

Nesting the Gulf of Mexico in Atlantic HYCOM: Oceanographic Processes Generated by Hurricanes Ivan, Katrina, and Rita

Luis Zamudio¹ & Pat Hogan²

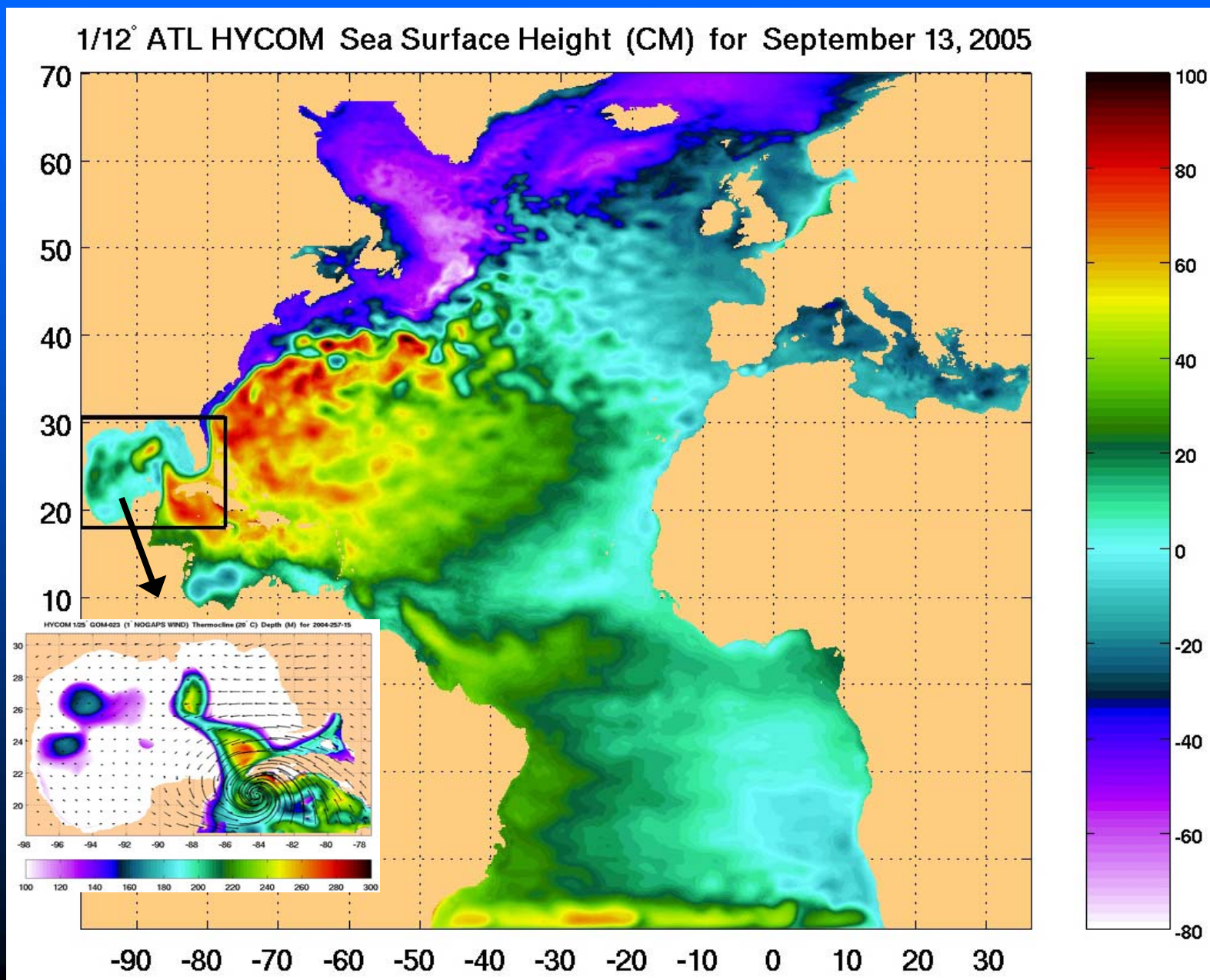
**¹Center for Ocean-Atmospheric Prediction Studies, Florida State
University**

²Naval Research Laboratory, Stennis Space Center, Mississippi

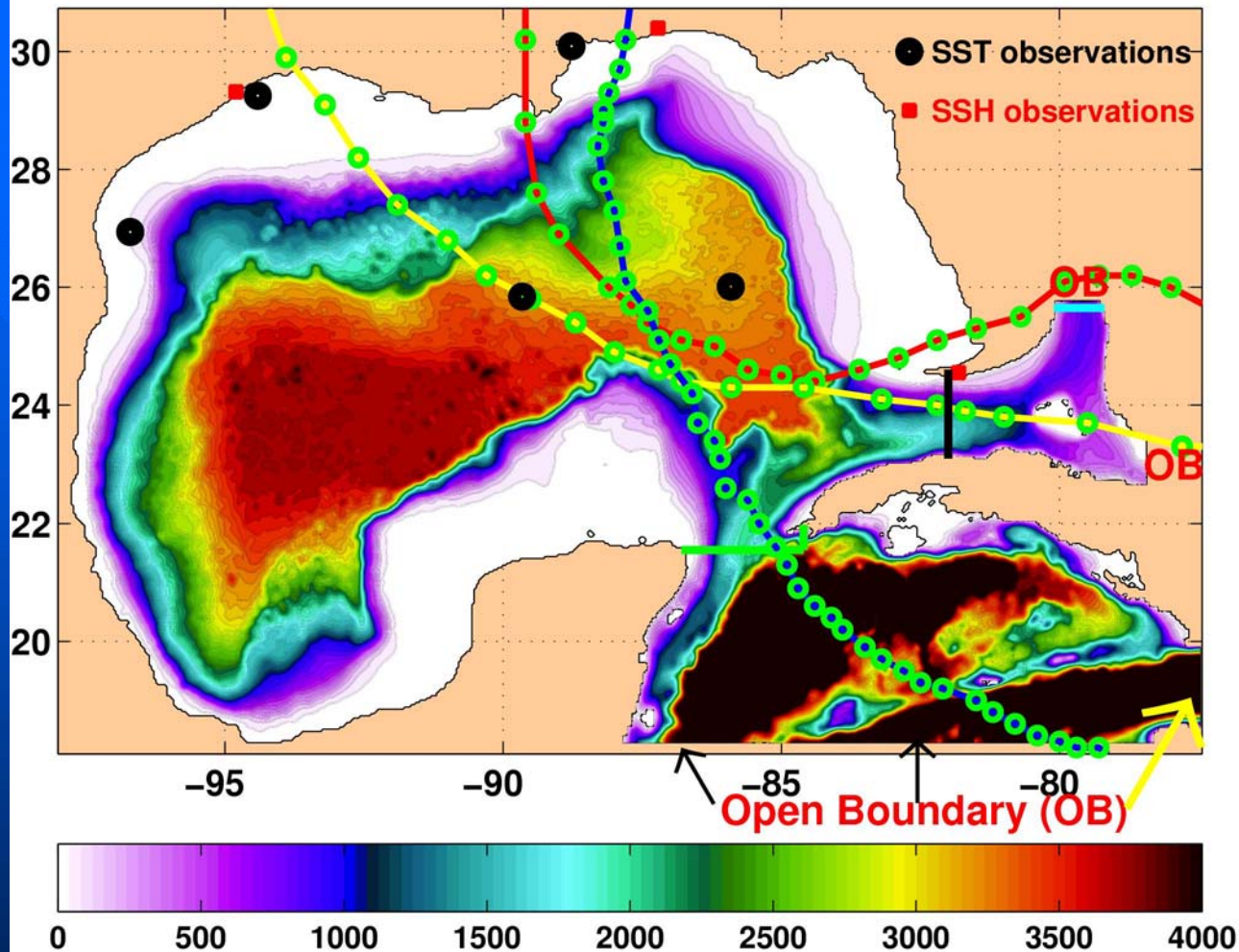
HYCOM NOPP GODAE meeting, (Dec. 6-8, 2005)

RSMAS, University of Miami, FL.

1/12° ATL HYCOM provides boundary conditions for the 1/25° GOM HYCOM Simulations



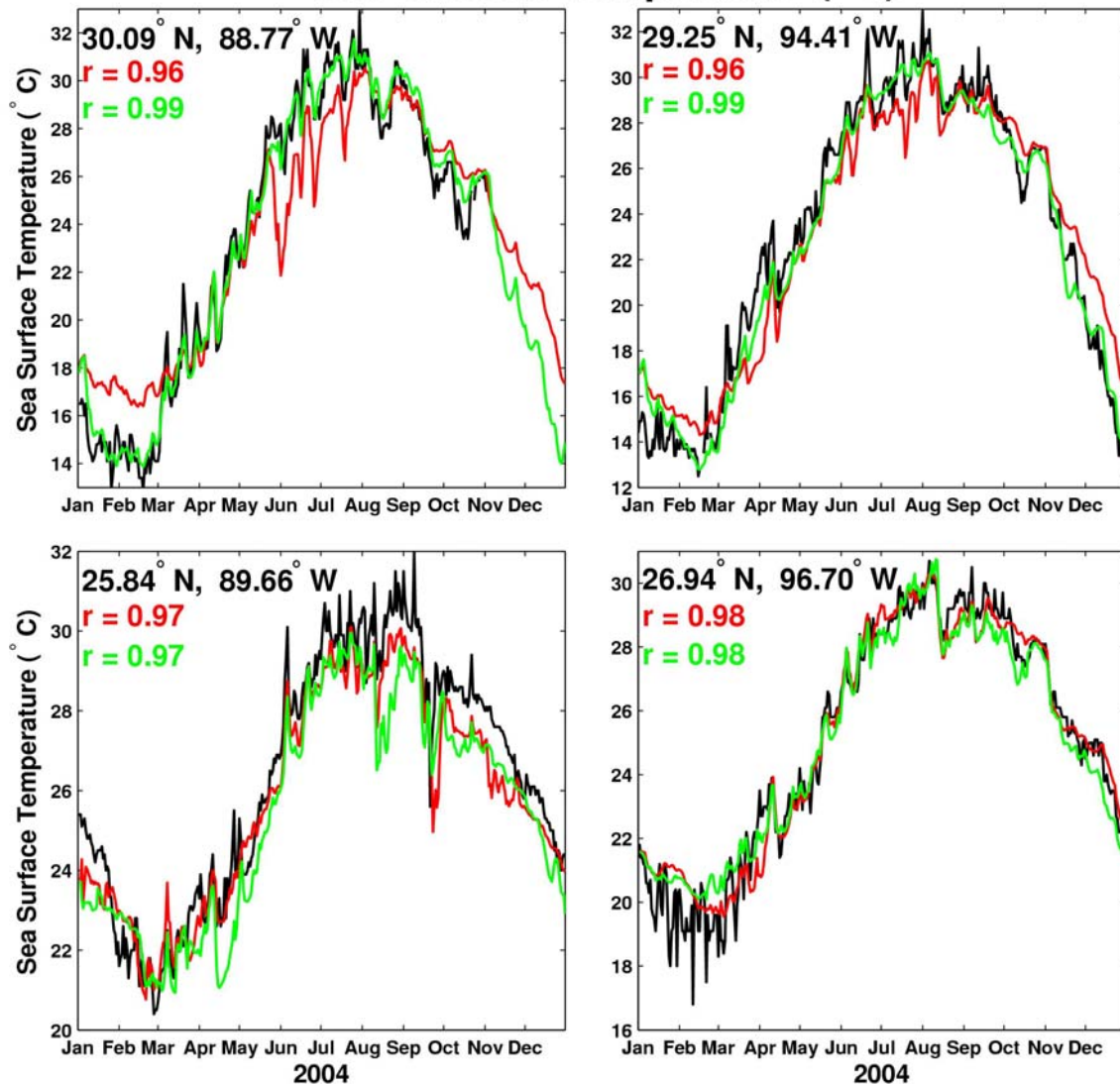
1/25° GOM-HYCOM Bottom Topography (m)



Nesting Parameters

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

Sea Surface Temperature (°C)

