Operational Oceanography in the South Atlantic Bight

A finite-element limited-area model as a coastal client to GODAE/HYCOM

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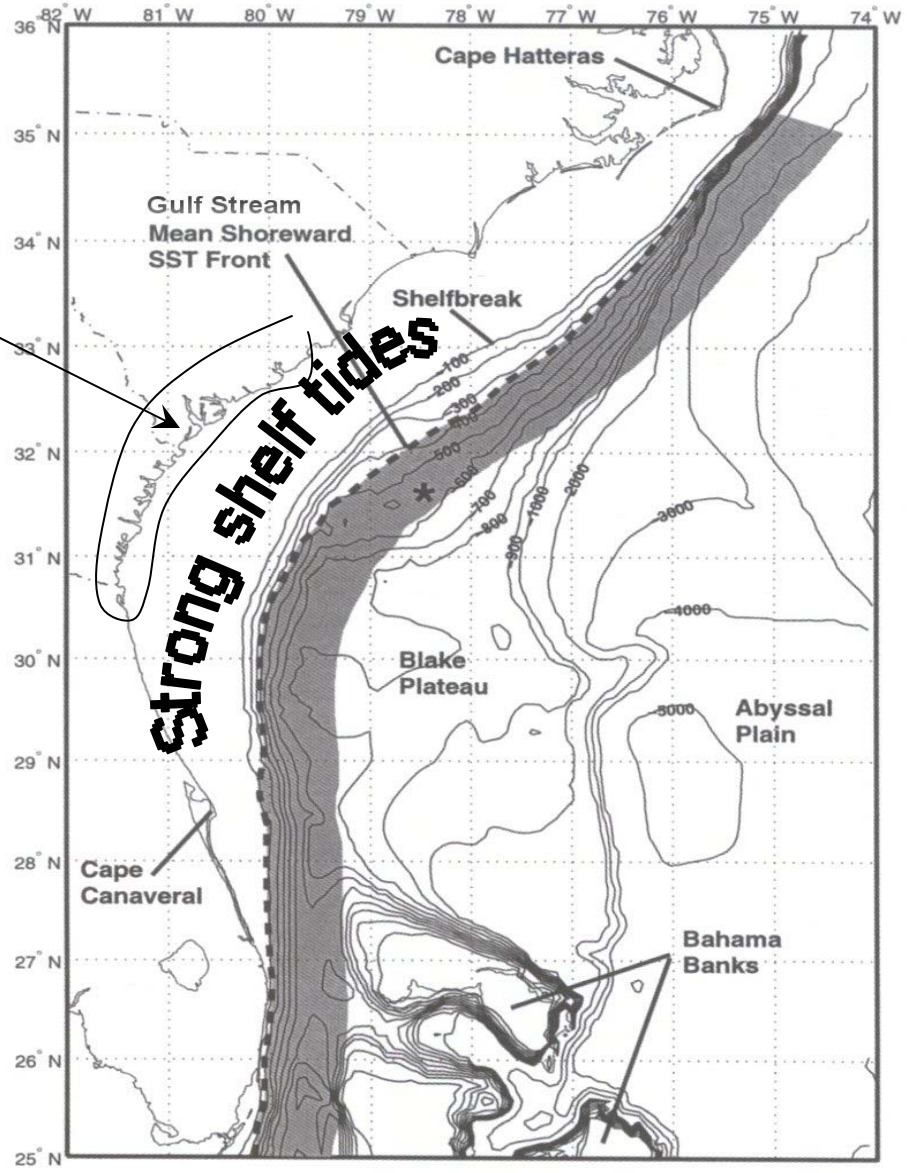
HYCOM MTG - 28 Oct 2004

South Atlantic Bight Characteristics

Significant tidal dissipation in estuaries and tidal inlets

Main inputs of Mass

- **Atmospheric flux (P-E)**
- **Shelfbreak exchange with Gulf Stream (meanders and filaments)**
- **Exchange with the Mid Atlantic Bight through the Cape Hatteras region**
- **River discharge**



Coastal perspective

- ***Why do coastal customers/clients/users matter?*** Bec/ of the impact of "events" on coastal (hence national) economics. I.e., STORM SURGE.

- **OceanUS** recommendations for coastal observing systems in conjunction with nowcast/forecast coastal ocean prediction systems

