U.S. GODAE: Global Ocean Prediction with

Community Effort: NRL, FSU, U. of Miami, NASA-GISS, NOAA/NCEP, NOAA/AOML, NOAA/PMEL, PSI, FNMOC, NAVOCEANO, SHOM, LEGI, OPeNDAP, UNC, Rutgers, USF, Fugro-GEOS, Orbimage, Shell, ExxonMobil

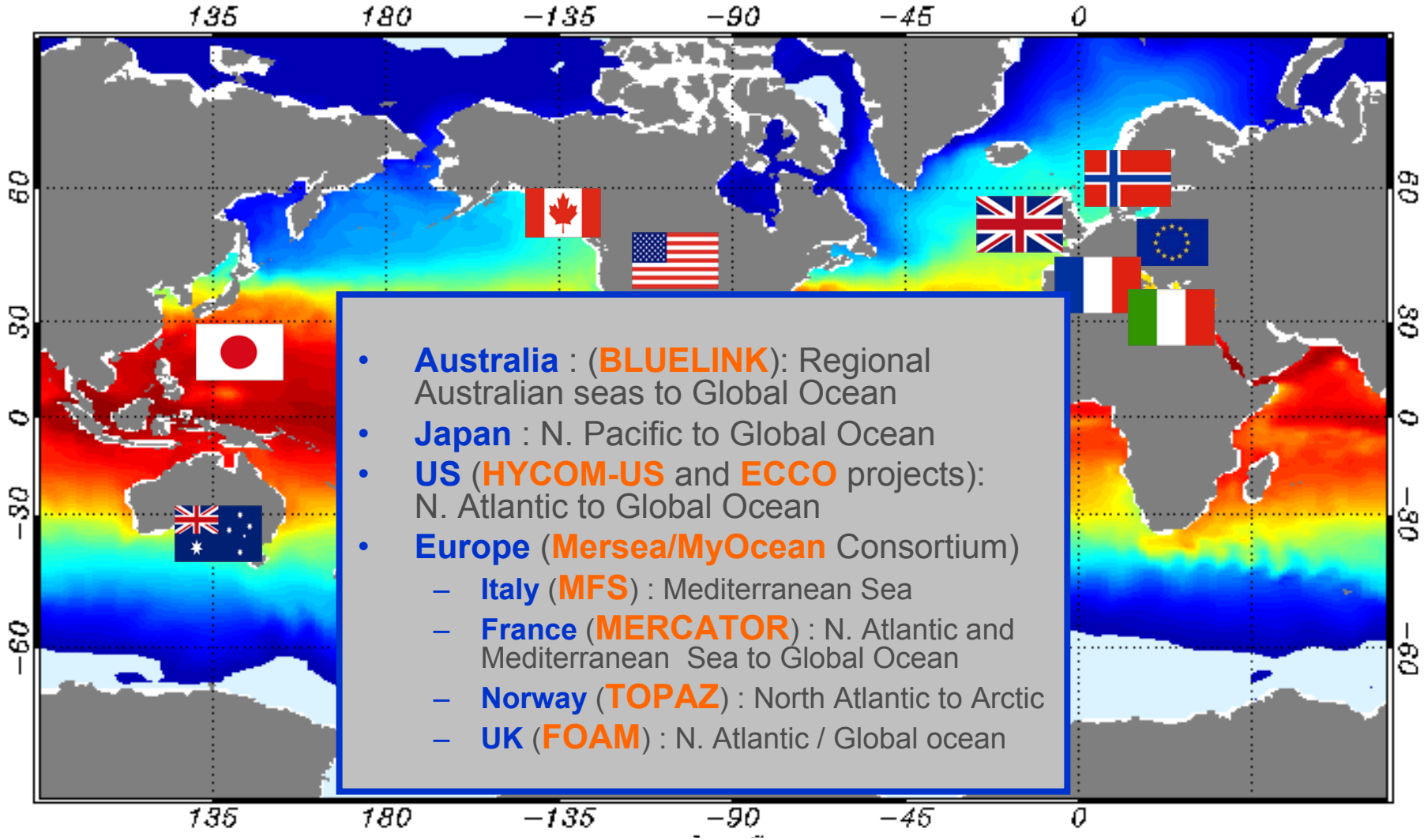
HYCOM
HYbrid Coordinate Ocean Model

Global Ocean Data Assimilation Experiment (GODAE)