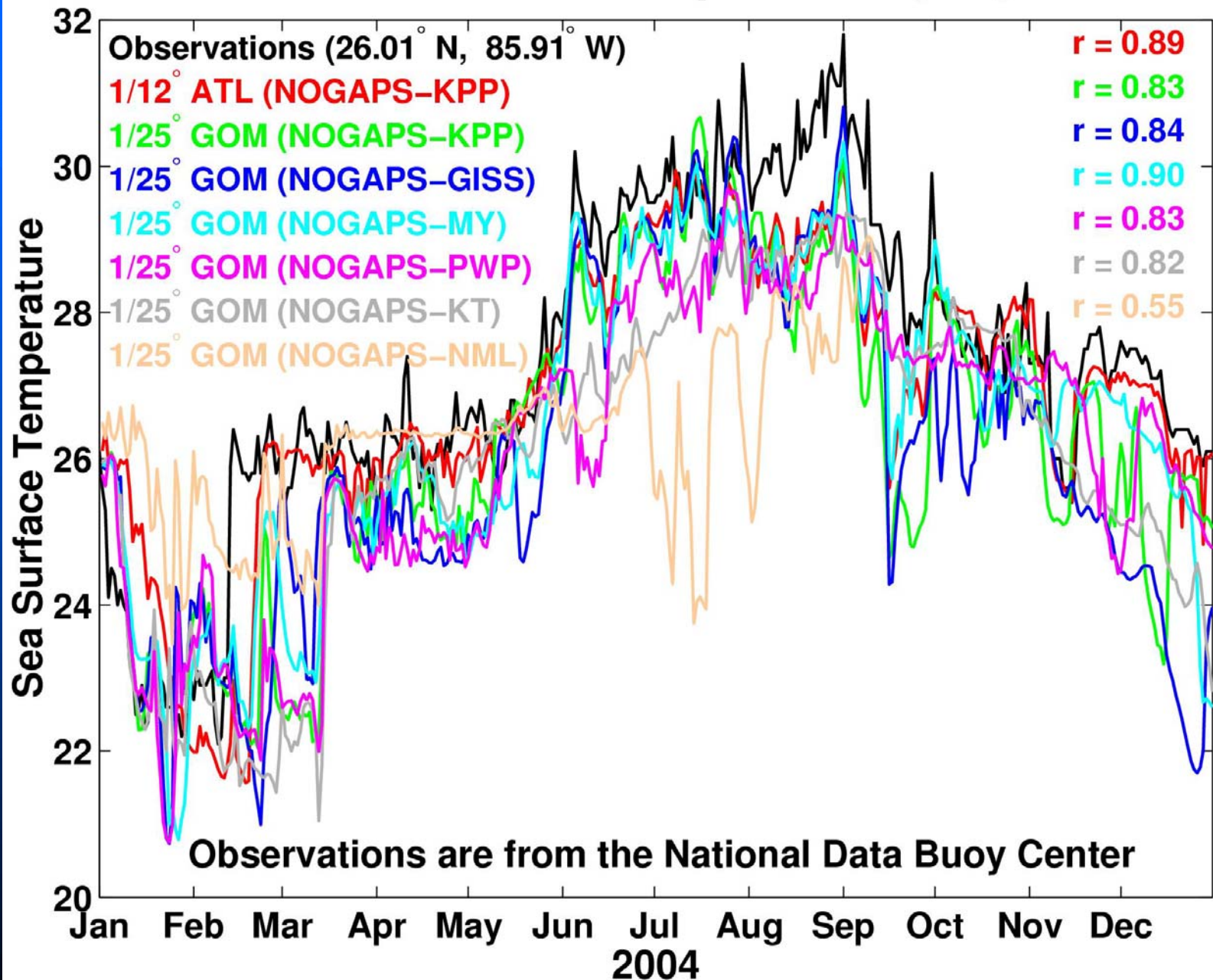


Observations (black) are from the National Data Buoy Center

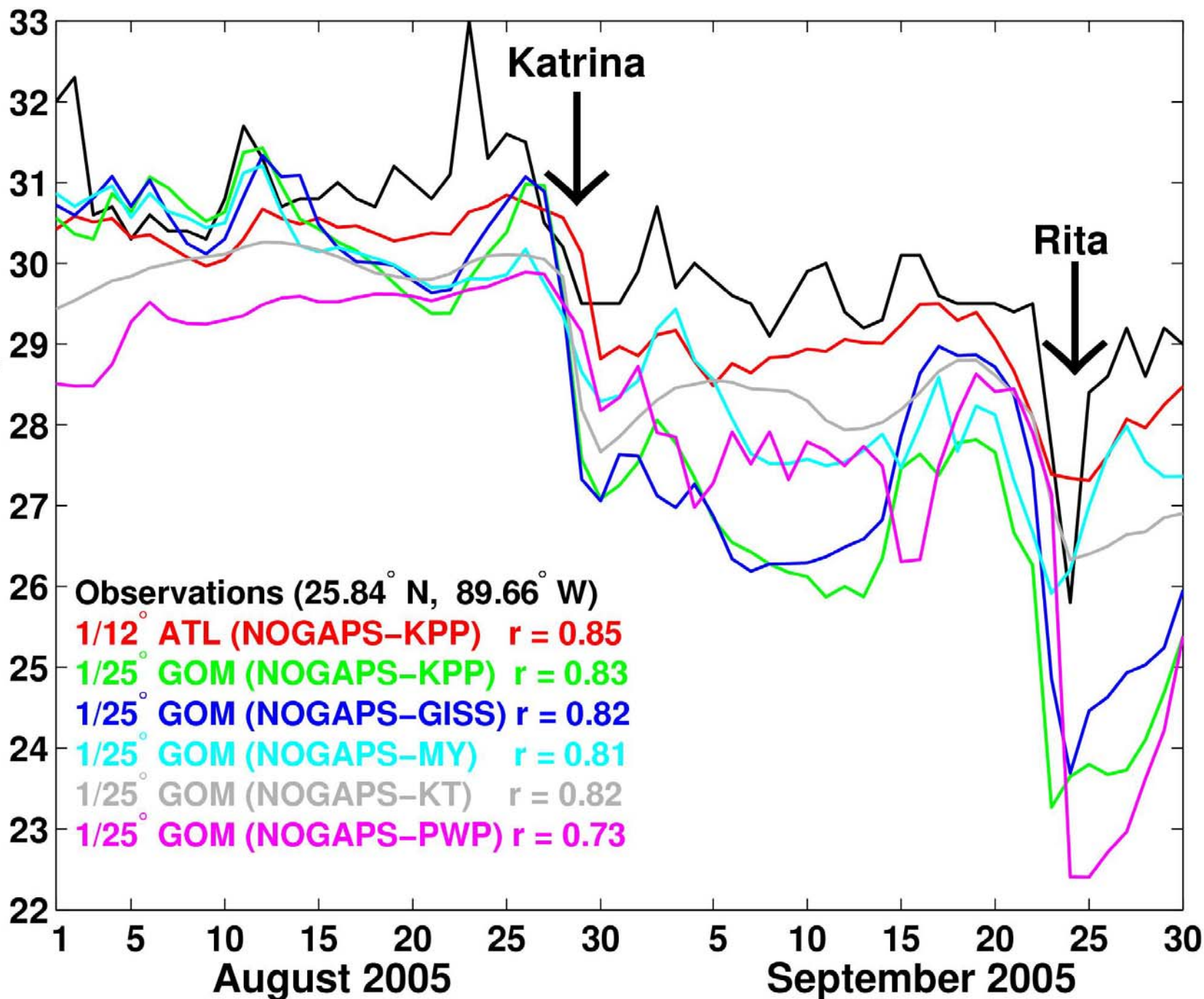
1/12° ATL (NOGAPS-KPP)

1/25° GOM (NOGAPS-KPP)

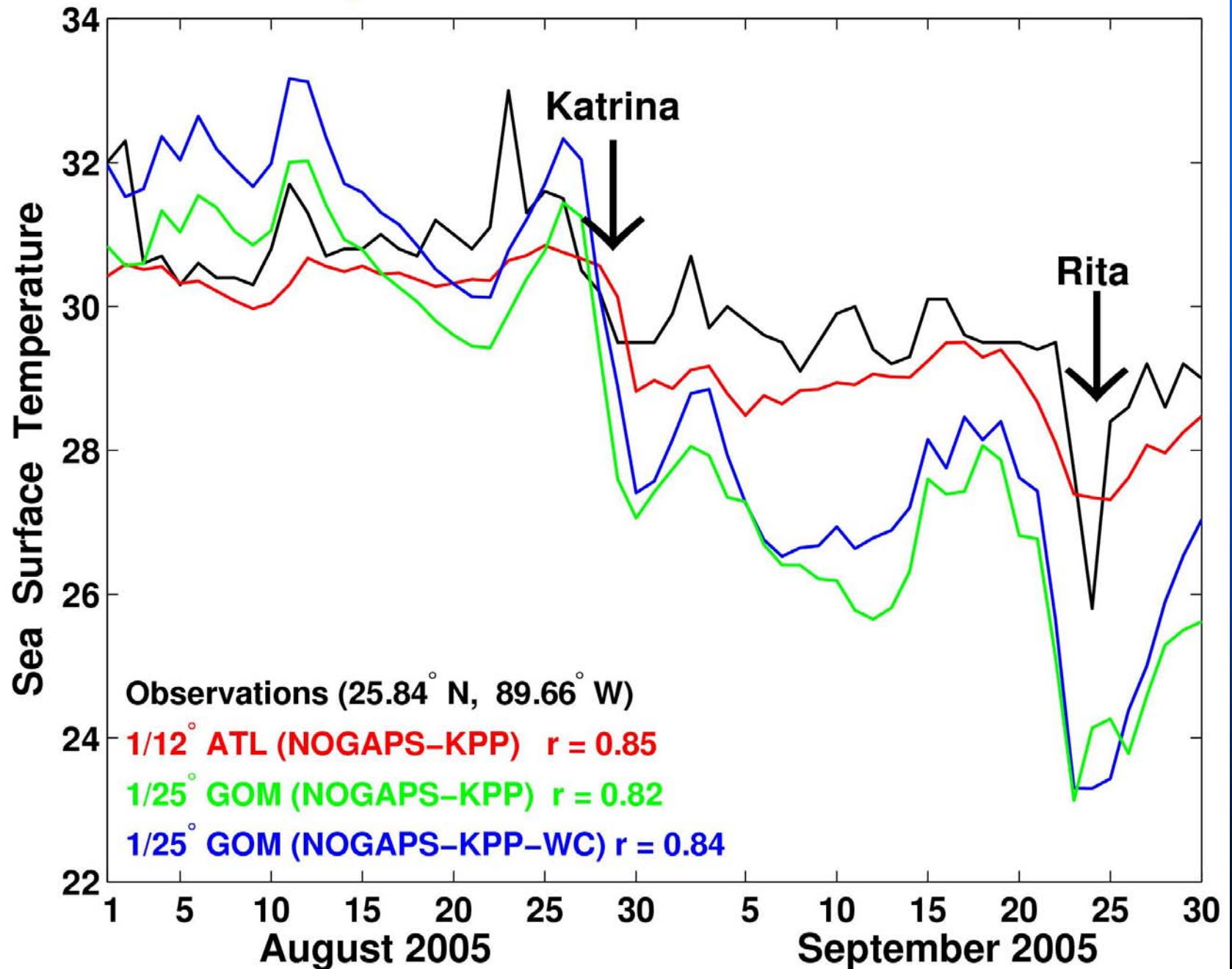
Sea Surface Temperature (°C)



