Preliminary results from the Florida Keys HYCOM

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In Collaboration with

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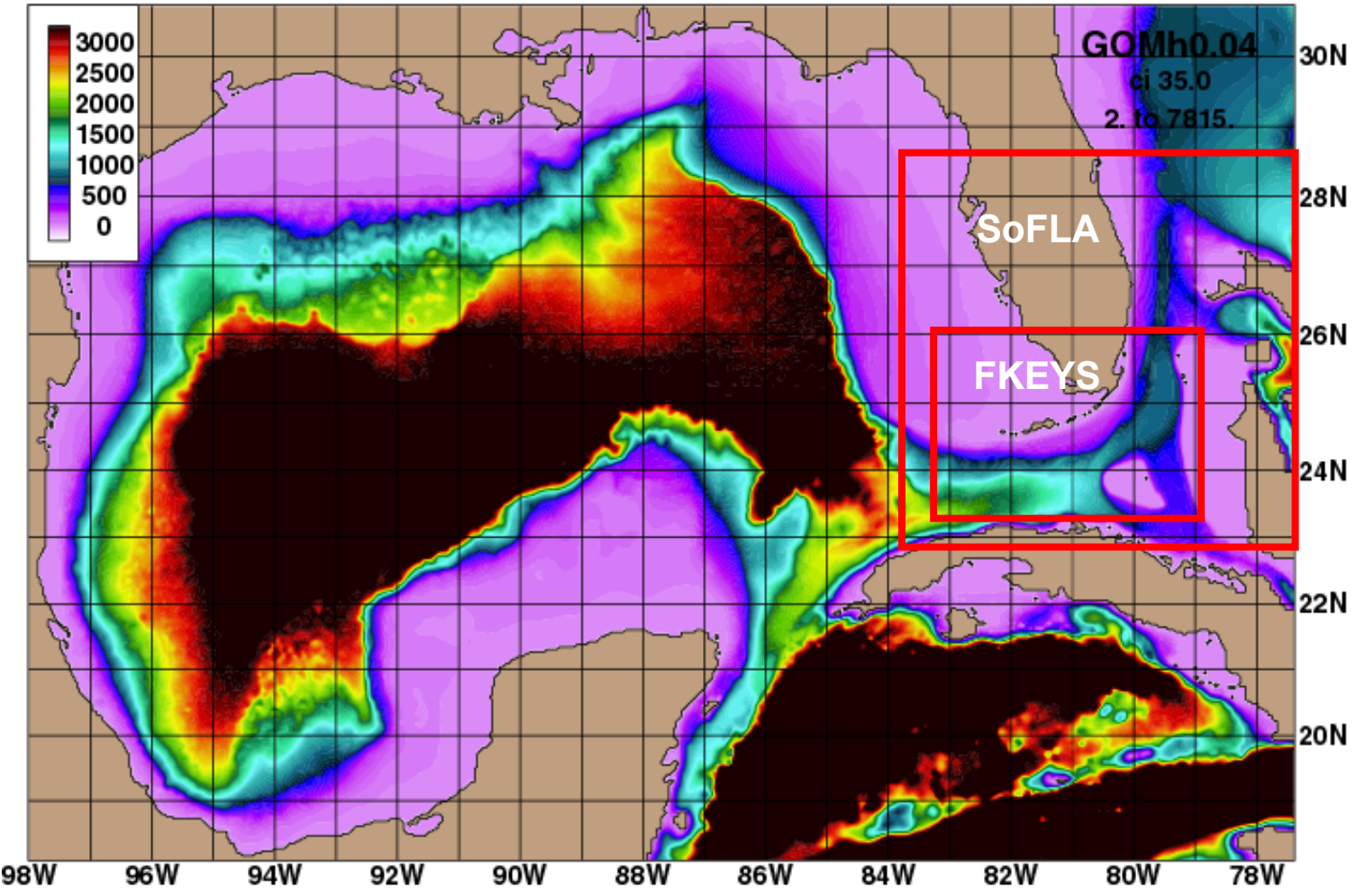
Alan Wallcraft (NRL)

1/100° FKEY domain is nested within 1/25° SoFLA which was nested within 1/25° GOM



FLAh0.04:

idm=161

jdm=163

kdm=26

83.76°W–77.36°W

22.78°N–28.61°N

Keyc0.01:

idm=437

jdm=301

kdm=26

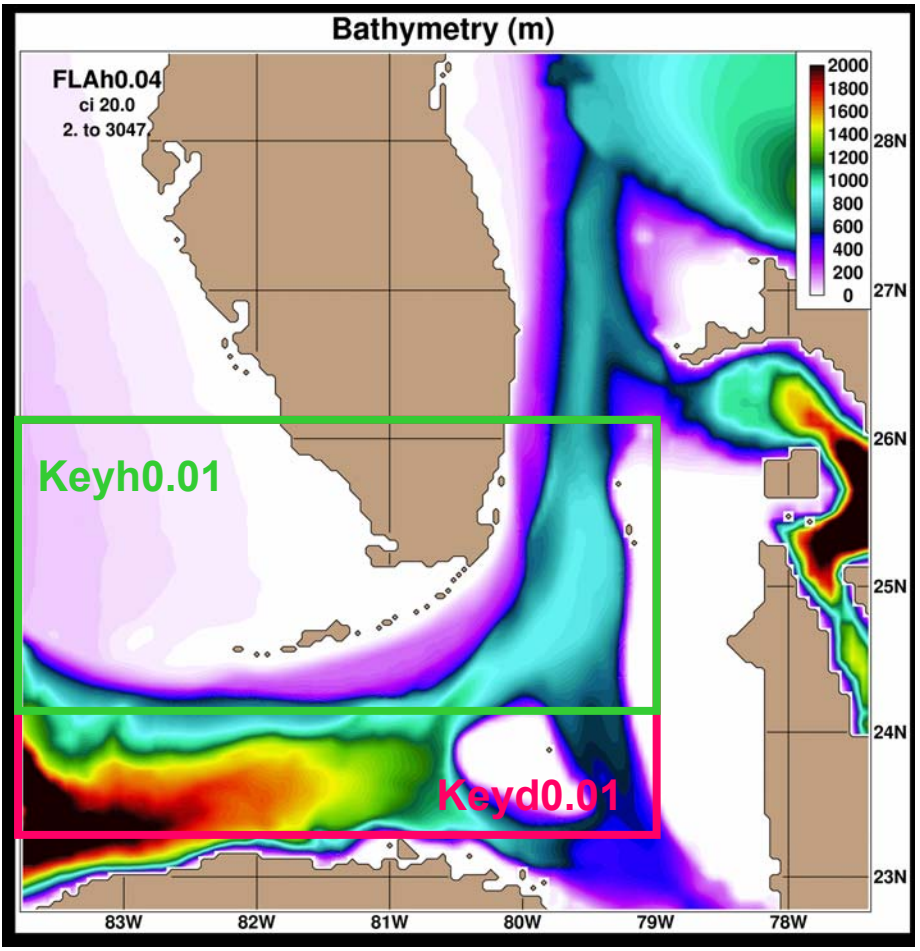
83.36°W–79.00°W

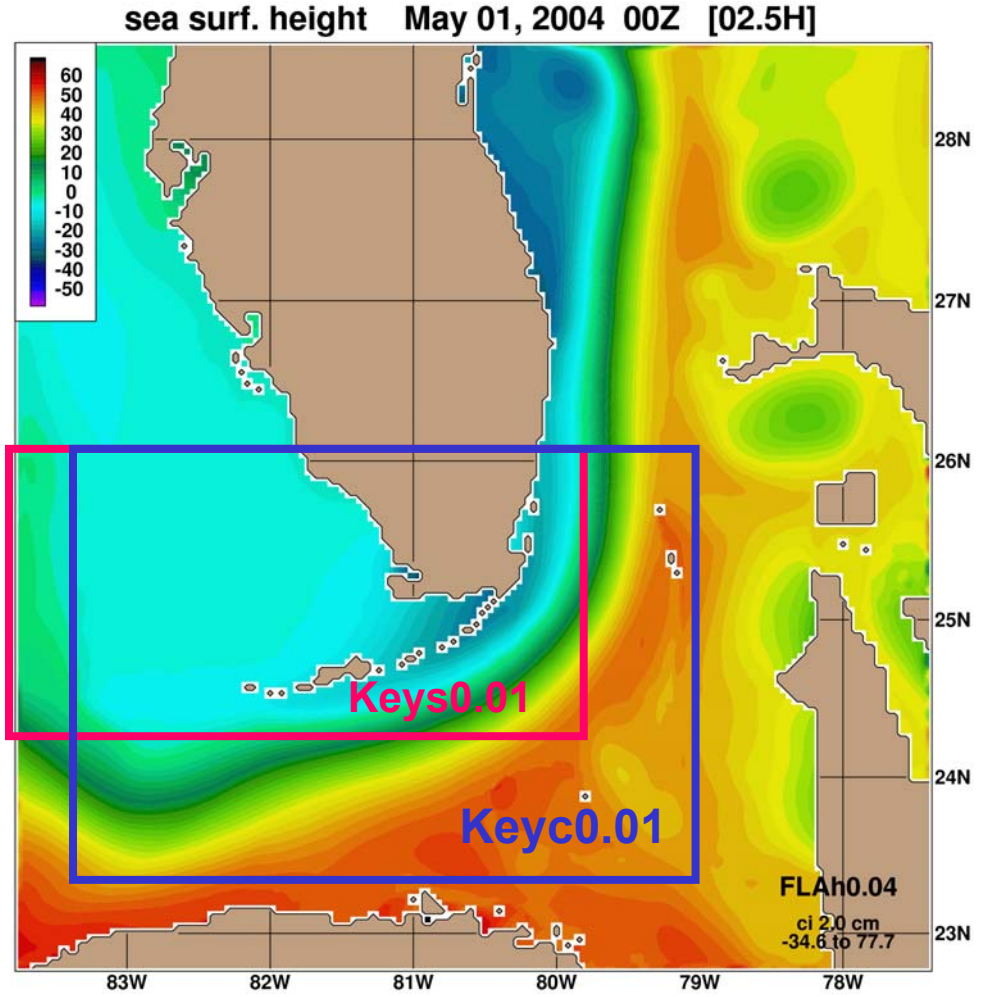
23.33°N–26.02°N

hourly 27-km COAMPS forcing for both domains

The nesting procedure follows the standard HYCOM robust capability for nesting one HYCOM grid within another.

