Nesting the Gulf of California in Global HYCOM: Summer generation of the Southern Gulf of California eddy train

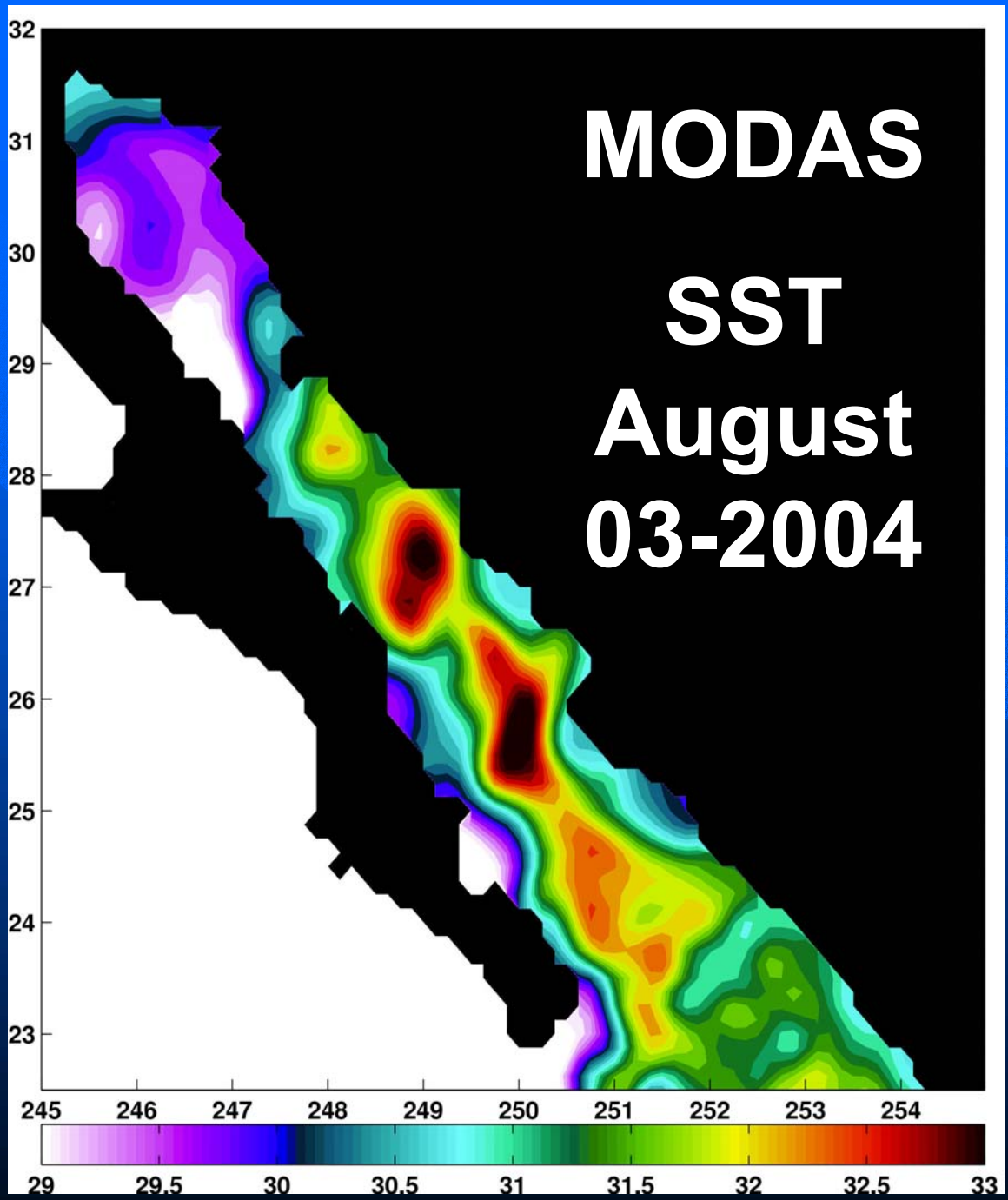
Luis Zamudio[1], Pat Hogan[2] & Joe Metzger[2]

[1]Center for Ocean-Atmospheric Prediction Studies, Florida State University

[2]Naval Research Laboratory, Stennis Space Center, Mississippi

11th HYCOM consortium meeting, (April 24-26, 2007)

Naval Research Laboratory, Stennis Space Center, MS


MODAS
SST
August
03-2004
32
31
30
29
28
27
26
25
24
23
245
246
247
248
249
250
251
252
253
254
29
29.5
30
30.5
31
31.5
32
32.5
33

Results indicate:

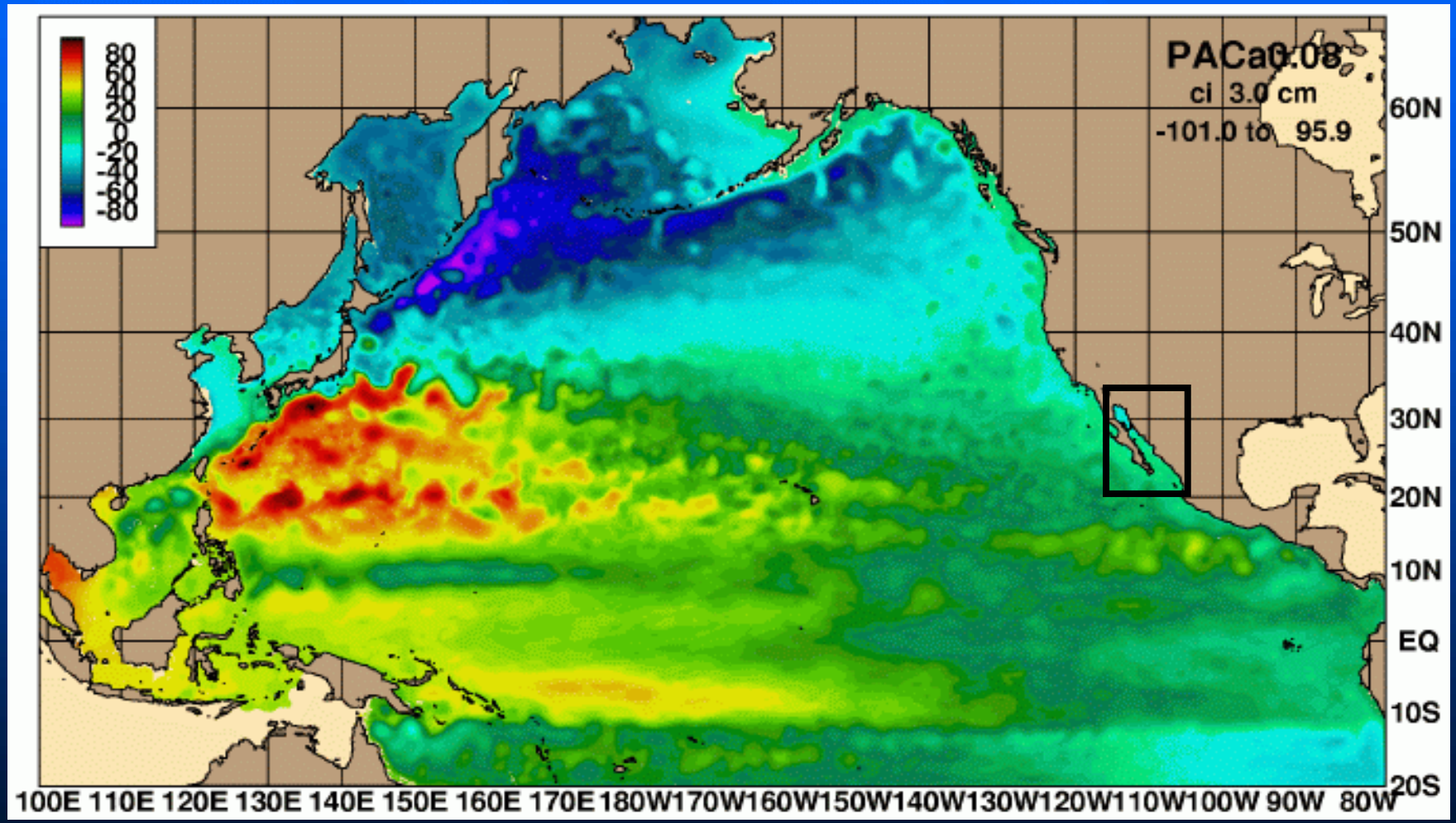
- The results indicate that the local wind is not essential for the generation of the southern GOC eddy train, but rather the local-plus-remote ocean currents are the primary forcing.