The vision:

"A global system of observations, communications, modeling and assimilation, that will deliver regular, comprehensive information on the state of the oceans in a way that will promote and engender wide utility and availability of this resource for maximum benefit to society."

GODAE
Modeling/Assimilation Centers



- **Australia** : (**BLUELINK**): Regional Australian seas to Global Ocean
- **Japan** : N. Pacific to Global Ocean
- **US** (**HYCOM-US** and **ECCO** projects): N. Atlantic to Global Ocean
- **Europe** (**Mersea/MyOcean** Consortium)
  - **Italy** (**MFS**) : Mediterranean Sea
  - **France** (**MERCATOR**) : N. Atlantic and Mediterranean Sea to Global Ocean
  - **Norway** (**TOPAZ**) : North Atlantic to Arctic
  - **UK** (**FOAM**) : N. Atlantic / Global ocean

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HYbrid Coordinate Ocean Model

Objectives and Goals

- A broad partnership of institutions that collaborate in developing and demonstrating the performance and application of eddy-resolving, real-time global and basin-scale ocean prediction systems using HYCOM.
- Transition for operational use by the U.S. Navy at NAVOCEANO (2008) and by NOAA at NCEP (N. Atlantic - 2007).

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Objectives and Goals

- Strong participation of the coastal ocean modeling community in using and evaluating boundary conditions from the global and basin-scale ocean modeling prediction systems
- Efficient data distribution (100 Terabytes Storage Area Network)

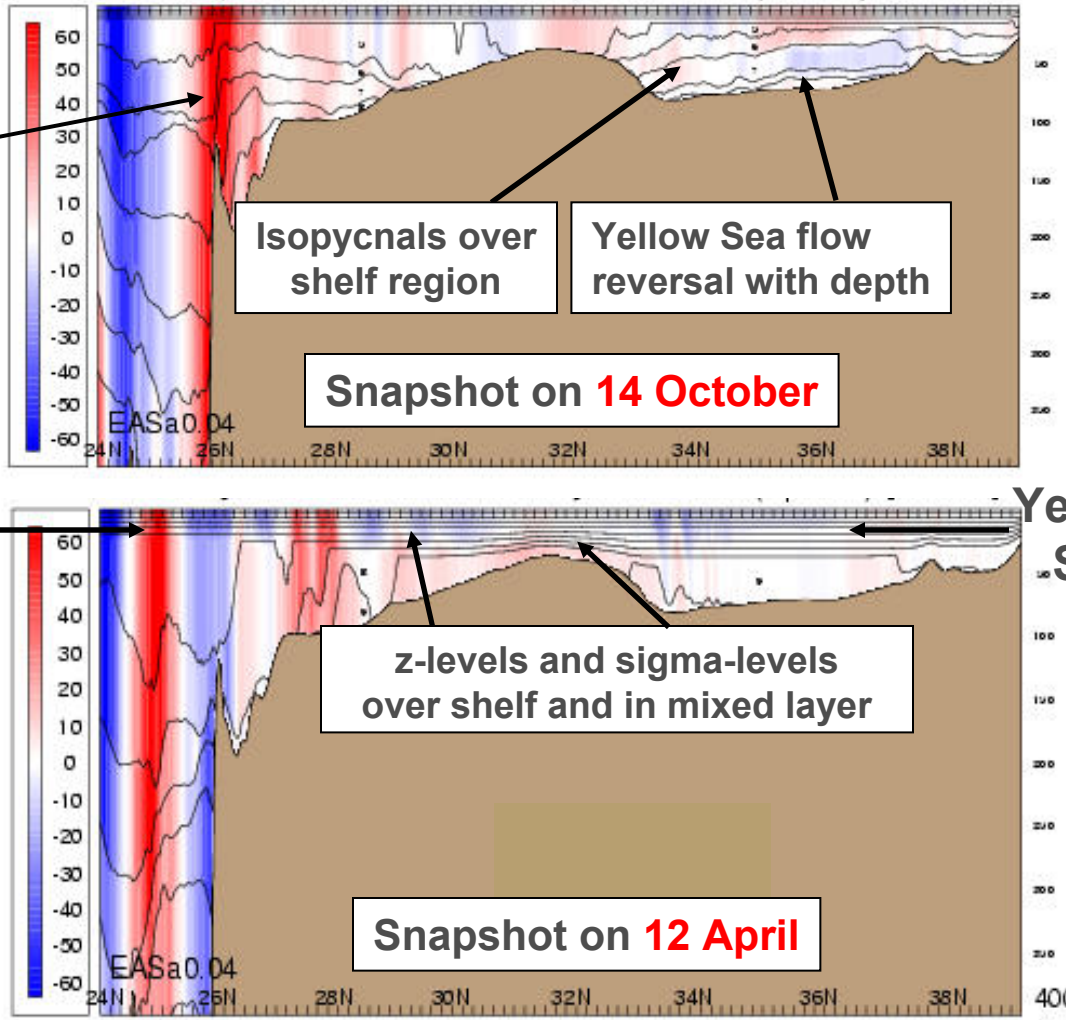
  The data are available to the community at large within 24 hours via Live Access Server (LAS), ftp, and OPeNDAP at http://www.hycom.org