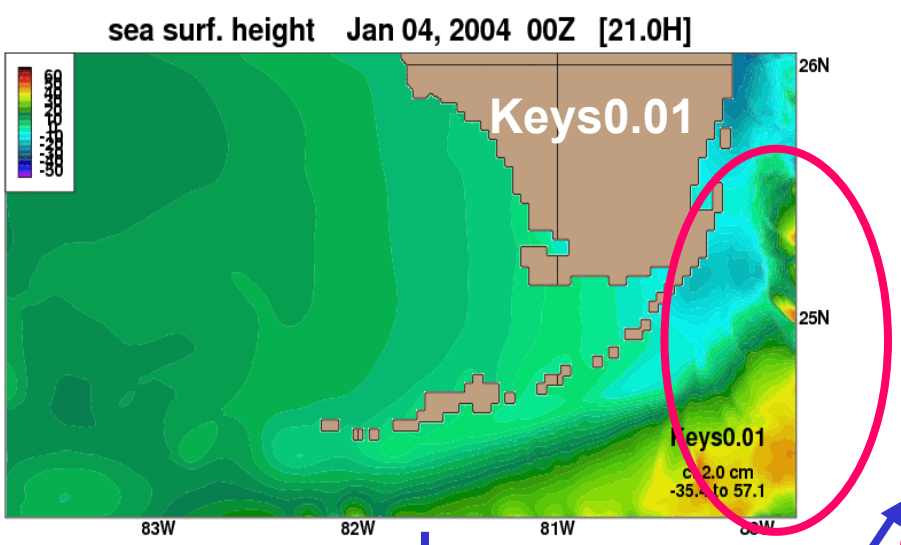
Looking for the right boundaries

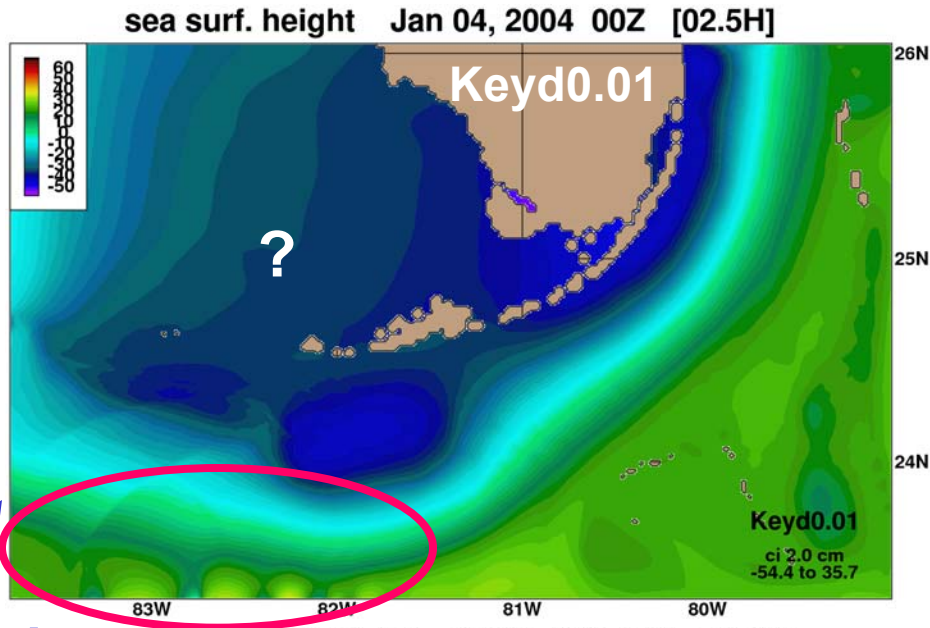


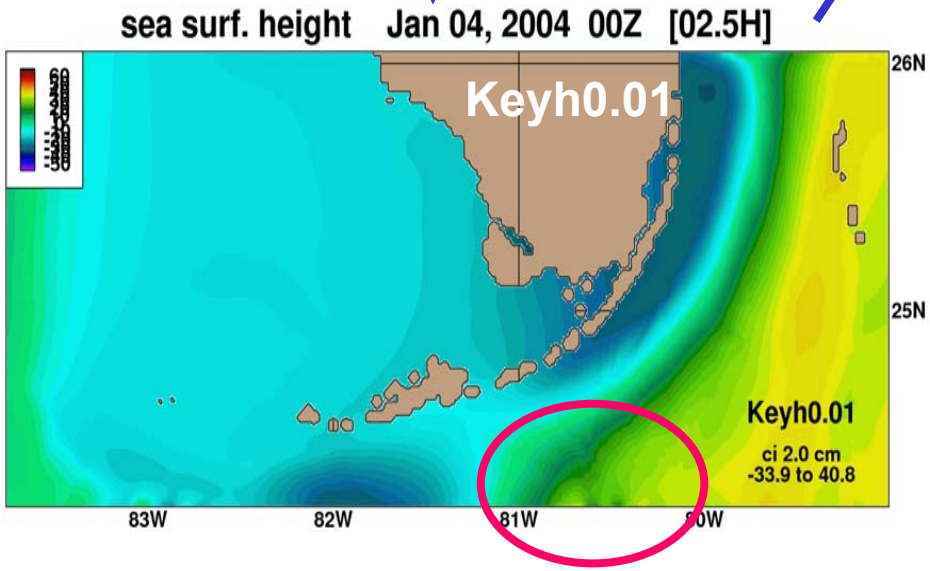


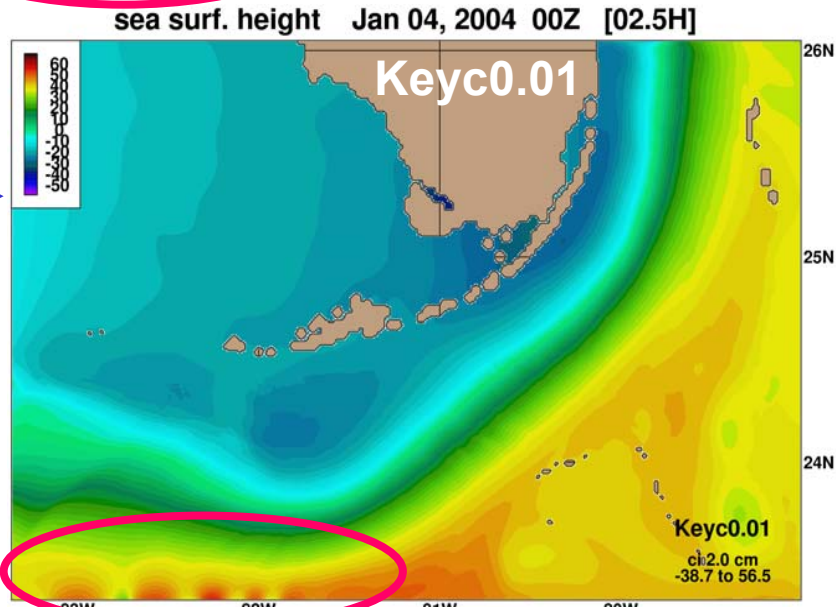
Keys0.01 => Keyh0.01 => Keyd0.01=> Keyc0.01

Noises along the boundaries









LESSONS learned from a series of experiments to set the boundaries for the finer inner region

Away from the strong current
Away from the sharp slop area

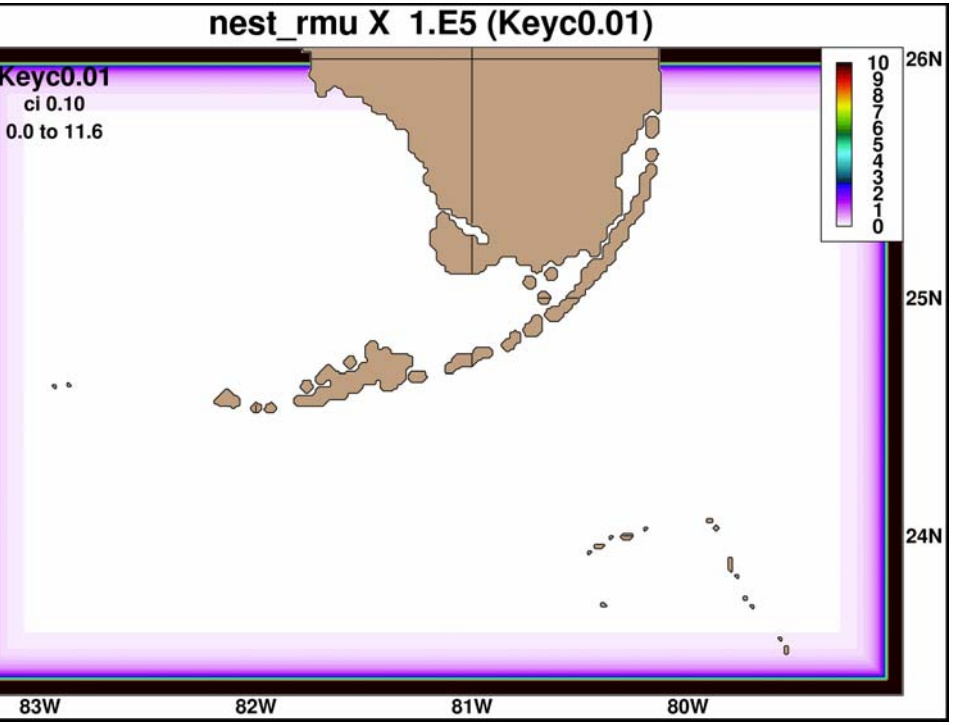
Still …..

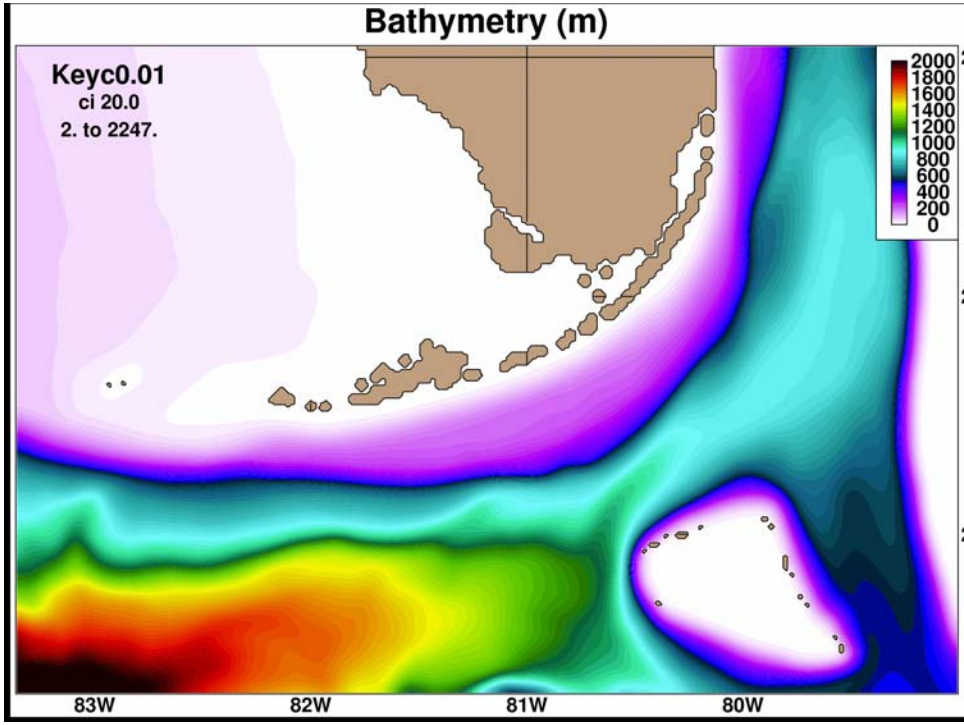
Starting from late spring/summer
to reduce the initial shock of the model
as much as possible

Keyc0.01: 30sec for baroclinic/internall mode & 1 sec for barotrophic/external mode