Tools

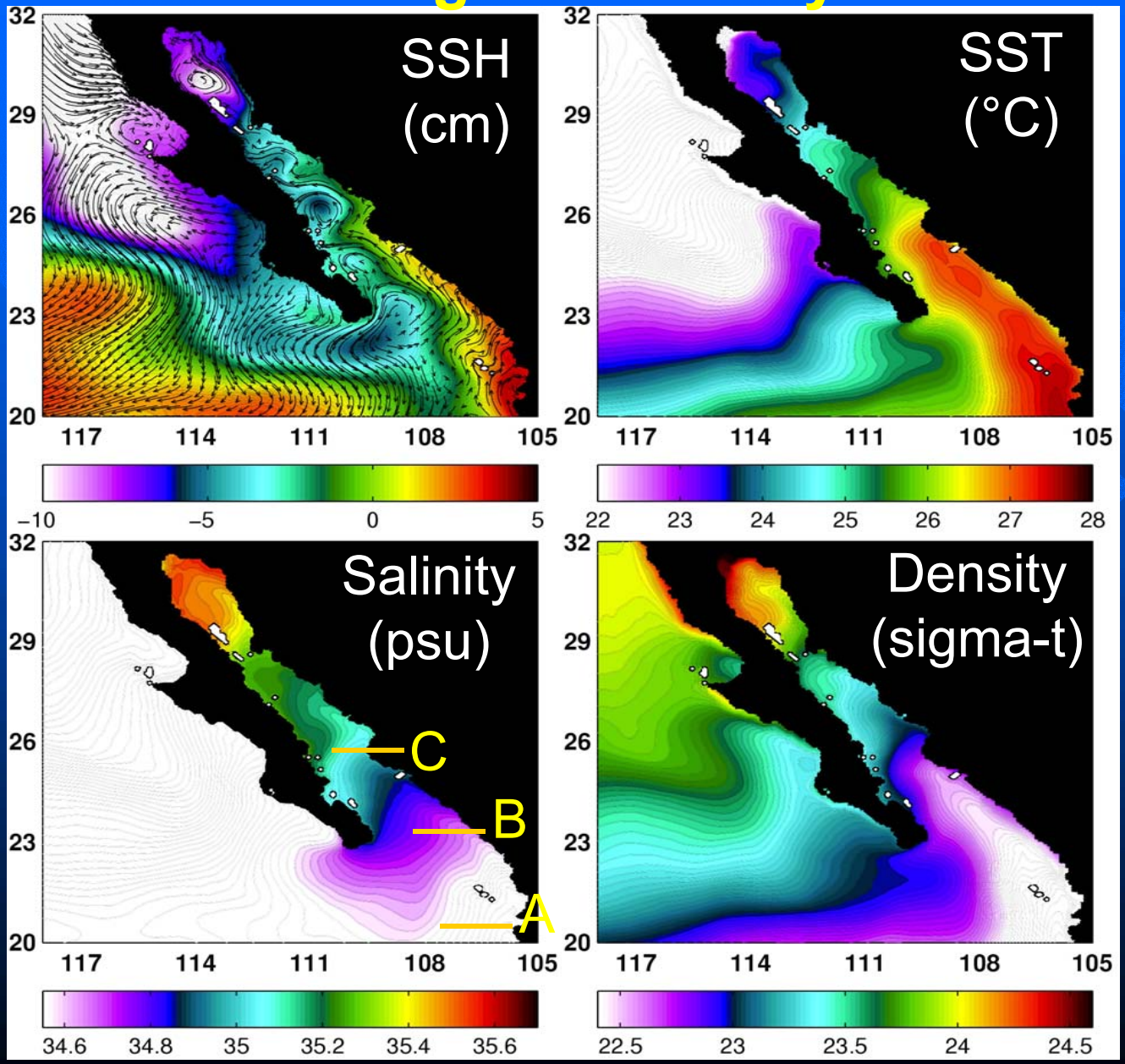
- 7 year climatological simulation of a Pacific configuration of HYCOM.
- 3 year (2003-2005) interannual simulations of a Gulf of California configuration of HYCOM.
- SST and SSH data from the Modular Ocean Data Assimilation System (MODAS).
- Hydrographic data from 9 oceanographic campaigns.

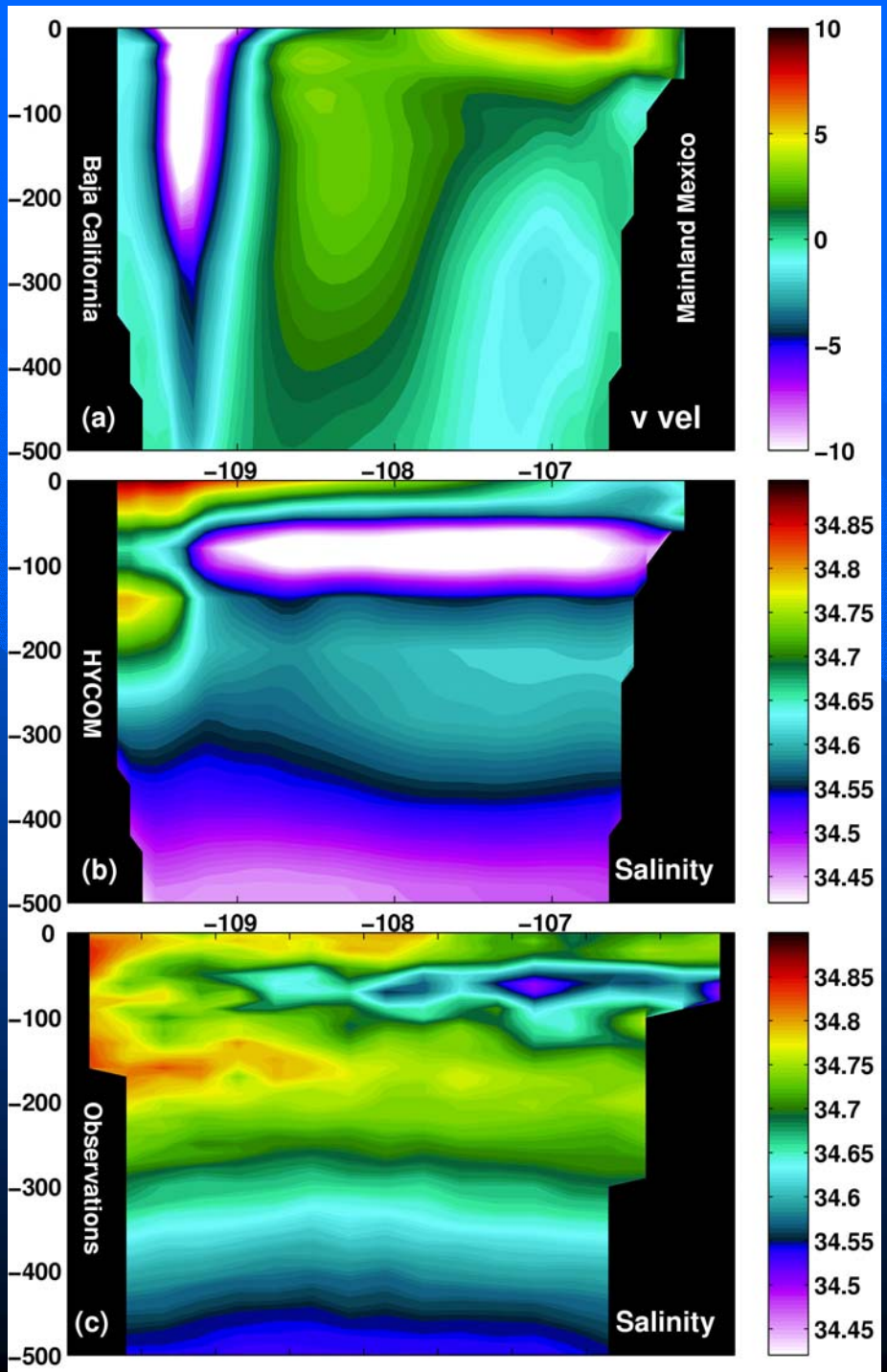
1/12° Pacific HYCOM Basin-scale Circulation

