Coastal HYCOM modeling in South Florida: evaluation of GODAE boundary conditions, resolution and forcing

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In Collaboration with

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R. Weisberg *(USF)*
M. Baringer and C. Meinen *(NOAA-AOML)***

SOUTH FLORIDA HYCOM NESTED MODELS
Nested in GoM-HYCOM / ATL-OI (one-way) / No tides

GOMh0.04
ci 35.0
2. to 7815.
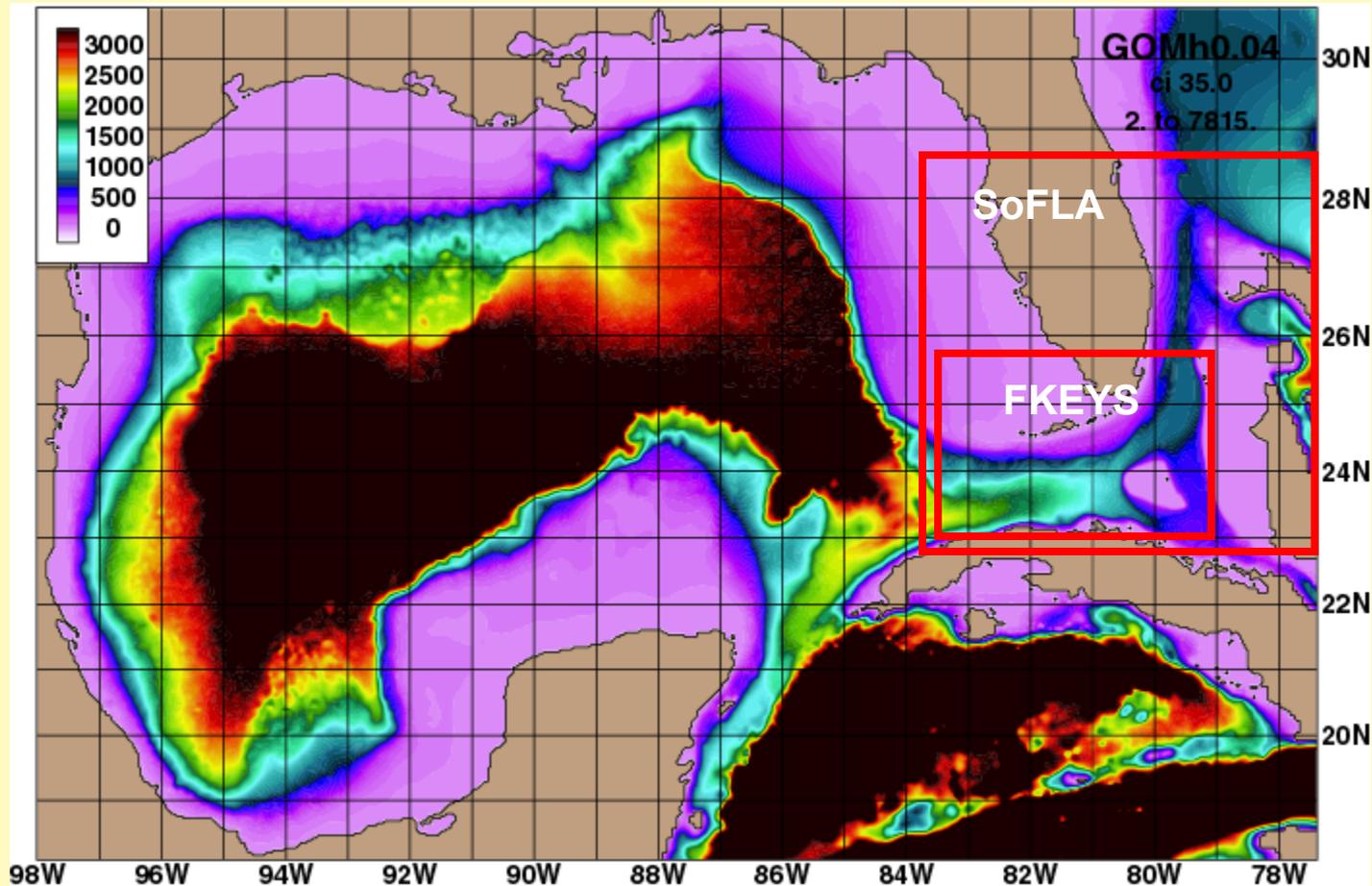
SoFLA

FKEYS

**SoFLA-HYCOM**

1/25° resolution

(~3-4 km)

FKEYS-HYCOM

1/100° resolution

(~ 900 m)

Gulf of Mexico topo / minimum water depth: 2m

The complex South Florida coastal system
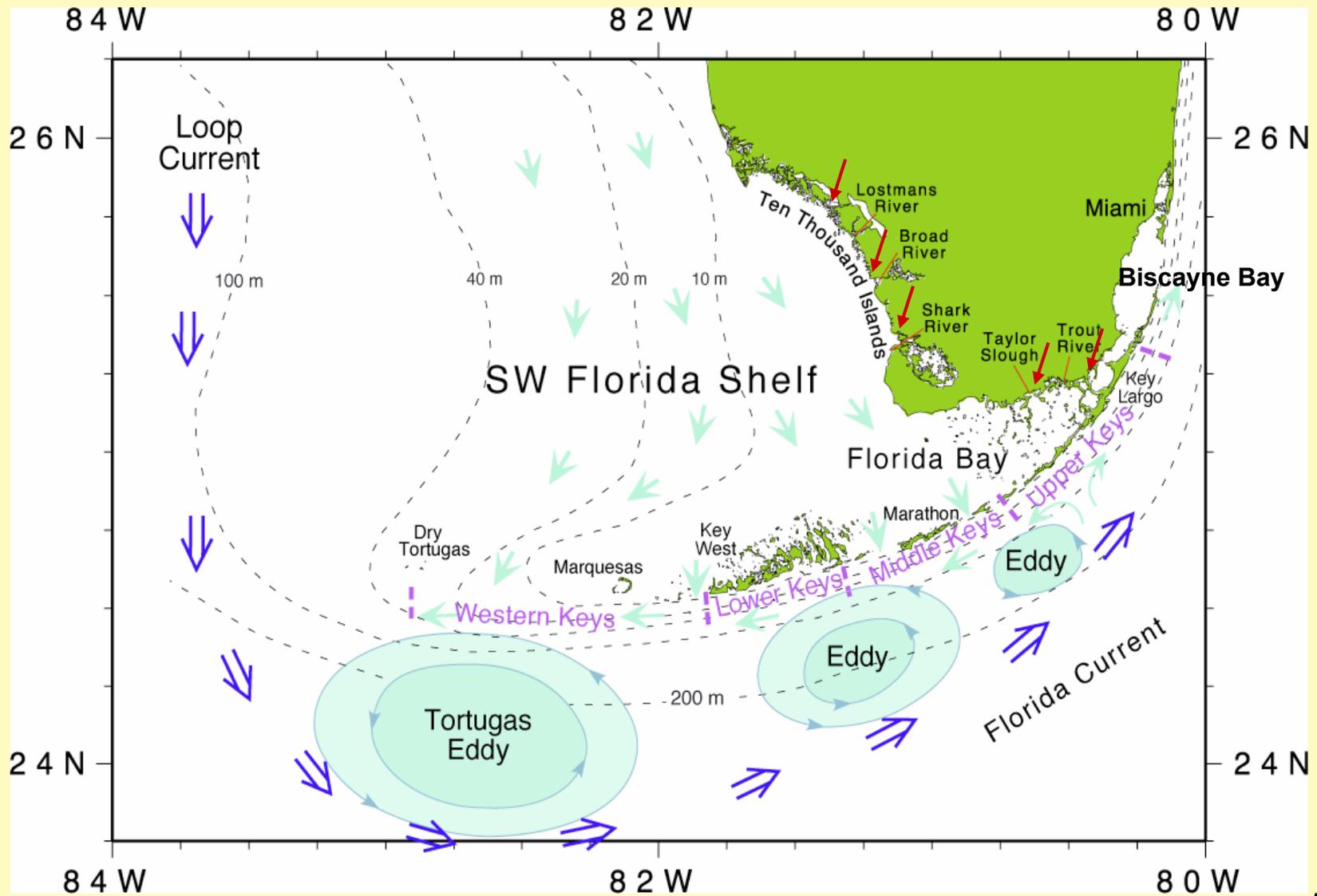
Lee et al., 2002