FLAh0.04: 180sec for baroclinic/internall mode & 9 sec for barotrophic/external mode

nested open boundaries and topography

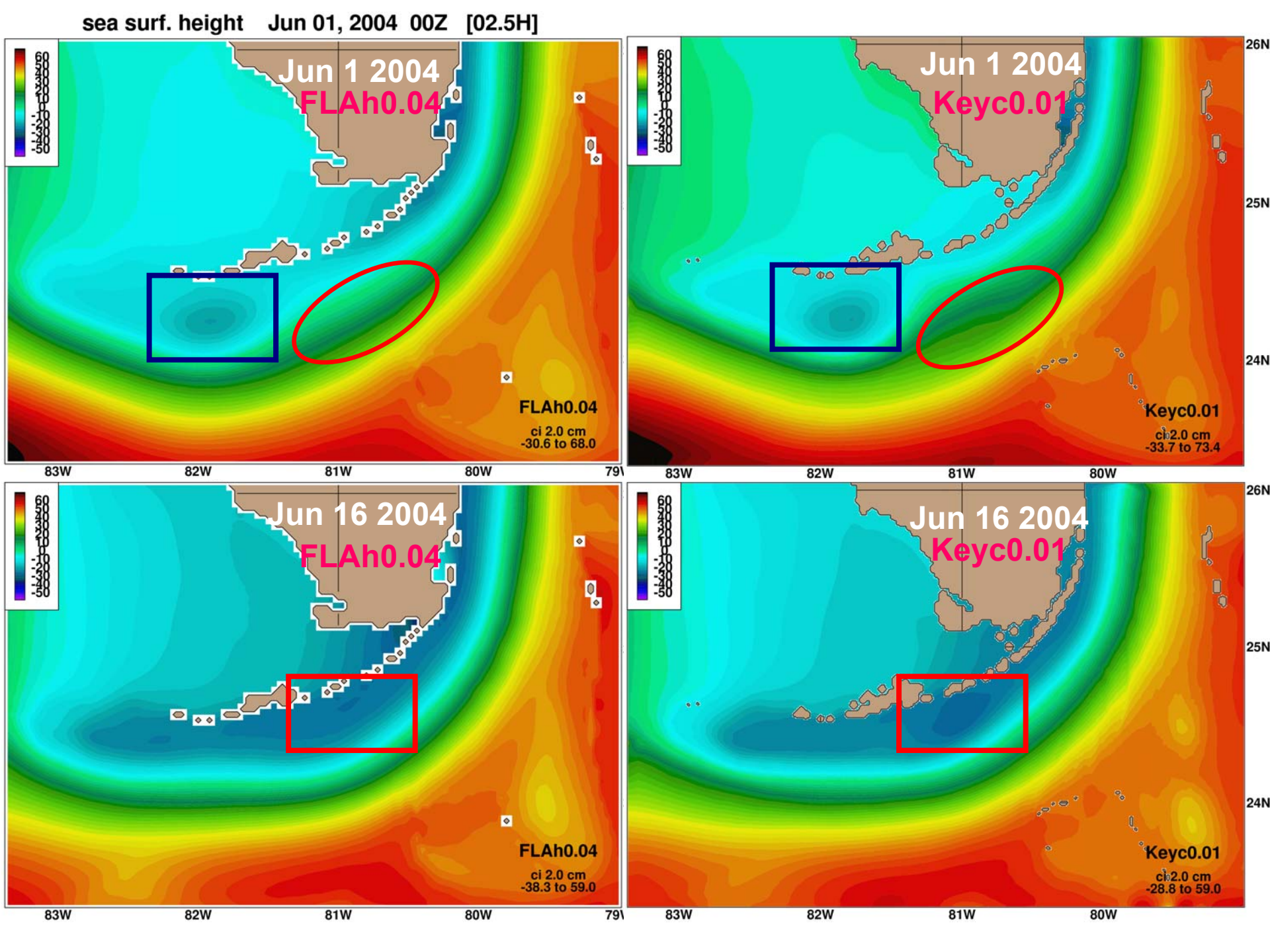


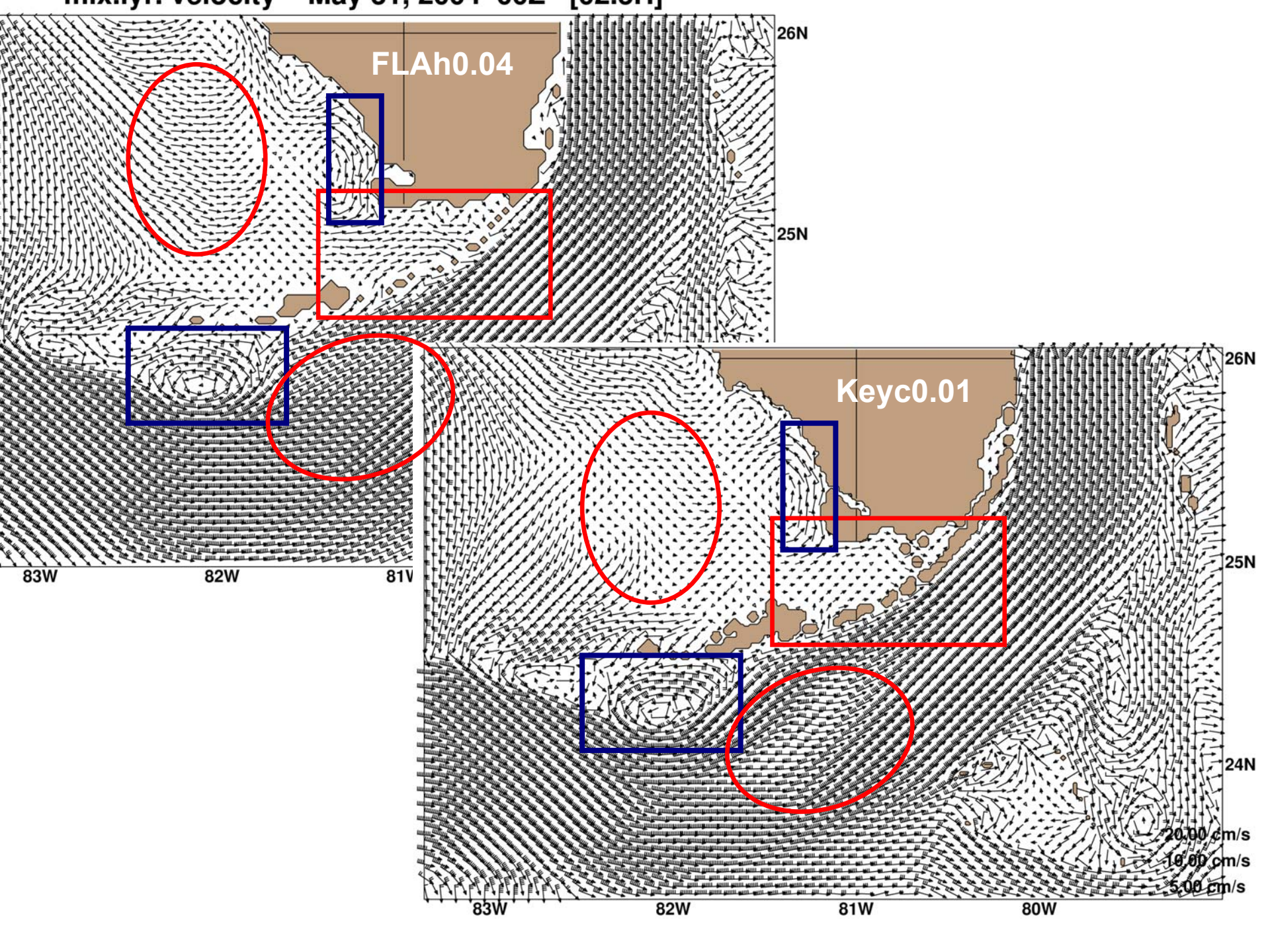


-0 grids relaxation zone along boundaries
E-folding scale of 0.1 to 24-days
n a relaxation zone
Daily updating for barotrophic &
baroclinic BCs

NRL_DBDB2 with
2m minimum water depth
More realistic passages between keys

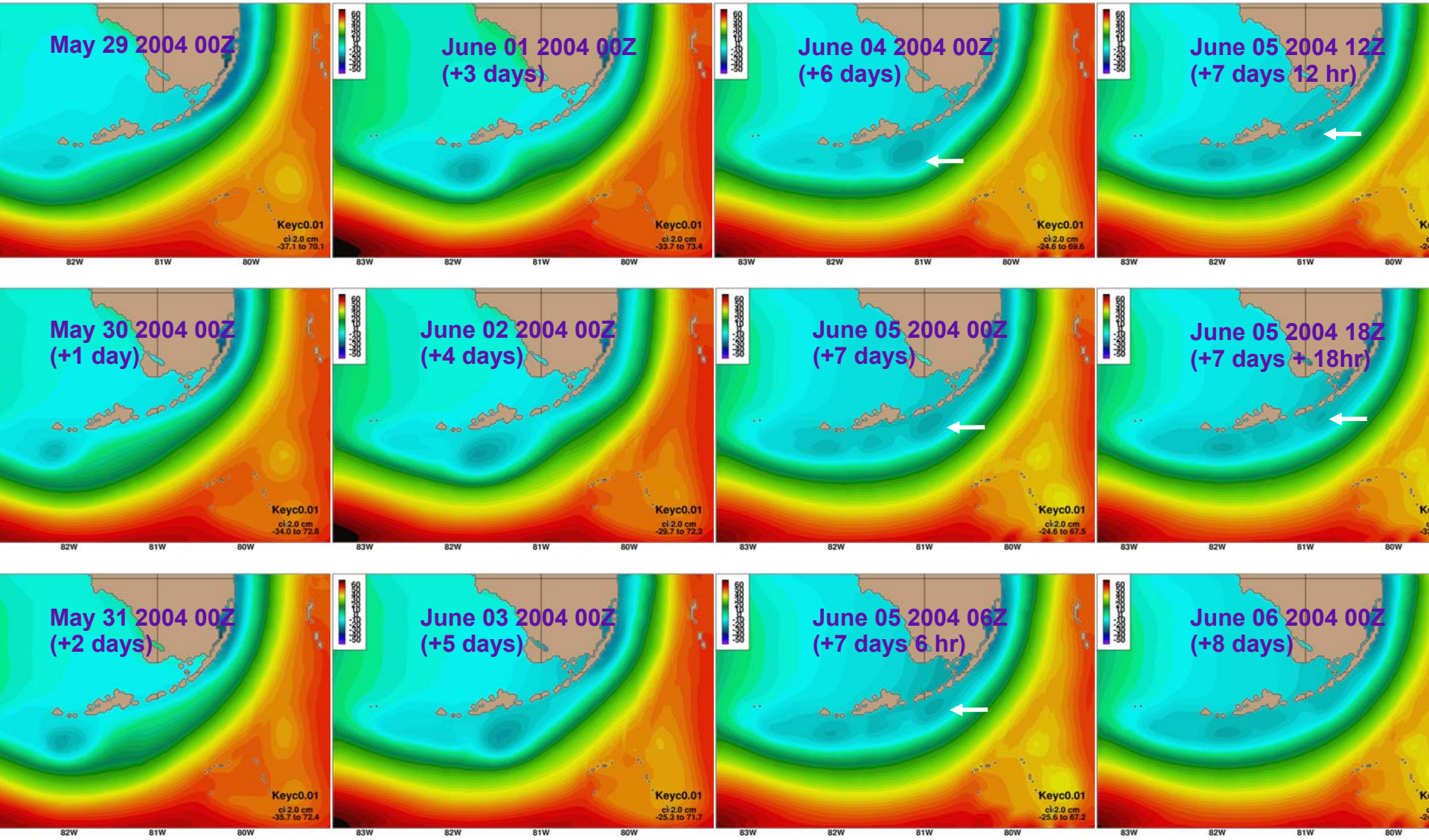
Comparison to SoFLA-HYCOM


sea surf. height Jun 01, 2004 00Z [02.5H]
Jun 1 2004
FLAh0.04
FLAh0.04
ci 2.0 cm
-30.6 to 68.0
Jun 1 2004
Keyc0.01
Keyc0.01
ci 2.0 cm
-33.7 to 73.4
Jun 16 2004
FLAh0.04
FLAh0.04
ci 2.0 cm
-38.3 to 59.0
Jun 16 2004
Keyc0.01
Keyc0.01
ci 2.0 cm
-28.8 to 59.0
83W
82W
81W
80W
26N
25N
24N