SSH Snapshot – 21 March



7-year Means from Pacific HYCOM forced with climatological monthly winds





HYCOM v-vel (cm/s)

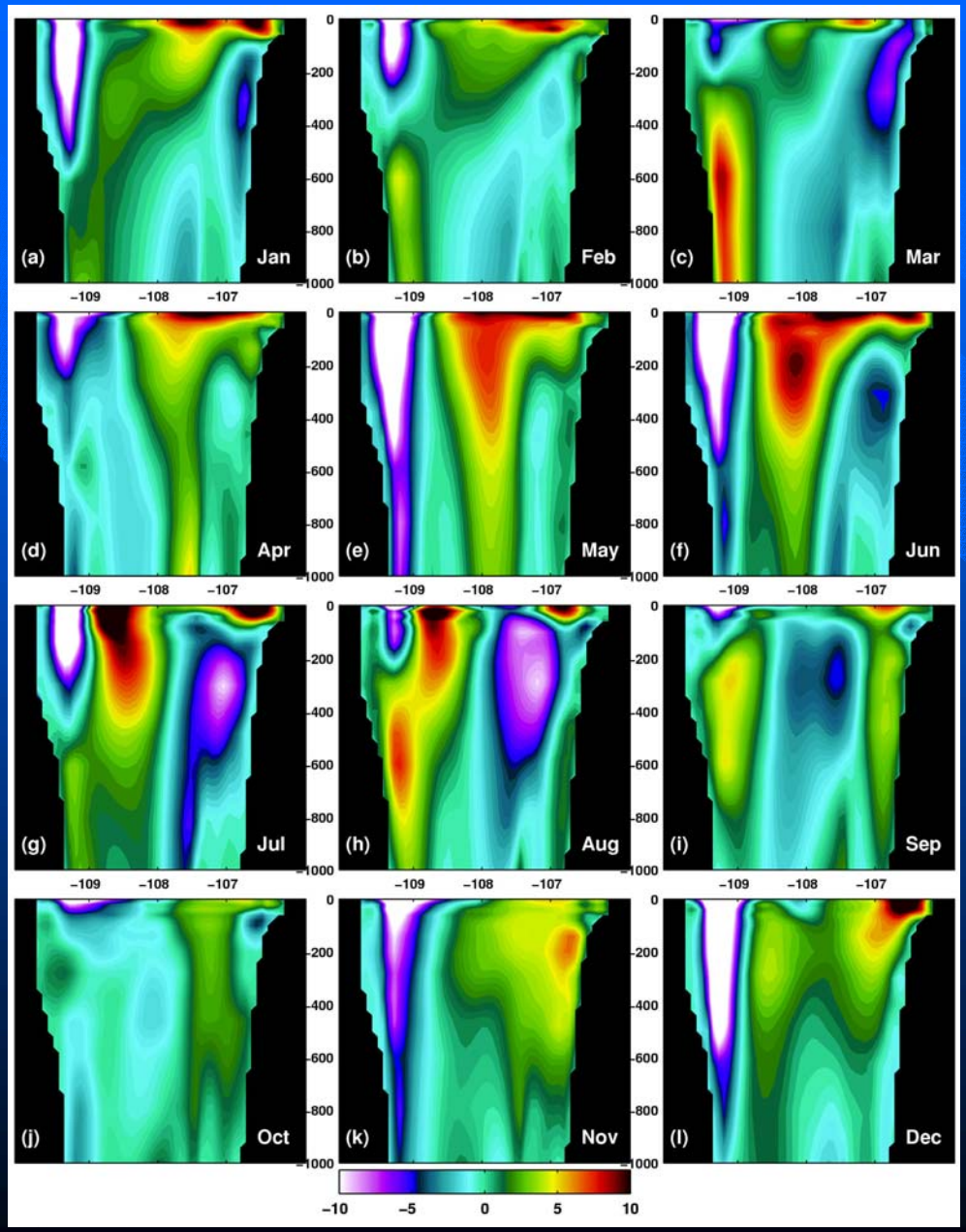
HYCOM salinity (psu)

Obs salinity (psu)

The hydrographic data is a contribution of Ruben Castro (UABC, Mexico)

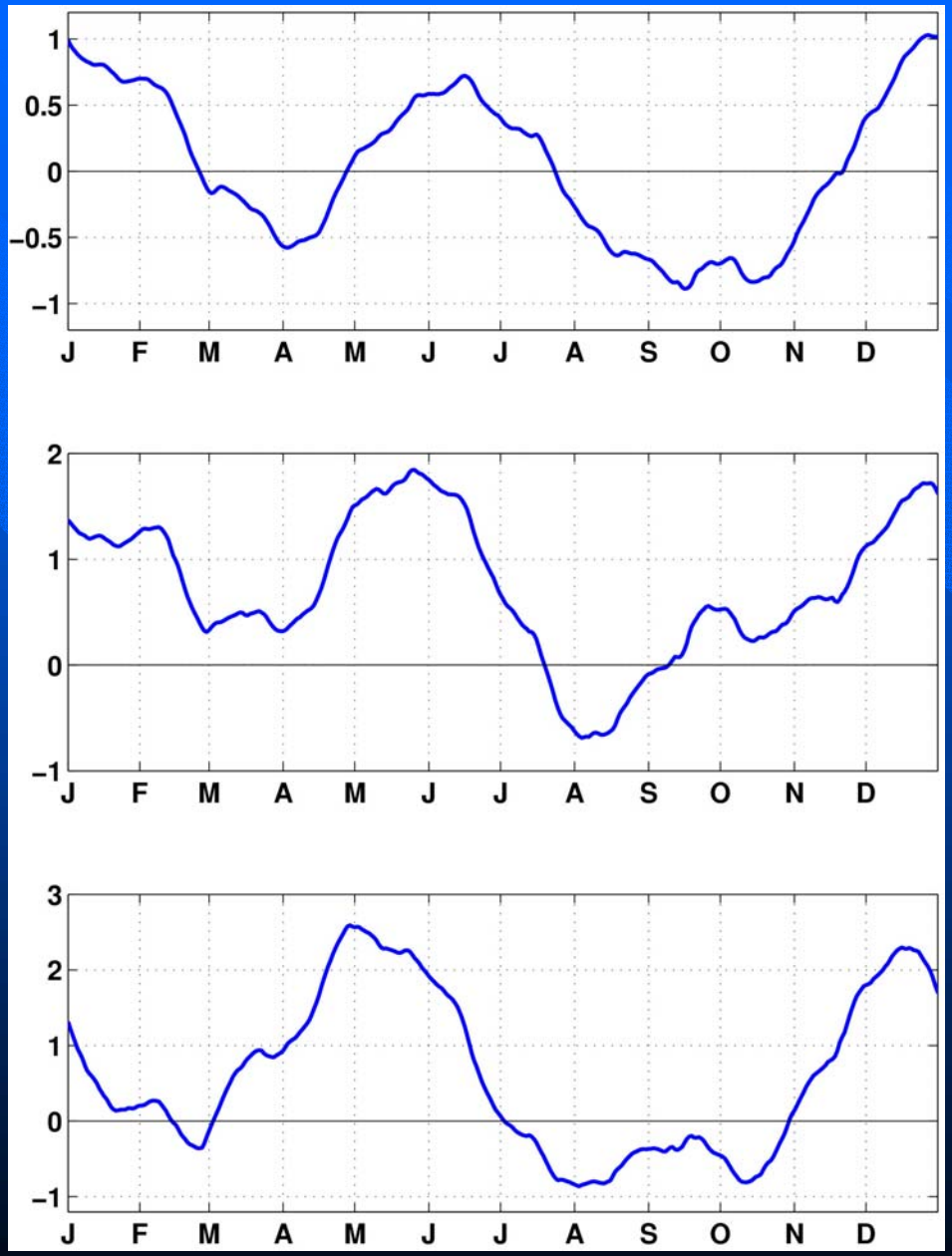
7-year monthly means from Pacific HYCOM forced with climatological winds