Sea Surface Temperature

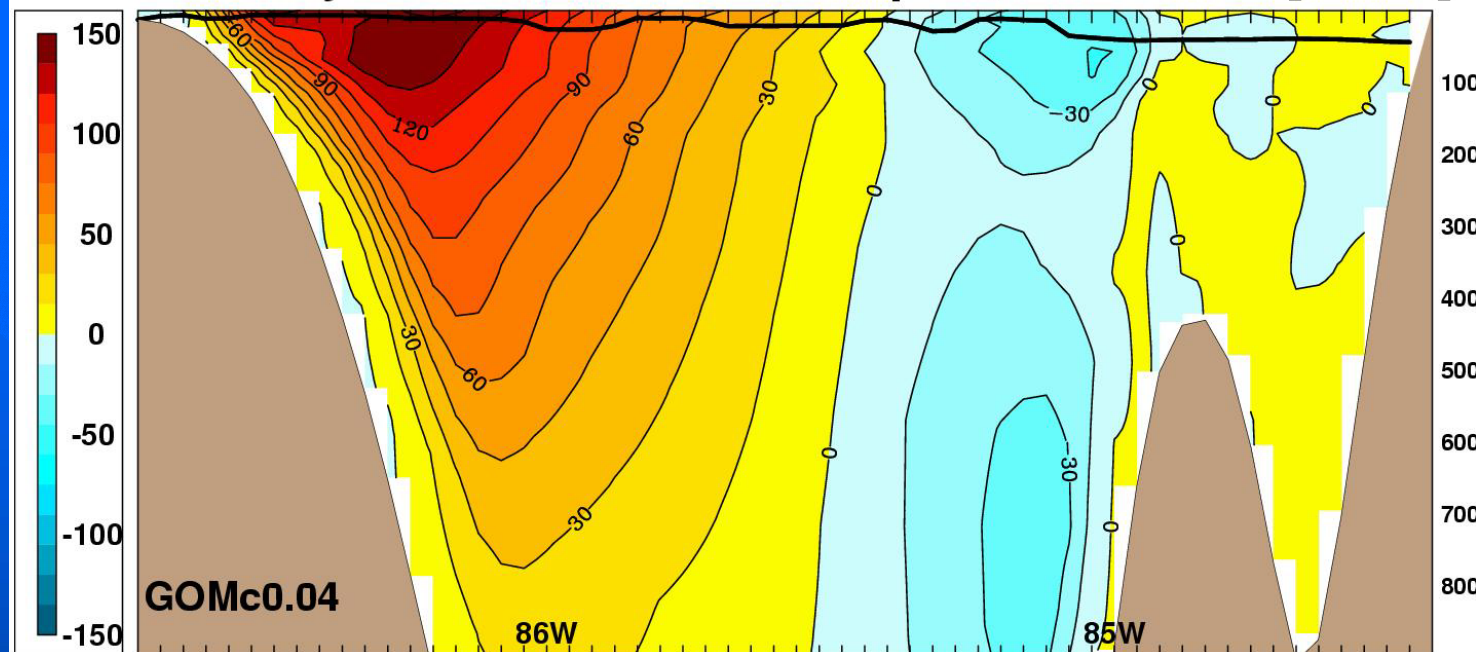


The blue experiment includes correction in heat fluxes

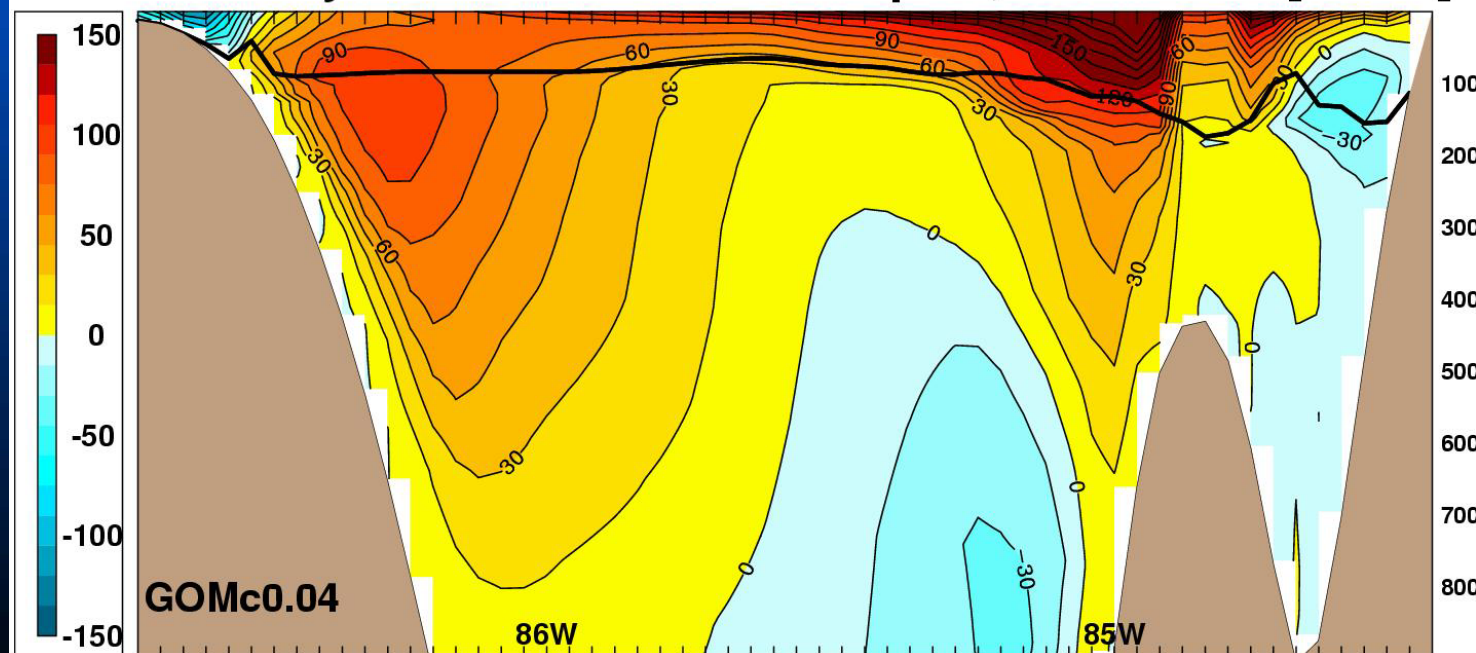


Y
U
C
A
T
A
N

v-velocity zonal sec. 21.81n Sep 09, 2004 00Z [02.3H]

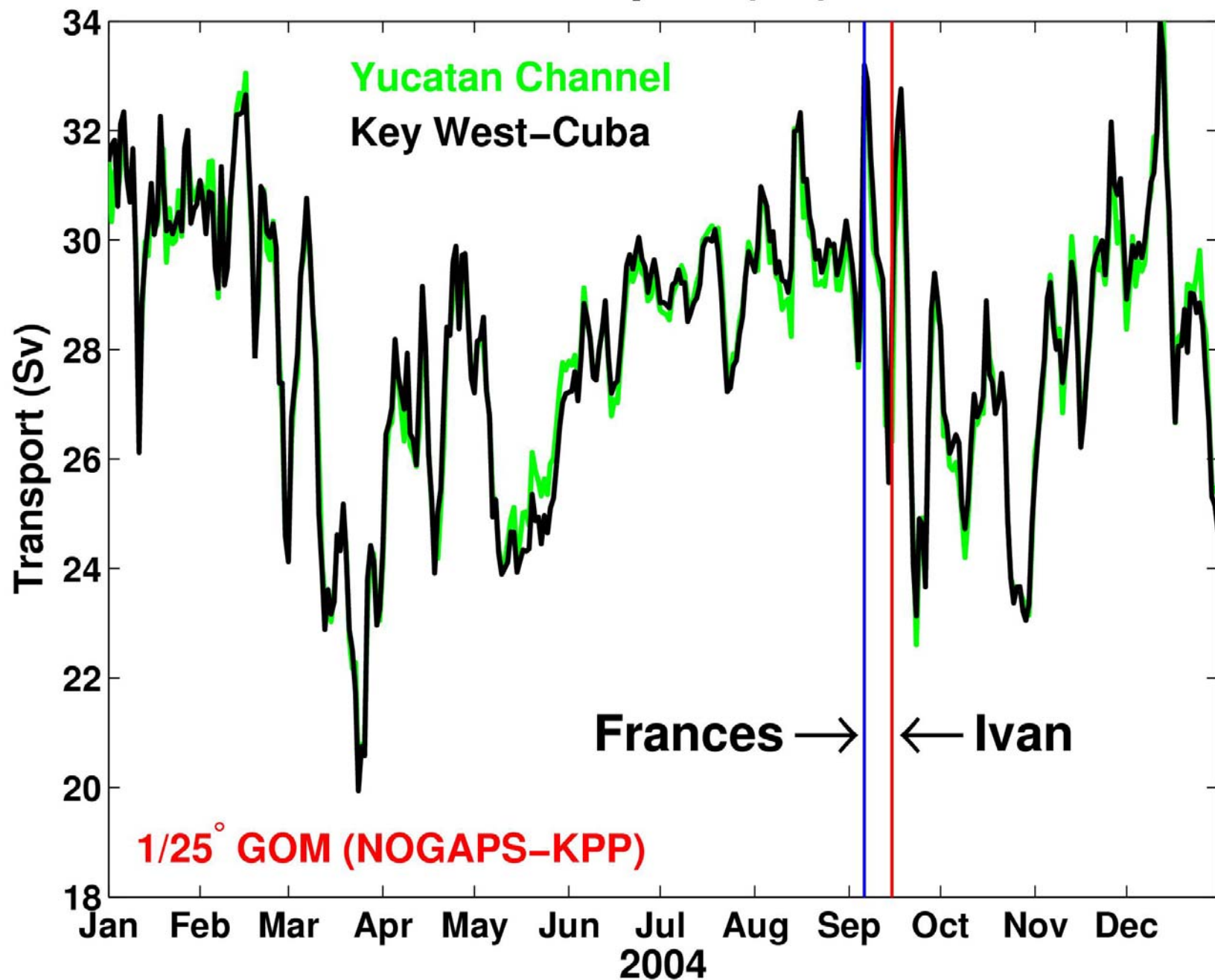


v-velocity zonal sec. 21.81n Sep 14, 2004 09Z [02.3H]