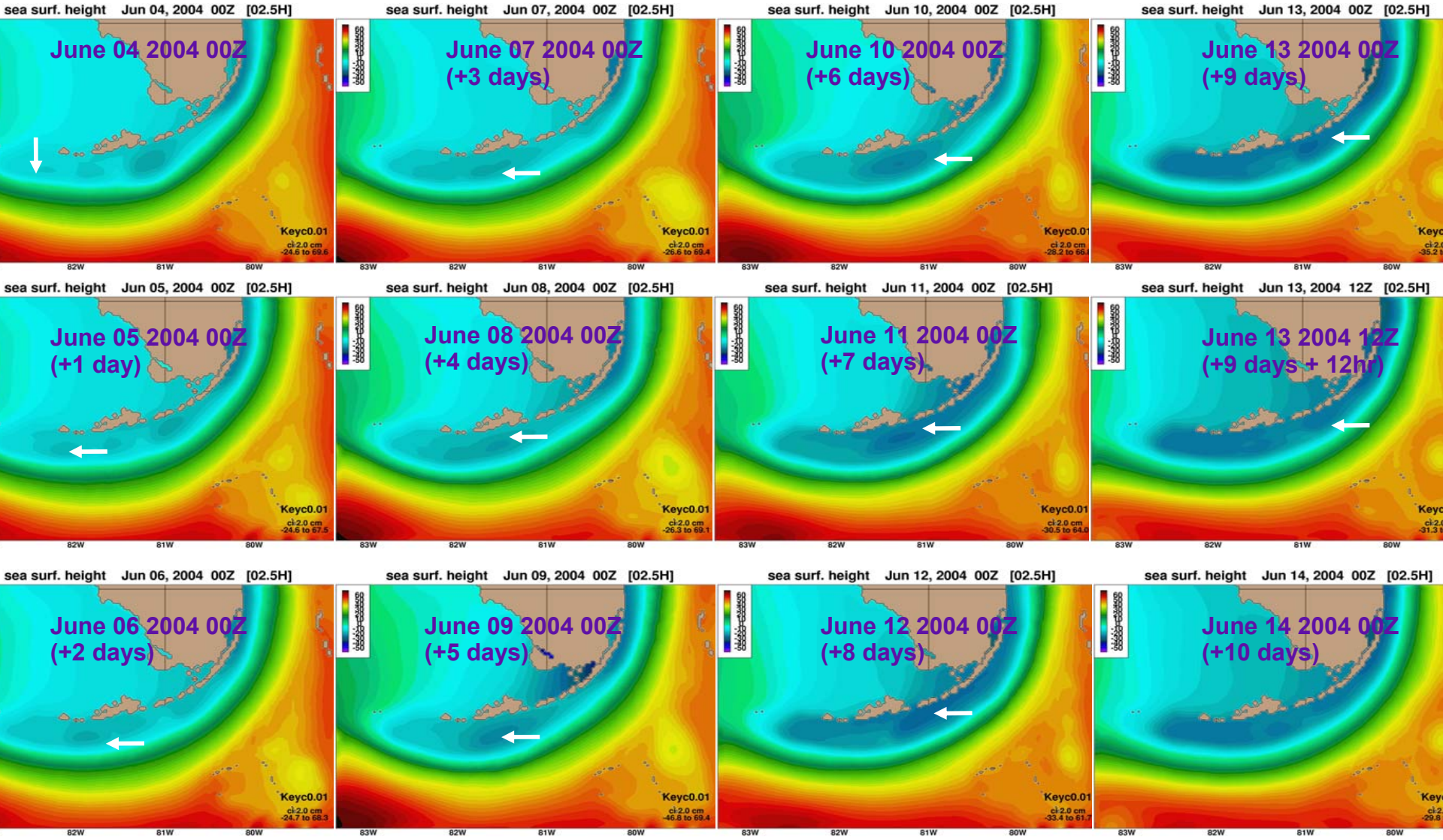

FLAh0.04
26N
25N
Keyc0.01
26N
25N
24N
83W
82W
81W
80W
20.00 cm/s
10.00 cm/s
5.00 cm/s

