A Hindcast Model of the Mid-Atlantic Ocean Region

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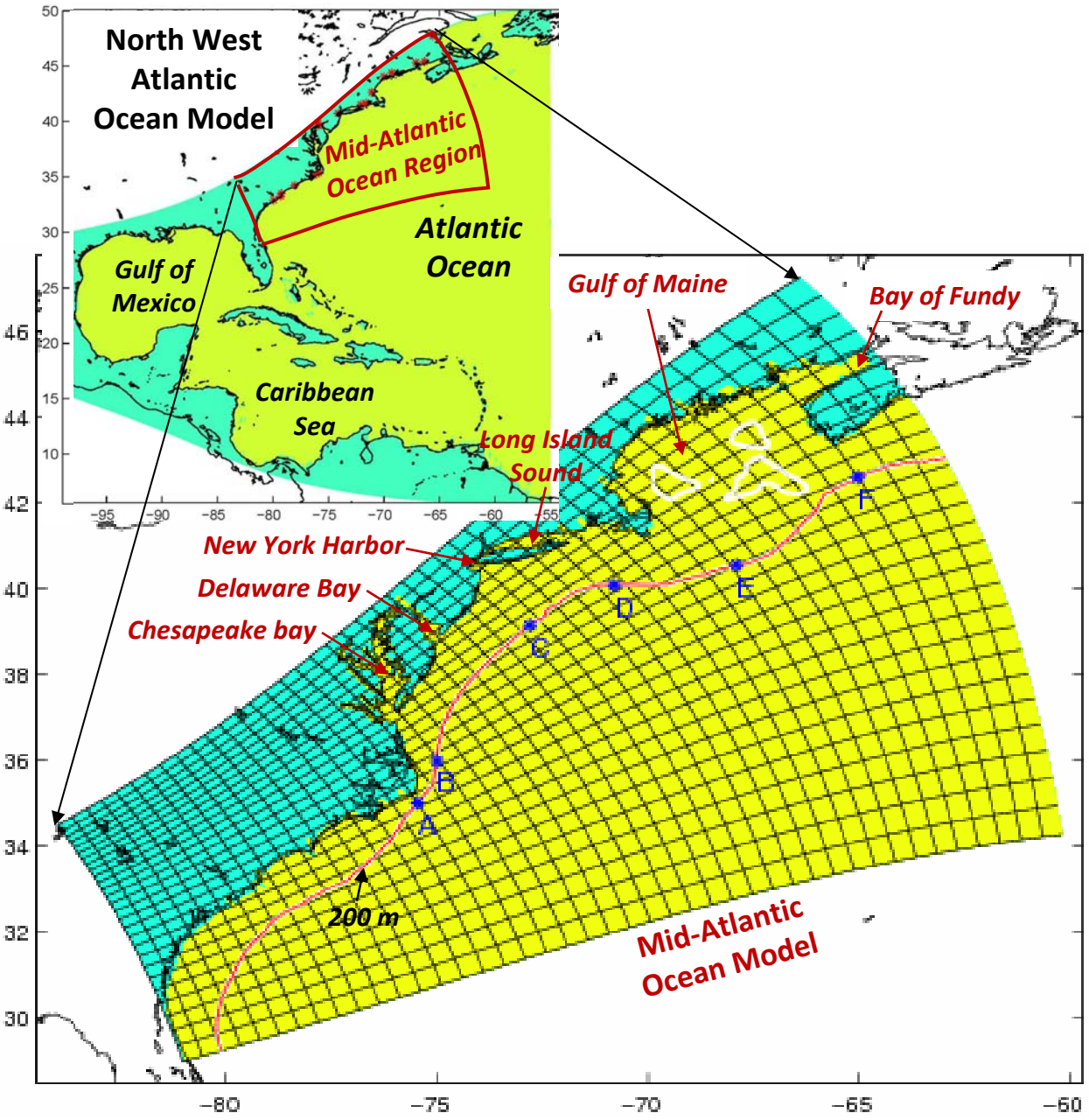