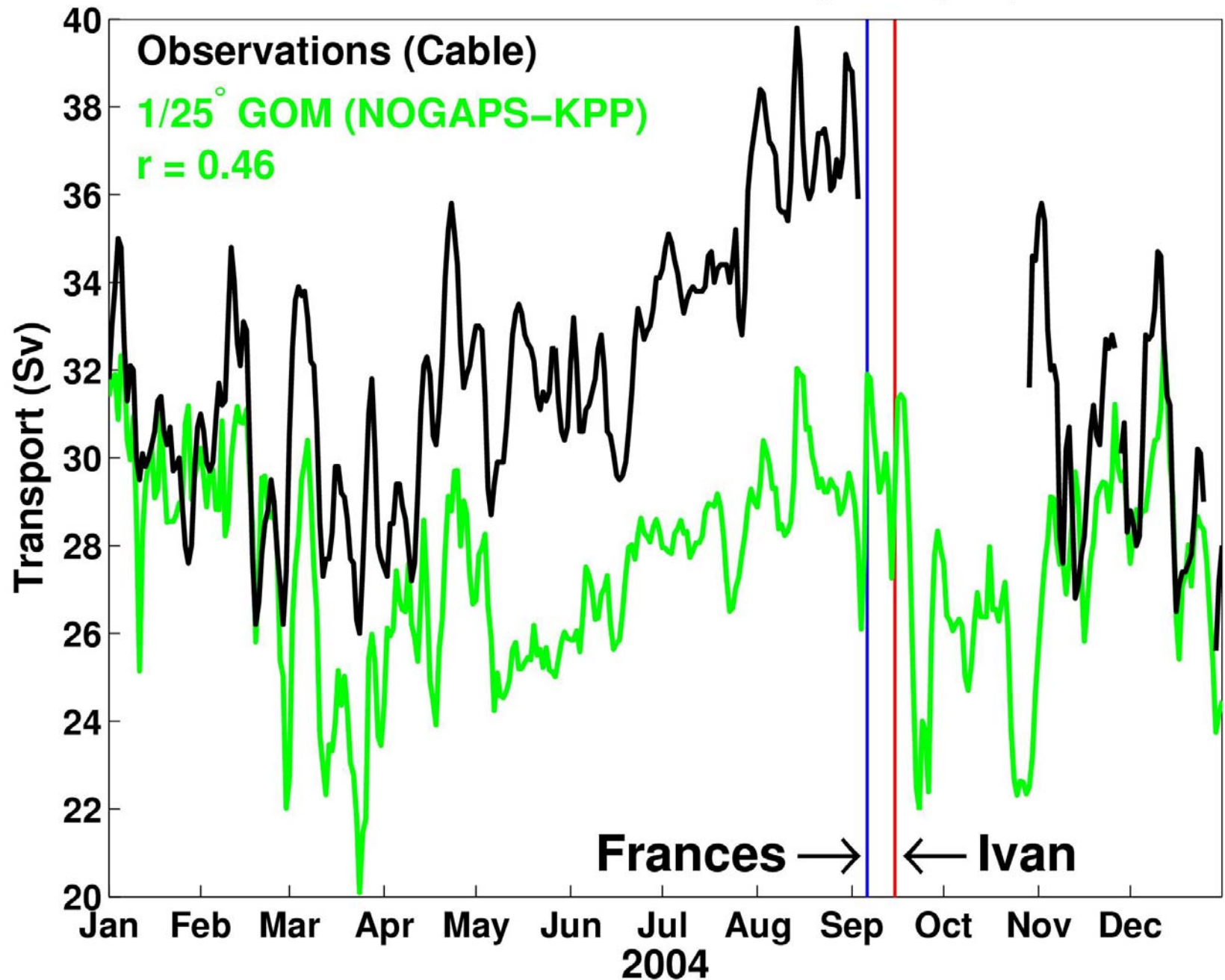


C
H
A
N
N
E
L

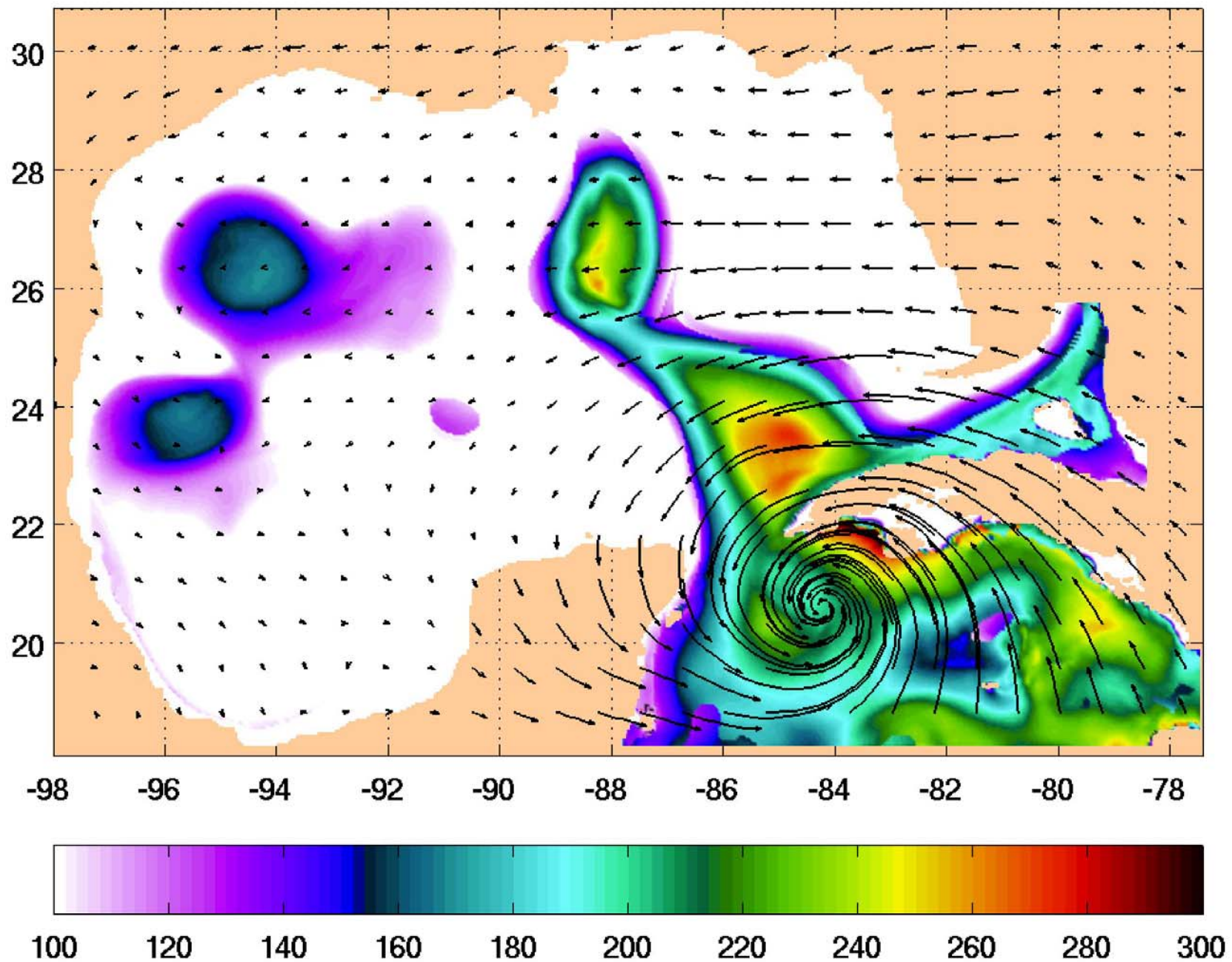
Transport (Sv)



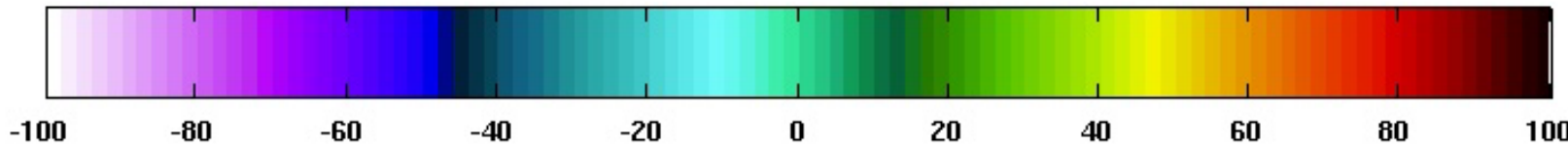
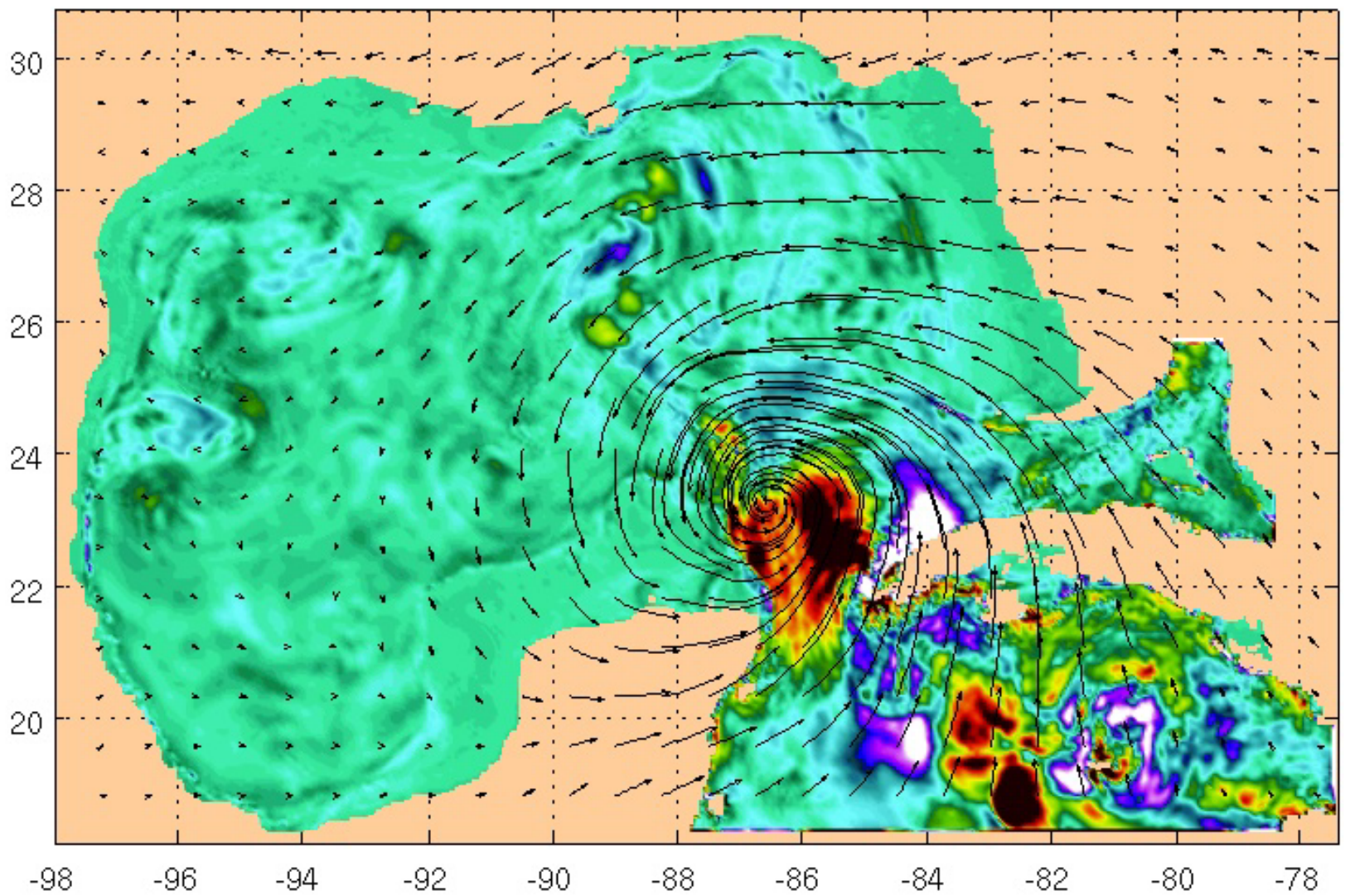
Florida Current Transport (Sv)



