Data Assimilation Schemes Inter-comparison Experiment

- The purpose of this experiment is to compare the assimilation outcomes of the systems being developed for HYCOM in the NOPP GODAE project

- Assimilation Systems:

ENOI	L. Bertino / F. Counillon
EnKF	H. Ngodock
MVOI	J. Cummings/O.M. Smedstad
ROIF	T.Chin / A. Srinivasan
SEEK	(?)
NCEP	C. Lozano

Domain and Model Configuration

- Forecast Model: HYCOM-2.1.36
- Domain: Gulf of Mexico
- Assimilation Time Period: 2004 through 2005
- Atmospheric Forcing: COAMPS (27 or 9 km)
- River Inputs: USGS (for US rivers only

Evaluation Criteria for the assimilation runs

- Skill of the forecasts issued from the different analysis initial conditions out to 7 to 15 days, as measured by anomaly correlation and forecast of yet-to-be-assimilated observations
- Skill of the Nowcasts as compared to the free run of the model
- Performance measures of the assimilation system based on time series of the innovations and the residuals
- Skill of the assimilative lateral boundary conditions for downscaling to nested models in the NOPP CODAE experiment
- Prediction of unassimilated observations
- Prediction of loop current and loop current eddy locations
- Evaluate the consistency of the assimilative model runs with our knowledge of the oceanography of the Gulf of Mexico

A pilot study on data assimilation techniques comparison

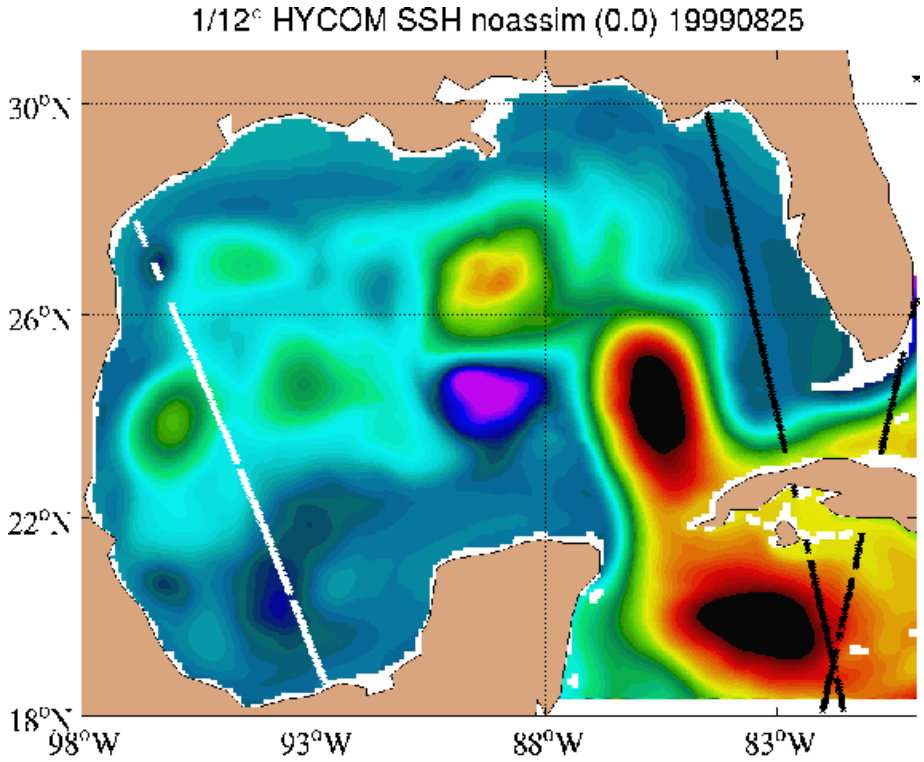
- Identical Twin Experiments

- Assimilation Schemes:
  1) OI/Cooper-Haines (SLA & SST)
  2) NCODA (SLA & SST)
  3) ROIF (SLA)
  4) ENOI (SLA)

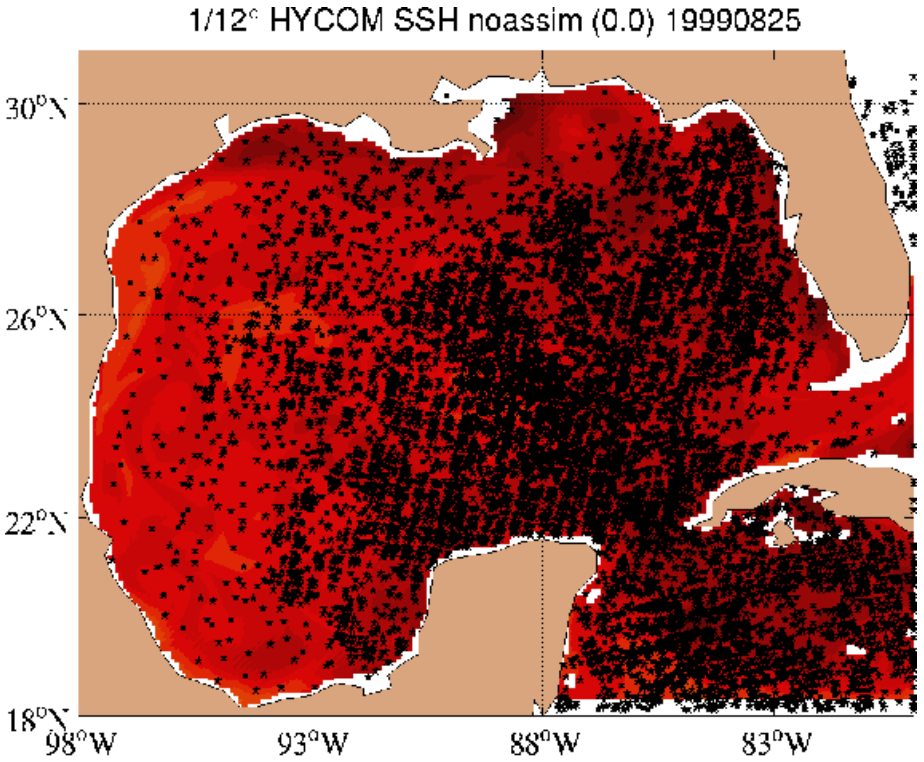
- Model: HYCOM-2.1.36
- Domain: Gulf of Mexico
- Assimilation Time Period: 1999 through 2000
- Atmospheric Forcing: FNMOC
- Nested within the 1/12 N. Atlantic System