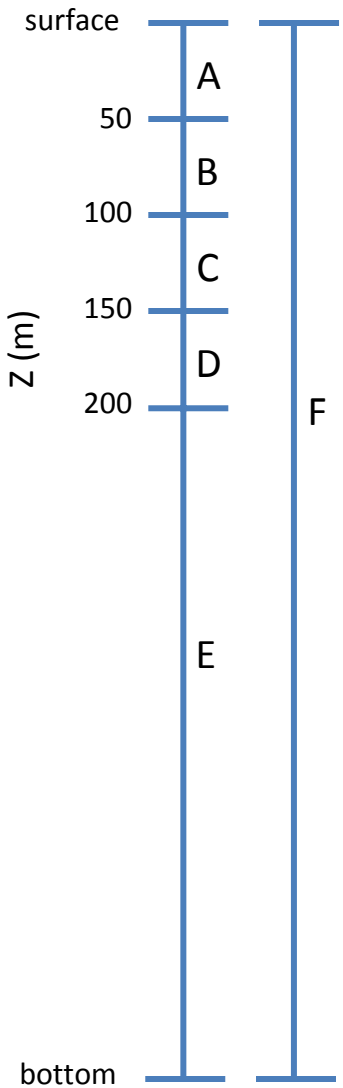
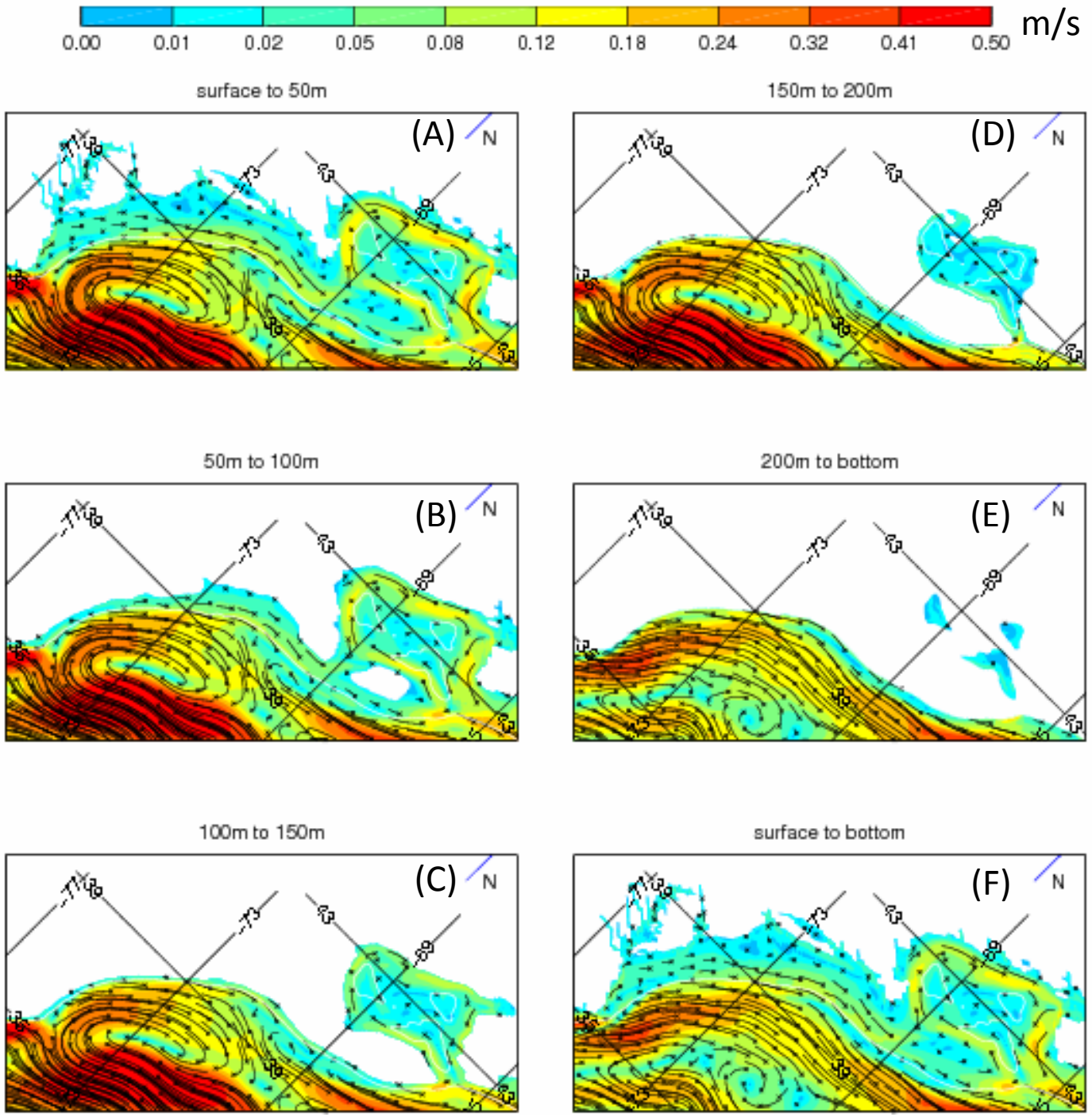