HYCOM
HYbrid Coordinate Ocean Model

The hybrid coordinate in HYCOM is one that is isopycnal in the open, stratified ocean, but smoothly reverts to a terrain-following coordinate in shallow coastal regions, and to pressure coordinate in the mixed layer and/or unstratified seas

1/25° East Asian Seas HYCOM (nested inside 1/6° Pacific HYCOM)

North-south velocity cross-section along 124.5°E, upper 400 m



blue=westward flow

red=eastward flow

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Present nowcast/forecast systems

1/12º Atlantic near real-time system

- Running once a week since July 2002
- Assimilation: gridded surface observations only
- 10 day hindcast, 14 day forecast

1/12º Global real time system

- Running daily since December 2006
- Assimilation: NCODA
- 5 day hindcast, 5 day forecast

1/25º Gulf of Mexico real time system

- Running daily since November 2006
- Assimilation: NCODA
- 5 day hindcast, 7 day forecast

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Global HYCOM configuration

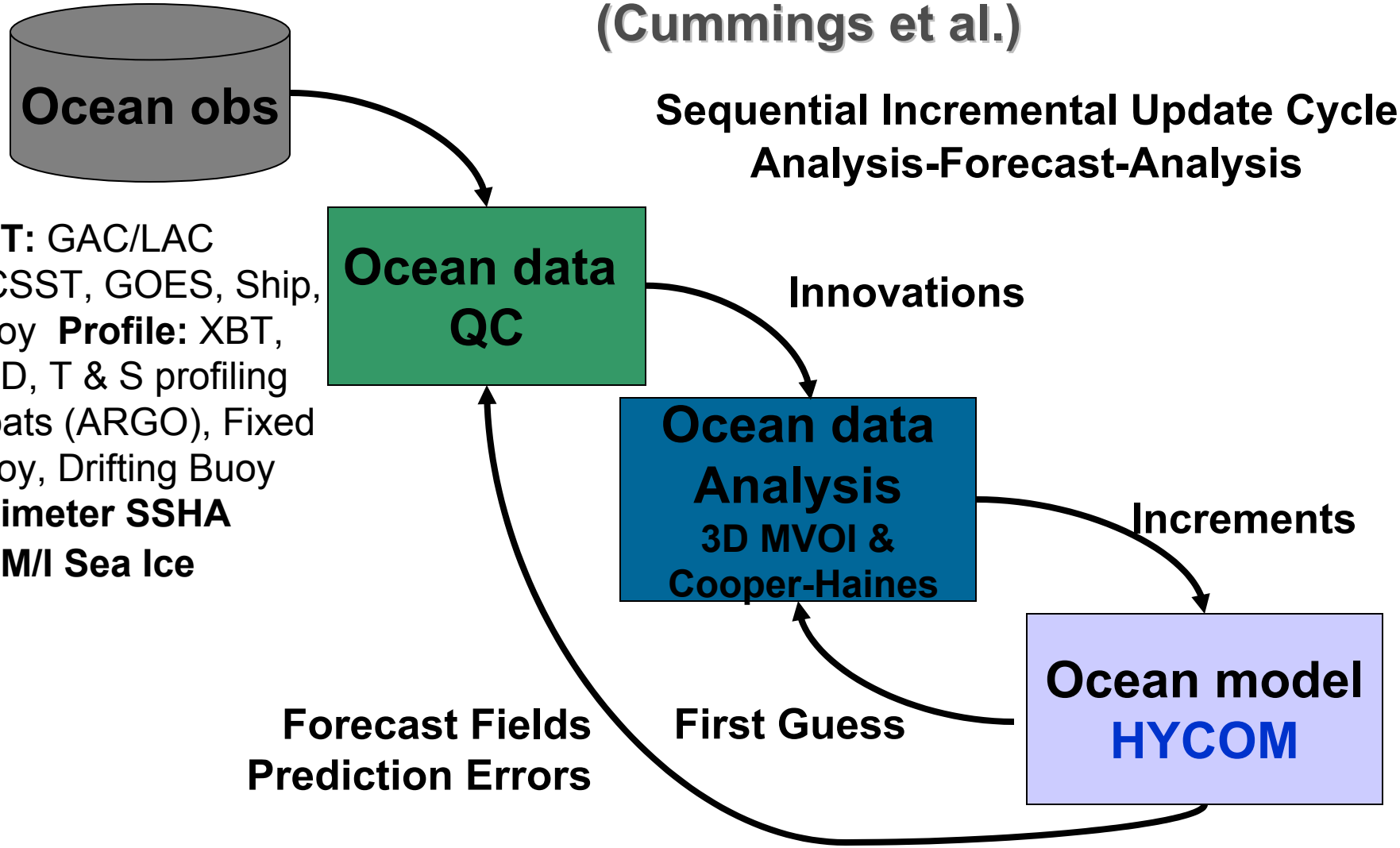
- Horizontal grid: 1/12° equatorial resolution
  - 4500 x 3298 grid points, ~6.5 km spacing on average, ~3.5 km at pole, 5 m minimum depth
- Mercator 79°S to 47°N, then Arctic dipole patch
- 32 σ_2* vertical coordinate surfaces:
- KPP mixed layer model
- Thermodynamic sea-ice model (soon to be PIPS/CICE)
- Surface forcing: wind stress, wind speed, thermal forcing, precipitation, weak relaxation to climatological SSS
- Monthly river runoff (986 rivers)
- Initialized from January climatology (GDEM3) T and S

216,000 CPU hrs/model year on 784 IBM Power 4+ CPUs

7.2 TB/model year for daily 3-D output

Data Assimilation via NCODA

(Cummings et al.)