HYCOM Identical Twin SSH and SST Data

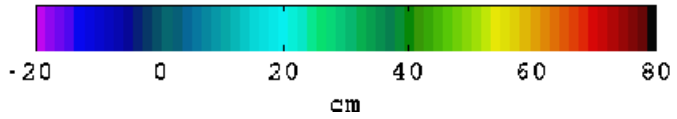
Ocean model sampled along observed tracks

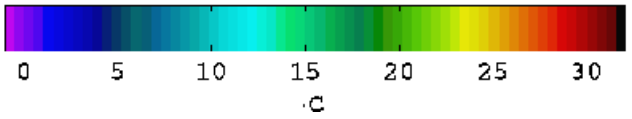


Ocean model sampled at observed MCSST locations



1/25° Gulf of Mexico HYCOM

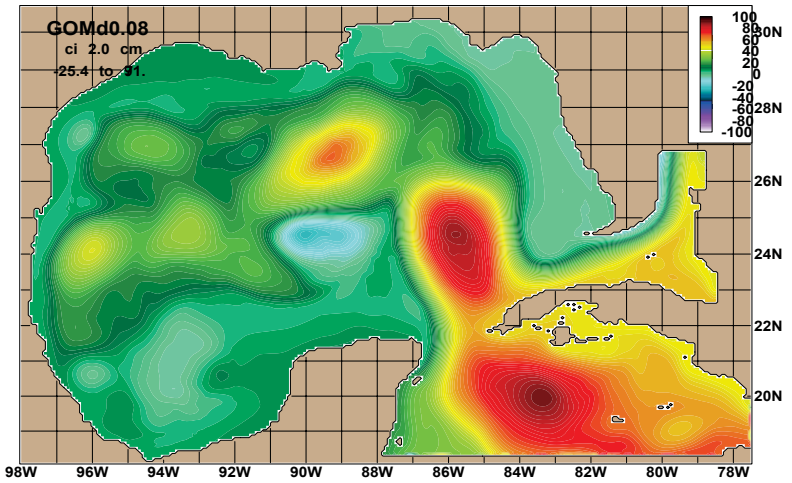




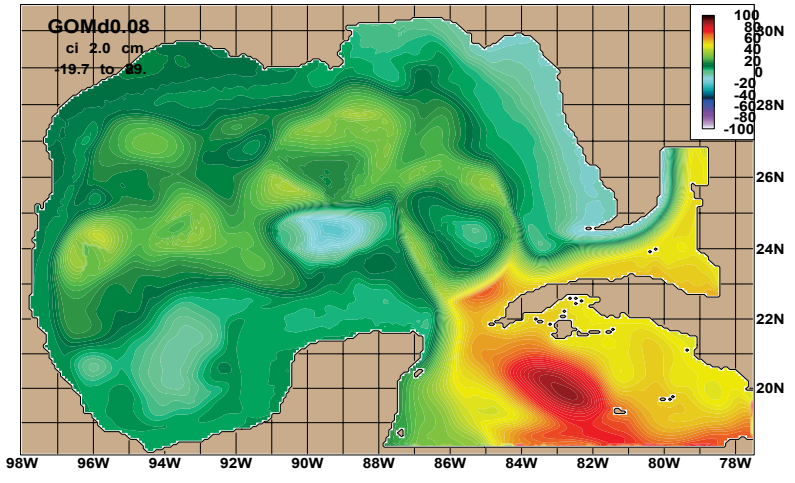
Smedstad et al.

SSH Aug 30,1999 00Z (Analysis Day 2)