Regional South Florida Model (SoFLA- HYCOM)
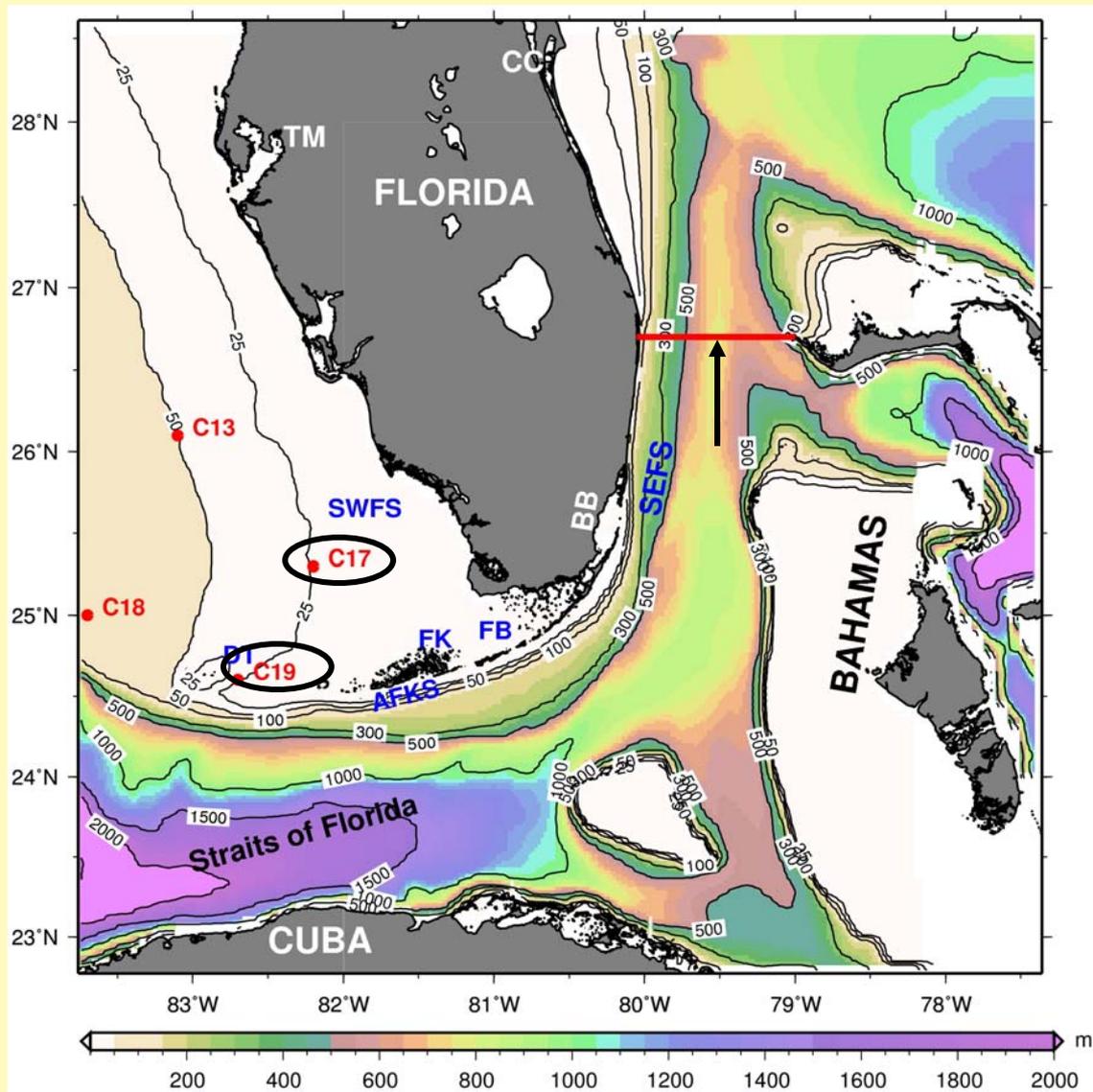
SoFLA-HYCOM Experiments on Boundary Condition effects

Experiment	Layers	Nesting BC	Forcing	Integration Time
SoFLA(exp1)	26	GOM-Free	coamps 27km	2004-2005
SoFLA(exp2)	26	GoM-NCODA	coamps 27km	2004-2005
SoFLA(exp3)	26	ATL-OI	coamps 27km	2004-2005

*Kourafalou et al., 2008 (submitted to Ocean Dynamics)*

SEA SURFACE HEIGHT


sea surf. height   Jan 30, 2004 00Z [01.1H]

exp_011
ci 2.0 cm
-43.4 to 63.2

sea surf. height   Jan 30, 2004 00Z [01.1H]

exp_011
ci 2.0 cm
-42.1 to 55.9

Jan 04

sea surf. height   May 29, 2004 00Z [01.1H]

exp_011
ci 2.0 cm
-45.2 to 65.1

sea surf. height   May 29, 2004 00Z [01.1H]