Cross sections at the entrance of the GOC

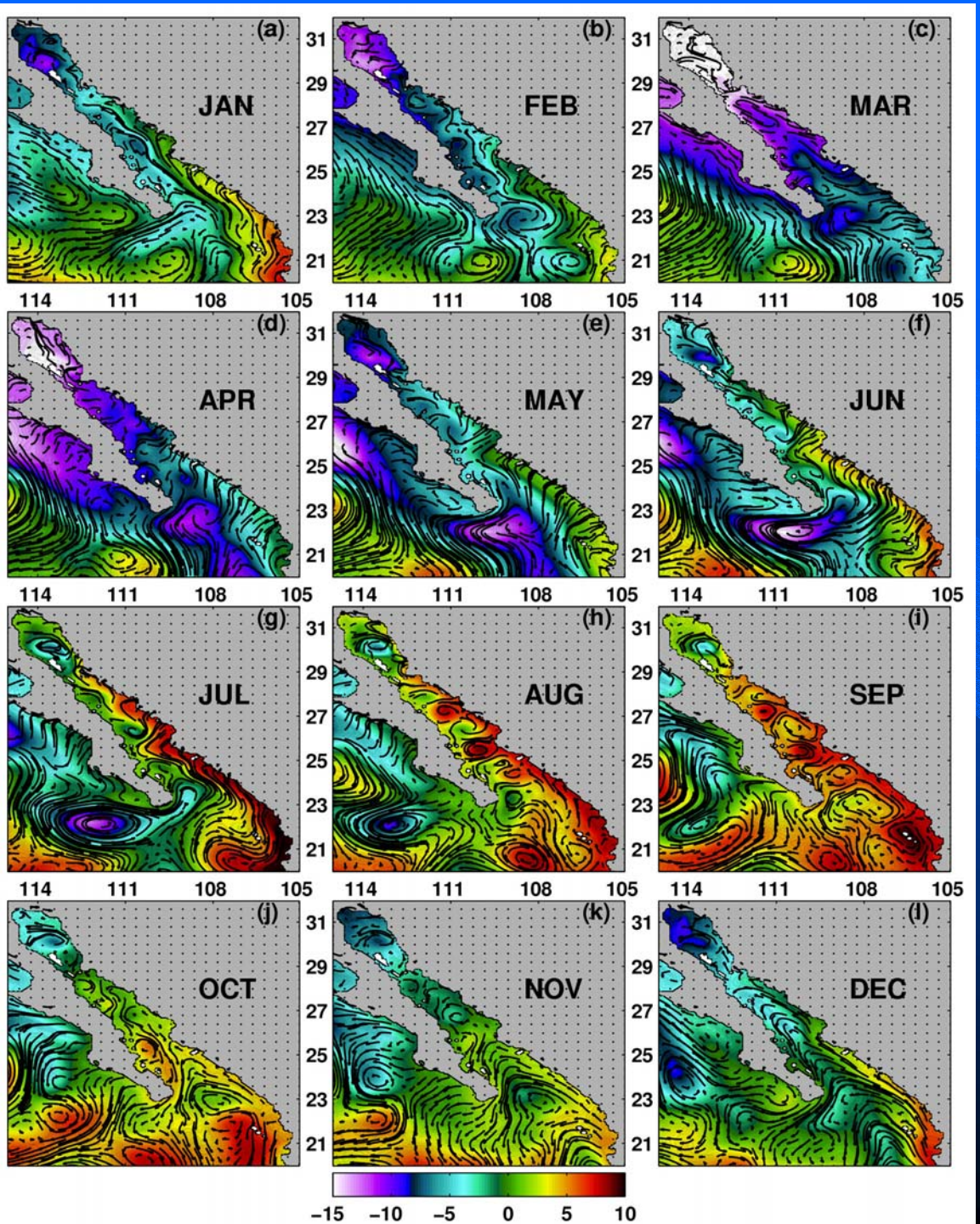


meridional velocity (cm/s)

Annual Baroclinic transport (Sv)

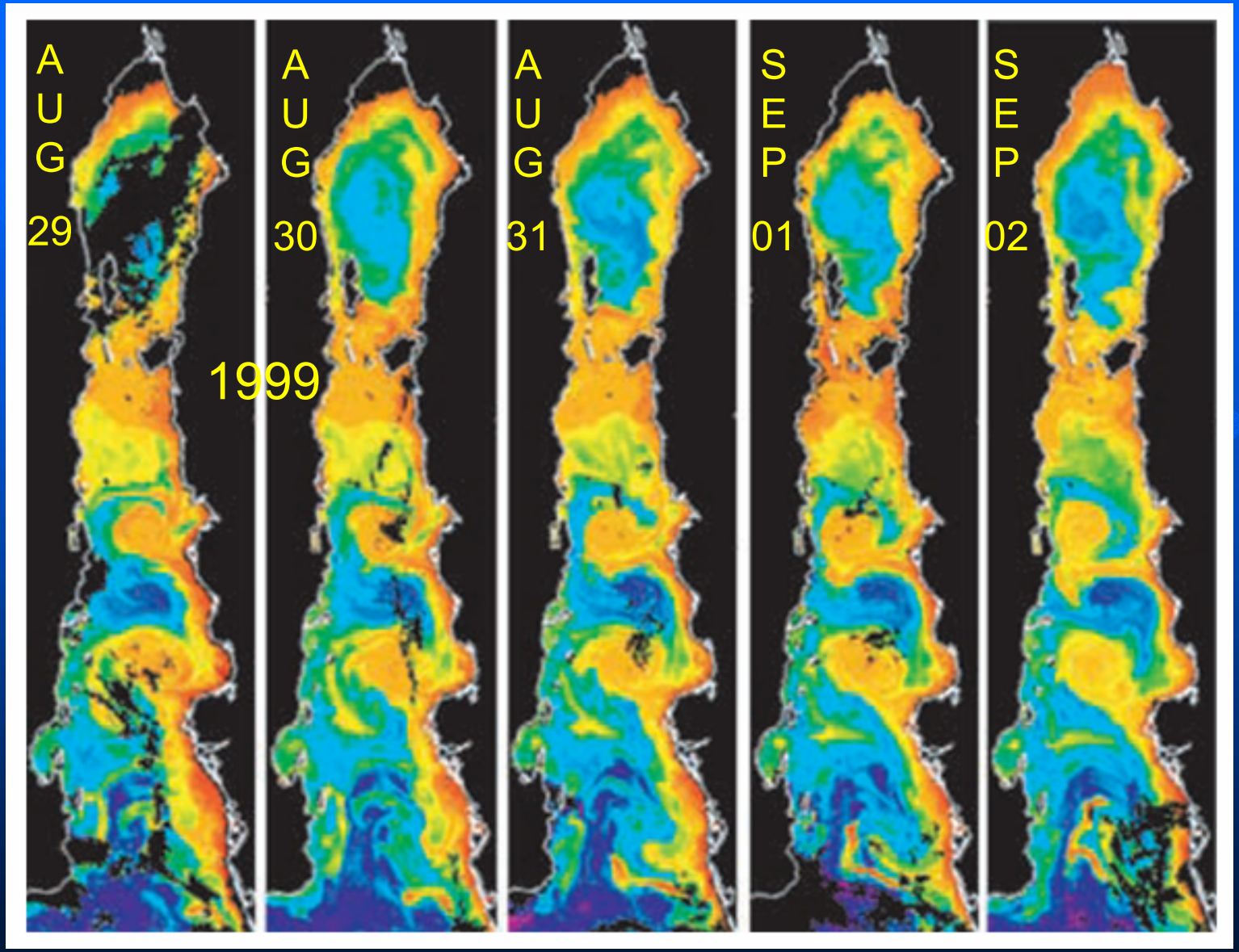


7-year monthly means from Pacific HYCOM forced With climatological winds



SSH (cm)