MVOI - simultaneous analysis 5 ocean variables
temperature, salinity, pressure, velocity (u,v)

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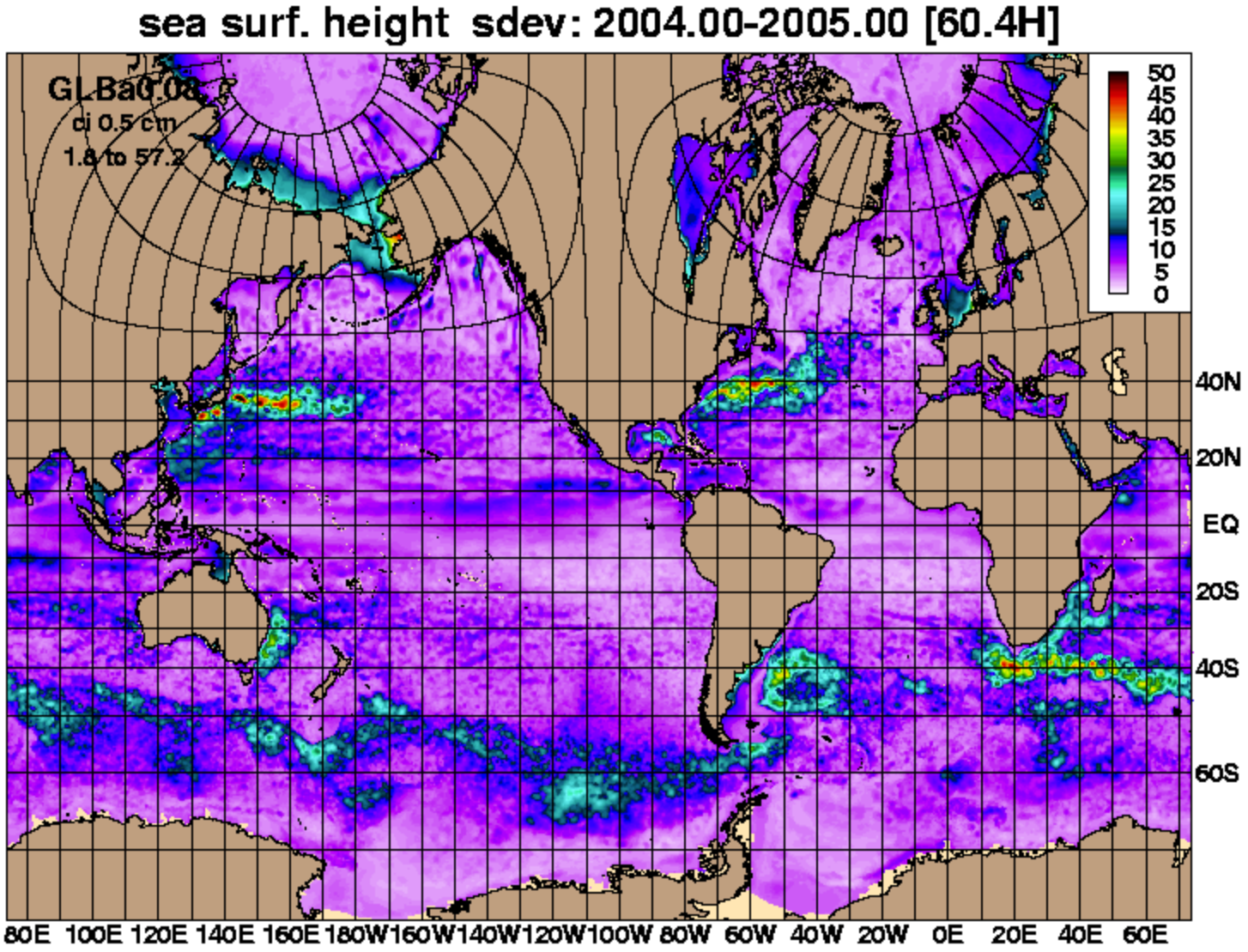
HYbrid Coordinate Ocean Model



with assimilation (GLBa0.08-60.4)