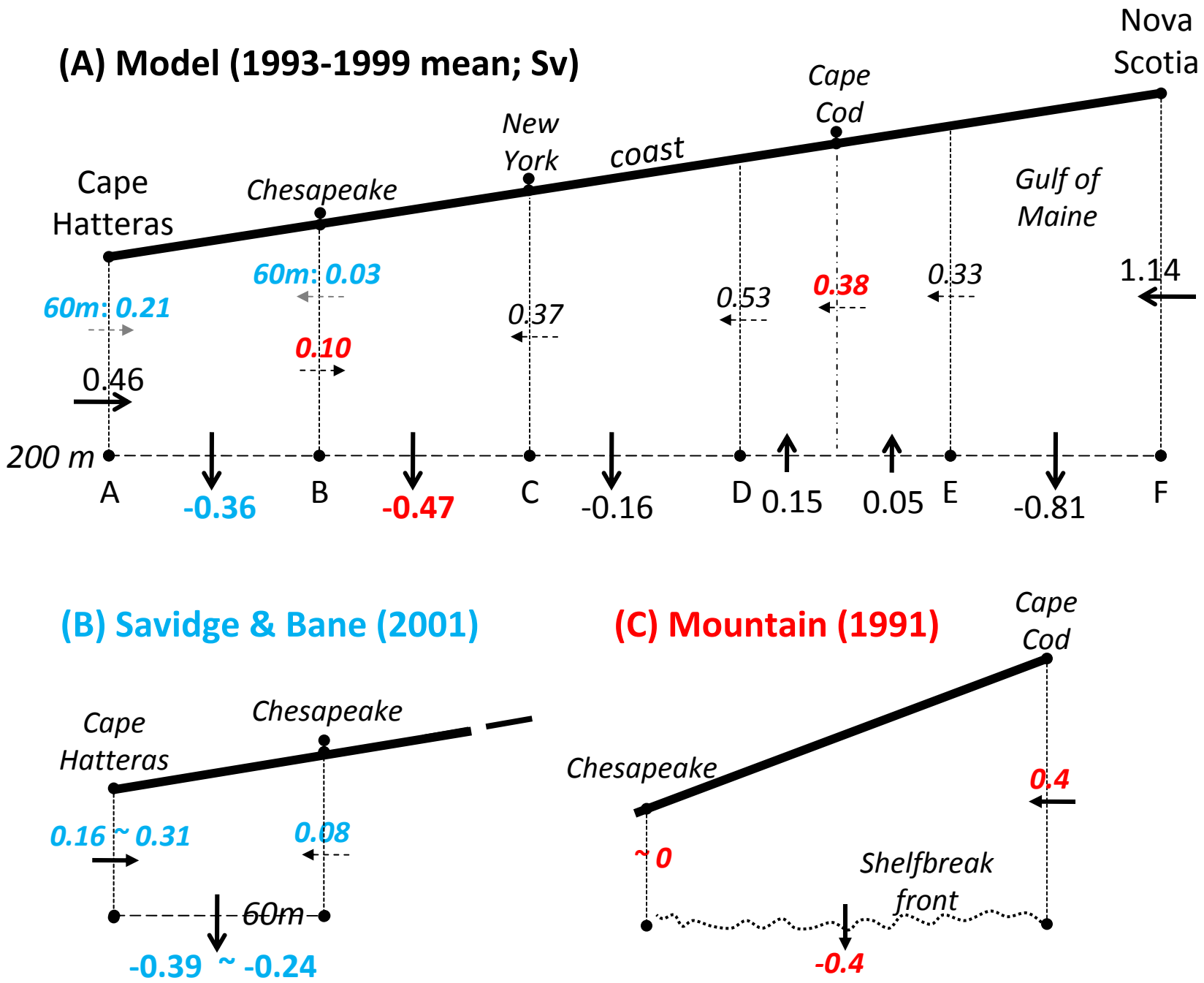
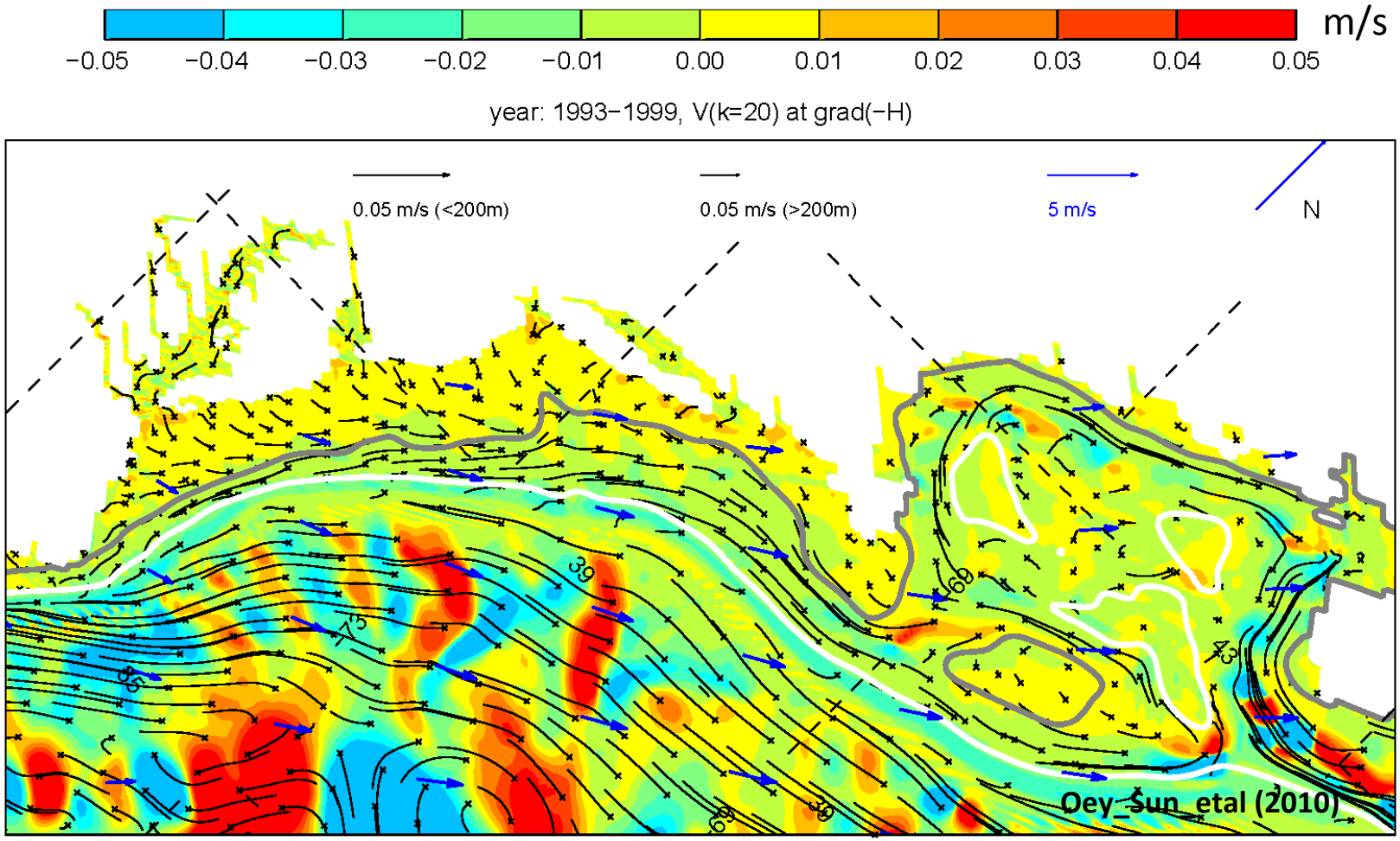