SeaWiFS chlorophyll images



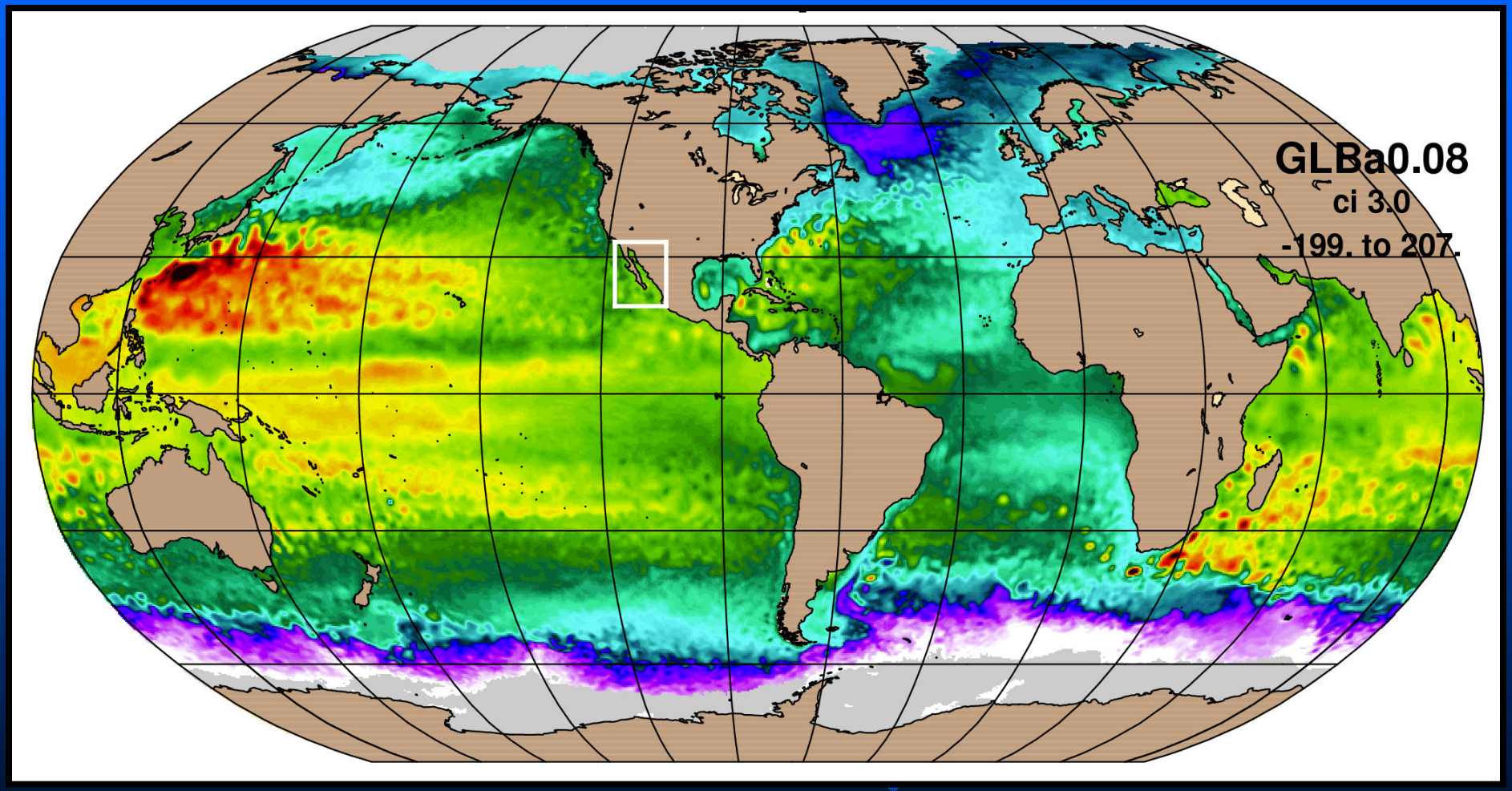
From Pegau et al., 2002

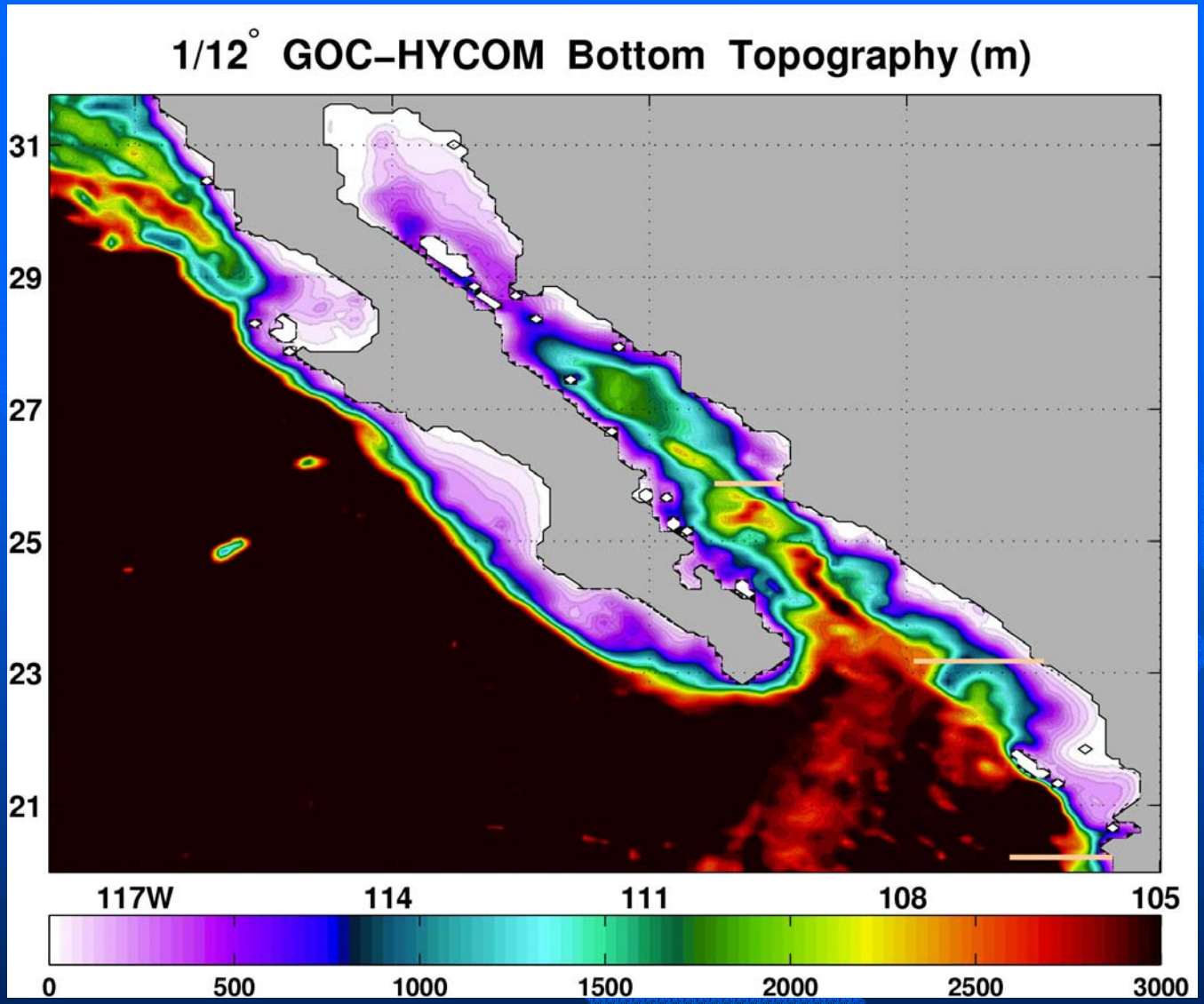
- Hypothesis: The southern GOC eddies are induced by the local-plus-remote ocean currents.

To test the hypothesis we developed three basic simulations:

- 1. Simulation using local and remote forcing.
- 2. Simulation using local forcing.
- 3. Simulation using remote forcing.