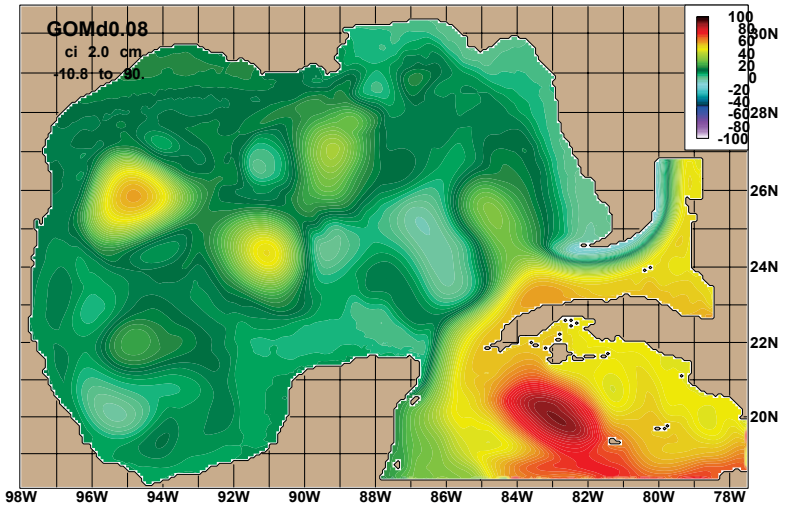
TRUTH



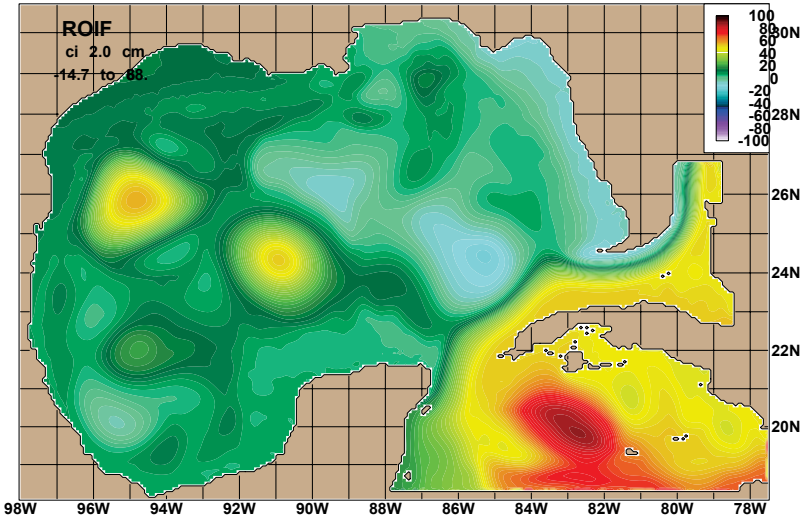
OI/Atlantic-System



NCODA

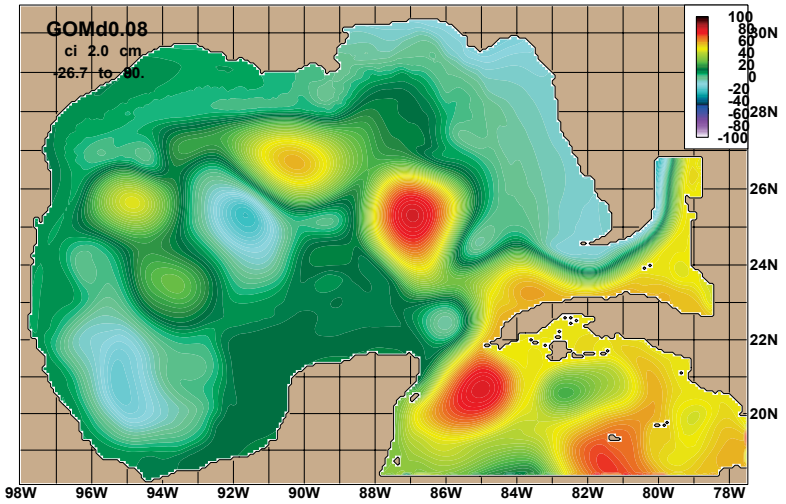


ROIF



SS H O ct 18, 1999 00Z (Analysis- Day 50)

TRUTH



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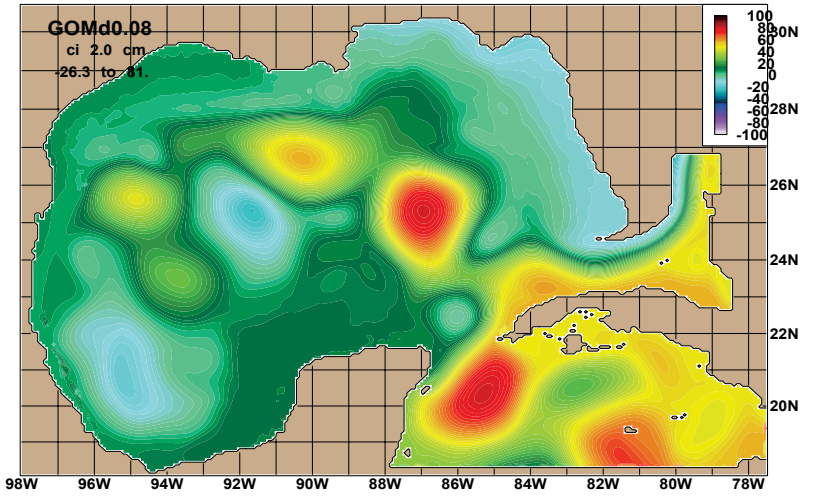