exp_011
ci 2.0 cm
-43.1 to 67.8
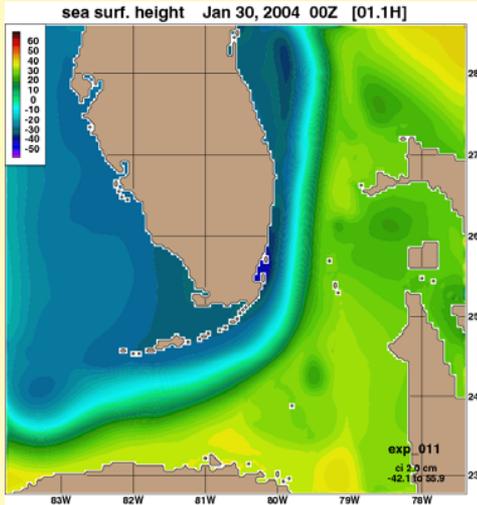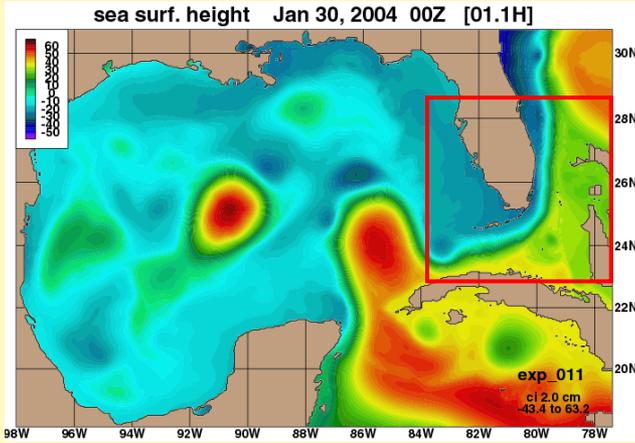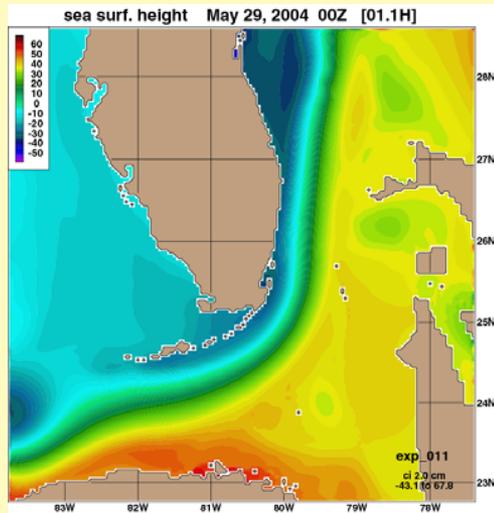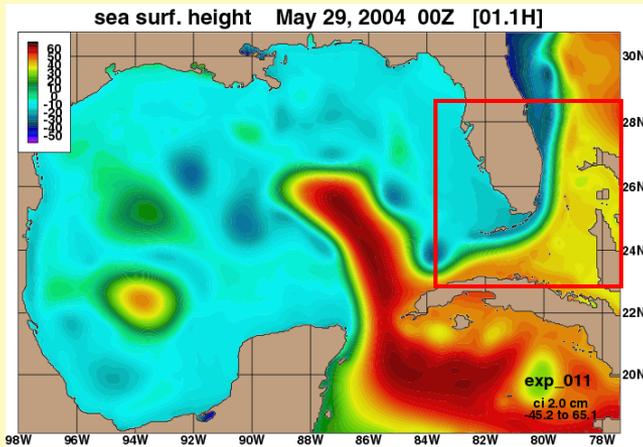
May 04

Near surface SALINITY
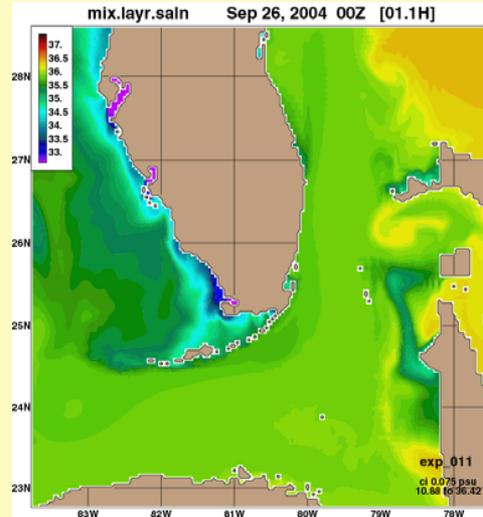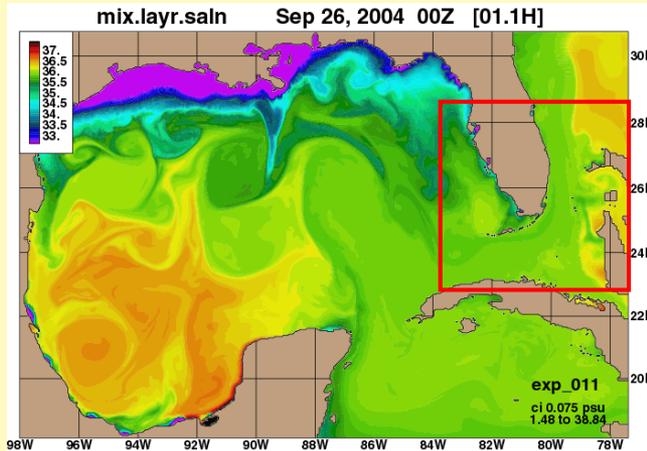
Near surface TEMPERATURE
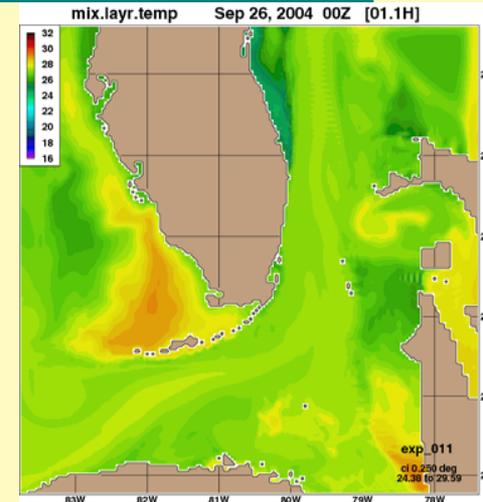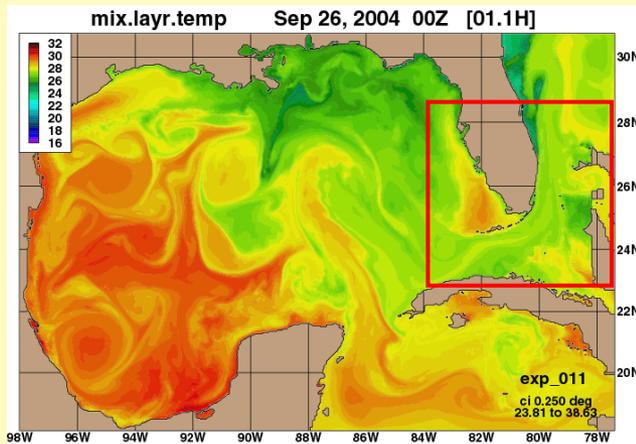
Sept. 2004

Model-Data Comparison: along-shore velocity   #C17   2004
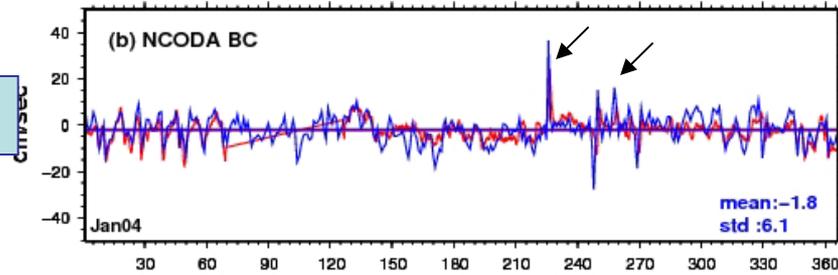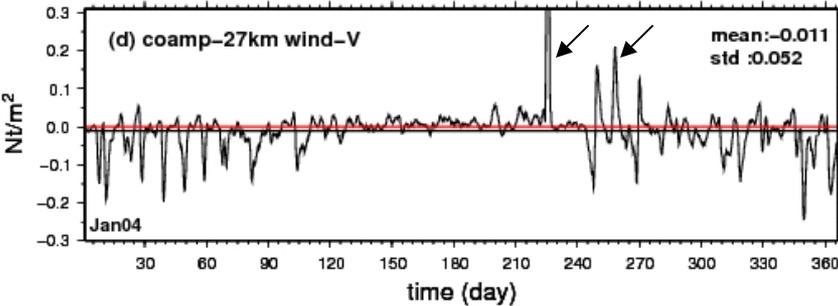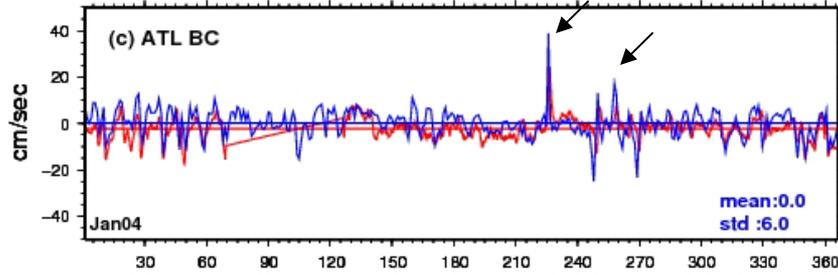
Observed/Simulated V5m at C17 (82.2°W & 25.3°N) For 2004