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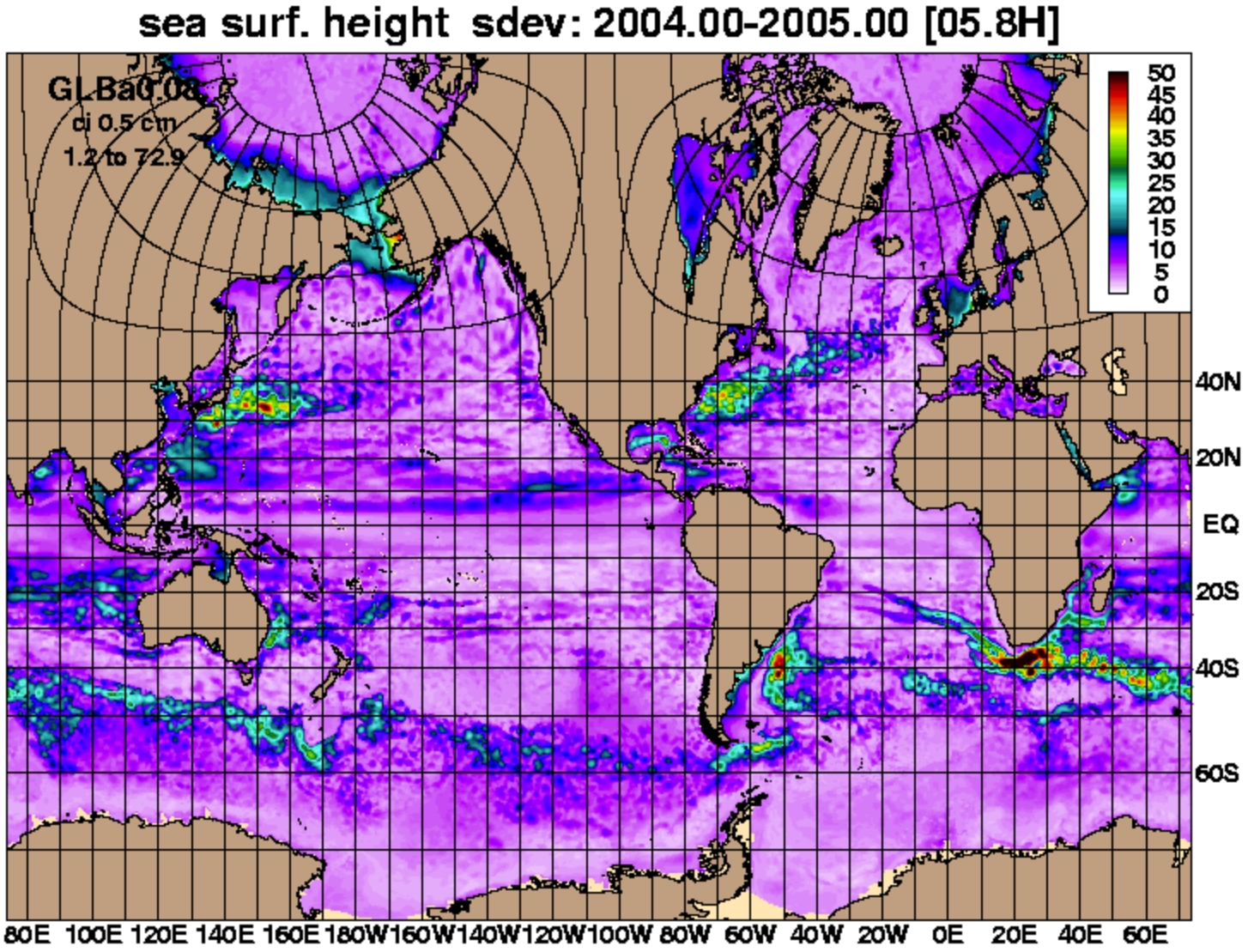
HYbrid Coordinate Ocean Model



without assimilation (GLBa0.08-05.8)