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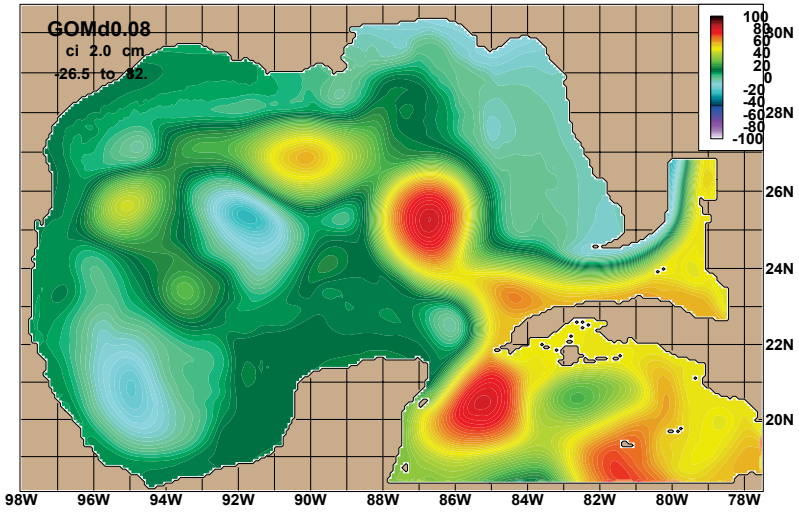
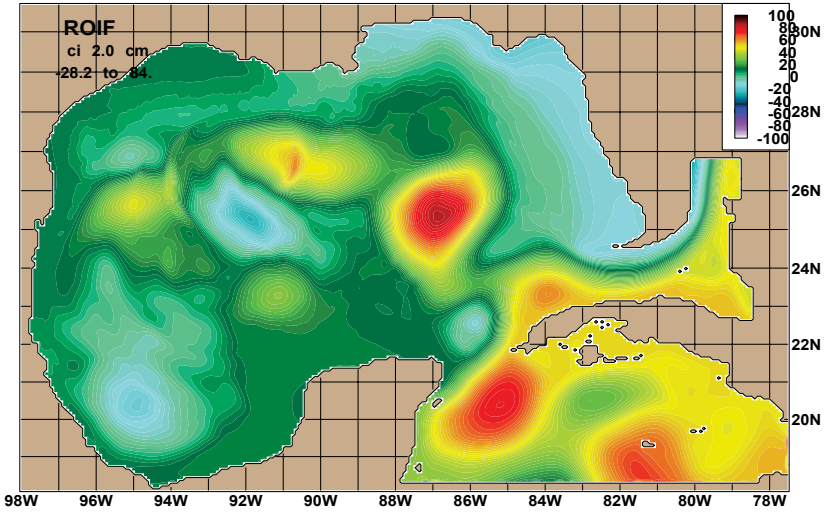
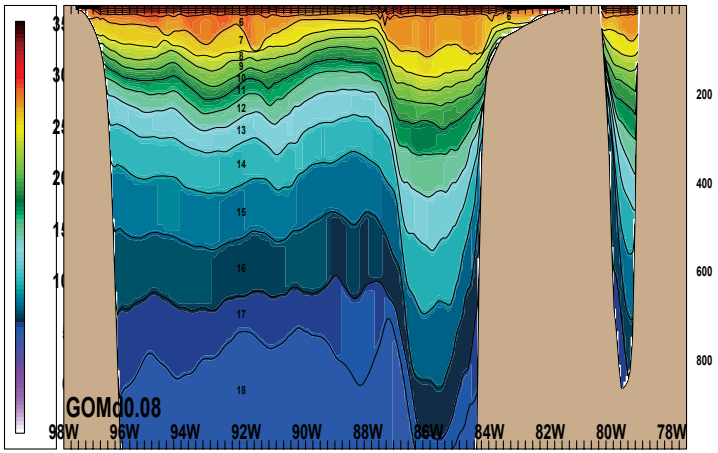


ROIF

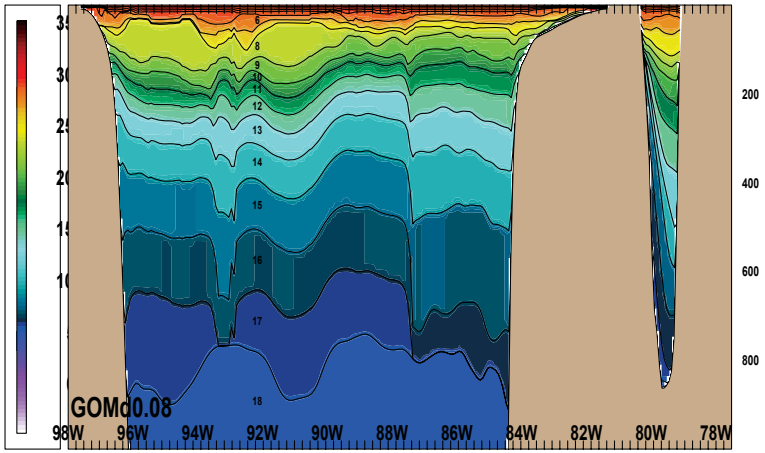


temperature zonal sec. 25.08n Aug 30, 1999 00Z [75.1H]