North West
Atlantic
Ocean Model
Mid-Atlantic
Ocean Region
Atlantic
Ocean
Gulf of
Mexico
Caribbean
Sea
Gulf of Maine
Bay of Fundy
Long Island
Sound
New York Harbor
Delaware Bay
Chesapeake bay
A
B
C
D
E
F
200 m
Mid-Atlantic
Ocean Model

Depth-Averaged Currents:
⇩(udy, vdx) dz/depth



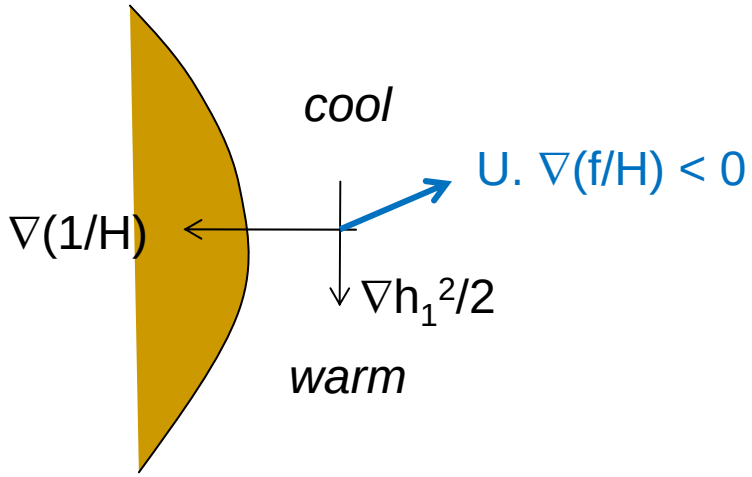



(A) Model (1993-1999 mean; Sv)
Nova Scotia
Cape Cod
New York
coast
Cape Hatteras
Chesapeake
Gulf of Maine
60m: 0.03
60m: 0.21
0.37
0.53
0.38
0.33
1.14
0.10
0.46
200 m
A
B
C
D
E
F
-0.36
-0.47
-0.16
0.15
0.05
-0.81
(B) Savidge & Bane (2001)
Cape Hatteras
Chesapeake
0.16 ~ 0.31
0.08
60m
-0.39 ~ -0.24
(C) Mountain (1991)
Cape Cod
Chesapeake
0.4
~ 0
Shelfbreak front
-0.4


m/s
−0.05
−0.04
−0.03
−0.02
−0.01
0.00
0.01
0.02
0.03
0.04
0.05
year: 1993−1999, V(k=20) at grad(−H)
0.05 m/s (<200m)
0.05 m/s (>200m)
5 m/s
N
Oey_Sun_etal (2010)