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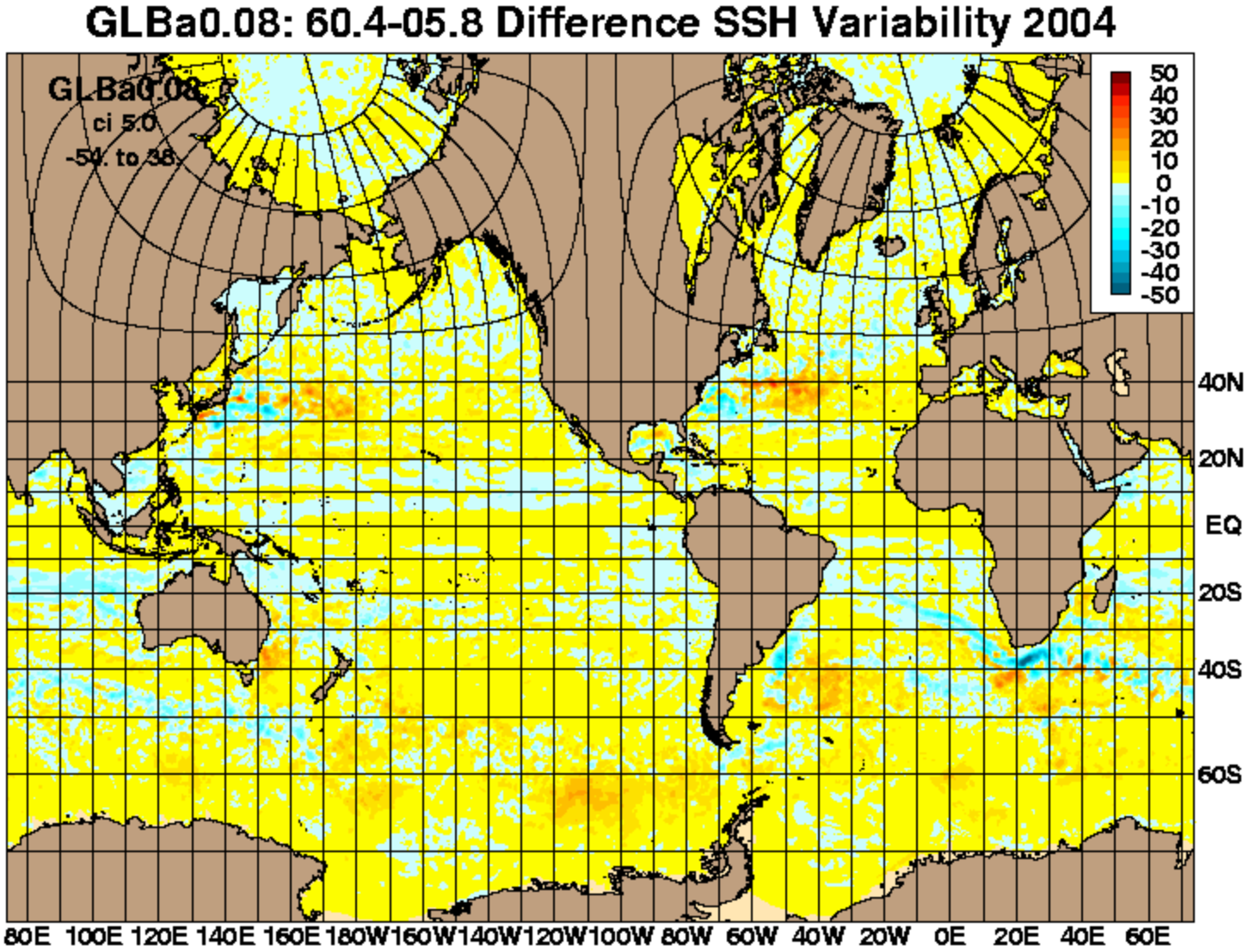

Overall increase in variability - largest changes occur in the western boundary currents