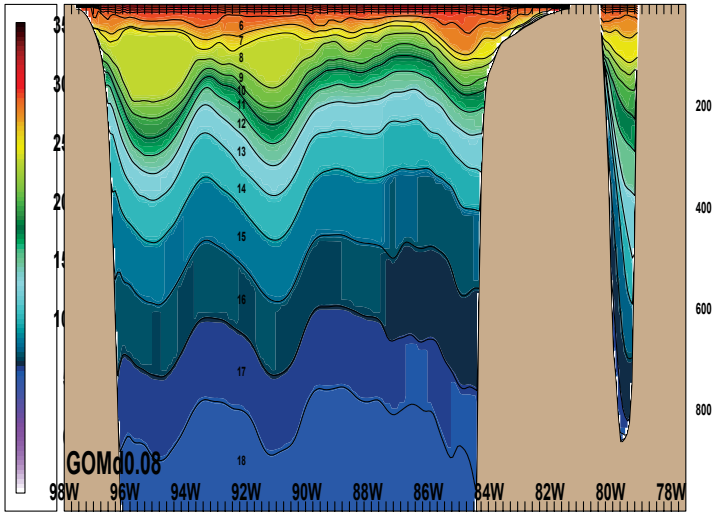
TRUTH



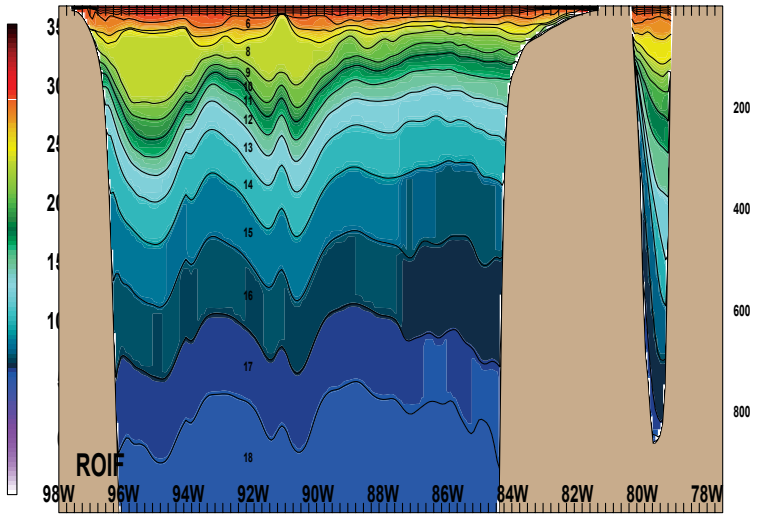
OI/Atlantic-system



NCODA

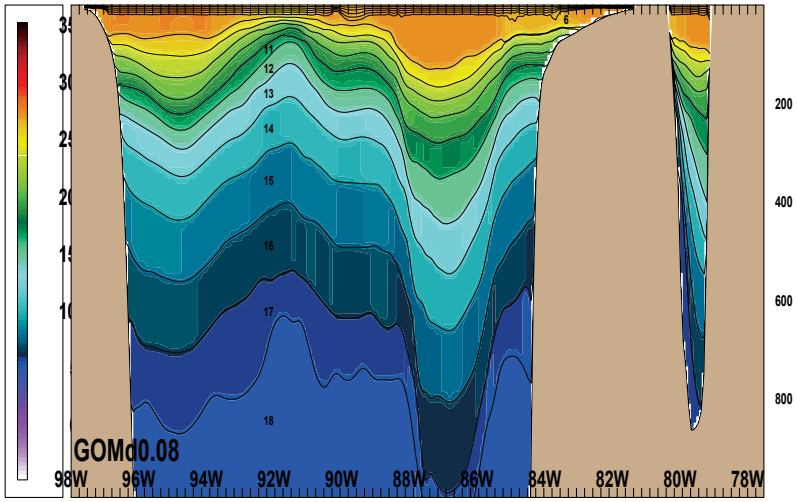


ROIF

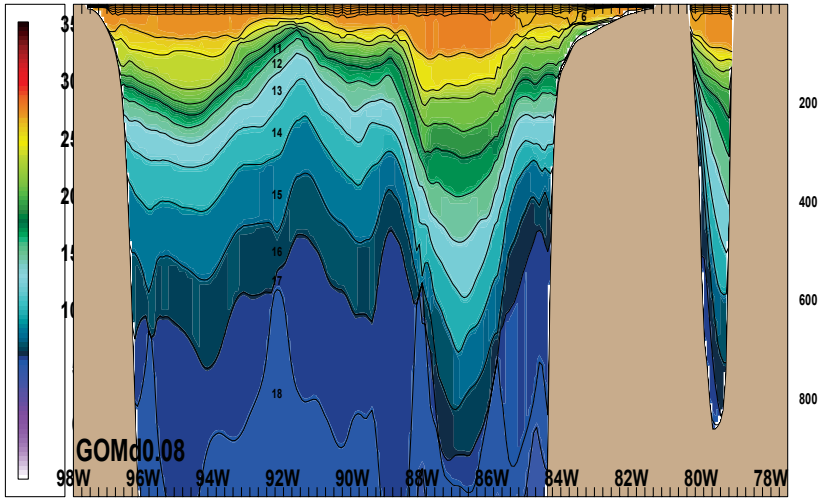


Temperature zonal sec. 25.08n O ct 18,1999 00Z (Analysis - Day 50)