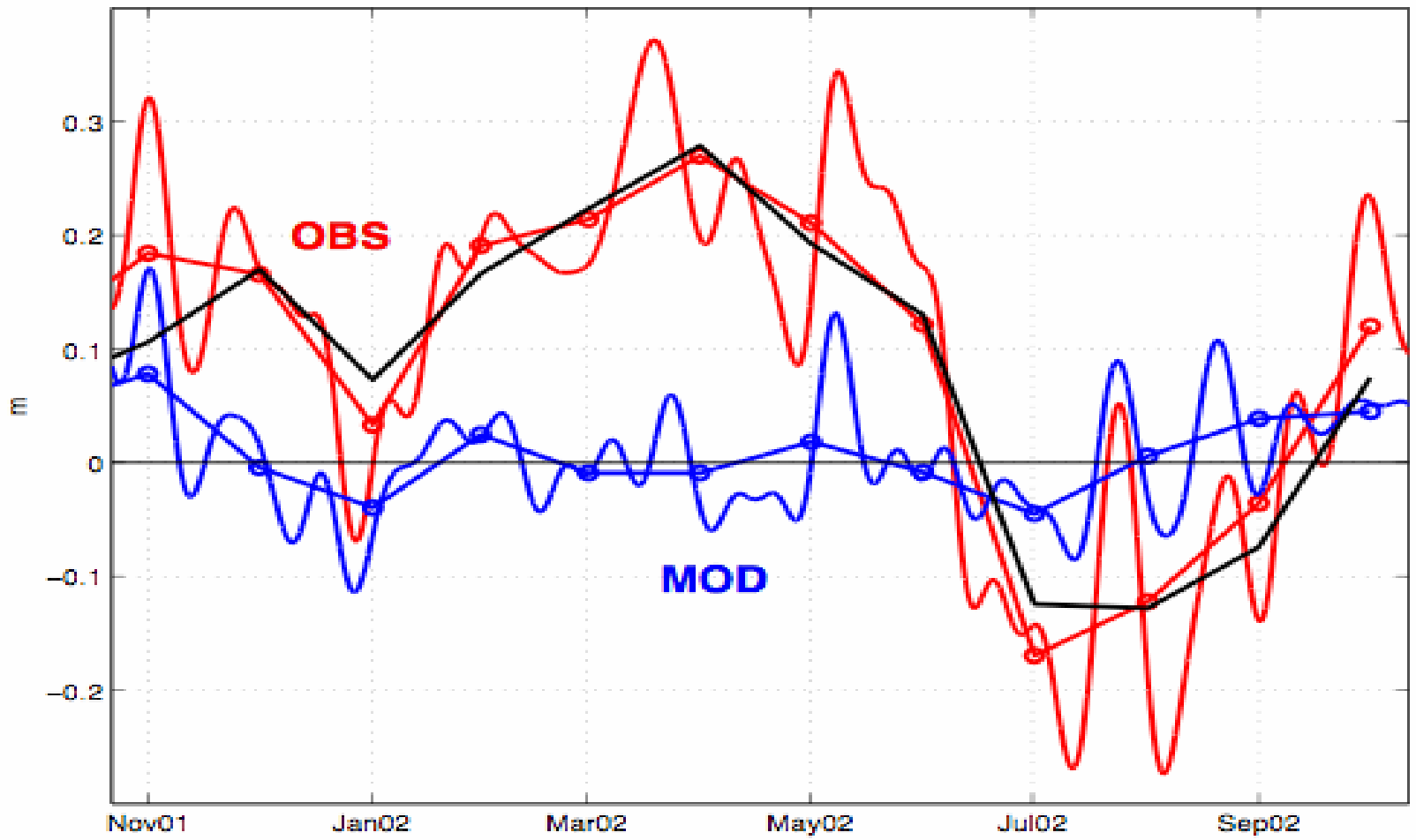
- Barotropic mode from "deep" ocean to continental shelf

- Use basin-scale models (HYCOM) for TS initialization
  - Use "regional" HYCOM
  - OR regional "familiar" models (ADCIRC,QUODDY)

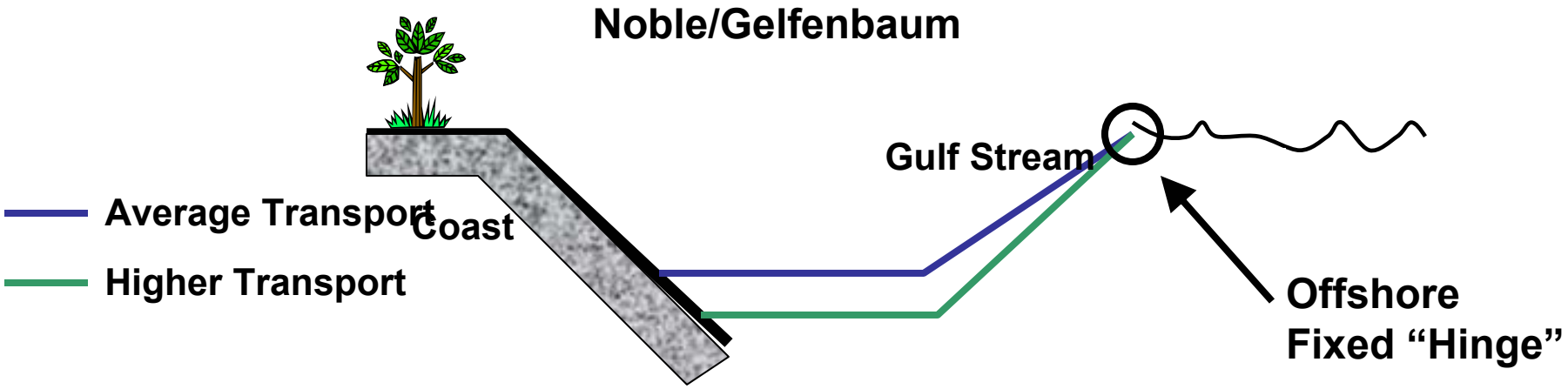
- "Coastal" doesn't mean "shelf-break"

ADCIRC St. Johns Water Level

Very-Low-Frequency (<1/15 c.p.d)