1/12º GLB HYCOM provides boundary conditions for the 1/12º GOC HYCOM Simulations

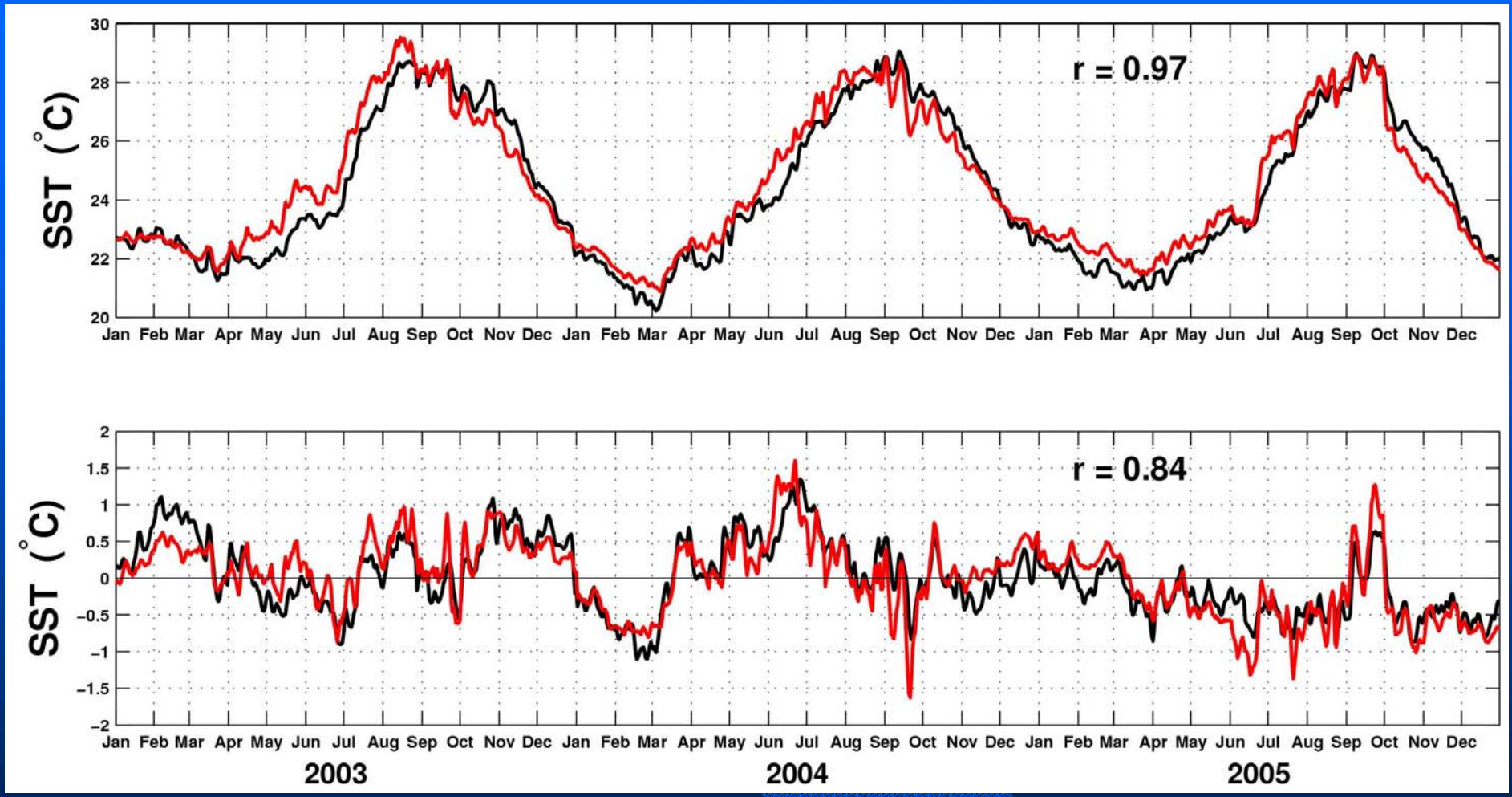




Nesting Parameters

BCS are updated every 1-day
Barotropic and Baroclinic modes in BCs
10 grid-point wide relaxation zone
.1-1 day relaxation e-folding time

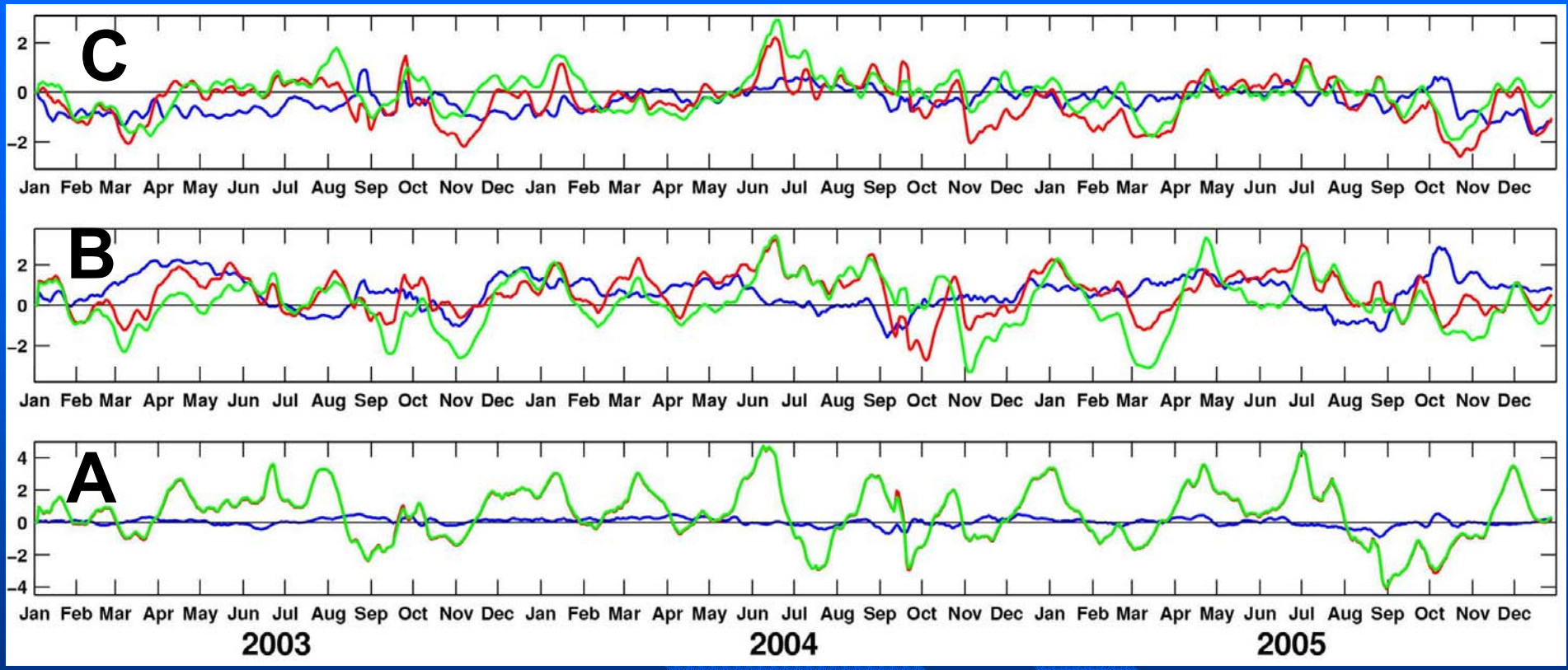
SST daily averages for the GOC region



MODAS is black

HYCOM is red

Baroclinic transport (Sv)