Eddy passages captured by Sea Surface Height

May 29 - June 6, 2004

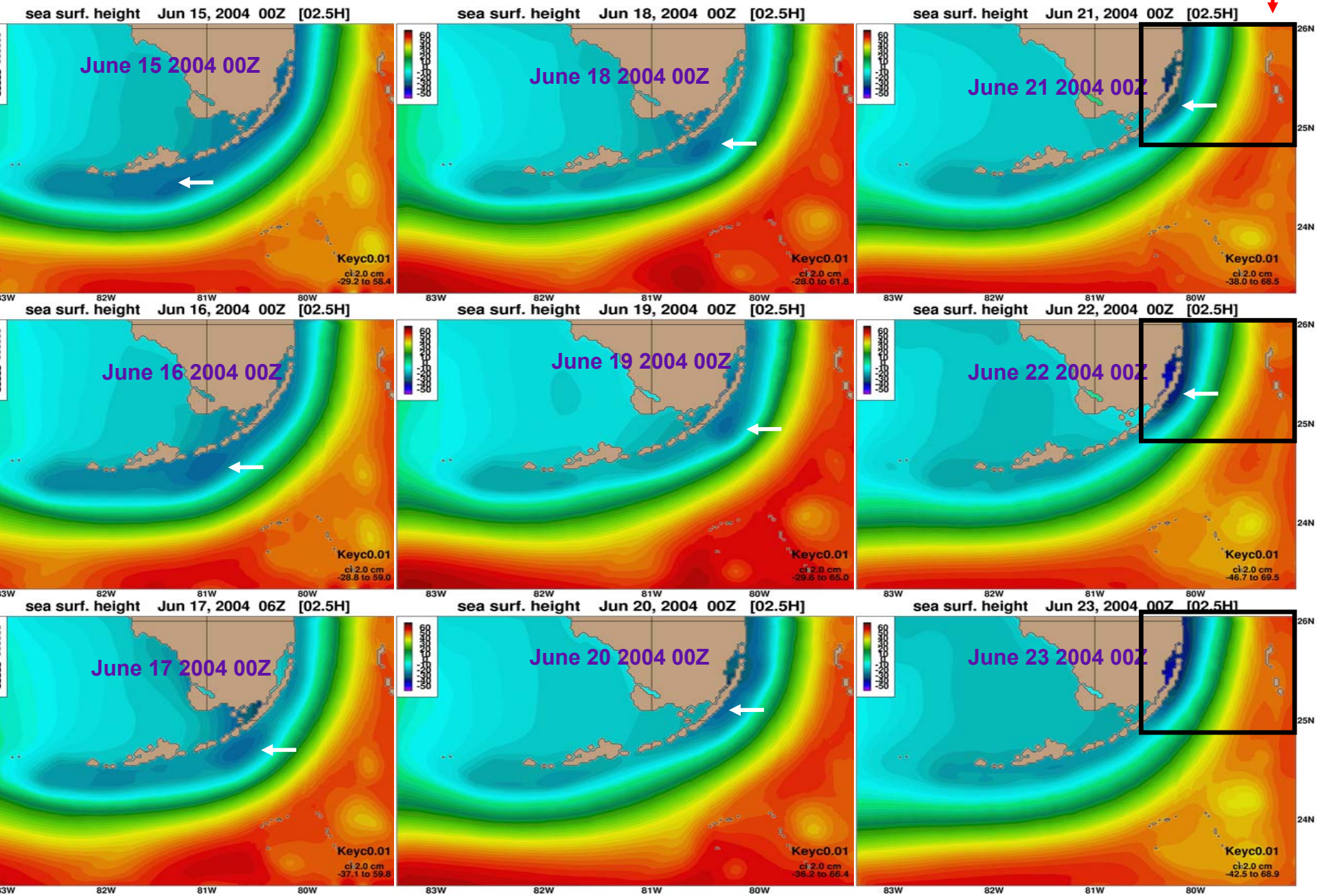


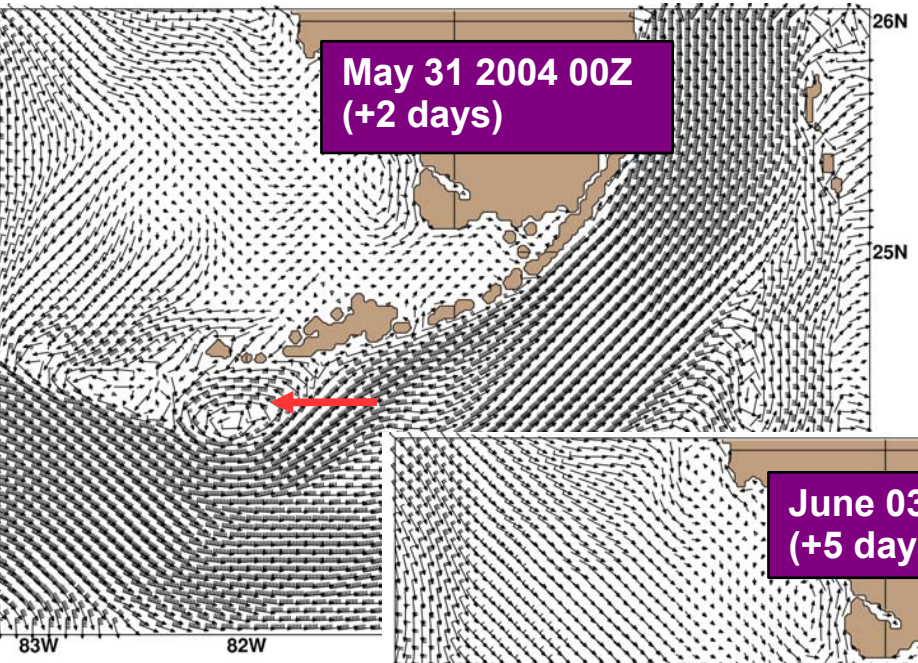
June 4 - June 14, 2004

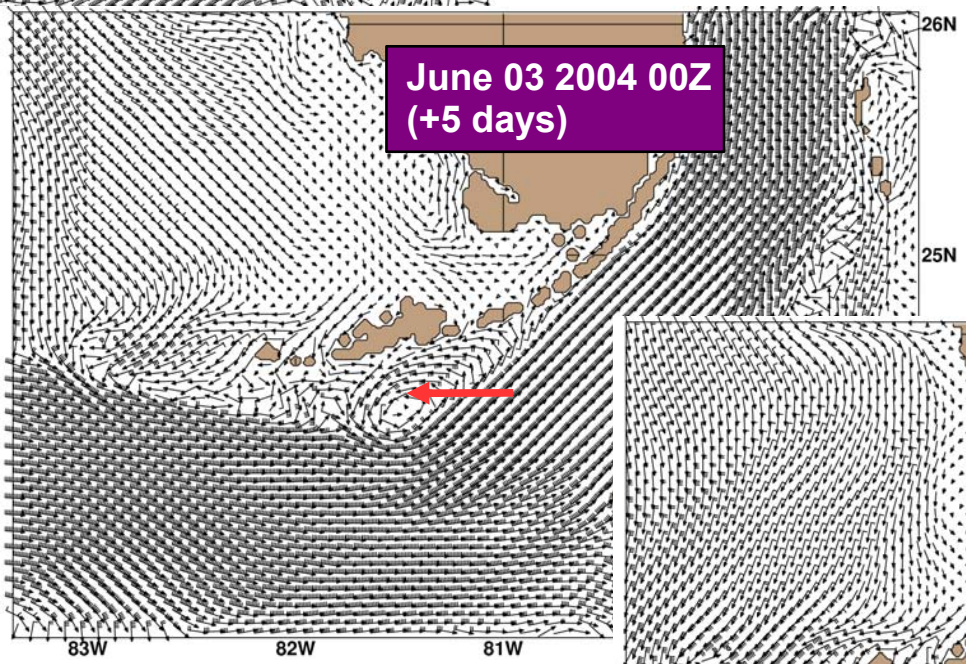


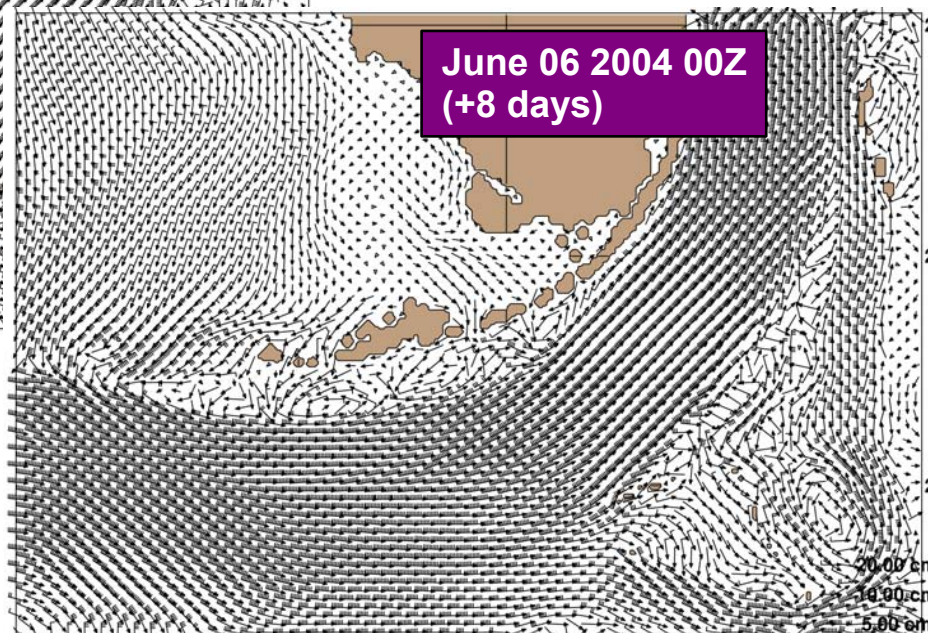
June 15 - June 23, 2004

WERA Coverage

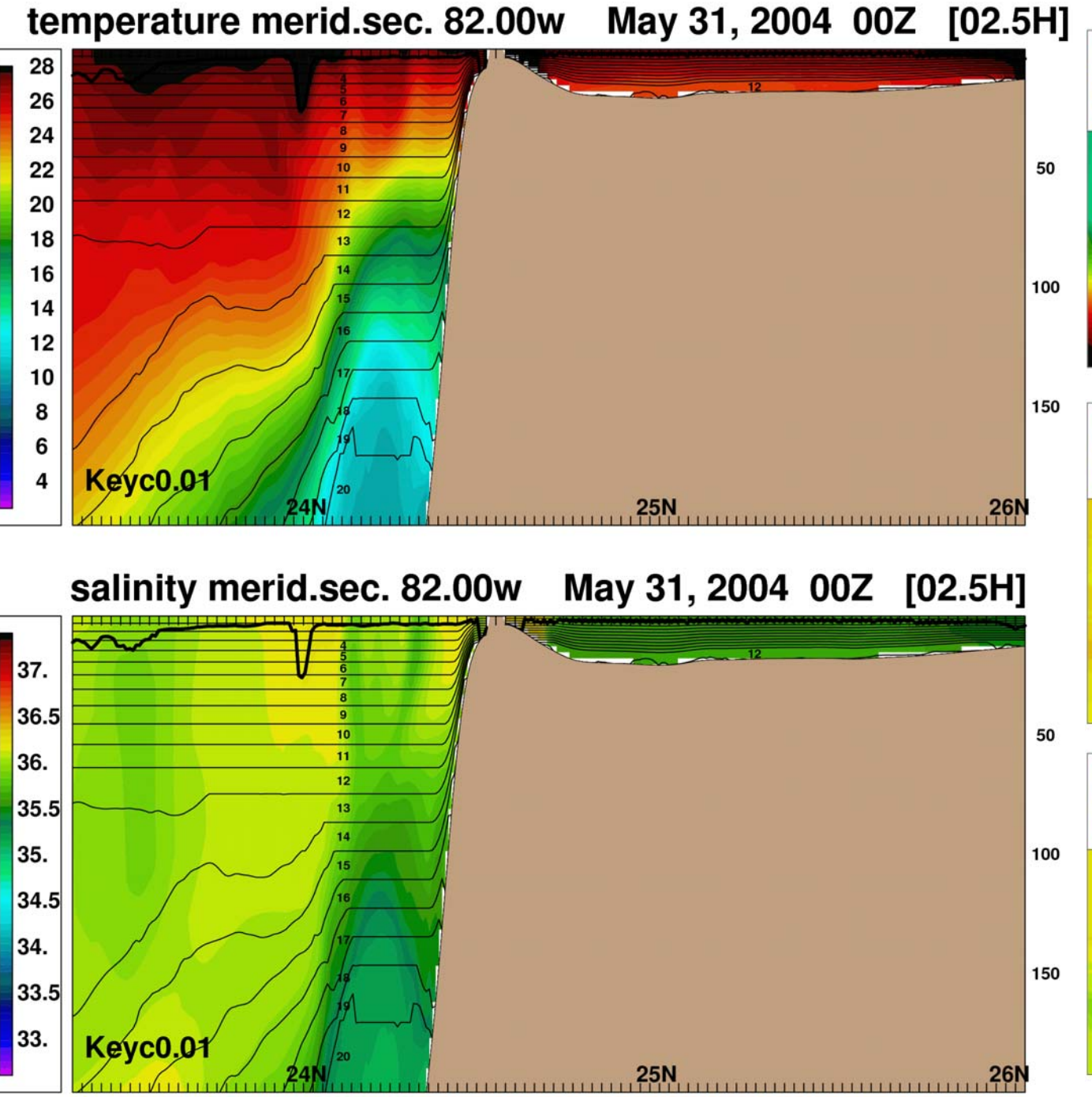


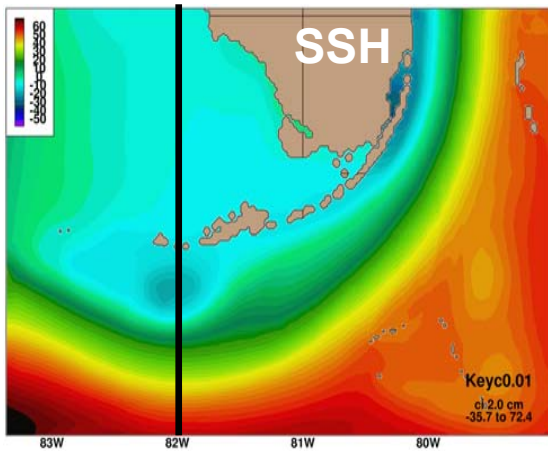


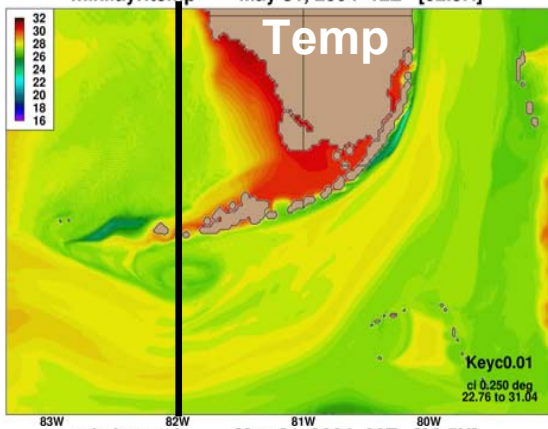


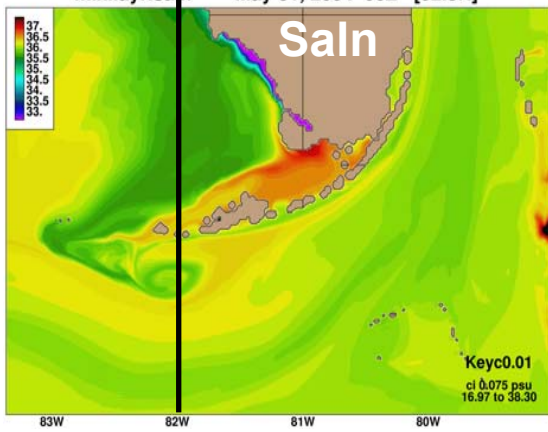


Eddy passage captured by mixed layer currents

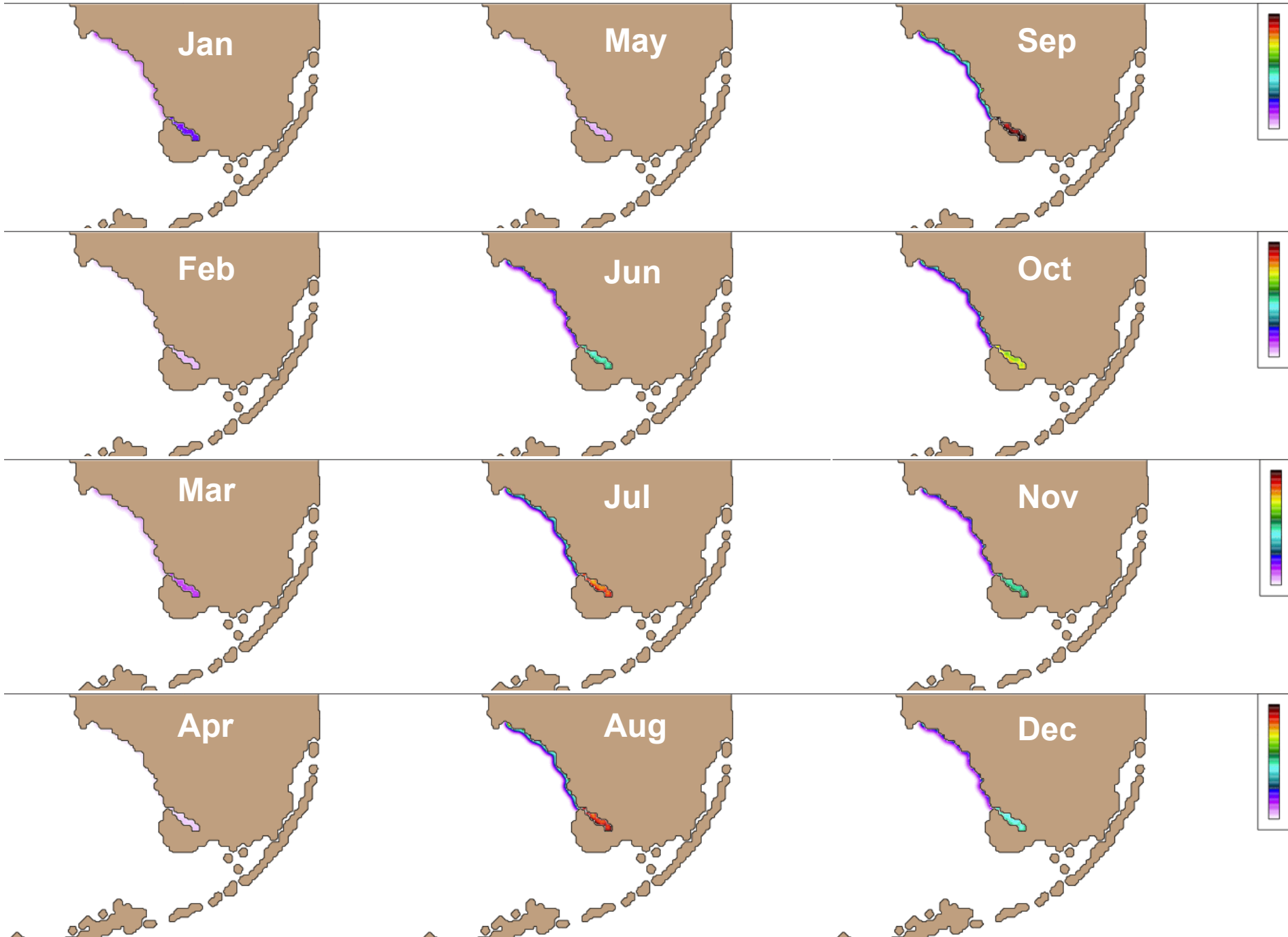

temperature merid.sec. 82.00w May 31, 2004 00Z [02.5H]