Lower Mean Sealevel



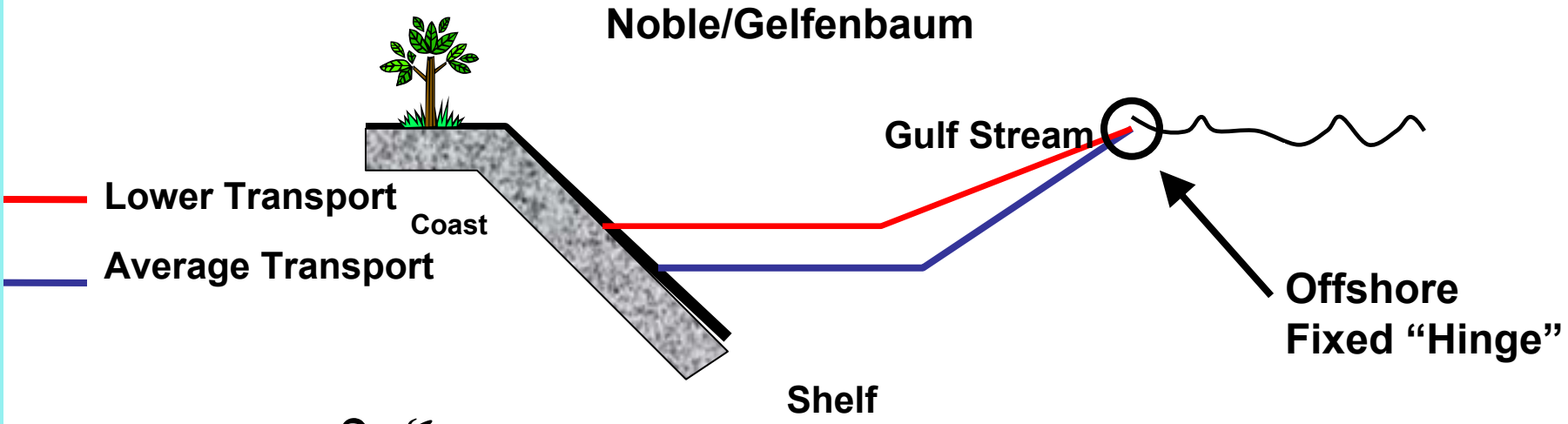
$$V_n \propto \frac{\partial \zeta}{\partial x}$$

Increased Transport

Increased Cross-stream Slope

LOWER Coastal Sealevel

Higher Mean Sealevel



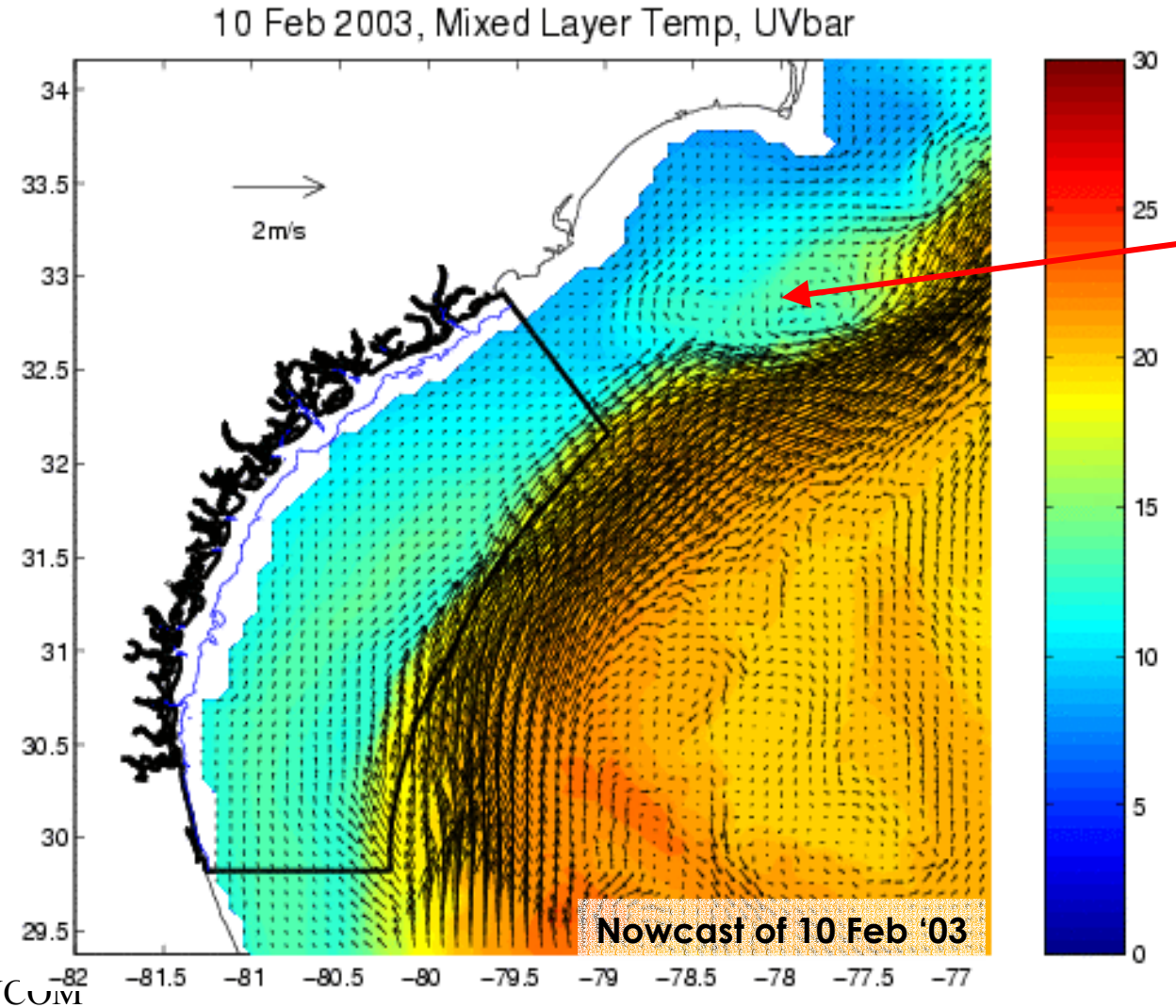
$$V_n \propto \frac{\partial \zeta}{\partial x}$$