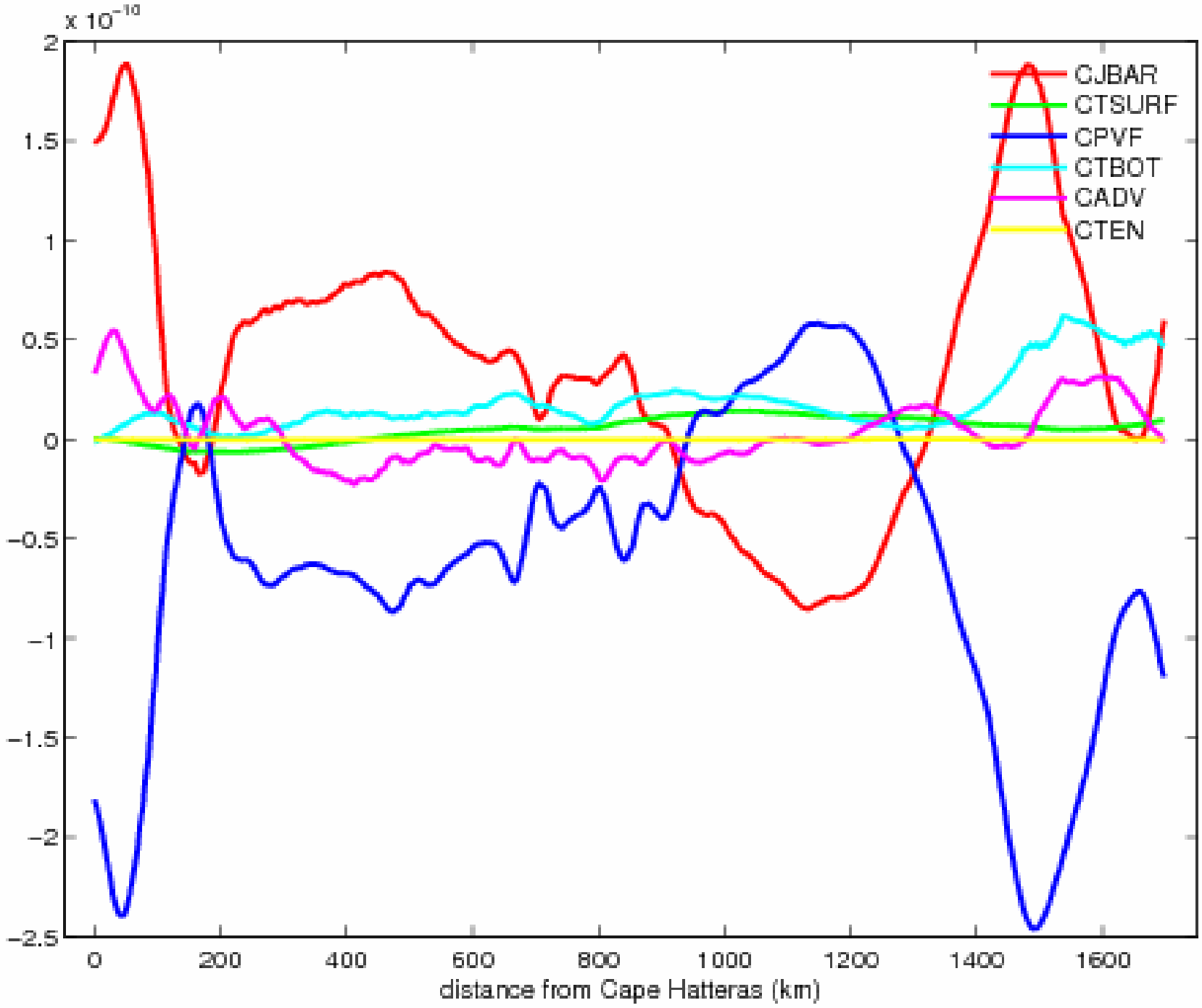
(a) what drives the mean cross-shelf/slope flow? JEBAR & origin of pressure gradient?