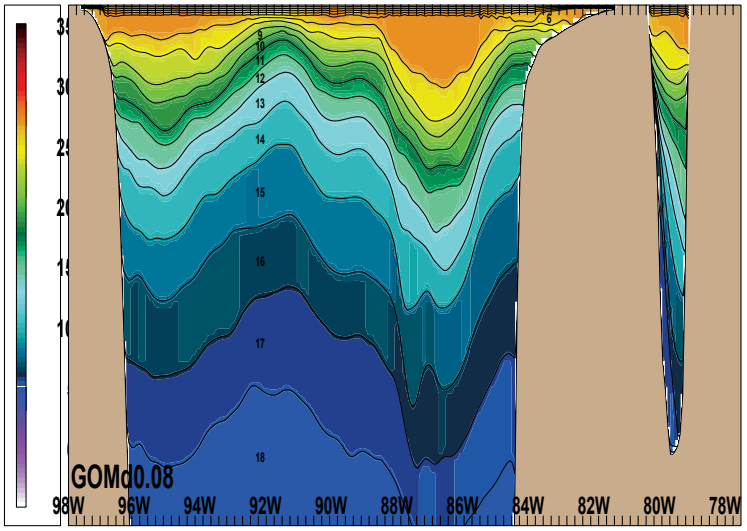
TRUTH



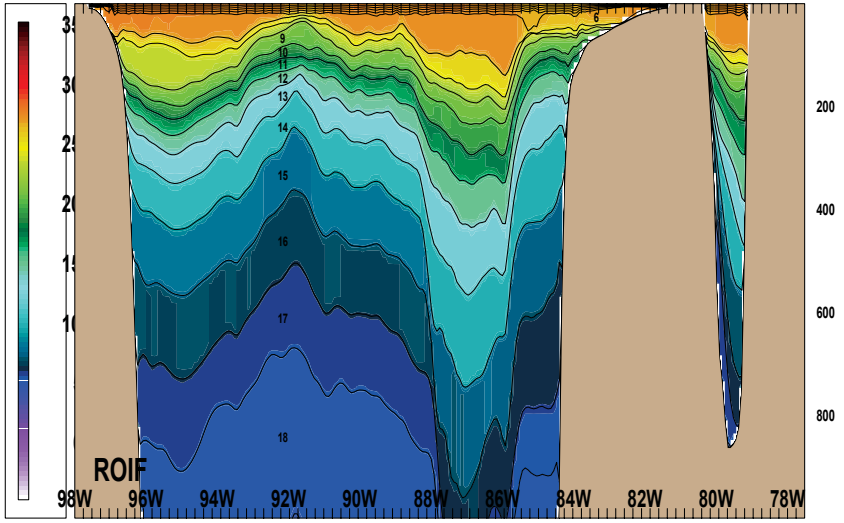
OI/Atlantic-System



NCODA

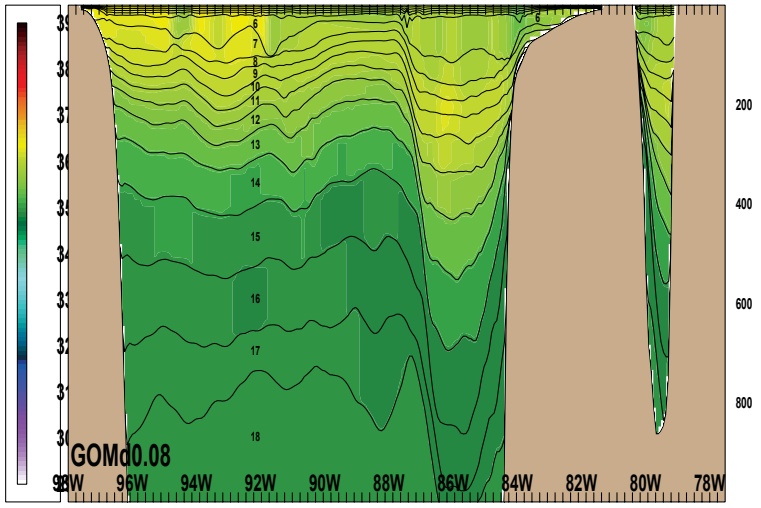


ROIF

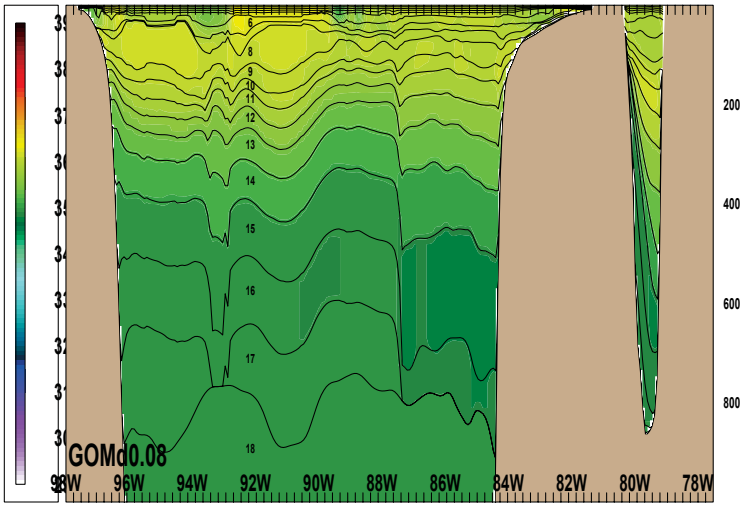


Salinity zonal sec. 25.08n Aug 30, 1999 00Z (Analysis - Day 2)

TRUTH



OI/Atlantic-System



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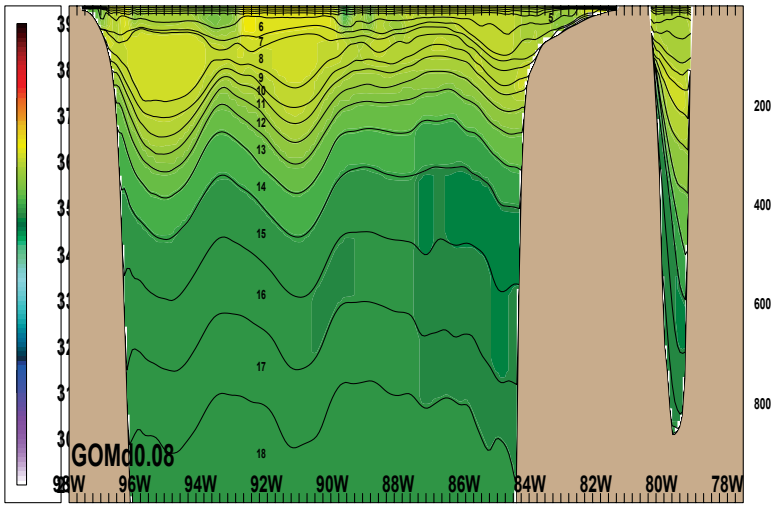
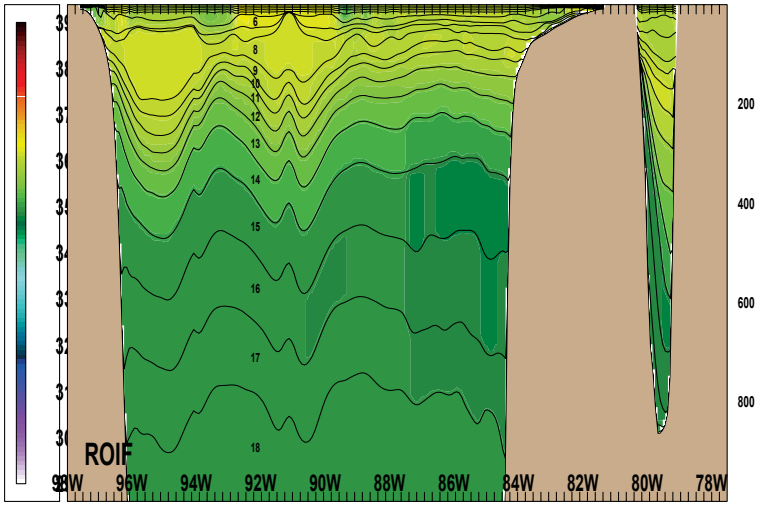
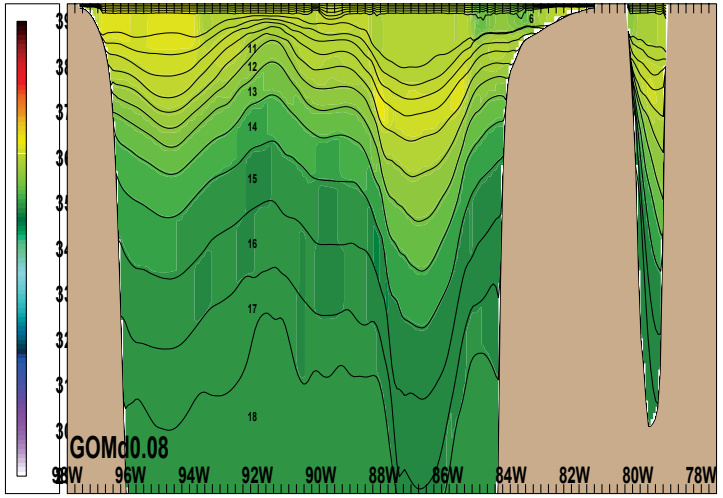