Decreased Transport

Decreased Cross-stream Slope

HIGHER Coastal Sealevel

HYCOM, Charleston Bump



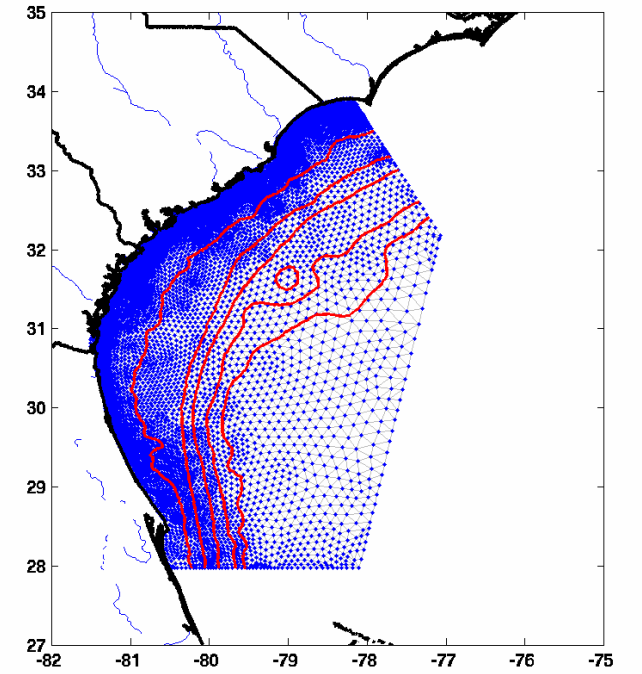
Deflection at Charleston Bump

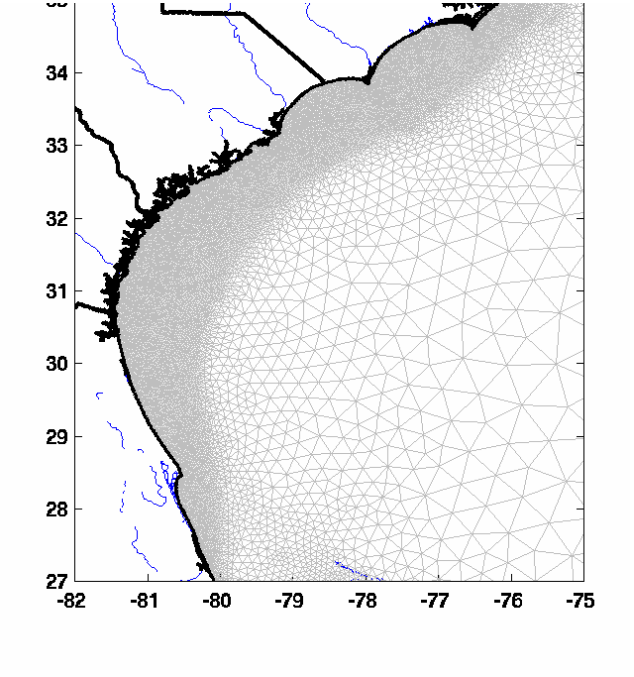
General "Operational" Procedure

- Acquire GODAE/HYCOM nowcast from OPeNDAP (**http://hycom.rsmas.miami.edu/cgi-bin/nph-dods/datasets/NAT_Nowcast**)

General "Operational" Procedure

- Map to unstructured QUODDY domain
  - Finite element, 21 sigma levels
  - Tides+Winds+HeatFlux
  - Advection: Pointwise Corrected Transport via Nodal Quadrature





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- Acquire GODAE/HYCOM nowcast from OPeNDAP (**http://hycom.rsmas.miami.edu/cgi-bin/nph-dods/datasets/NAT_Nowcast**
- Map to unstructured QUODDY domain
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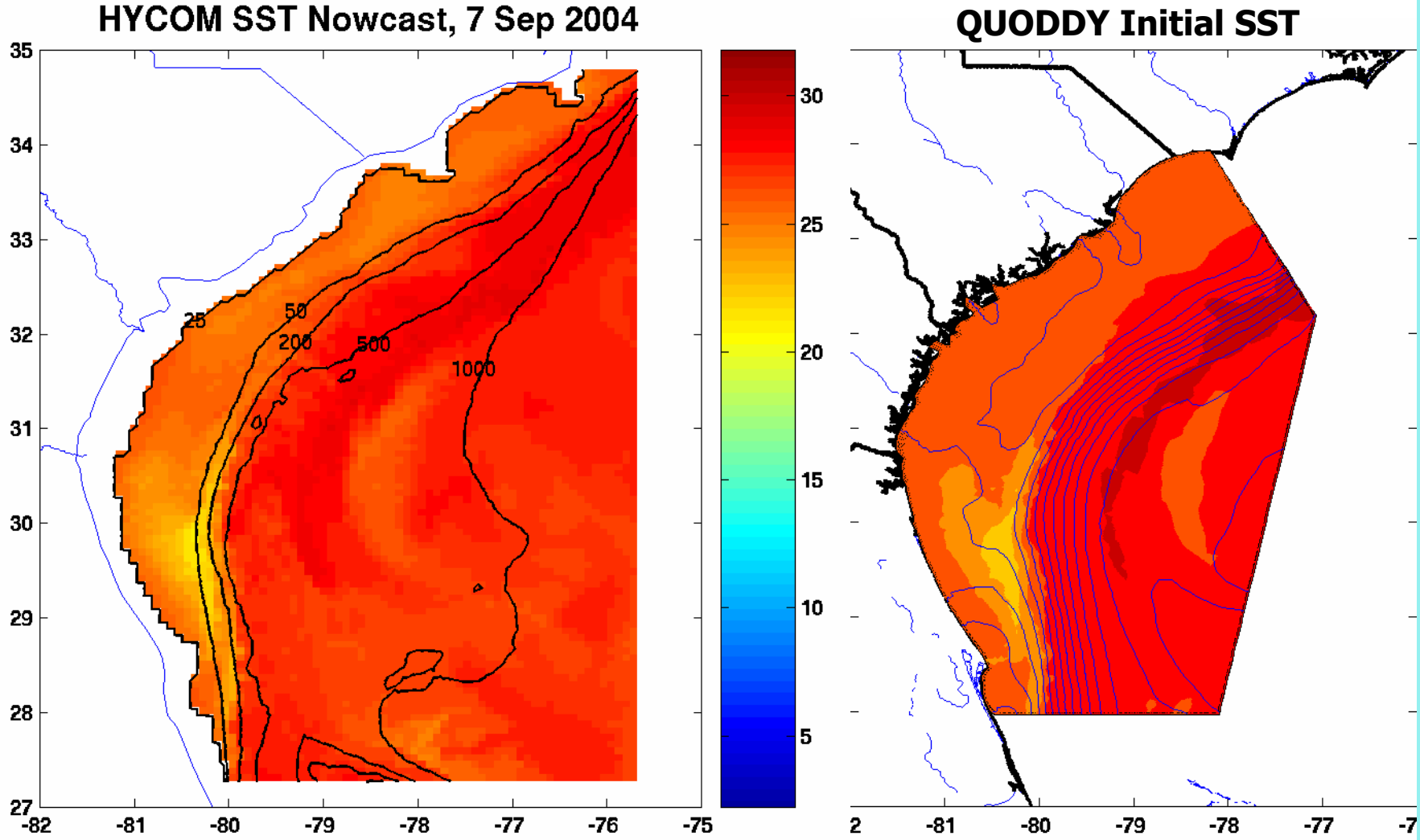
  - Advection: Pointwise Corrected Transport via Nodal Quadrature
- **Spin up tides+winds, diagnostic (7 days)**
- **Let loose netQ and advection**