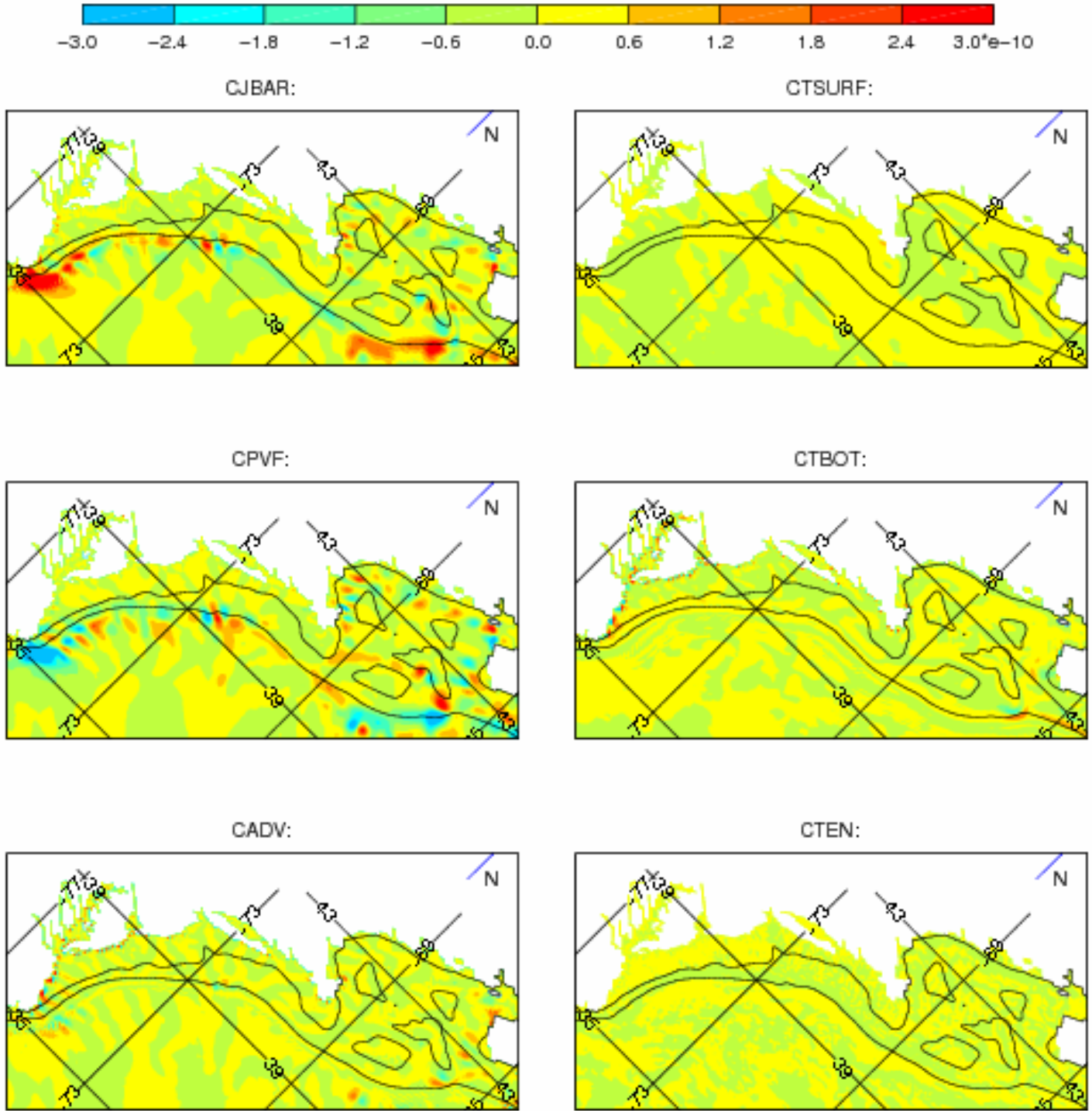
U. $\nabla(f/H) = +g'k.[(\nabla h_1^2/2) \times \nabla(1/H)] - \nabla.[(r/H)\nabla\psi]$



$$\zeta_t + \left(H \underset{\sim}{\bar{u}}\right) \cdot \nabla\left(\frac{f}{H}\right) = J(\chi, H^{-1}) + \nabla \times \left(\frac{\underset{\sim}{\tau^o}}{\rho_o H} - \frac{\underset{\sim b}{\tau}}{\rho_o H}\right) - \nabla \times \left(\frac{\underset{\sim}{A}}{H}\right)$$

$$where: \chi = \int_{-H}^{0} z \frac{g\rho}{\rho_o} dz$$


x 10^-10
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
0
200
400
600
800
1000
1200
1400
1600
distance from Cape Hatteras (km)
CJBAR
CTSURF
CPVF
CTBOT
CADV
CTEN


−3.0
−2.4
−1.8
−1.2
−0.6
0.0
0.6
1.2
1.8
2.4
3.0*e−10
CJBAR:
CTSURF:
CPVF:
CTBOT:
CADV:
CTEN:
N

The BP Oil Spill of 2010

- Long-term projection
- Loop + Eddies + Winds
- Drifters are NOT oil