ROIF

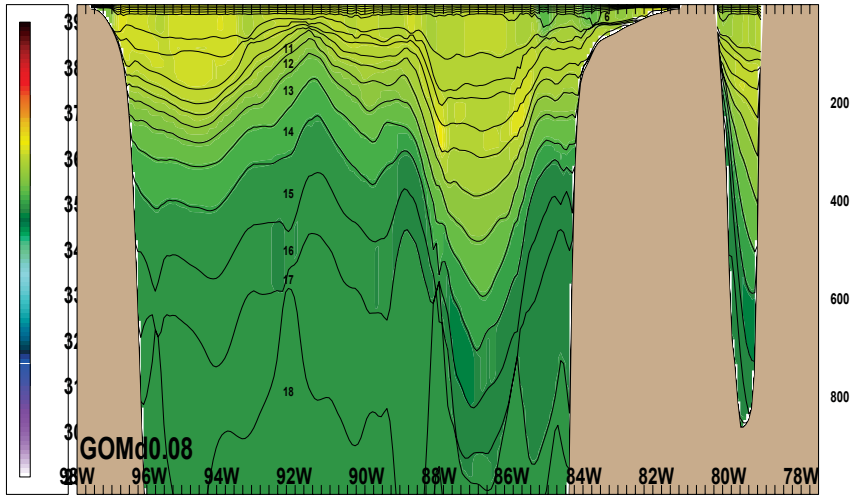


Salinity zonal sec. 25.08n O ct 18, 1999 00Z (Analysis - Day 50)

TRUTH



OI/Atlantic-System



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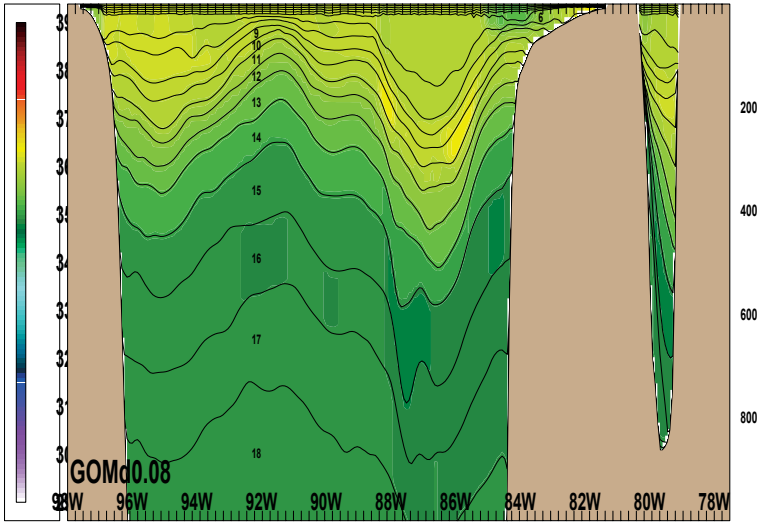
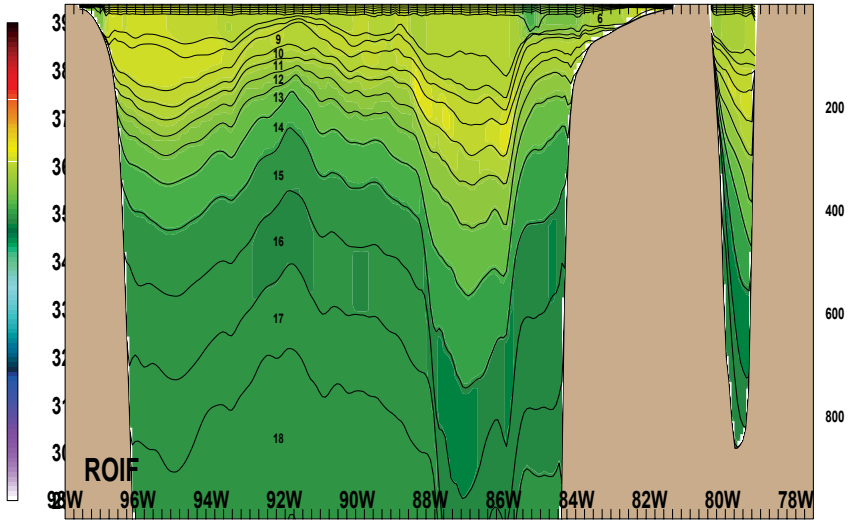