28
26
24
22
20
18
16
14
12
10
8
6
4
Keyc0.01
24N
25N
26N
50
100
150
salinity merid.sec. 82.00w May 31, 2004 00Z [02.5H]
37.
36.5
36.
35.5
35.
34.5
34.
33.5
33.
Keyc0.01
24N
25N
26N
50
100
150

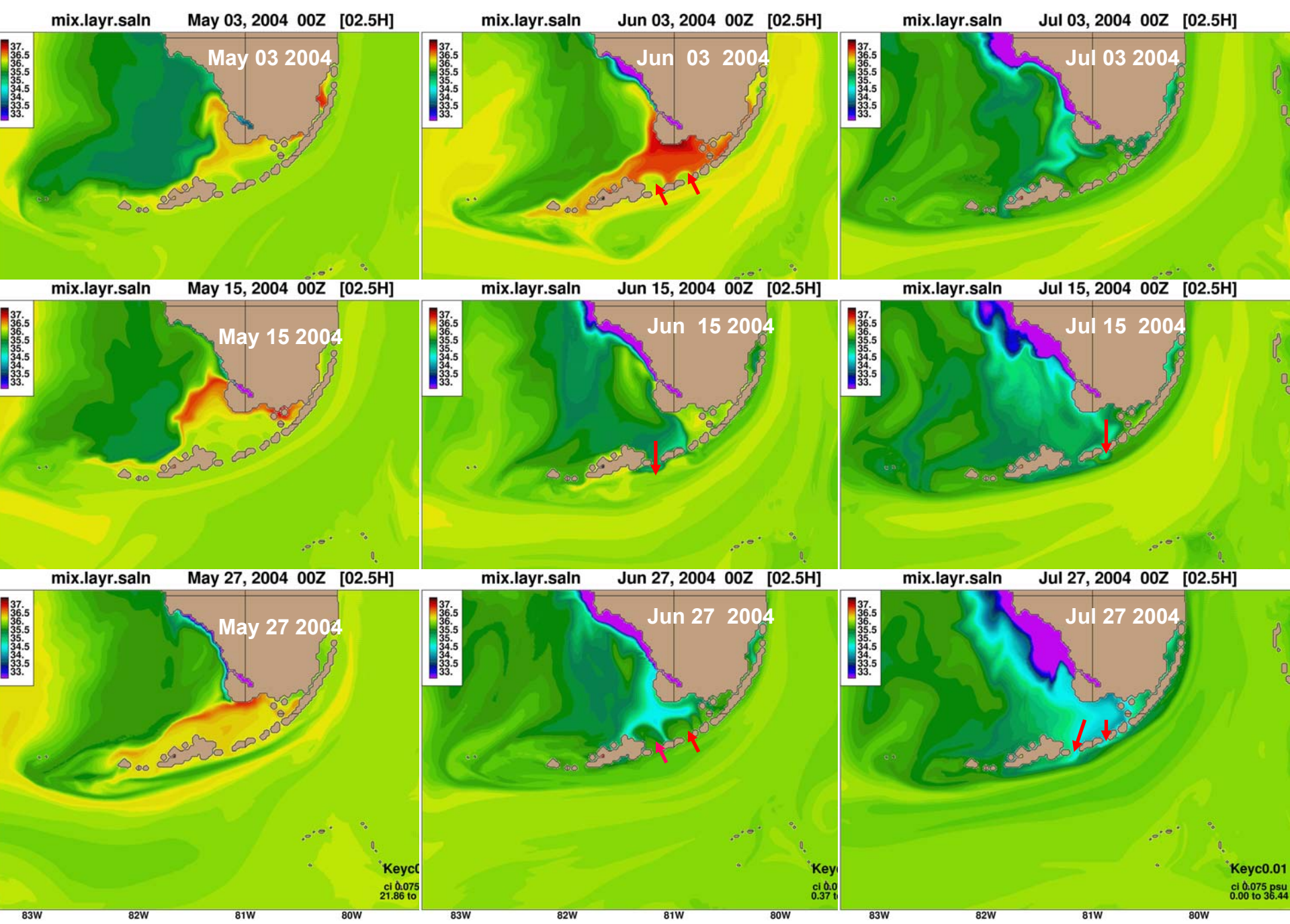

SSH
Keyc0.01
ci 2.0 cm
-35.7 to 72.4
83W
82W
81W
80W

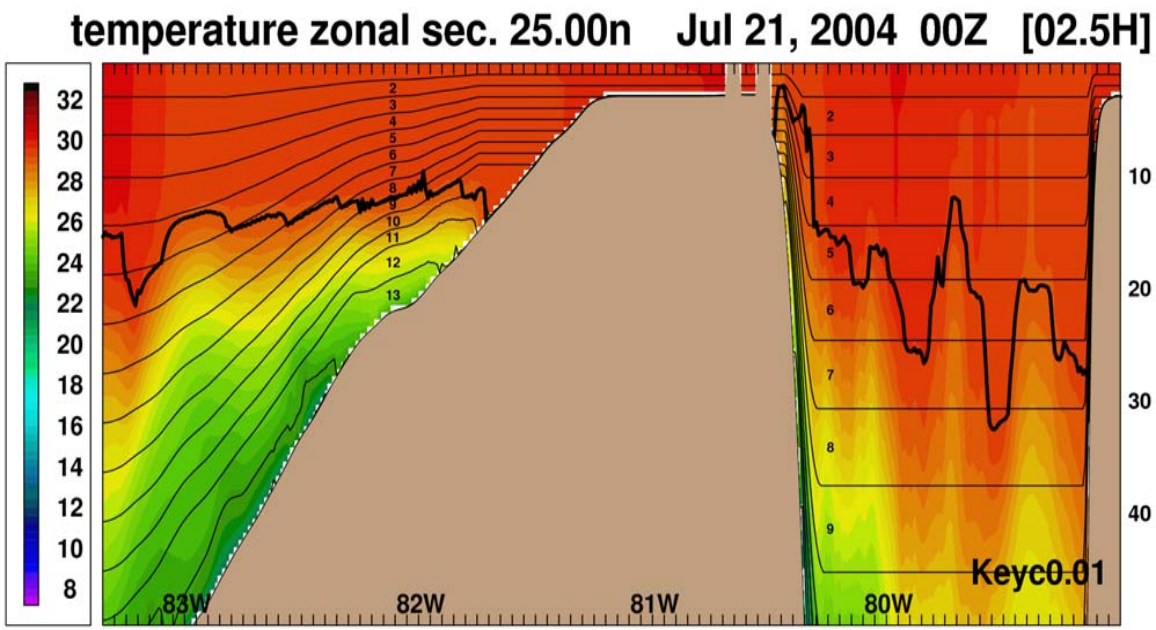

mix.layr.temp May 31, 2004 12Z [02.5H]
Temp
Keyc0.01
ci 0.250 deg
22.76 to 31.04
83W
82W
81W
80W

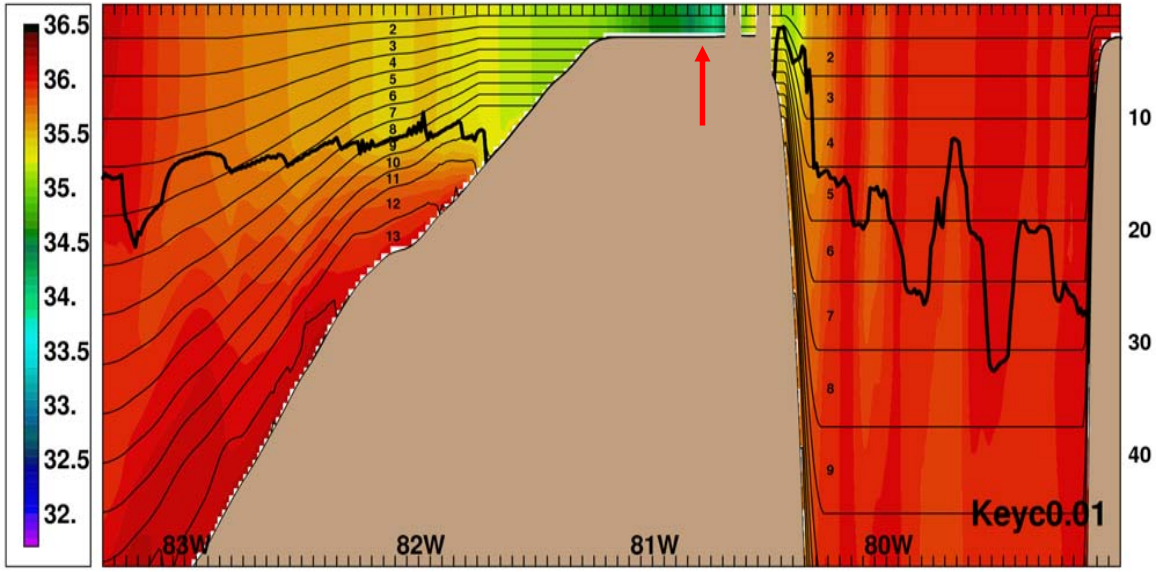

mix.layr.saln May 31, 2004 00Z [02.5H]
Saln
Keyc0.01
ci 0.075 psu
16.97 to 38.30
83W
82W
81W
80W