SST Mapping



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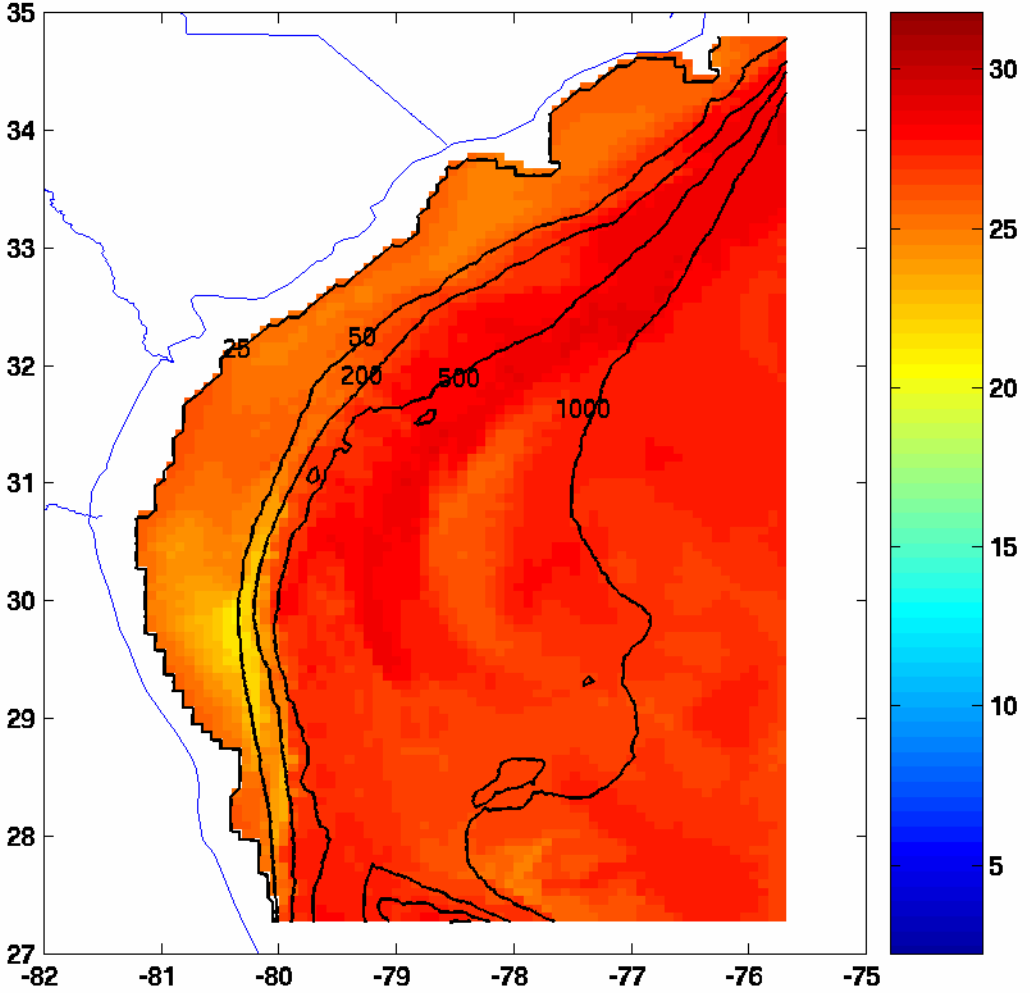
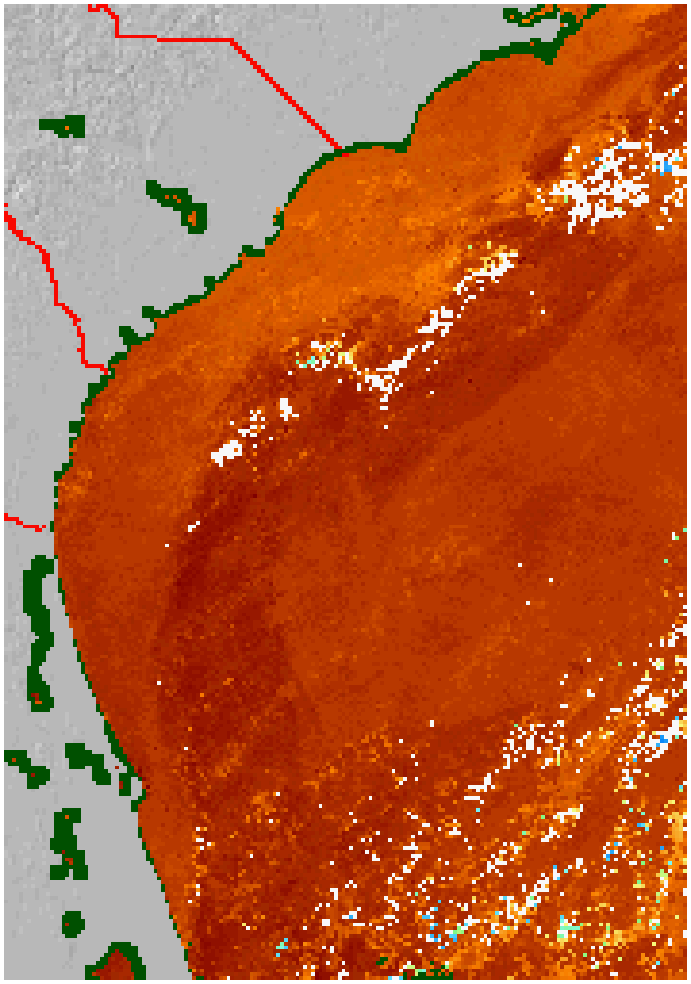
SST Comparison