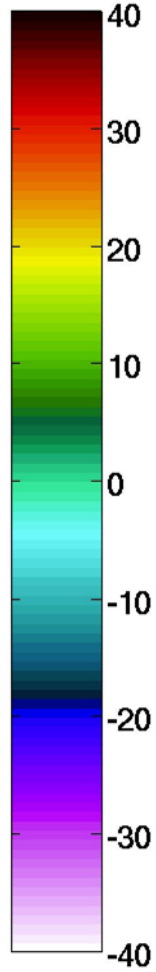
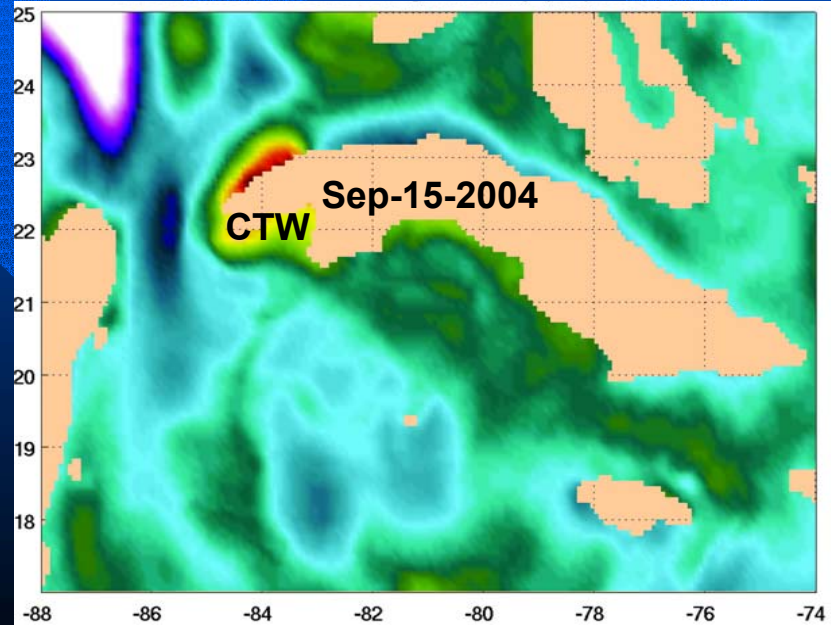
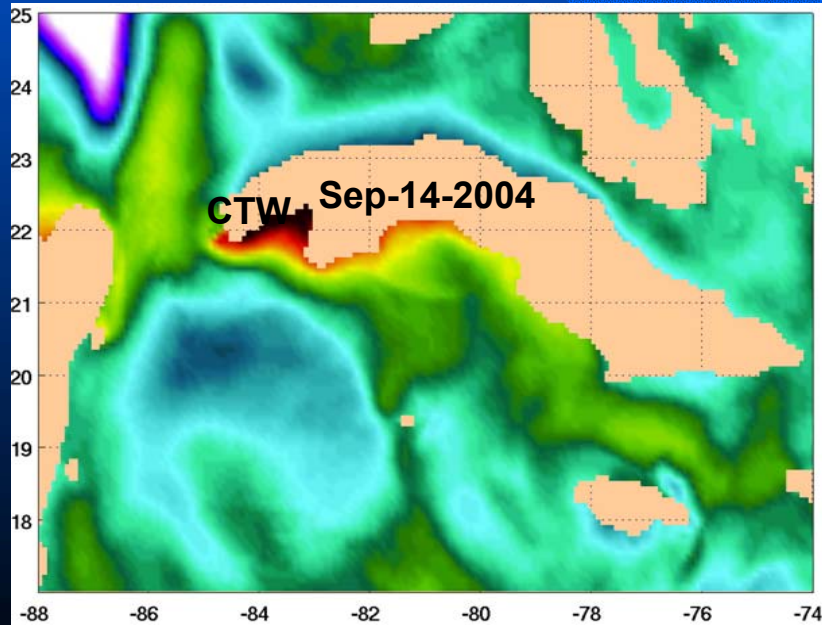
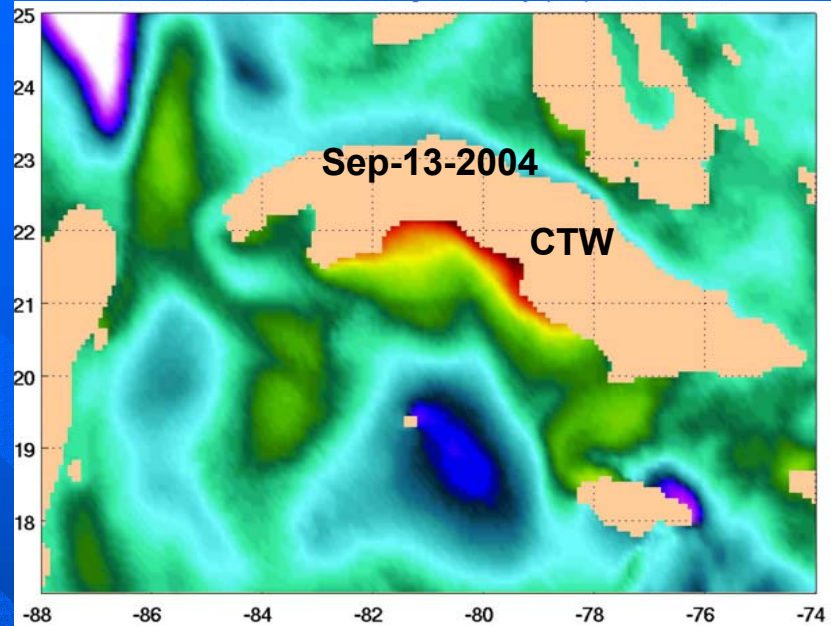
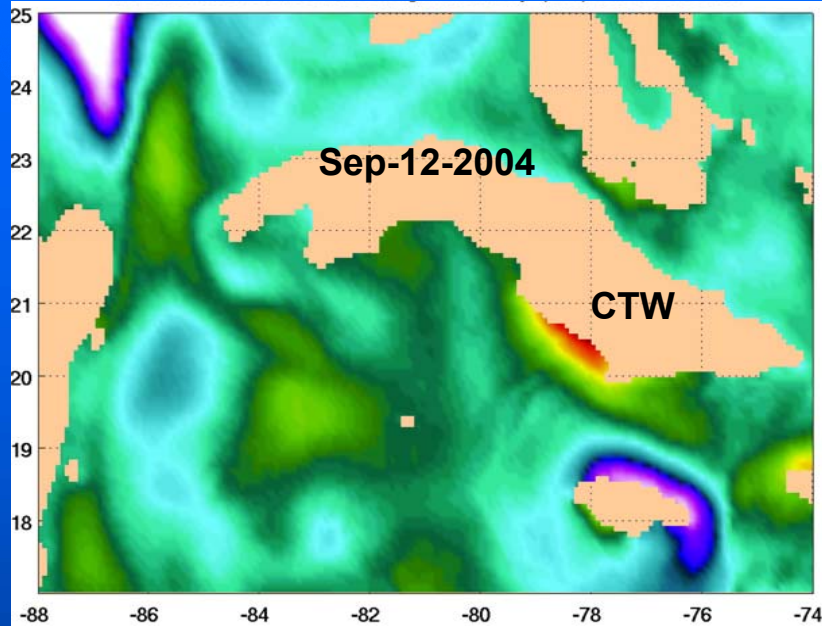
HYCOM 1/25° GOM-023 (1° NOGAPS WIND) Thermocline (20° C) Depth (M) for 2004-257-15



HYCOM 1/25° GOM-023 (1° NOGAPS WIND) Vert. Velocity (m/day) of the 20° C Isotherm for 2004-258-15

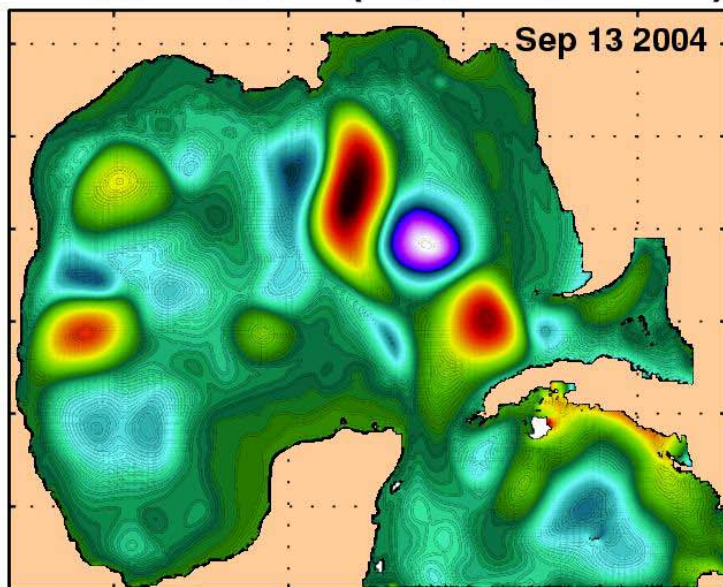


1/12° ATL HYCOM SSH Anomaly (cm)

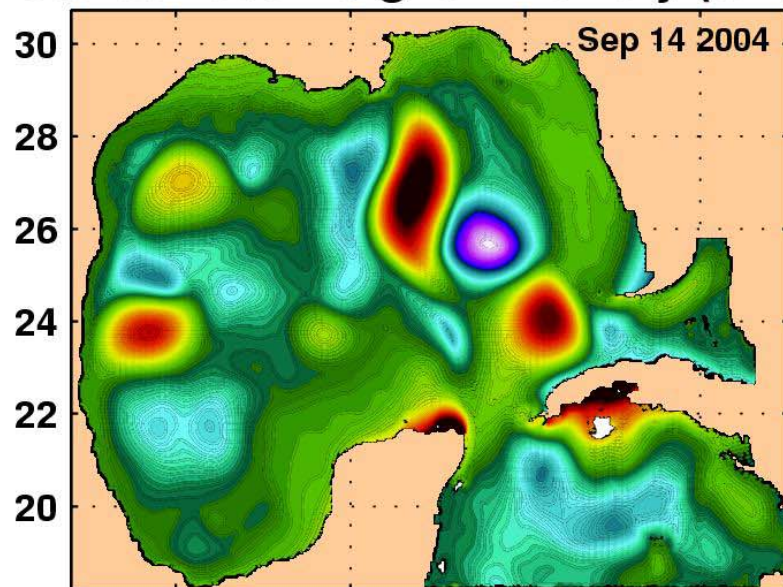


HYCOM-GOM (NOGAPS WIND)

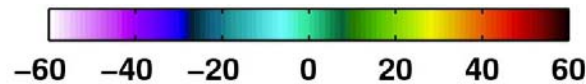
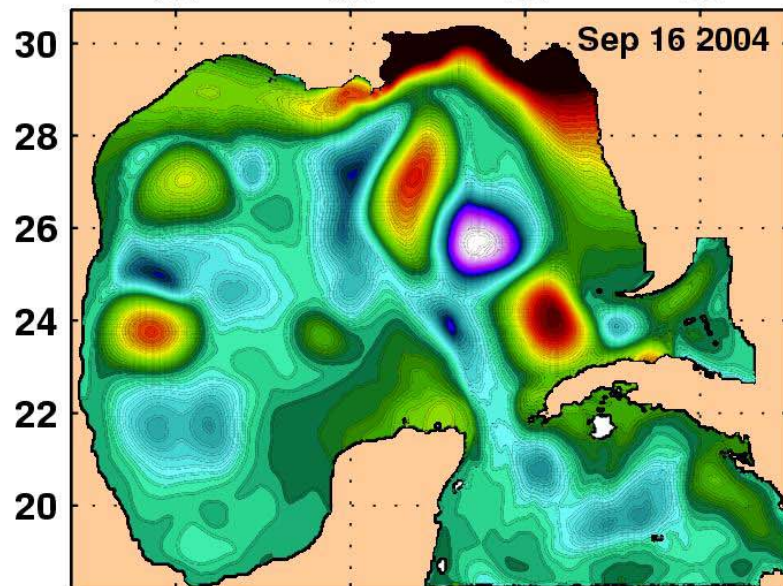
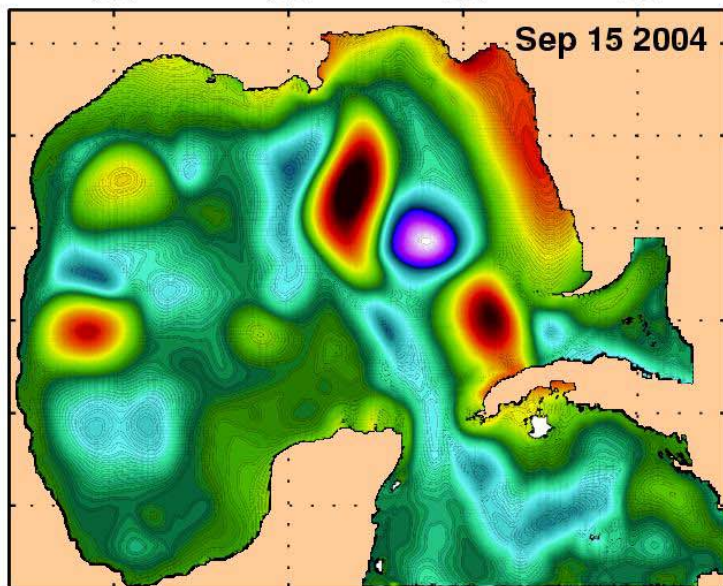
Sea Surface Height Anomaly (CM)