FREE

(a) Free BC   mean:−2.4 std :4.4   mean:−2.1 std :5.7

NCODA

(b) NCODA BC   mean:−1.8 std :6.1

ATL

(c) ATL BC   mean:0.0 std :6.0

(d) coamp−27km wind−V   mean:−0.011 std :0.052

SoFLA-HYCOM

Wind (COAMPS 27 km)

3-hourly winds & hourly mooring data
=> Daily filtering

Data by Bob Weisberg, USF

Model-Data Comparison: along-shore velocity   #C19   2004
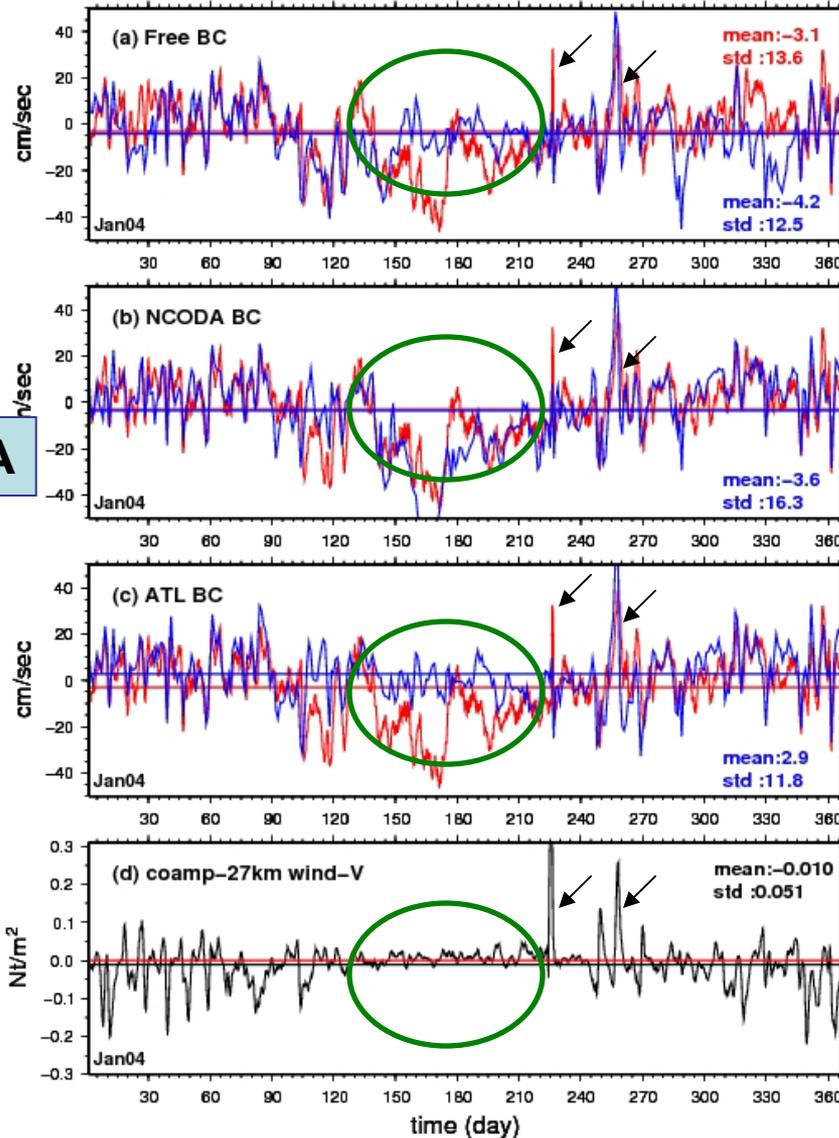
FREE
NCODA
ATL

SoFLA-HYCOM

Wind (COAMPS 27 km)