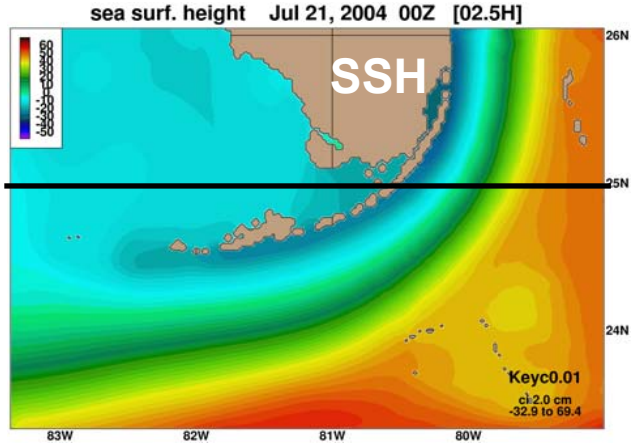
Shark River discharge as a line source along the Ten Thousands Islands

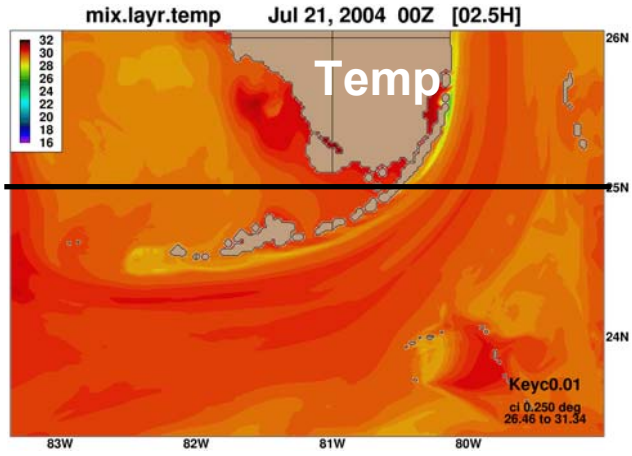

mm/
Jan
May
Sep
Feb
Jun
Oct
Mar
Jul
Nov
Apr
Aug
Dec

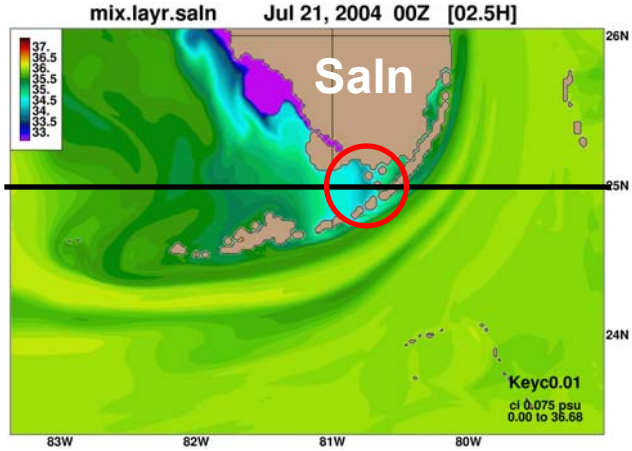

mix.layr.saln May 03, 2004 00Z [02.5H]
May 03 2004
mix.layr.saln Jun 03, 2004 00Z [02.5H]
Jun 03 2004
mix.layr.saln Jul 03, 2004 00Z [02.5H]
Jul 03 2004
mix.layr.saln May 15, 2004 00Z [02.5H]
May 15 2004
mix.layr.saln Jun 15, 2004 00Z [02.5H]
Jun 15 2004
mix.layr.saln Jul 15, 2004 00Z [02.5H]
Jul 15 2004
mix.layr.saln May 27, 2004 00Z [02.5H]
May 27 2004
mix.layr.saln Jun 27, 2004 00Z [02.5H]
Jun 27 2004
mix.layr.saln Jul 27, 2004 00Z [02.5H]
Jul 27 2004
37.
36.5
36.
35.5
35.
34.5
34.
33.5
33.
Keyc0.01
ci 0.075 psu
0.00 to 36.44
83W
82W
81W
80W


temperature zonal sec. 25.00n Jul 21, 2004 00Z [02.5H]
32
30
28
26
24
22
20
18
16
14
12
10
8
83W
82W
81W
80W
10
20
30
40
Keyc0.01


salinity zonal sec. 25.00n Jul 21, 2004 00Z [02.5H]
36.5
36.
35.5
35.
34.5
34.
33.5
33.
32.5
32.
83W
82W
81W
80W
10
20
30
40
Keyc0.01


sea surf. height Jul 21, 2004 00Z [02.5H]
SSH
26N
25N
24N
83W
82W
81W
80W
Keyc0.01
ci 2.0 cm
-32.9 to 69.4


mix.layr.temp Jul 21, 2004 00Z [02.5H]
Temp
32
30
28
26
24
22
20
18
16
26N
25N
24N
83W
82W
81W
80W
Keyc0.01
ci 0.250 deg
26.46 to 31.34


mix.layr.saln Jul 21, 2004 00Z [02.5H]
Saln
37.
36.5
36.
35.5
35.
34.5
34.
33.5
33.
26N
25N
24N
83W
82W
81W
80W
Keyc0.01
ci 0.075 psu
0.00 to 36.68

Summary

@ The nesting between FKEY0.01 and FLA0.04 works well.

@ Well-organized eddies along the Florida Keys
were captured well.
=> to be verified with WERA Currents

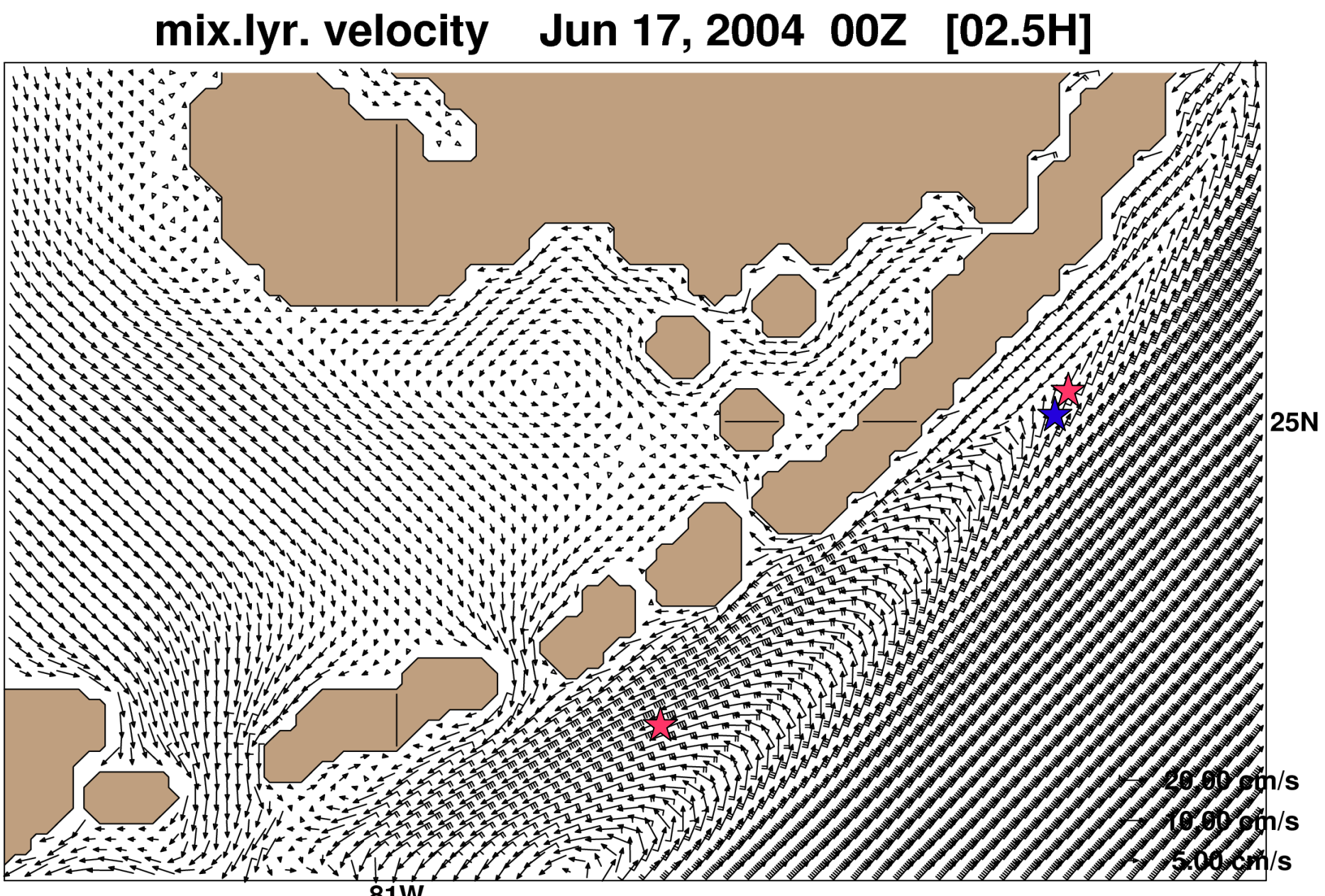
@ With more realistic passages of Keys,
the circulation and water property distributions
inside the Florida Bay can be simulated better.

=> can provide better boundary conditions
for coastal hydrodynamic, ecosystem and
water quality models for the Florida Bay and the Florida Keys.

