]

Froude Number = kinetic/potential energy



Kinetic Energy is $\rho_0 U^2 / 2$ per unit volume

Potential Energy

$+ (\rho_0 + \Delta\rho)\ g\ H$ of raised parcel with density $\rho_0+\Delta\rho$ by scale height H

$- (\quad \rho_0 \quad)\ g\ H$ of lowered parcel with density ρ_0 by scale height H

$= \quad \Delta\rho \quad g\ H$ net gain of Potential Energy (per unit volume)

Froude Number = $1/2\ \rho_0 U^2 / (\Delta\rho\ g\ H)$