3-hourly winds & hourly mooring data
=> Daily filtering

*Data by Bob Weisberg, USF*

# Model-Data Comparison: cross-shore velocity   #C19

DATA

u (m s^{-1}), USF Buoy/WFS, C19, 40hr LP

FREE

u (m s^{-1}), FLAh0.04, BC/GOM-free, C19

NCODA

u (m s^{-1}), FLAh0.04, BC/GOM-ncoda, C19

ATL

u (m s^{-1}), FLAh0.04, BC/ATL-OI, C19
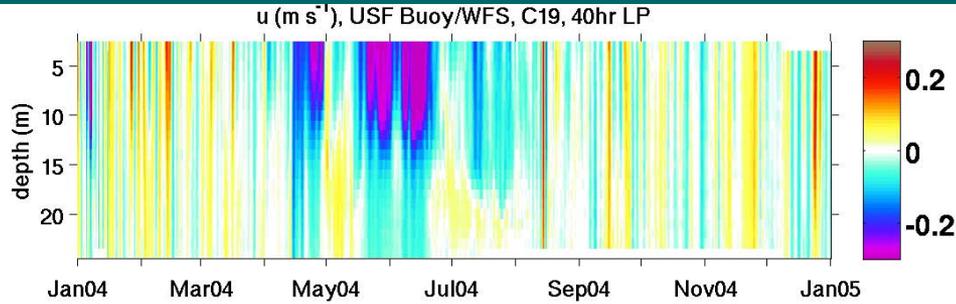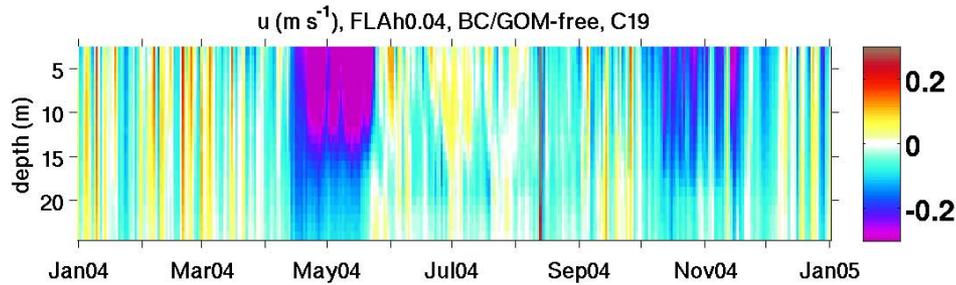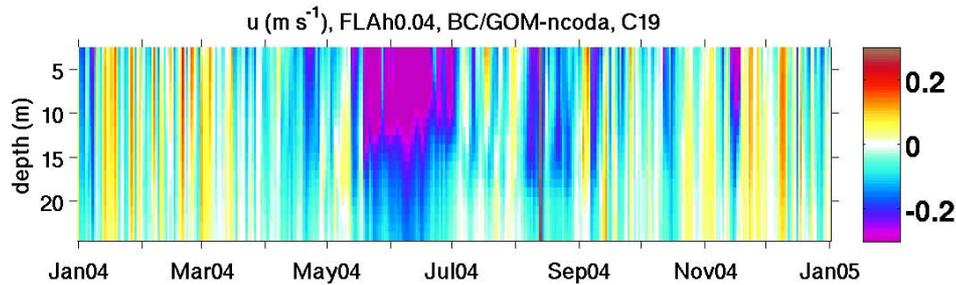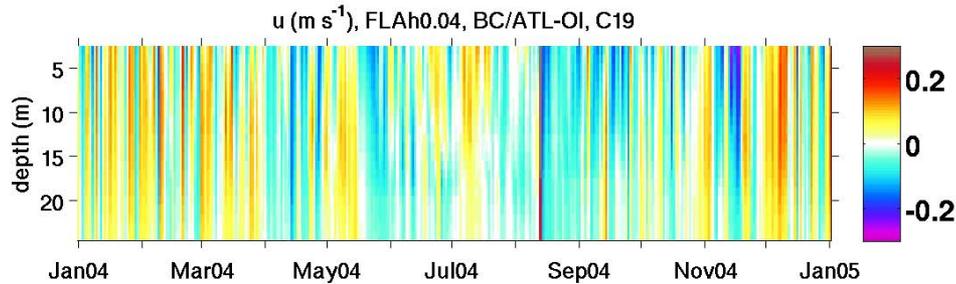
Velocity vector correlations
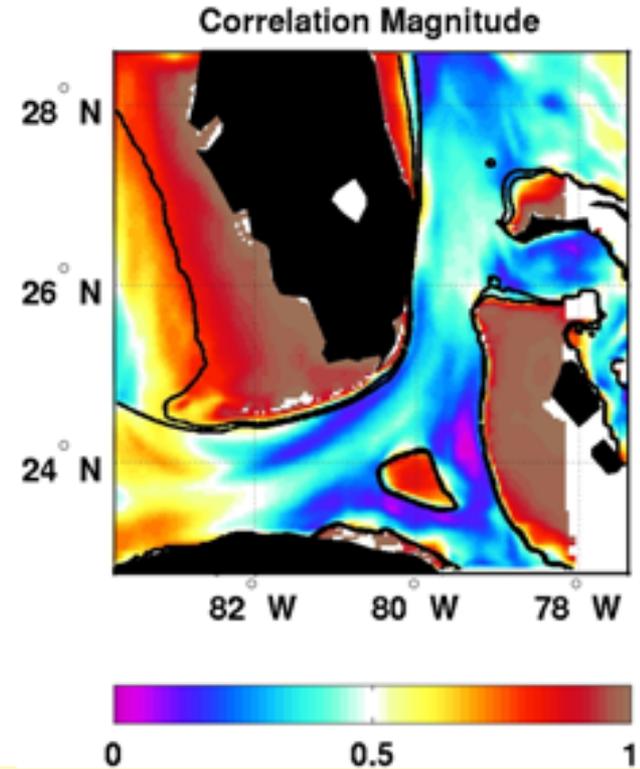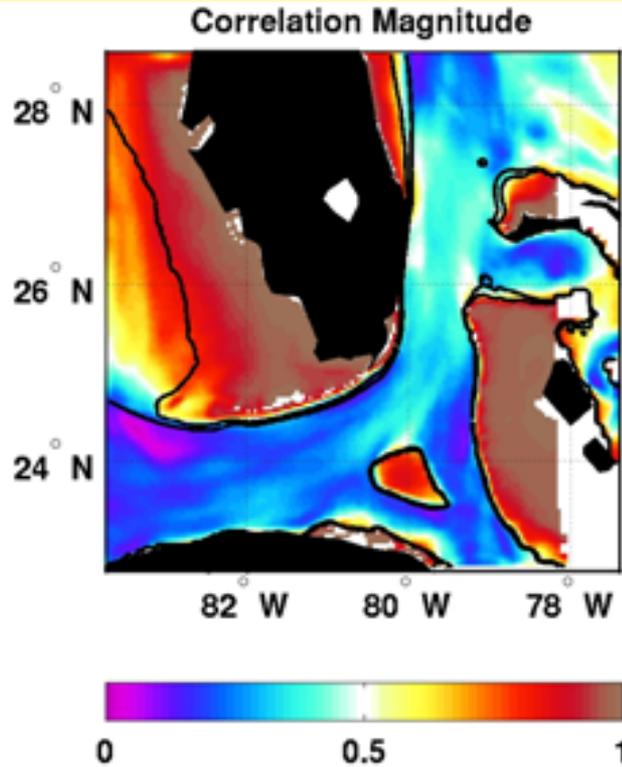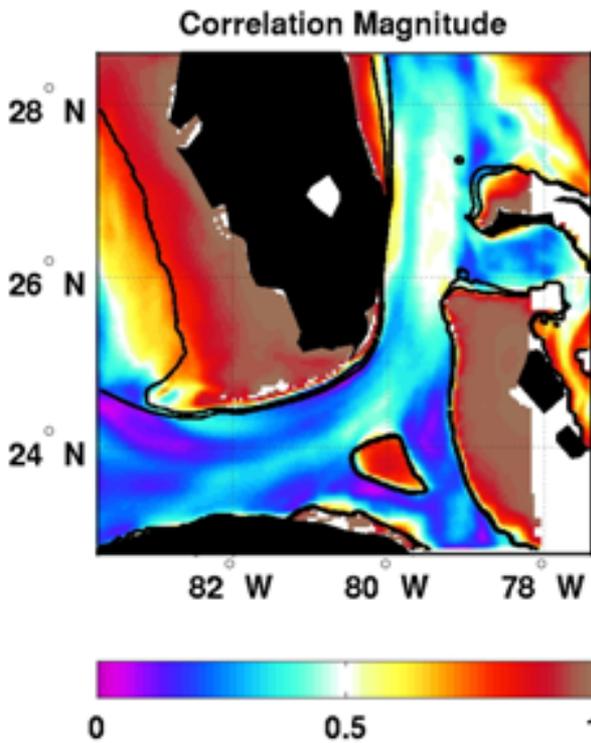
**exp1 / exp2** **exp1 / exp3** **exp2 / exp3**