AVHRR 7 Sep, 2004
7-day composite



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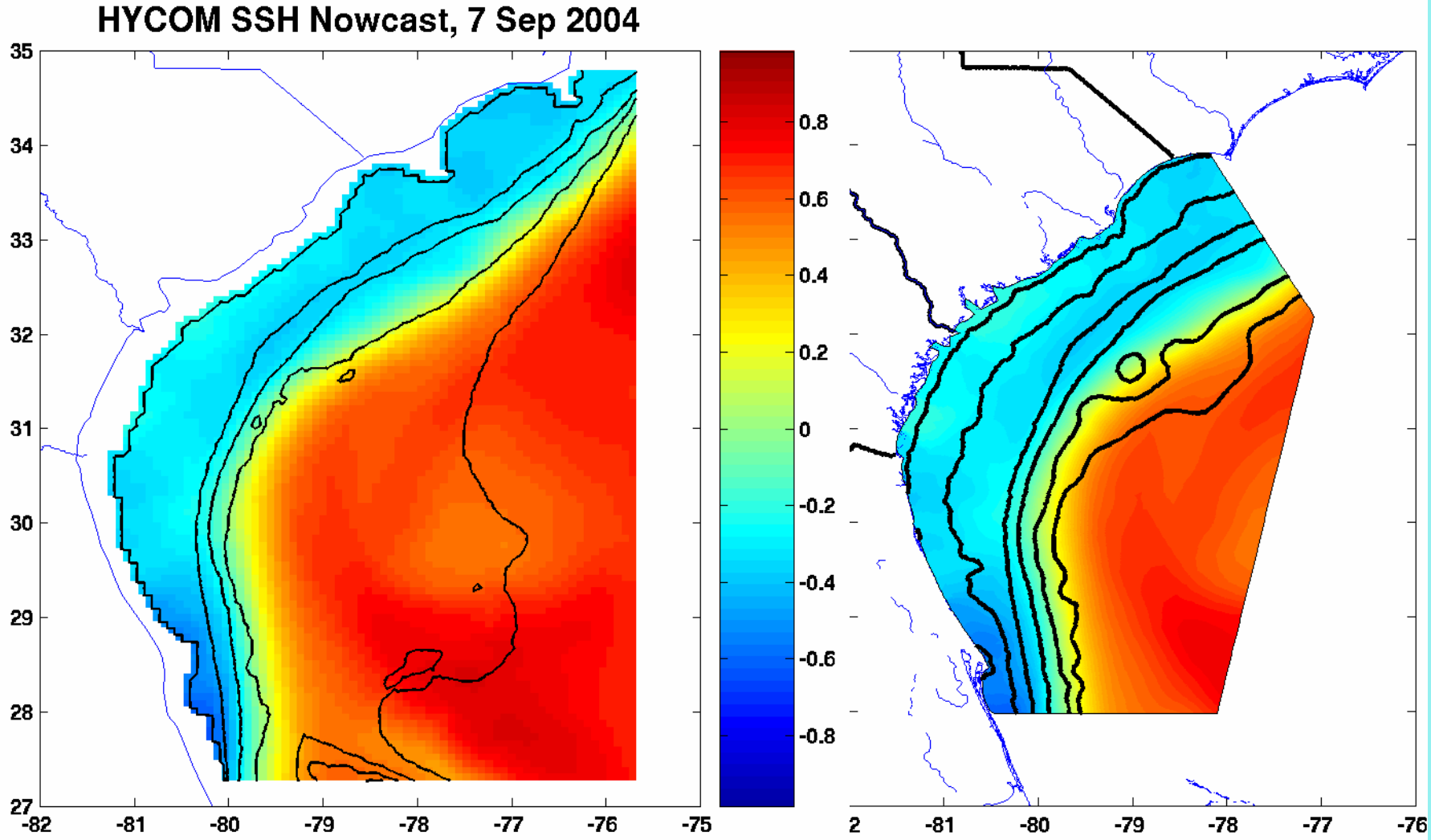
SSH …