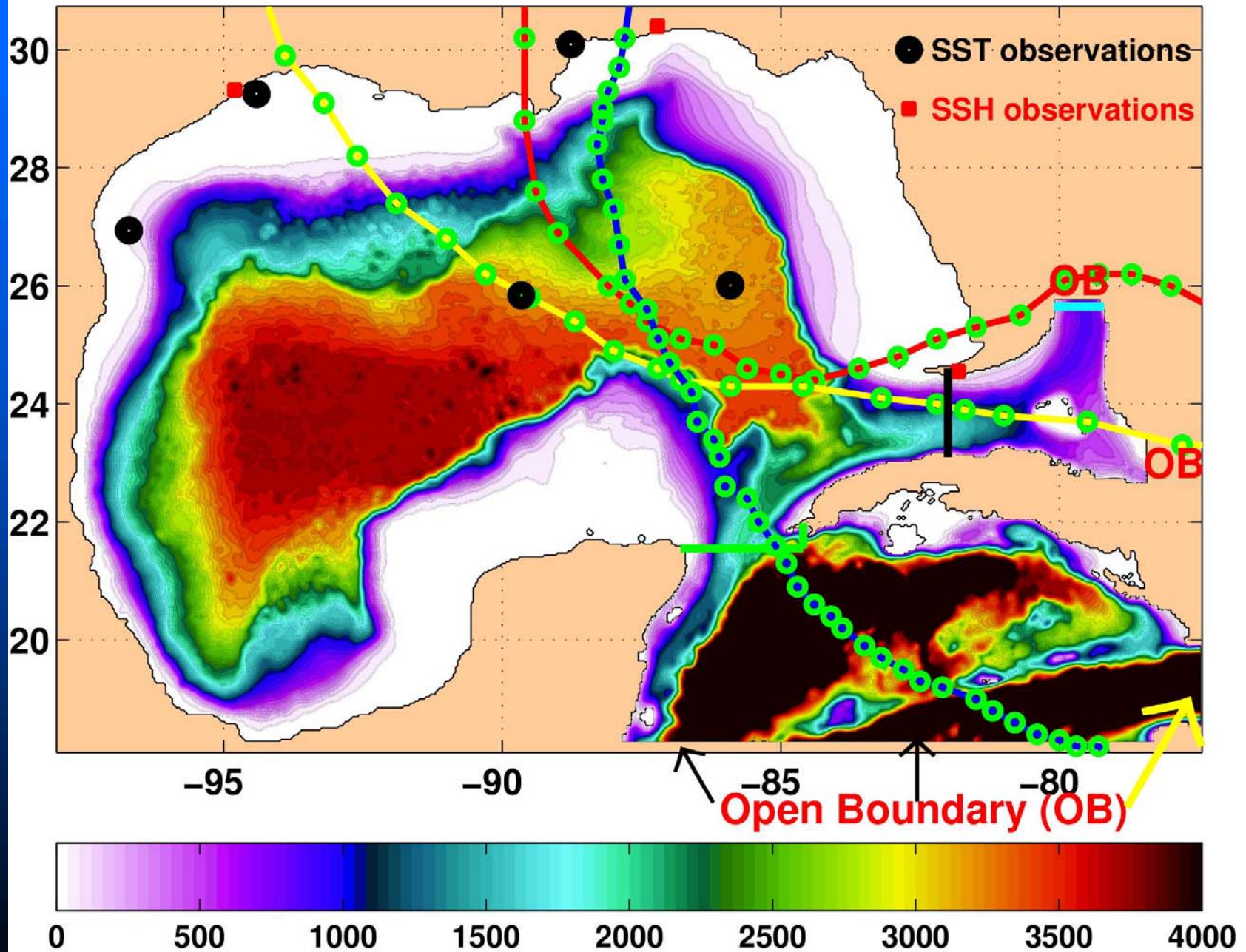
-95 -90 -85 -80



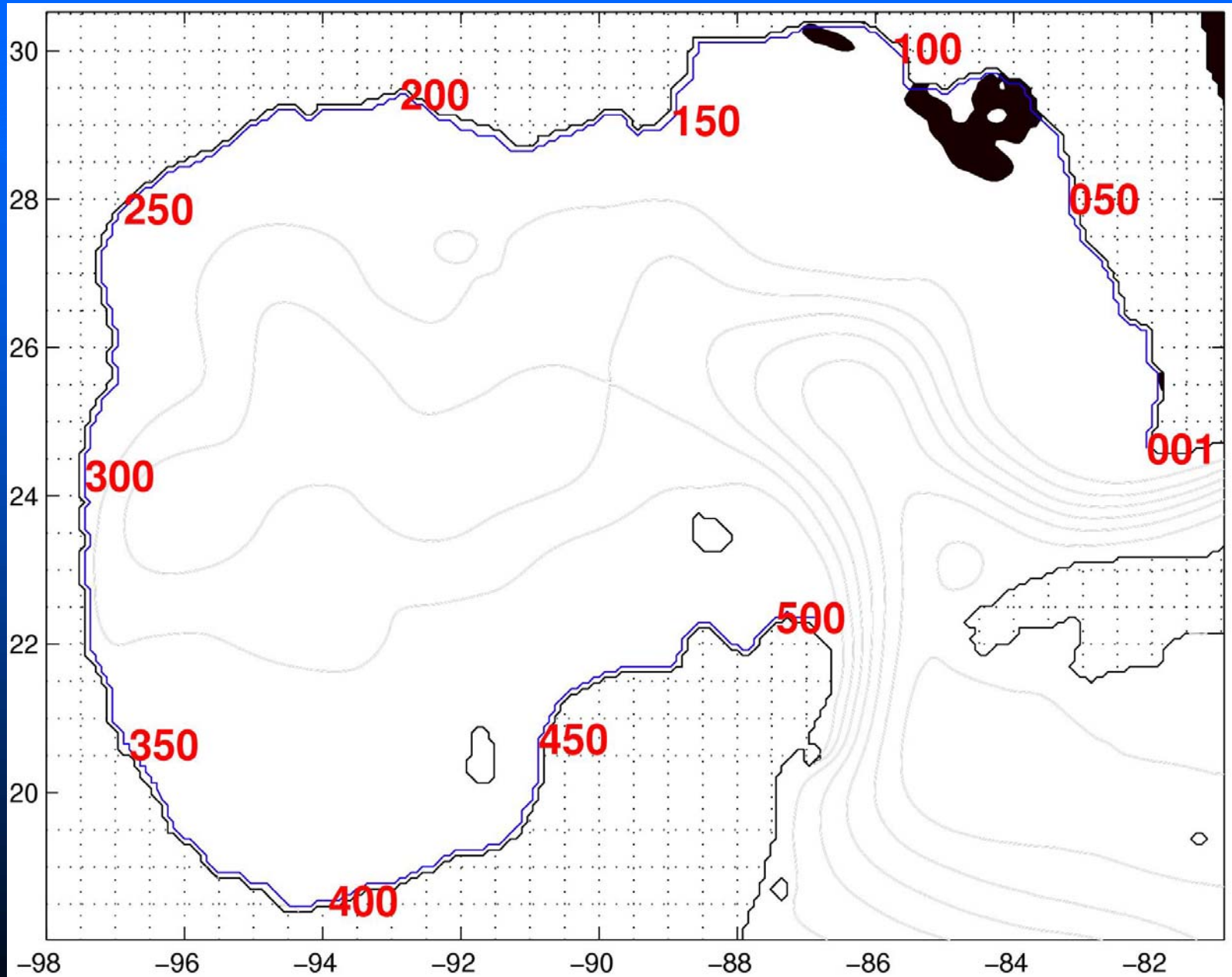
-95 -90 -85 -80

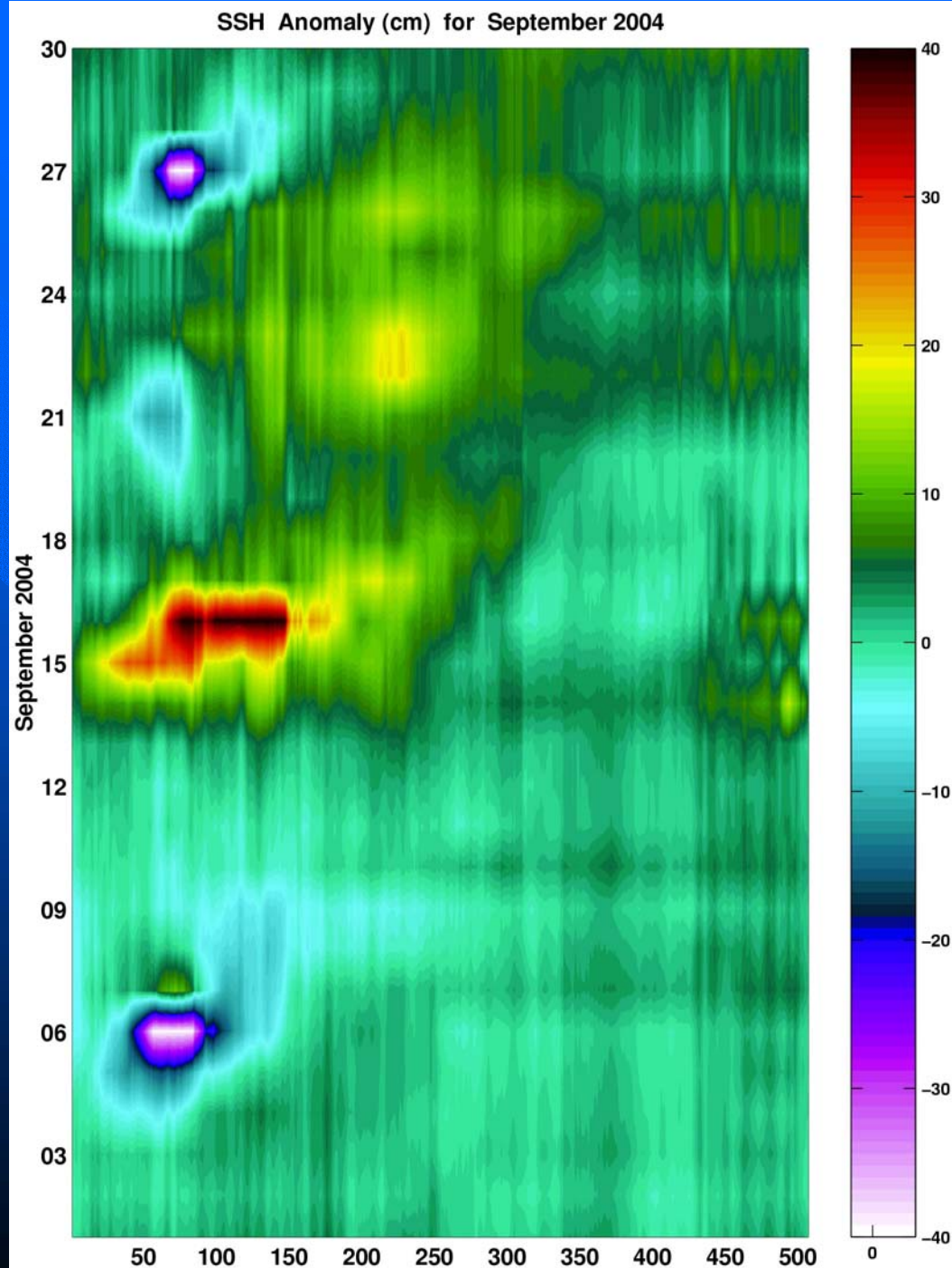


1/25° GOM-HYCOM Bottom Topography (m)

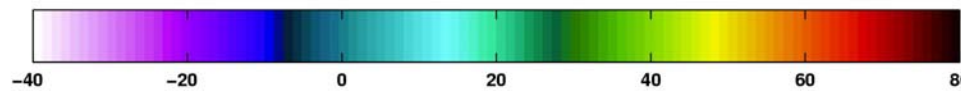
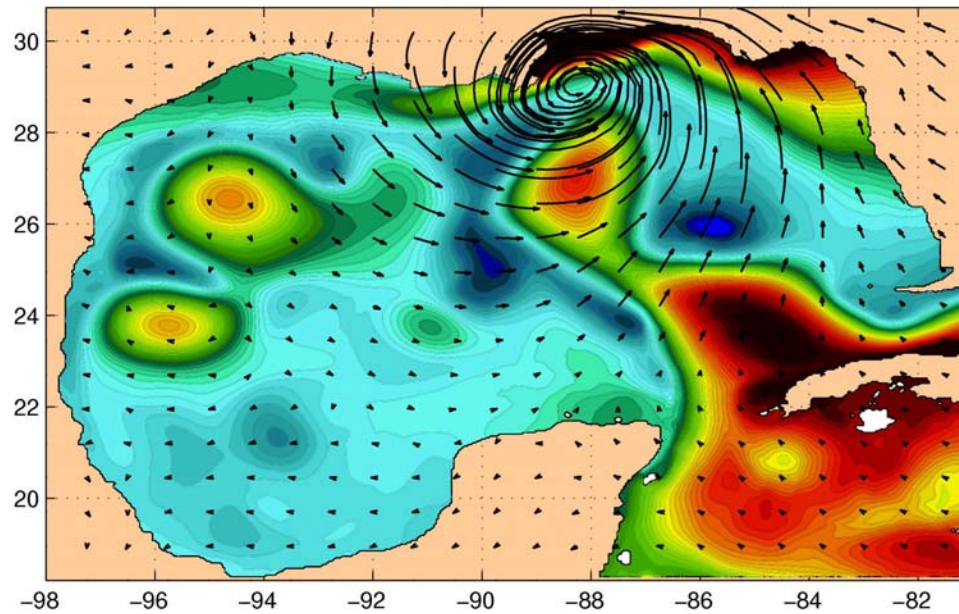