Florida Current Transport

Observed/Simulated FC Transport (Year 2004)
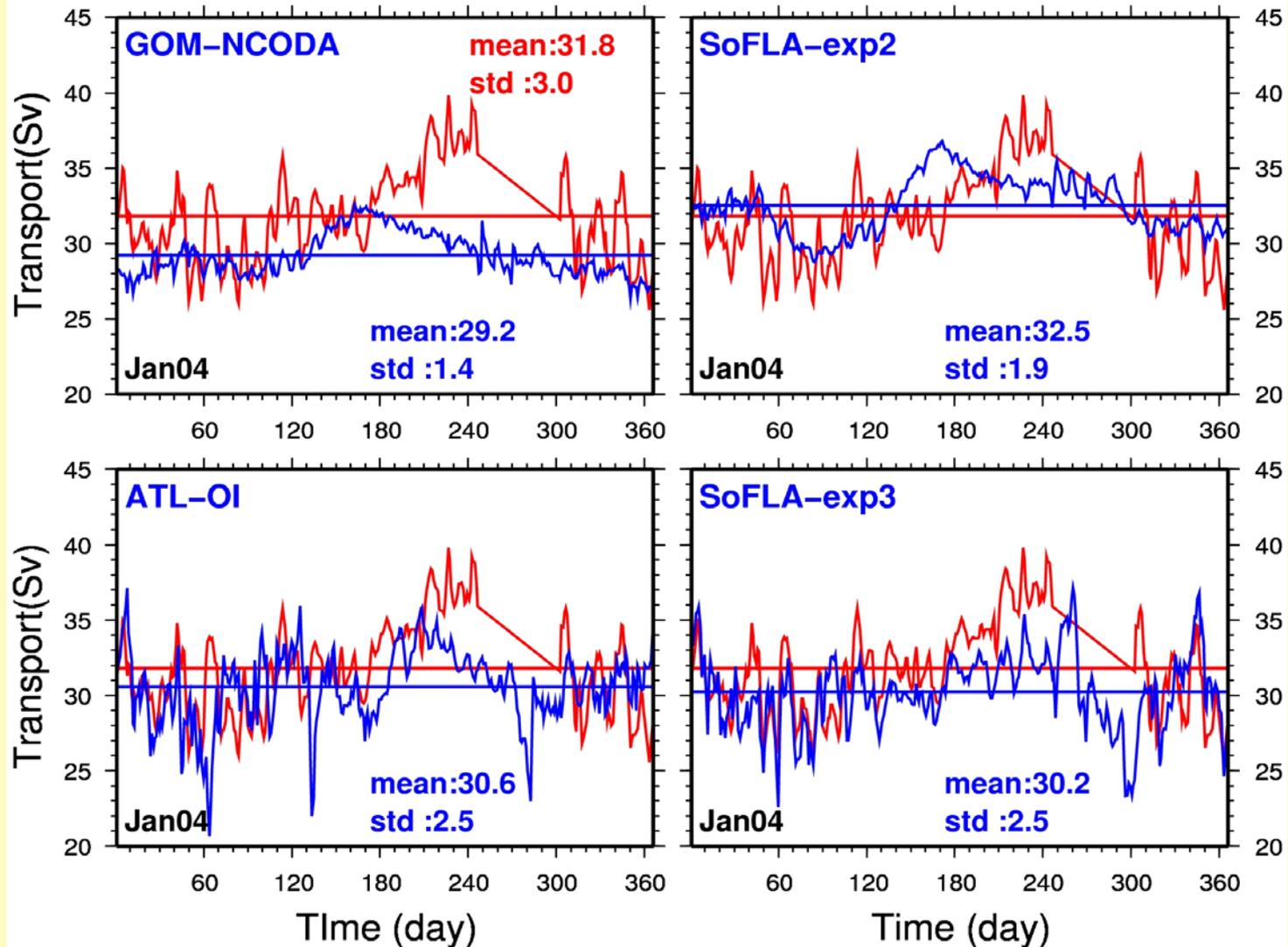
2004

Florida Current Transport

Observed/Simulated FC Transport (Year 2005)
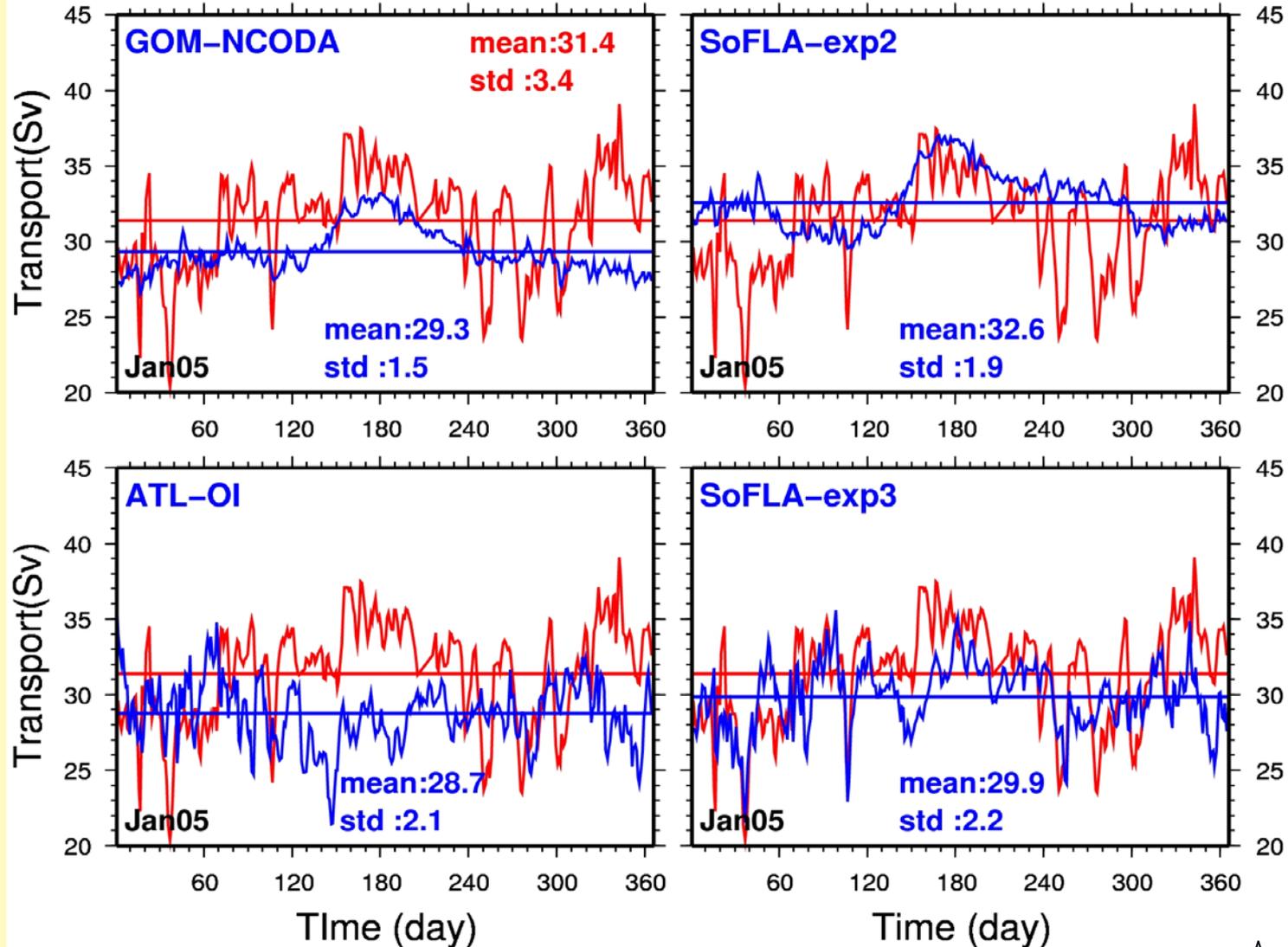
2005
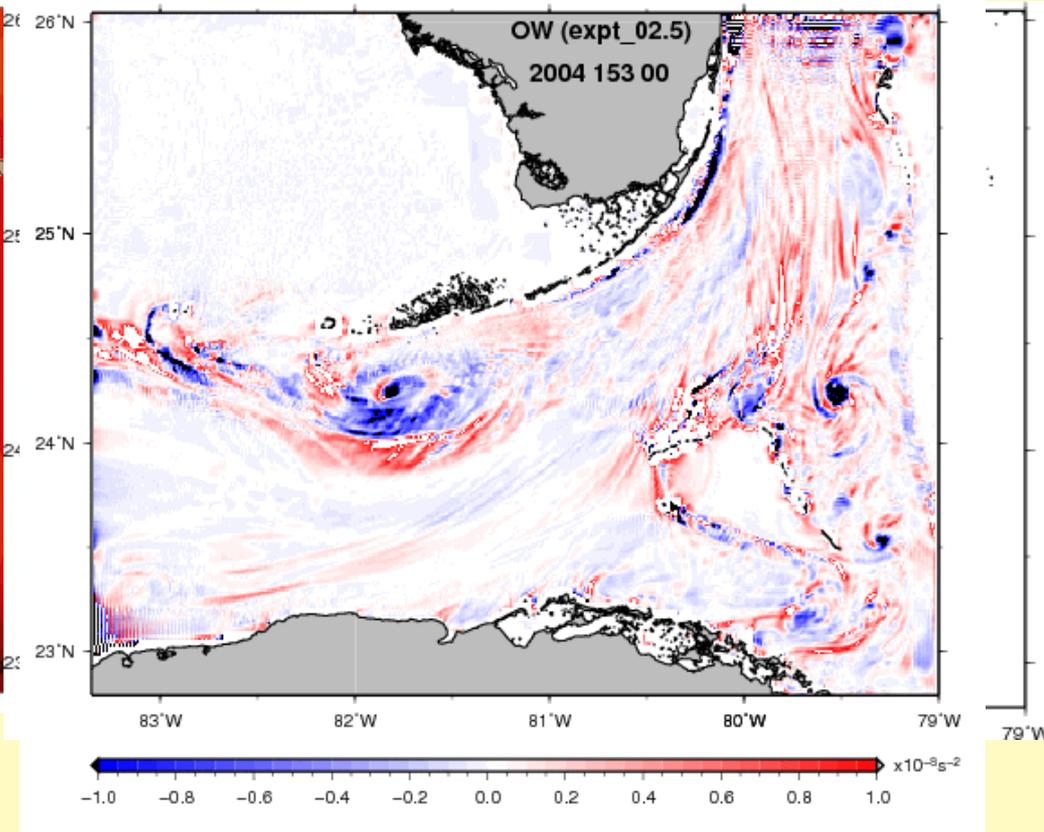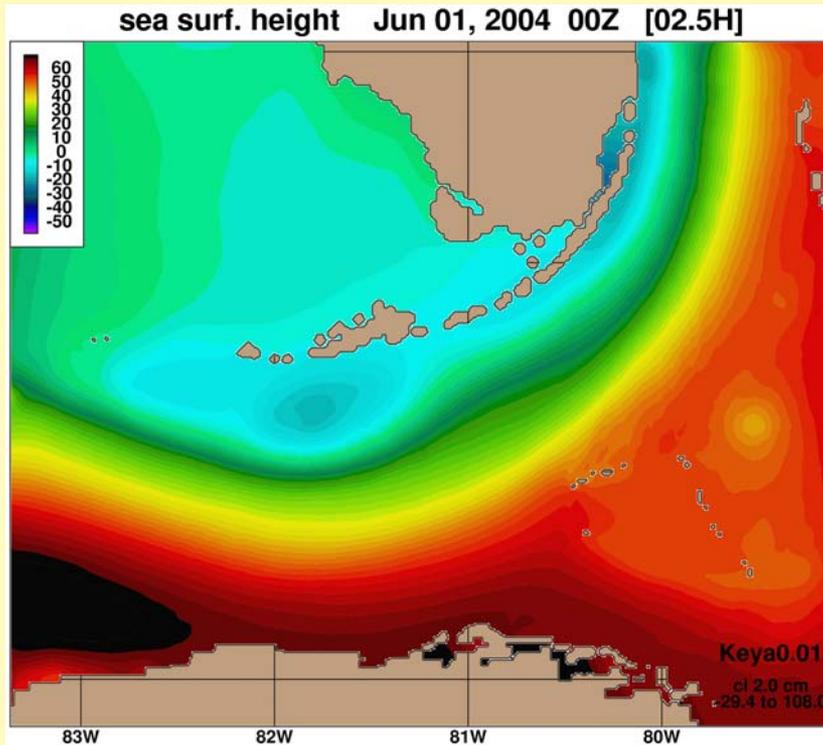
Okubo-Weiss parameter
$Q = d^2 - \zeta^2$