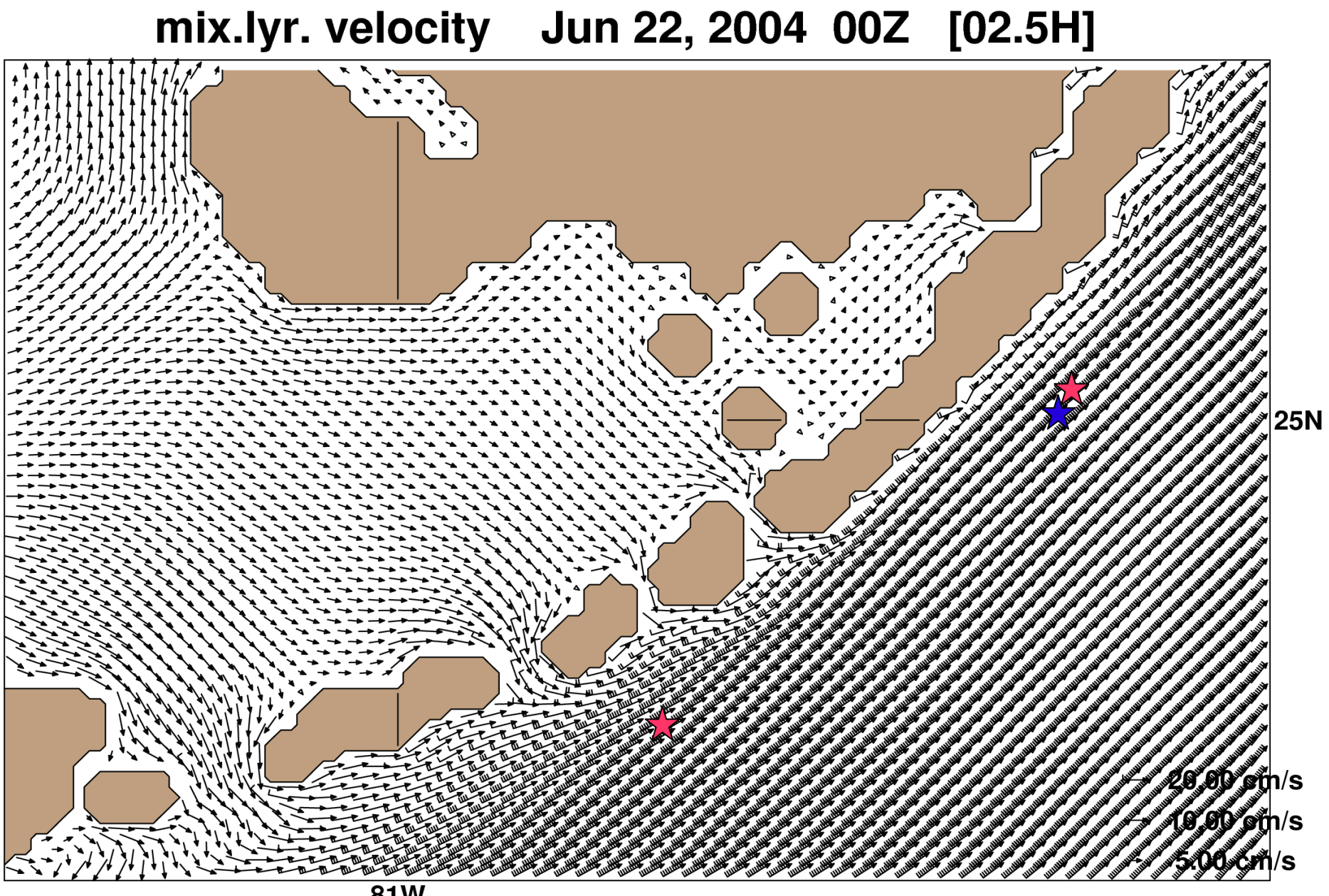
Future Work

@ Model-Observation Comparison

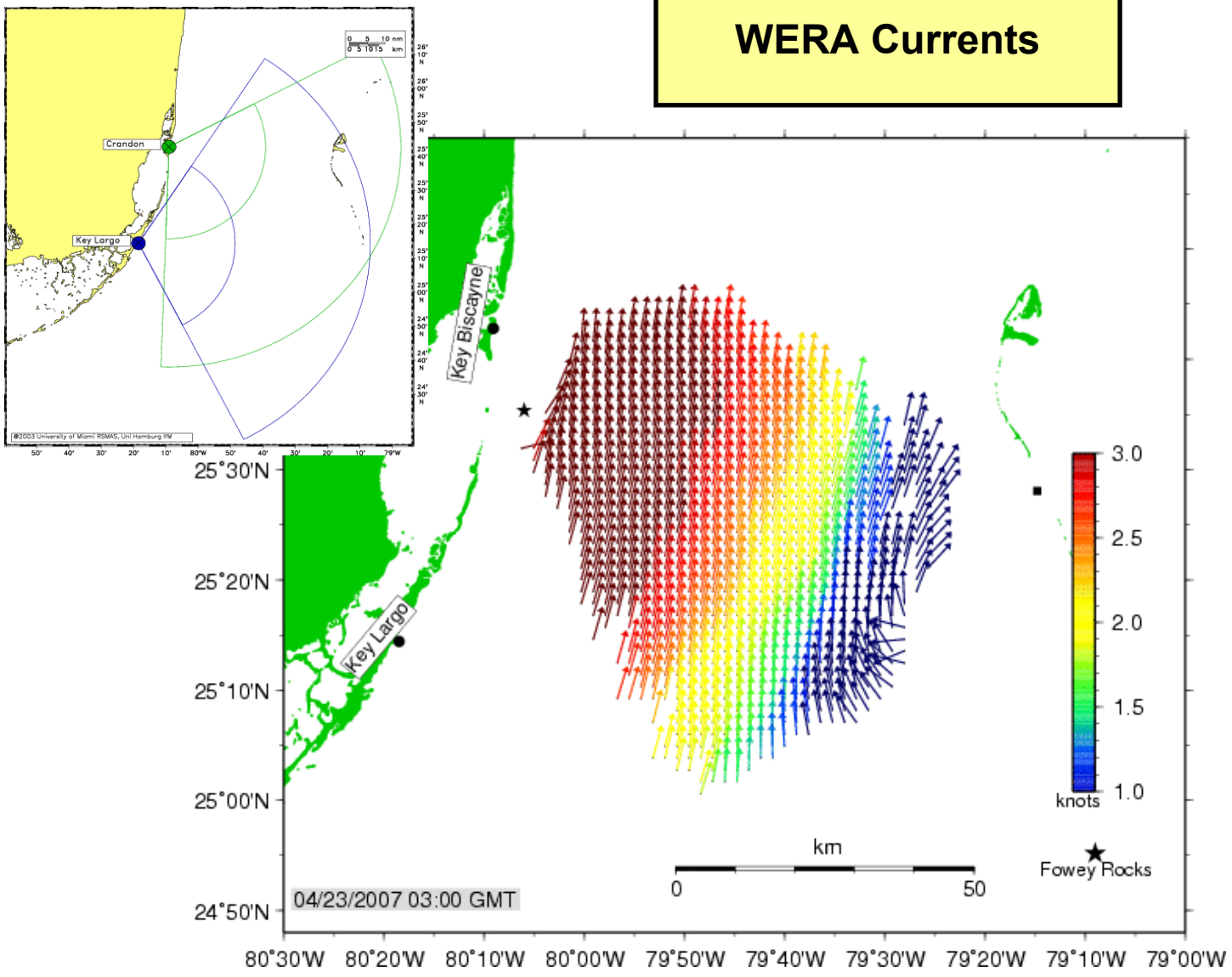
NSF Mooring sites: 80.35W & 25.033N, 80.75W &24.70N
AOML site: 80.38W & 24.99N



NSF Mooring sites: 80.35W & 25.033N, 80.75W & 24.70N
AOML site: 80.38W & 24.99N



WERA Currents



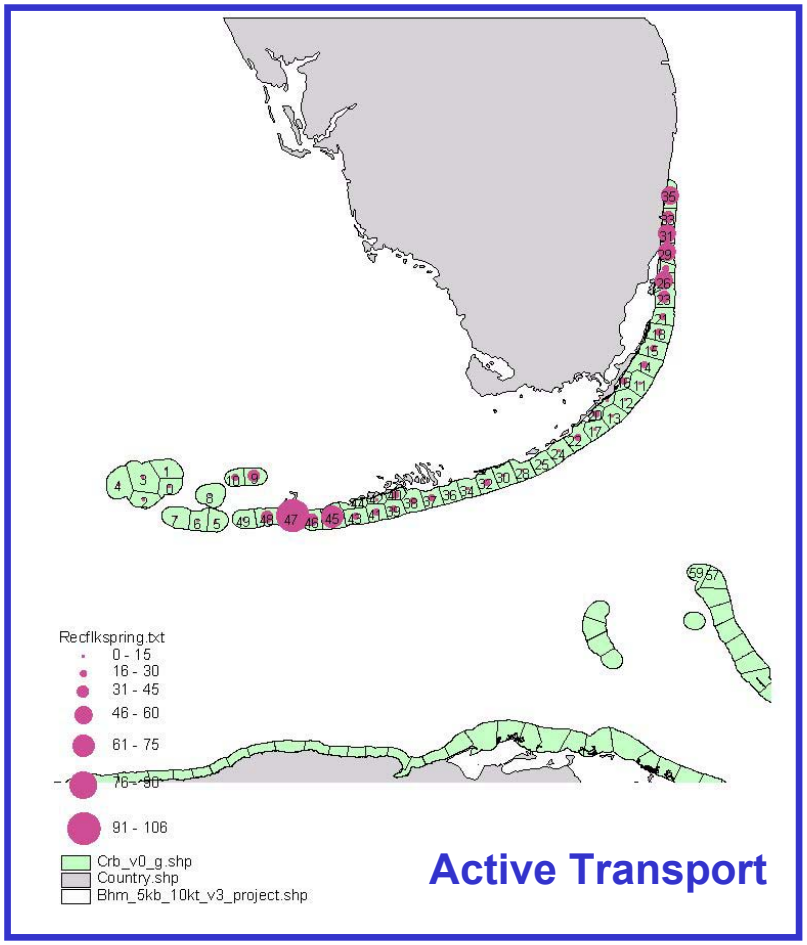
http://iwave.rsmas.miami.edu/wera/efs/maps/

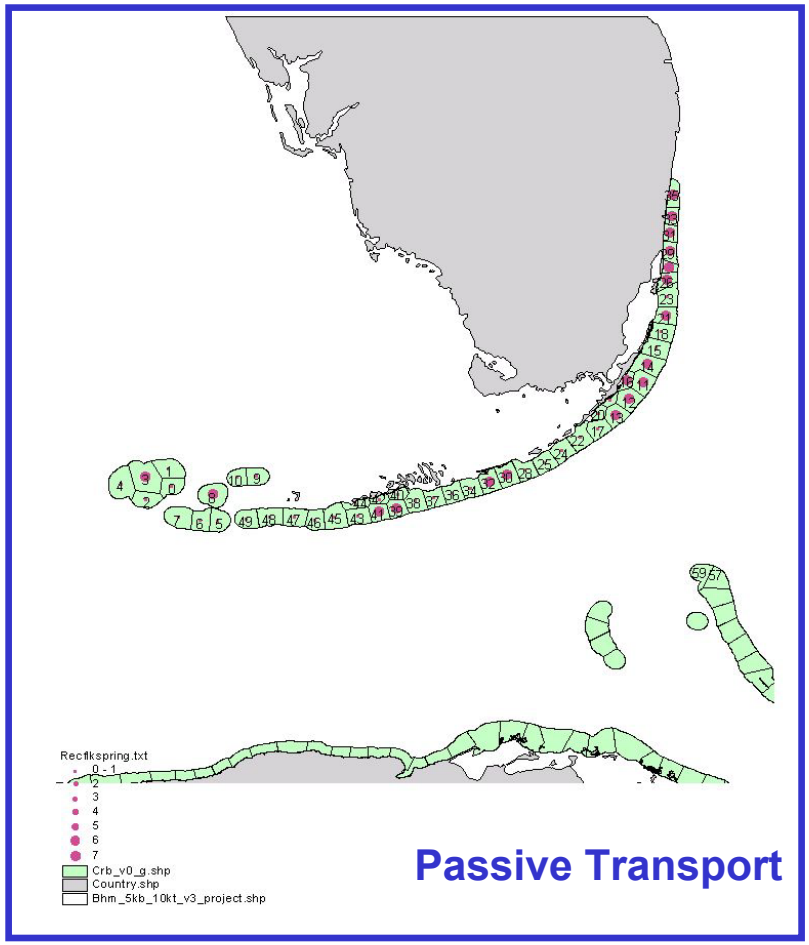
@ Linkages and Connectivity between Pelagic Larvae and Recruitment of Coral Reef Fishes along the Shelf System of the Florida Keys

@ Coupling of FKEY-HYCOM with a Lagrangian larval transport module BOLTS (BiOphysical Lagrangian Transport System) : C. Paris (RSMAS) and A. Srinivasan (FSU)

BOLTS: Coupled with 1/12º NAT-HYCOM

Will be done with 1/100º FKEY-HYCOM





Spatial recruitment of Damselfish onto coral reefs resulting from monthly virtual spawning events along the Florida Keys

Spatial distribution of passive particles released from the same reef areas after a 30-day pelagic transport within the upper layer (10-20m) of the 1/12º NAT-HYCOM

@ Impact of tides

THANKS !!!

THE END