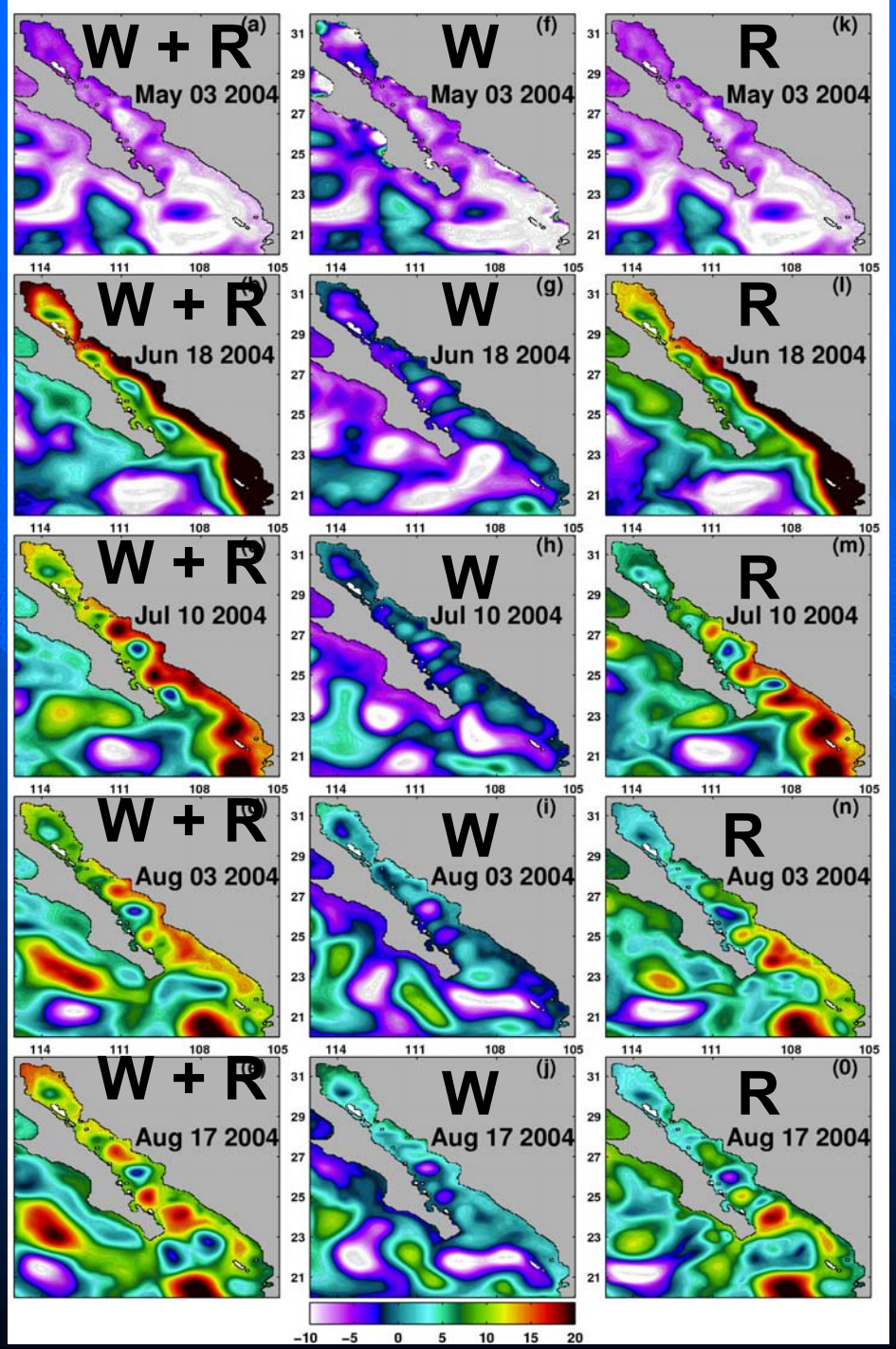


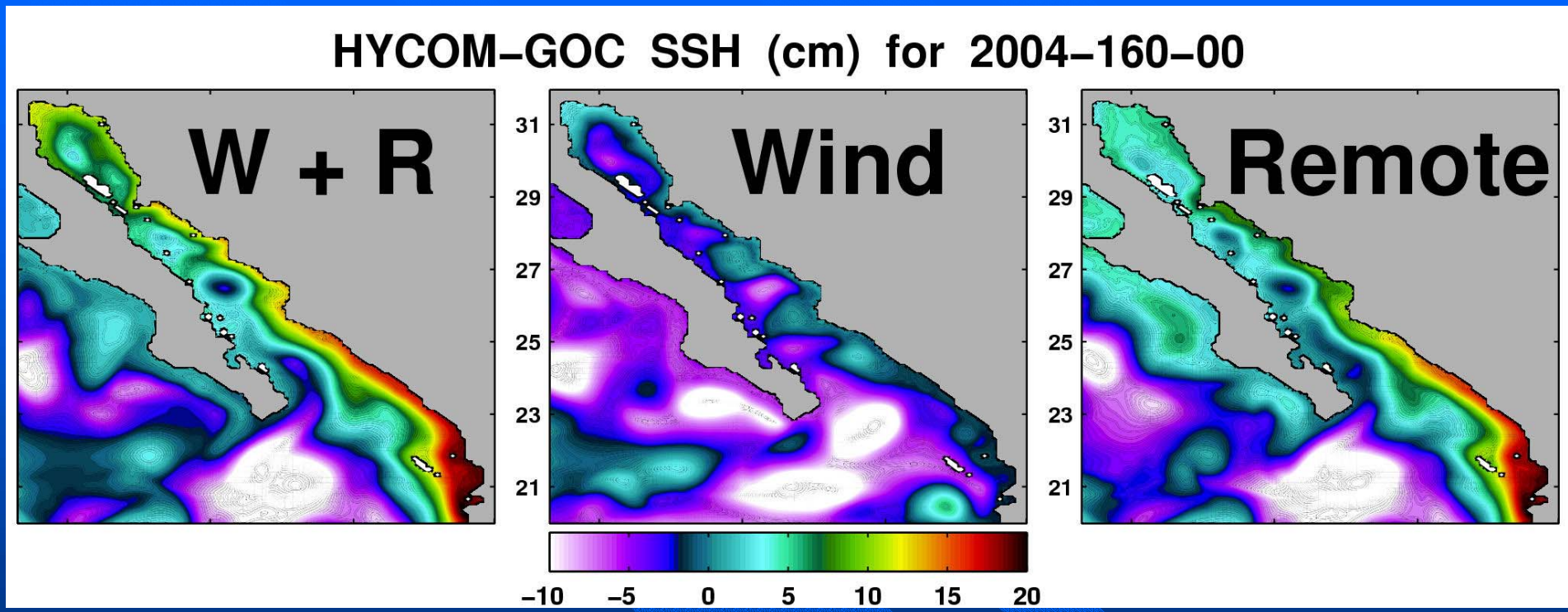
Wind plus remote forcing is red

Remote forcing is green

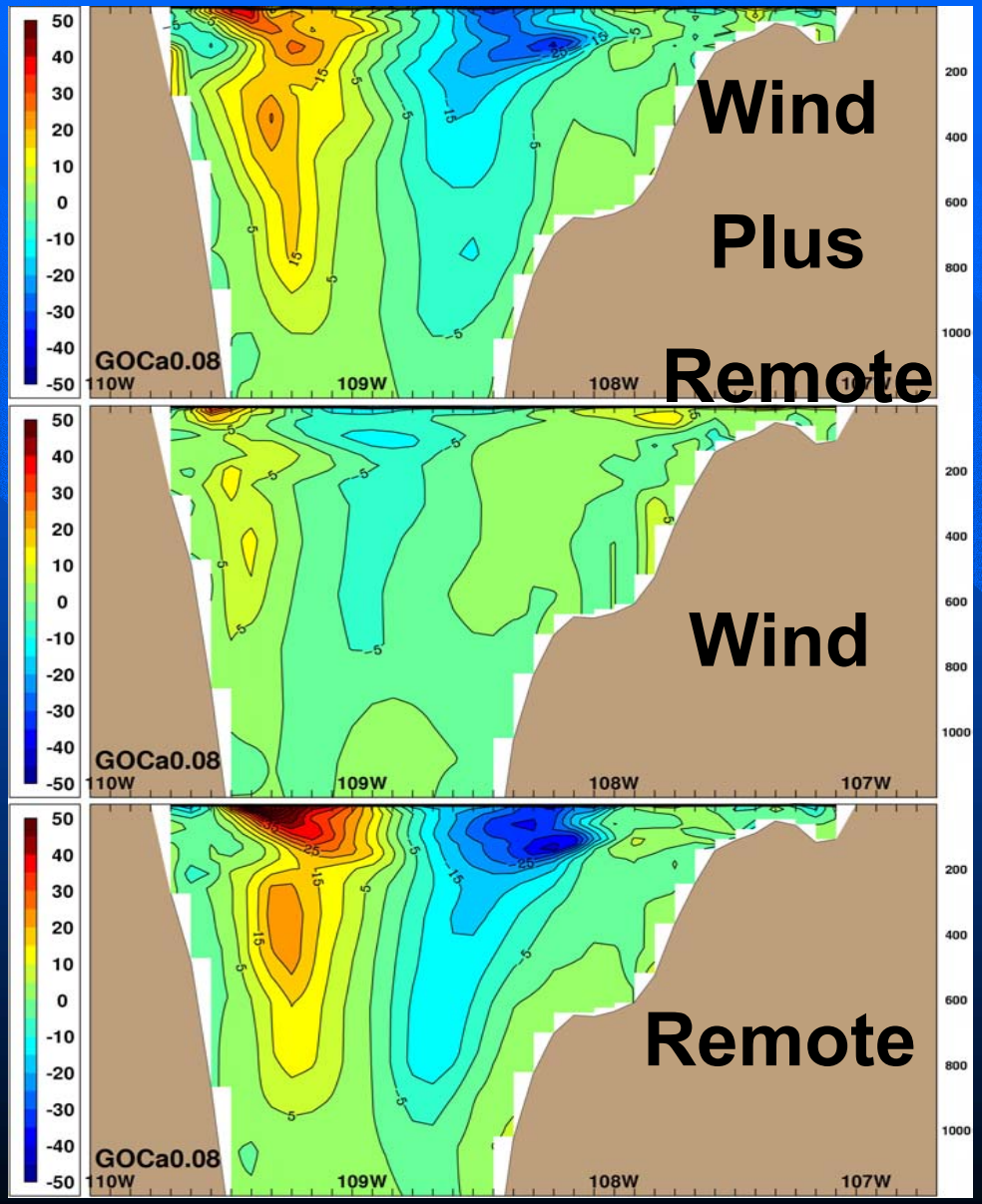
Wind forcing is blue

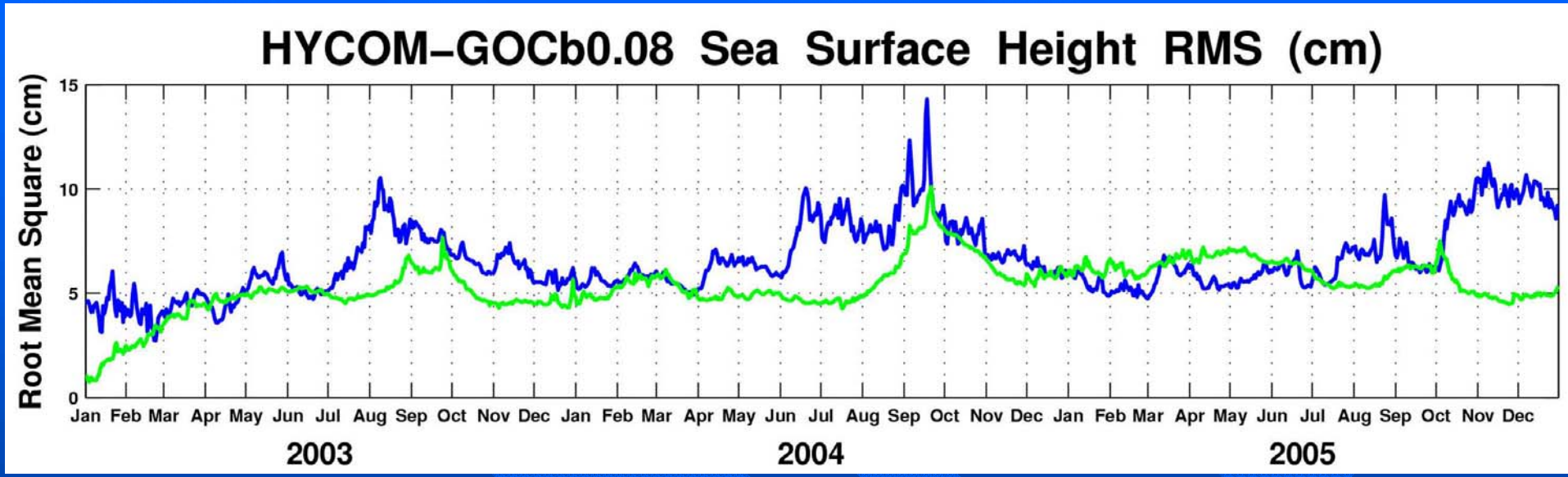
SSH (cm) Snapshots




HYCOM–GOC SSH (cm) for 2004–160–00
W + R
Wind
Remote
31
29
27
25
23
21
–10
–5
0
5
10
15
20

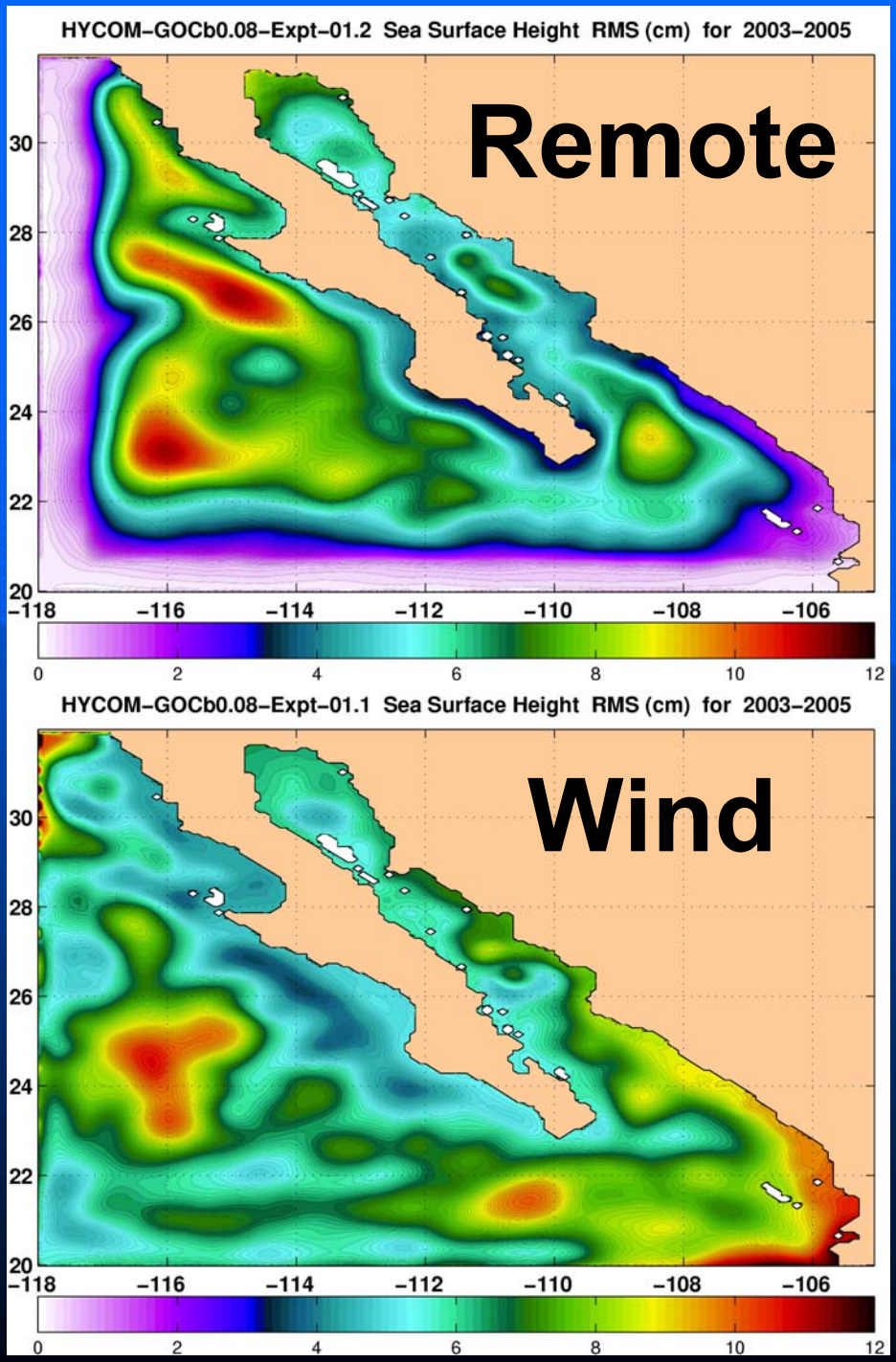
Snapshots of meridional velocity for August 17, 2004





Remote forcing is green

Wind forcing is blue


HYCOM-GOCb0.08-Expt-01.2 Sea Surface Height RMS (cm) for 2003-2005
Remote
30
28
26
24
22
20
-118
-116
-114
-112
-110
-108
-106
0
2
4
6
8
10
12
HYCOM-GOCb0.08-Expt-01.1 Sea Surface Height RMS (cm) for 2003-2005
Wind
30
28
26
24
22
20
-118
-116
-114
-112
-110
-108
-106
0
2
4
6
8
10
12

Summary

- The local wind is not essential for the generation of the southern GOC eddy train, but rather the local-plus-remote ocean currents are the primary forcing.

- The climatological baroclinic transport associated with the local-plus-remote ocean currents includes two maximums (one during spring-summer and the other during winter).