100 m   **200 m**   **300 m**

SSH along 100m isobath (CI=2cm)   SSH along 200m isobath (CI=2cm)   SSH along 300m isobath (CI=2cm)

June 2004 — Longitude

sea surf. height   Jun 03, 2004 00Z [02.5H]   sea surf. height   Jun 07, 2004 00Z [02.5H]   sea surf. height   Jun 14, 2004 00Z [02.5H]
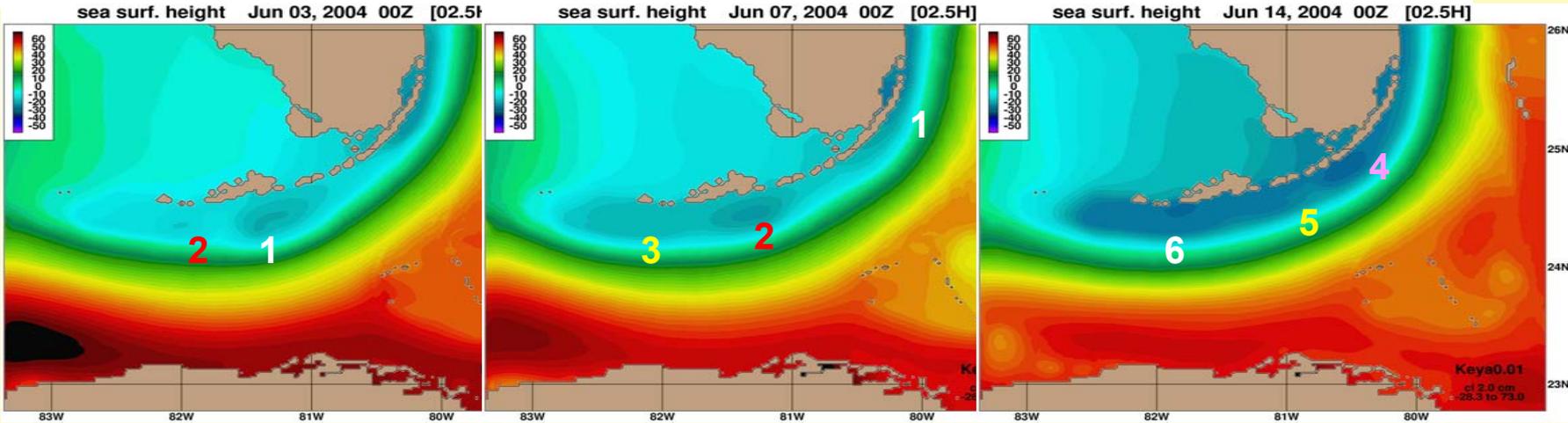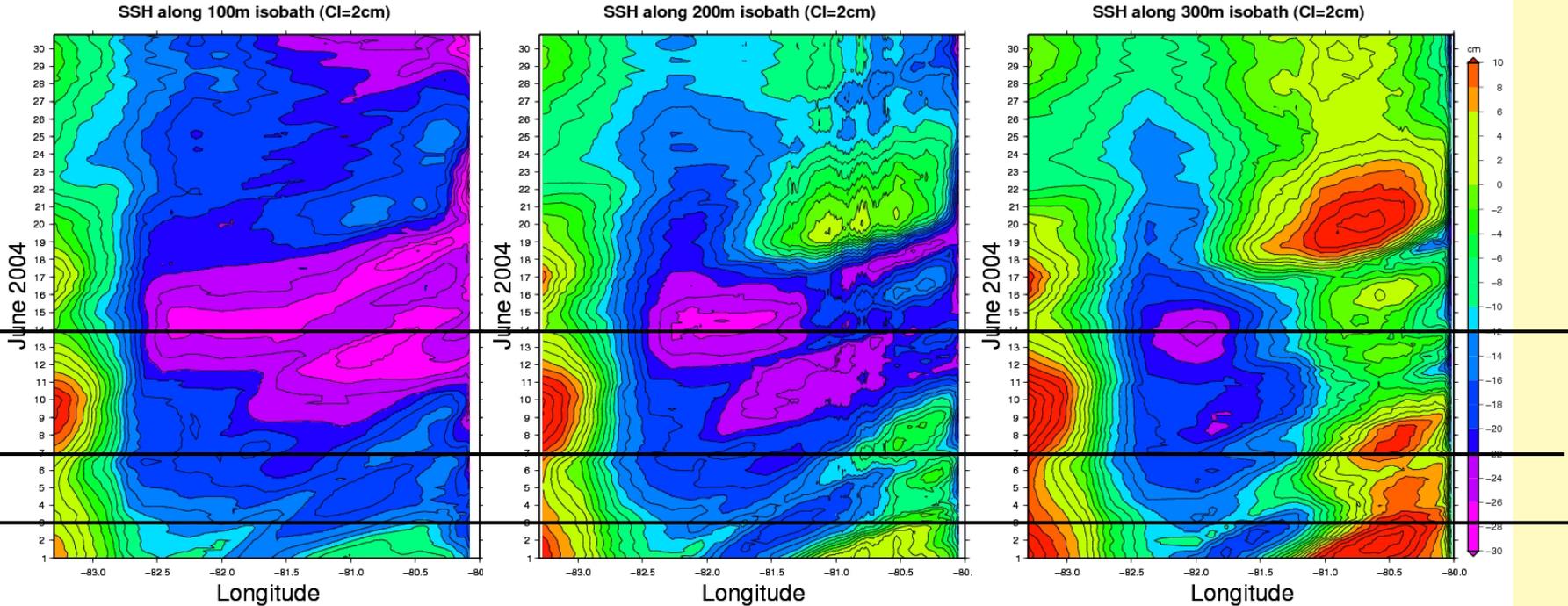
Model to data validation: eddy passages