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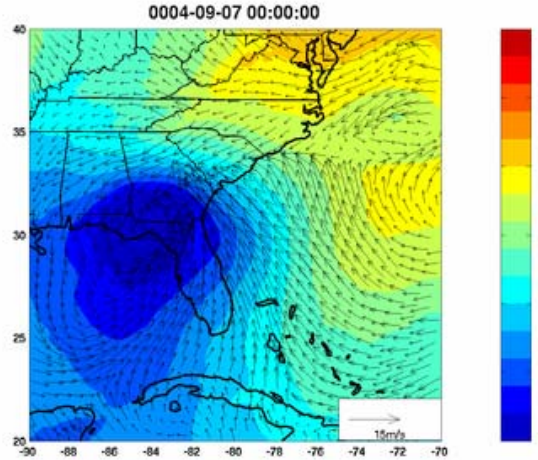
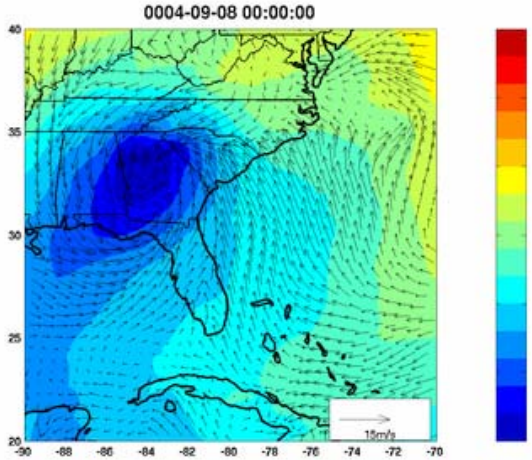
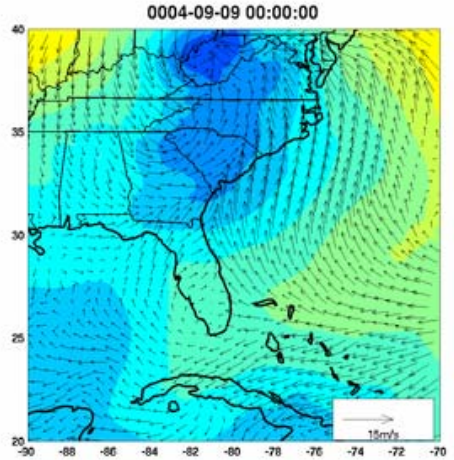
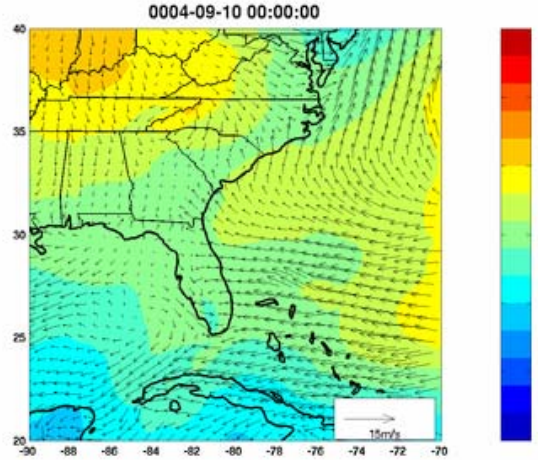
Synoptic Situation