From Florida to Yucatan along the coast of the GOM

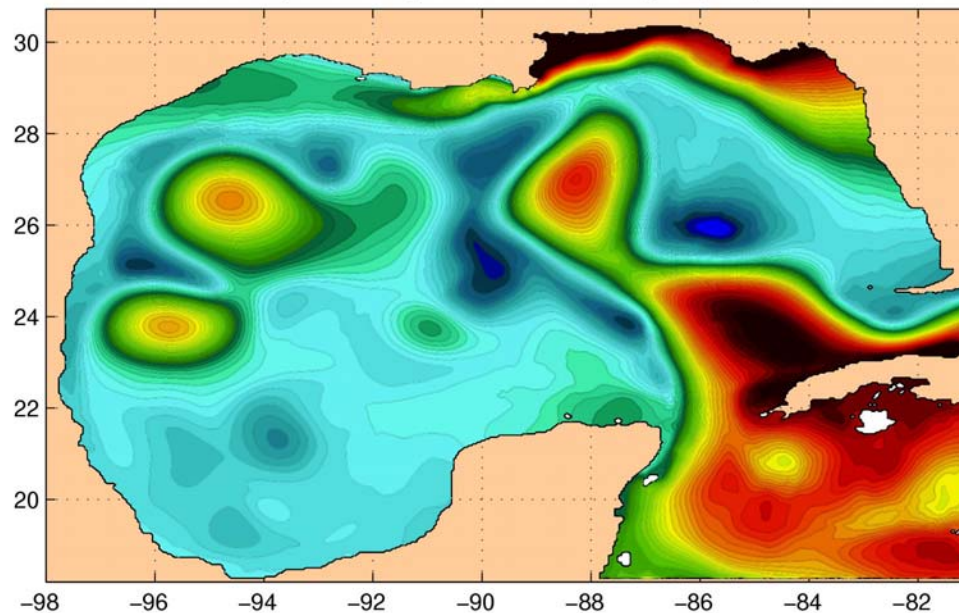




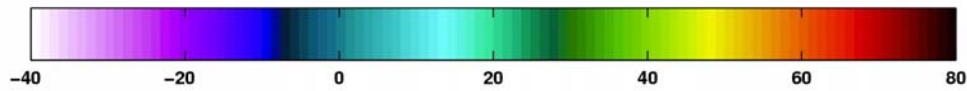
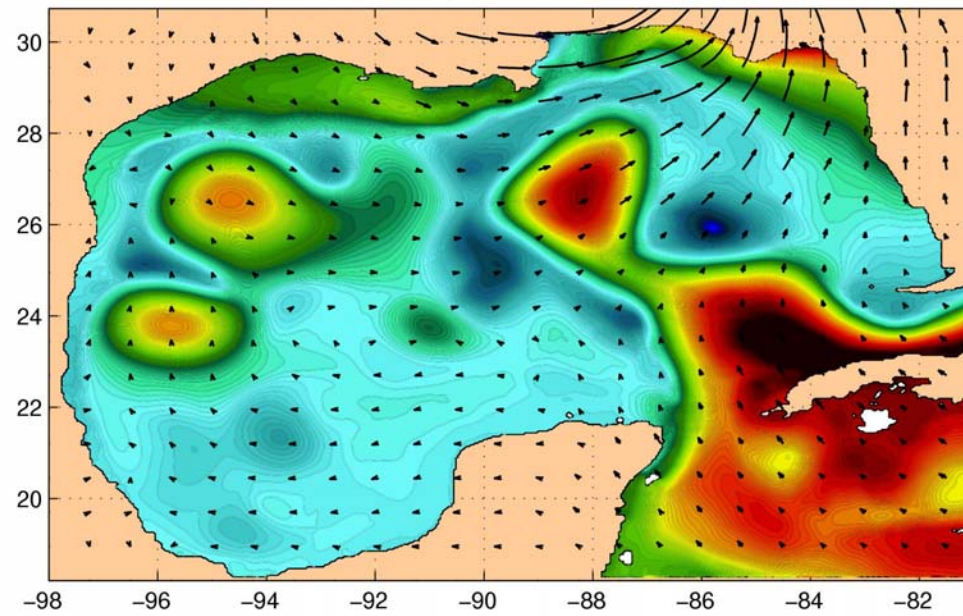
HYCOM-GOM-023 (NOGAPS WIND) Sea Surface Height (CM) for 2004-260-00



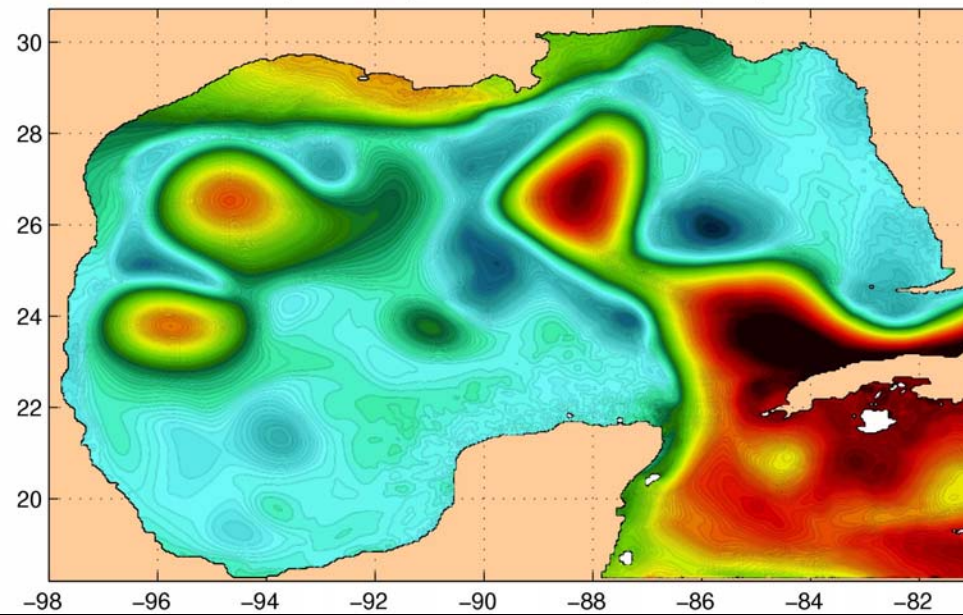
HYCOM-GOM-042 (NO WIND) Sea Surface Height (CM) for 2004-260-00



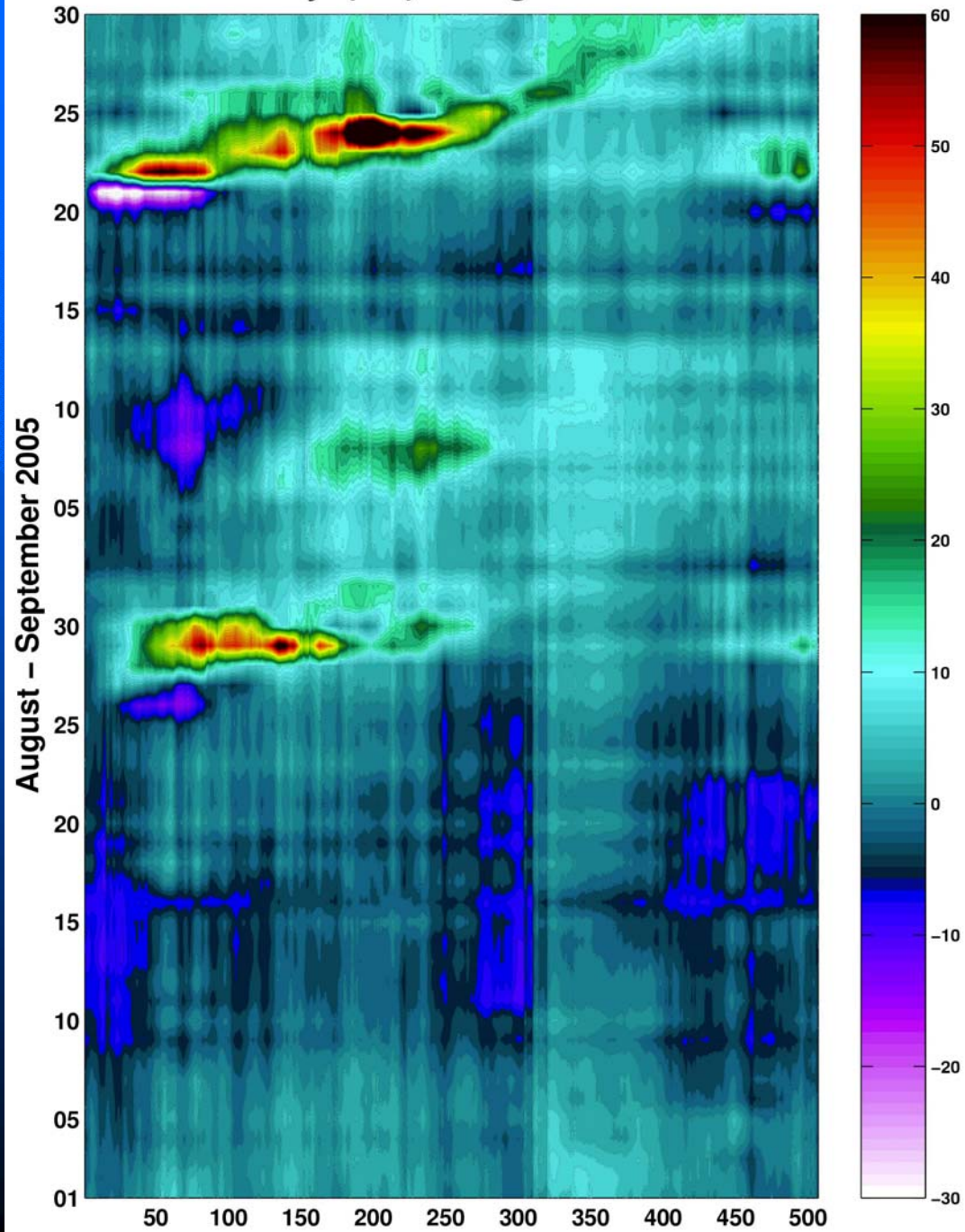
HYCOM-GOM-023 (NOGAPS WIND) Sea Surface Height (CM) for 2004-260-15