Eddy Kinetic Energy Comparison

EKE at ~700 m in the Gulf Stream

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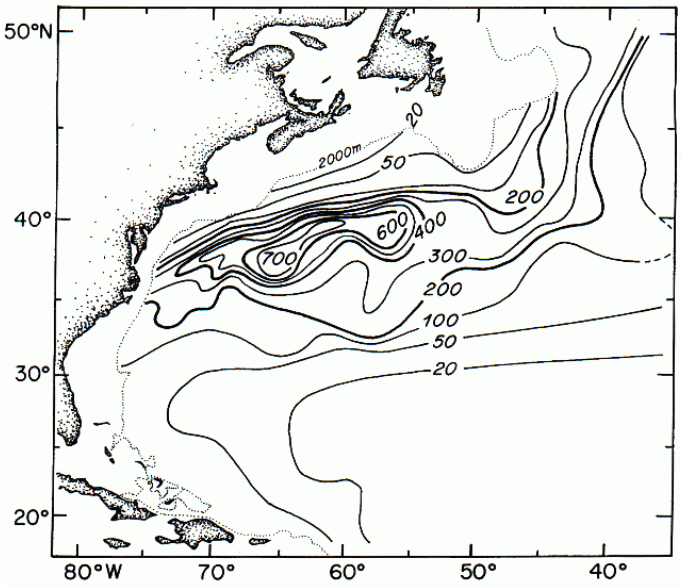
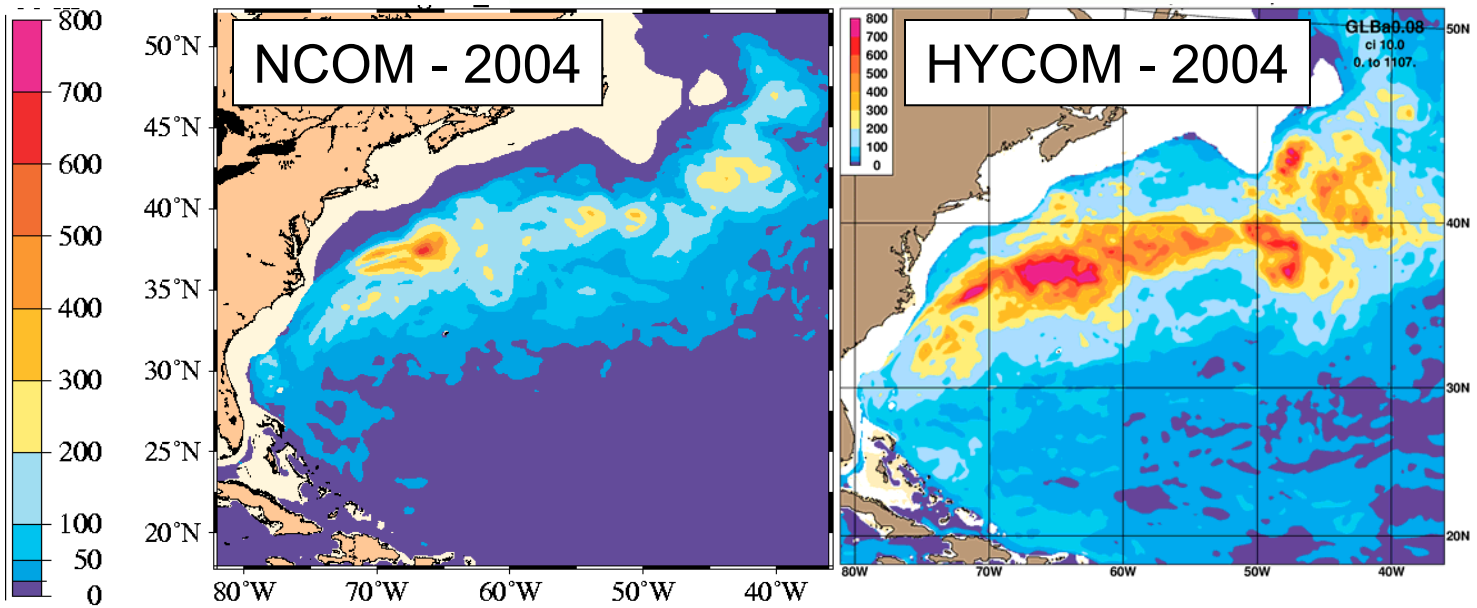
Observations from Schmitz (1996)





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