WERA data

FKEYS-HYCOM

Front at its strongest, vortex centered along 200-m isobath.
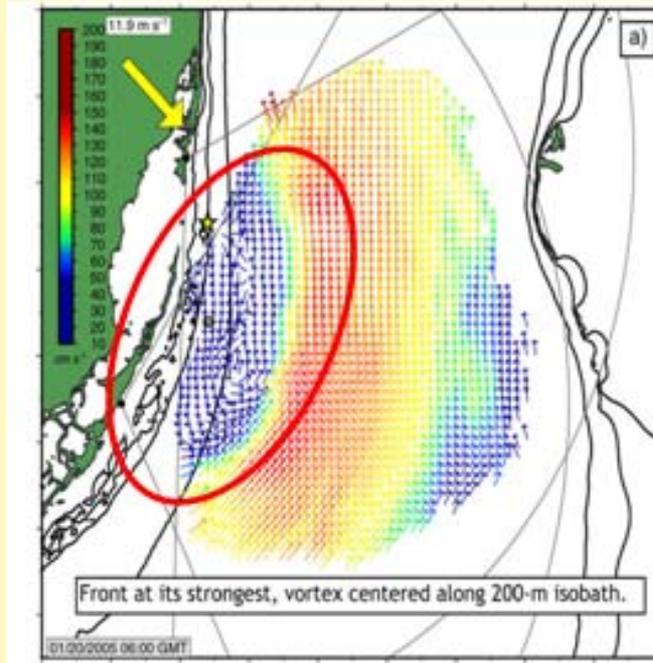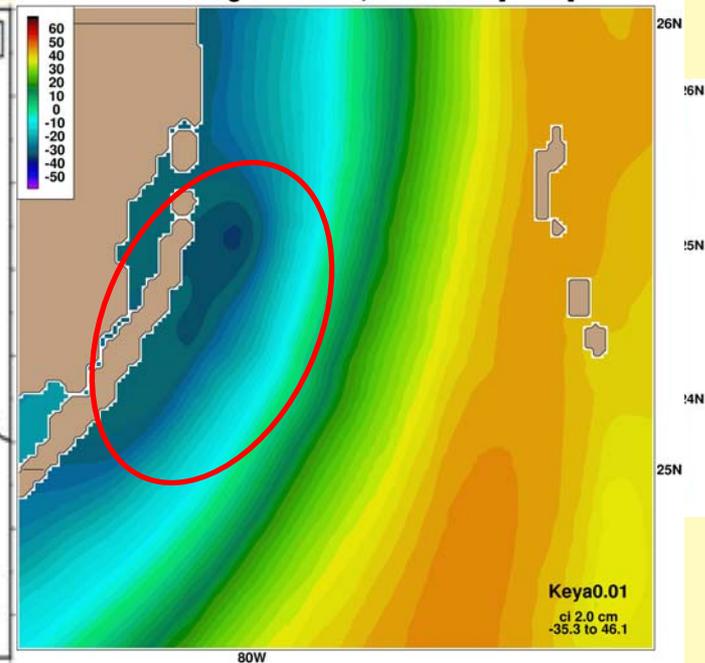
Data by Nick Shay, UM/RSMAS

Application: HYCOM-BiOphysical Lagrangian Tracking System (BOLTS)
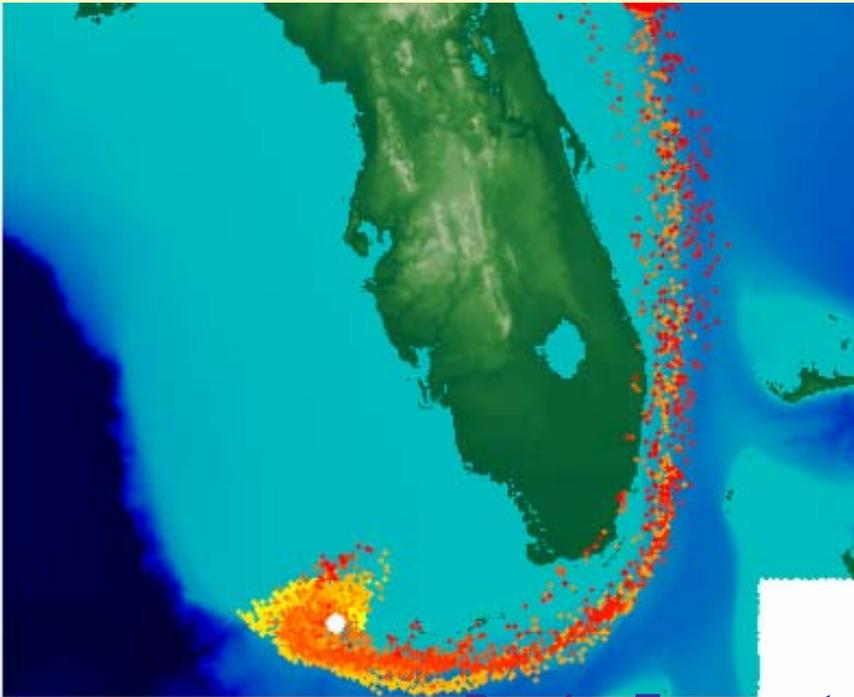
Passive Transport

Active Transport

Dry Tortugas - Release April 1, 2004
Daily position of particles during a 30-day
passive transport in the Florida Current

Recruitment to coral reef = 2%

Dry Tortugas - Release April 1, 2004
30-day active transport with OVM observed
from the bicolor damselfish larvae

Recruitment to coral reef = 38%

Photo: C Guigand

In collaboration with A. Srinivasan

Application: Comprehensive Everglades Restoration Project (CERP)