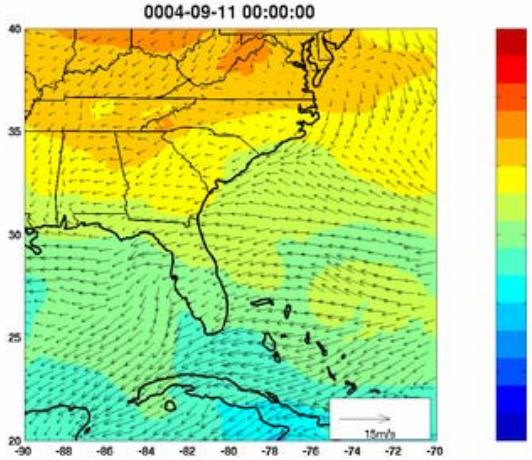
NCEP/Eta PRMSL, UV_{10m}

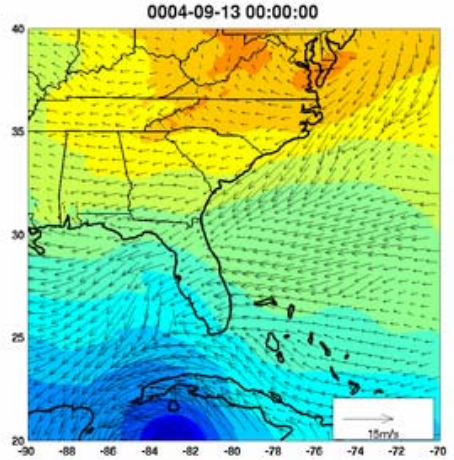




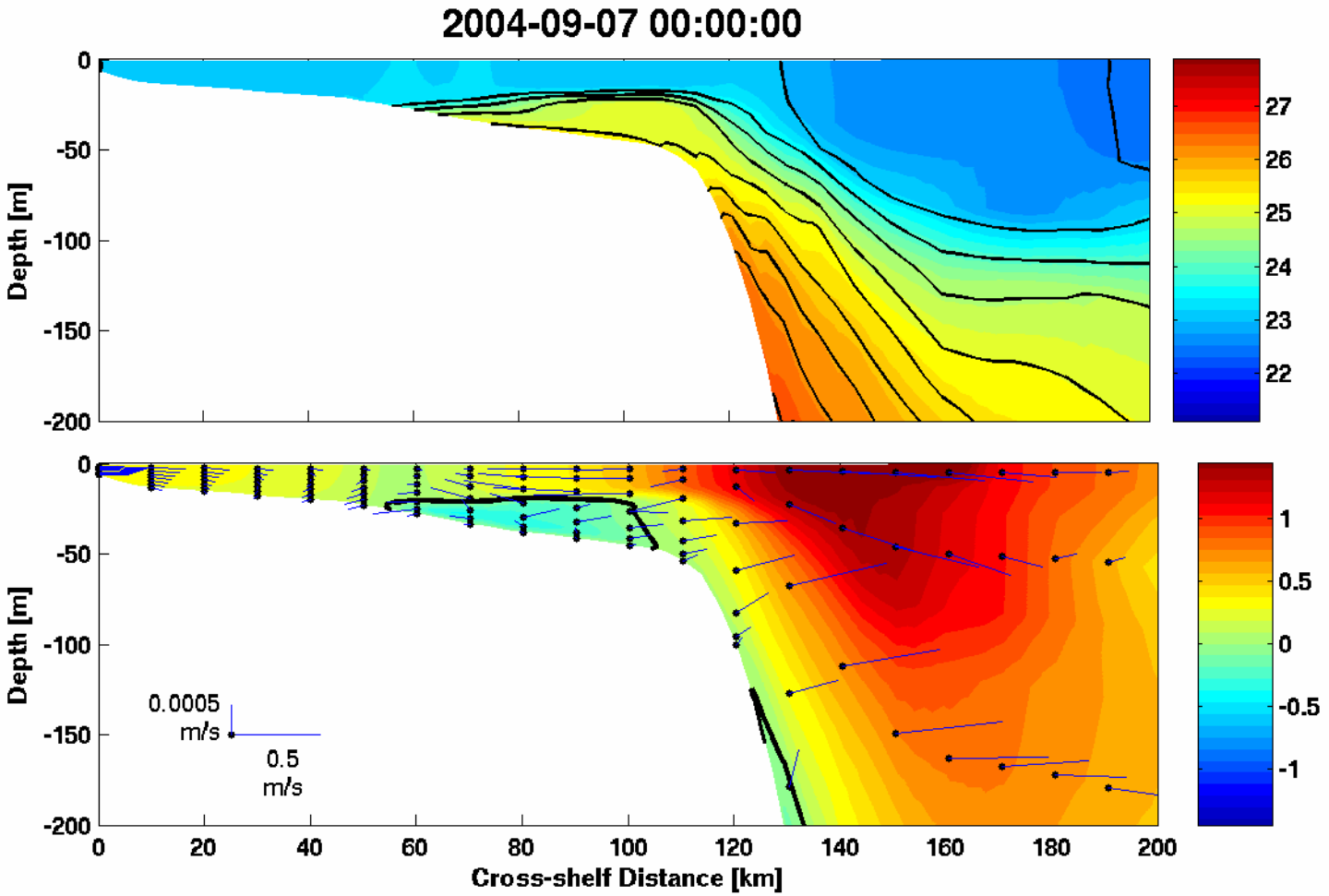








SAB Cross-shelf Transect



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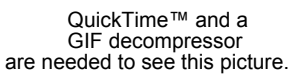
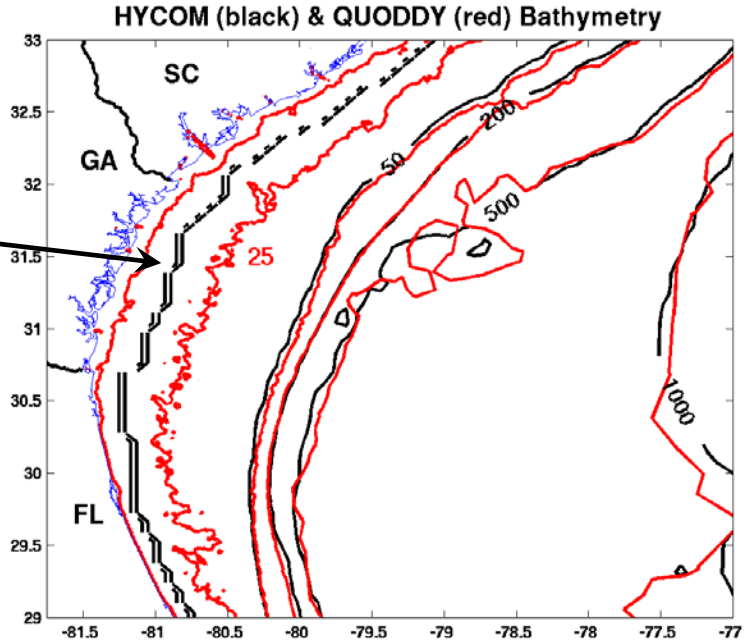

QuickTime™ and a
GIF decompressor
are needed to see this picture.

Issues

- Forcing compatability (ECMWF vs NCEP/ETA)
- Bathymetry/coastline

HYCOM Coastal Wall



Future …

- HYCOM SSH, TS comparison in SAB
  - Point-wise comparison of HYCOM products
- Very short-term (~ 3-4 day) forecasts of shelf state
- Use of HYCOM as best prior estimate of shelf ocean state
  - OI/EnsKF of shelf observations from Navy Towers
- "GRID"-based distribution of regional/limited-area results