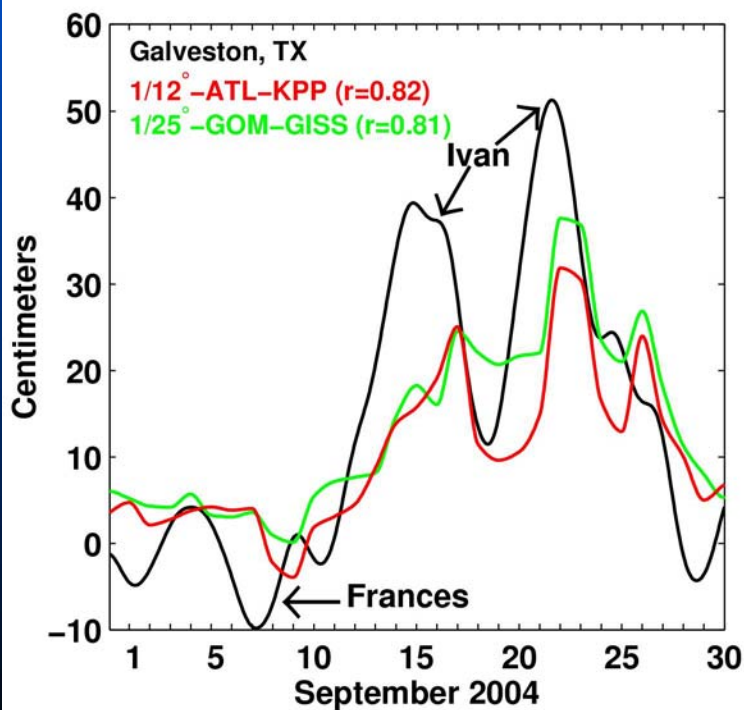
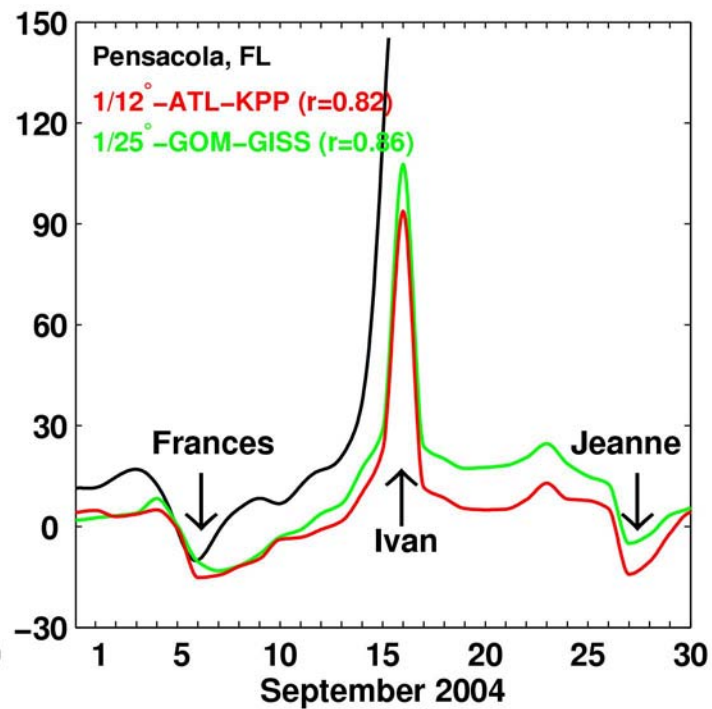
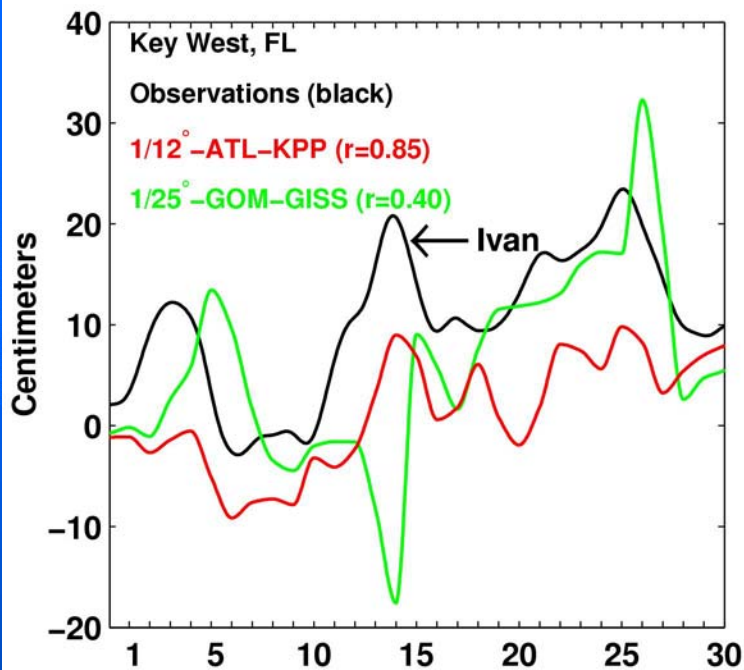


HYCOM-GOM-042 (NO WIND) Sea Surface Height (CM) for 2004-260-15



SSH Anomaly (cm) along the GOM Coast





Deterministic versus Nondeterministic variability of the GOM

In order to assess the degree of determinism in the experiments, an ensemble of seven simulations was integrated over the year 2004.

These simulations differed only in their initial states (one day apart).

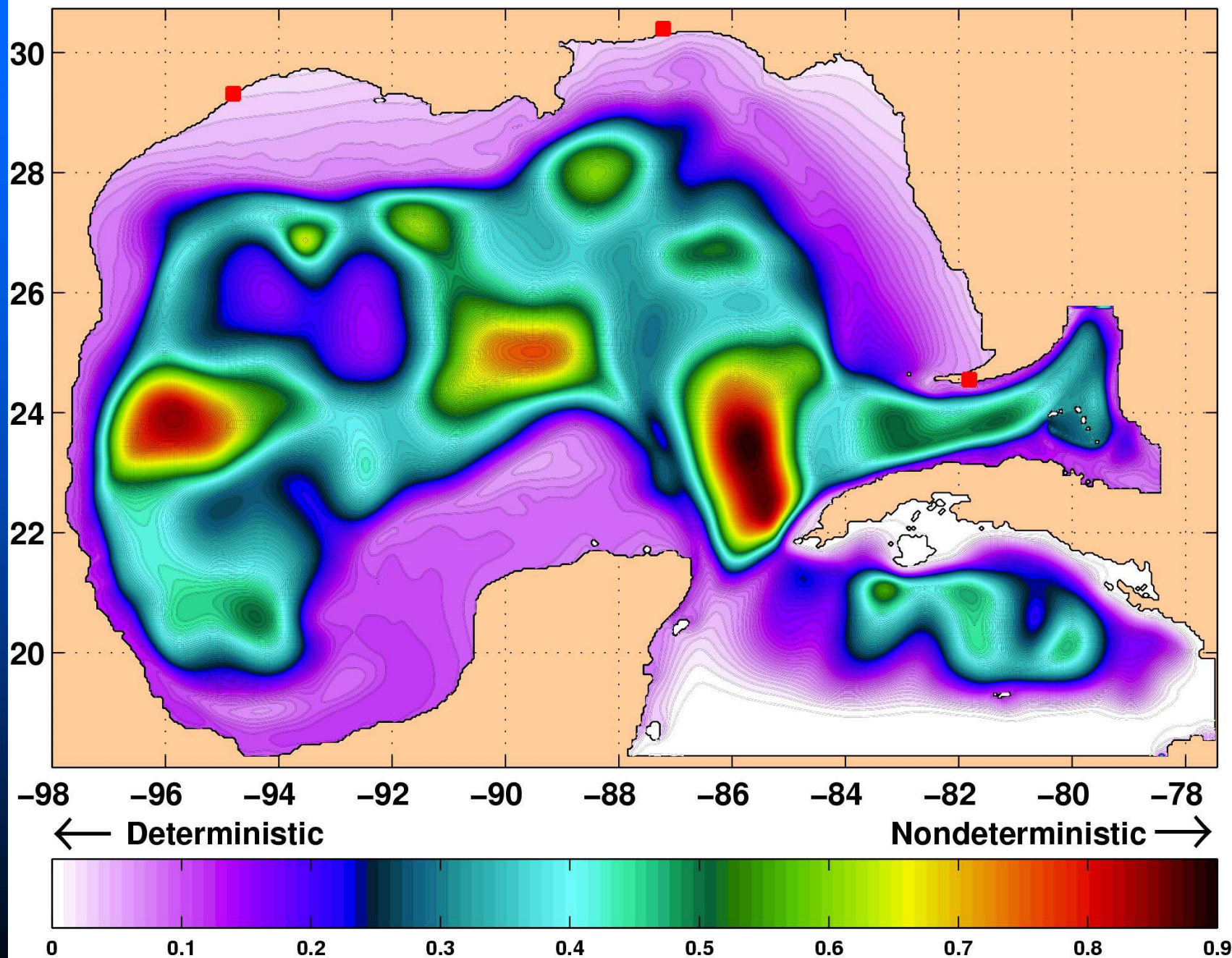
Since these simulations differ only in initial state, any differences between them can be attributed to nondeterministic differences in both the initial conditions and the evolution of the simulations.

Metzger et al. [1994] developed a technique to separate the variability of a variable into two components:

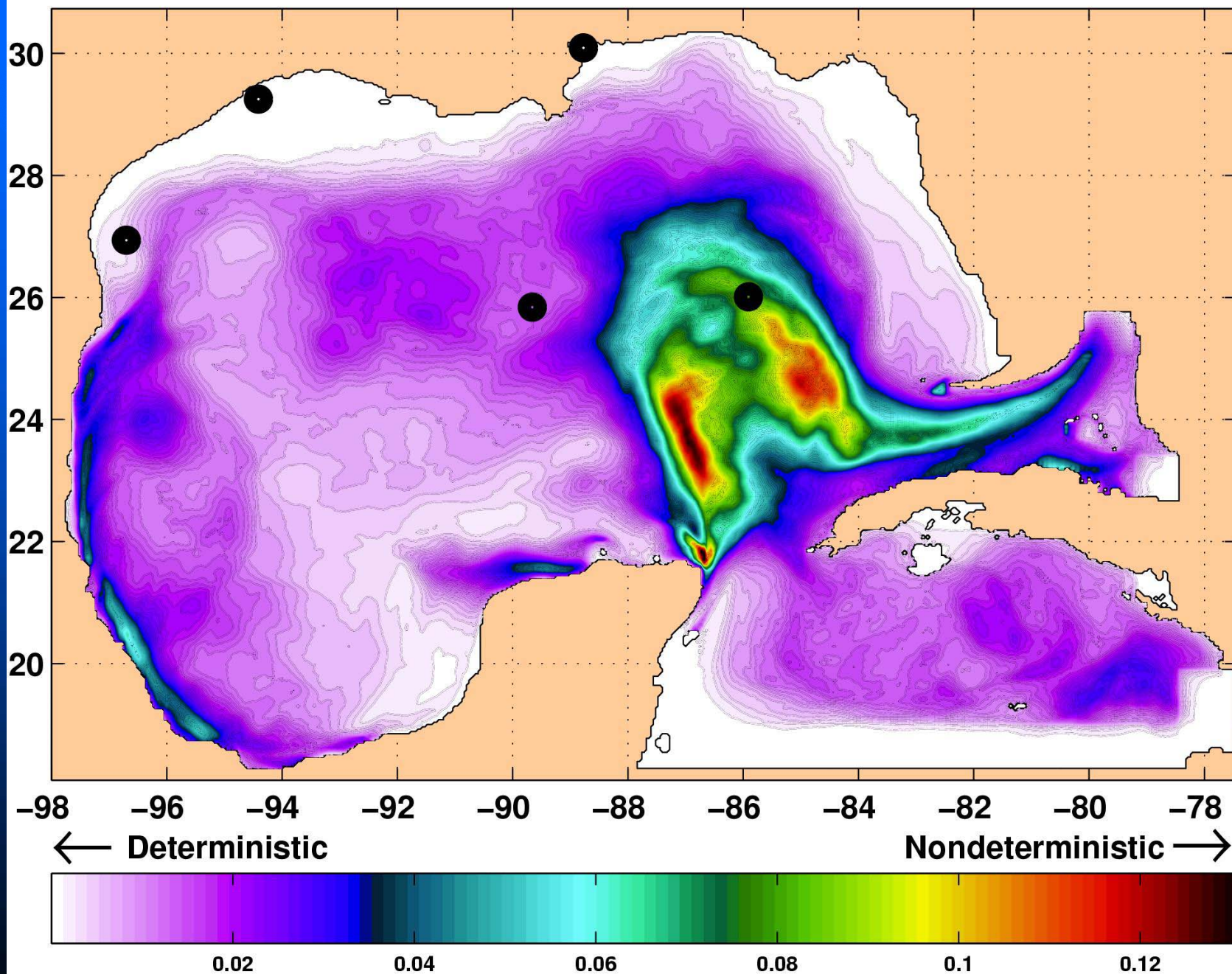
The deterministic component is a direct response to atmospheric forcing.

The nondeterministic component is due to nonlinear mesoscale flow instabilities.

HYCOM-GOM SSH (7 Experiments) Deterministic vs Nondeterministic



HYCOM-GOM MLT (7 Experiments) Deterministic vs Nondeterministic



Sea Surface Temperature (°C)