ROIF

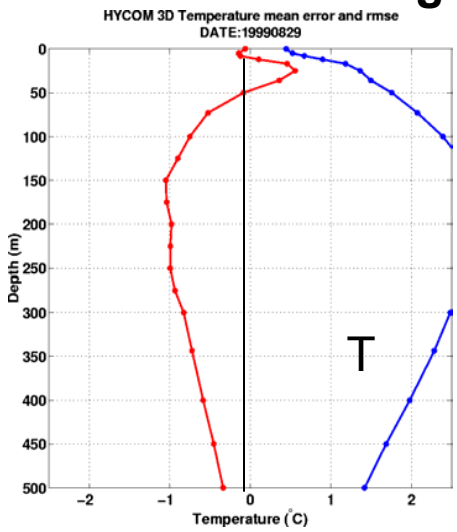


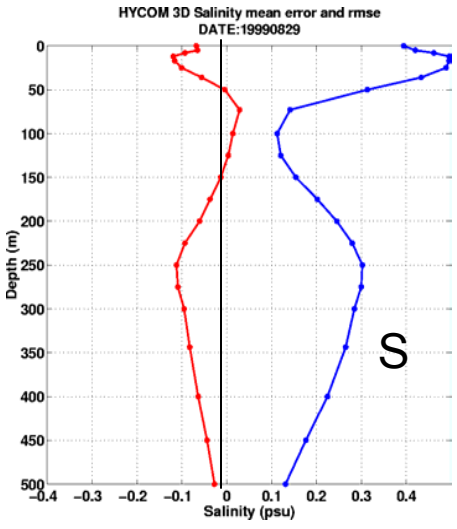
HYCOM Identical Twin Results

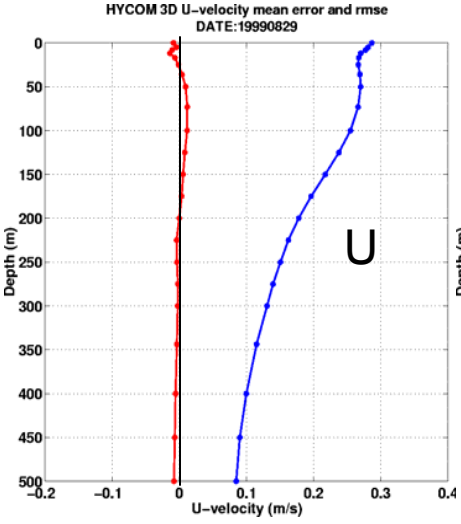
Vertical Profiles (0-500m)

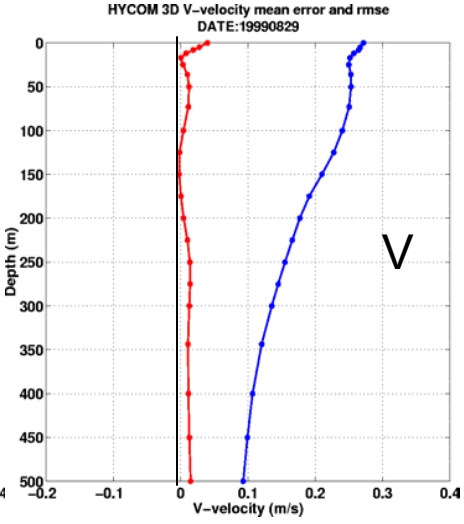
RMS error (50.4)
Mean error (50.4)

29 August 1999

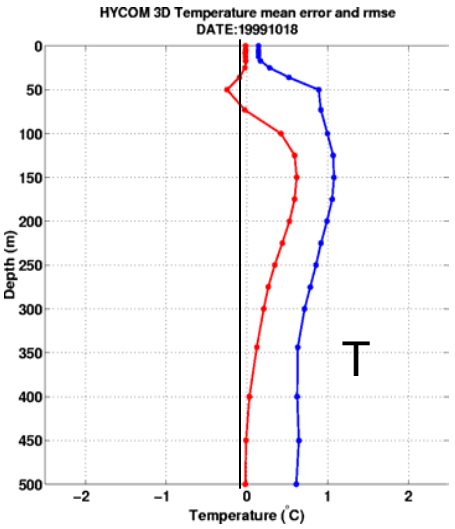


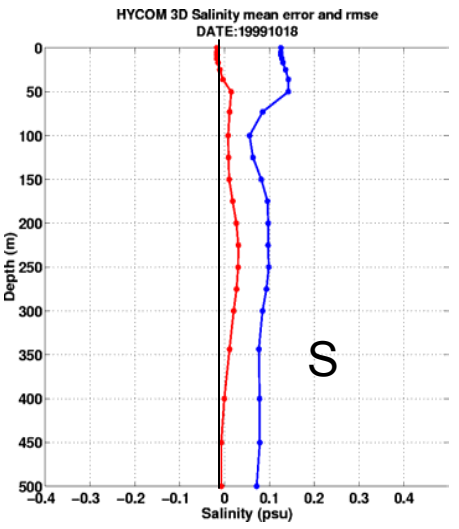


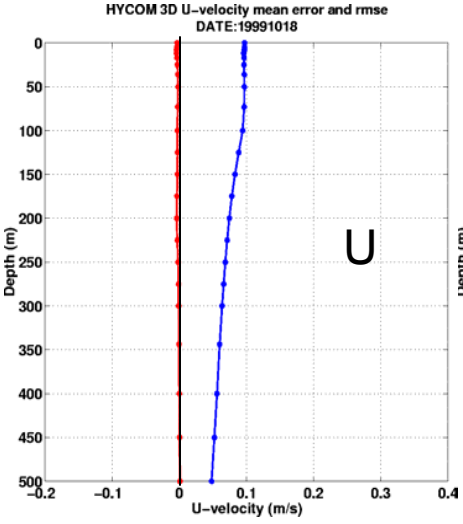


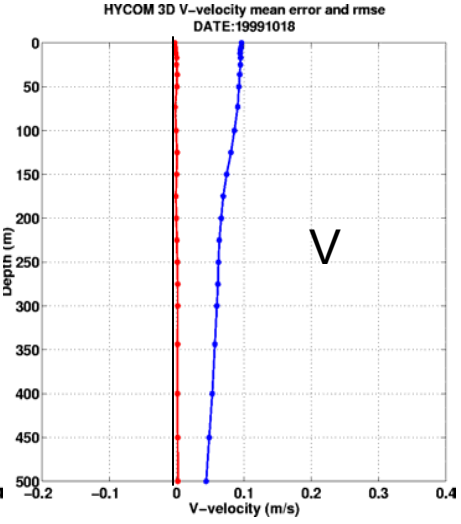


18 October 1999



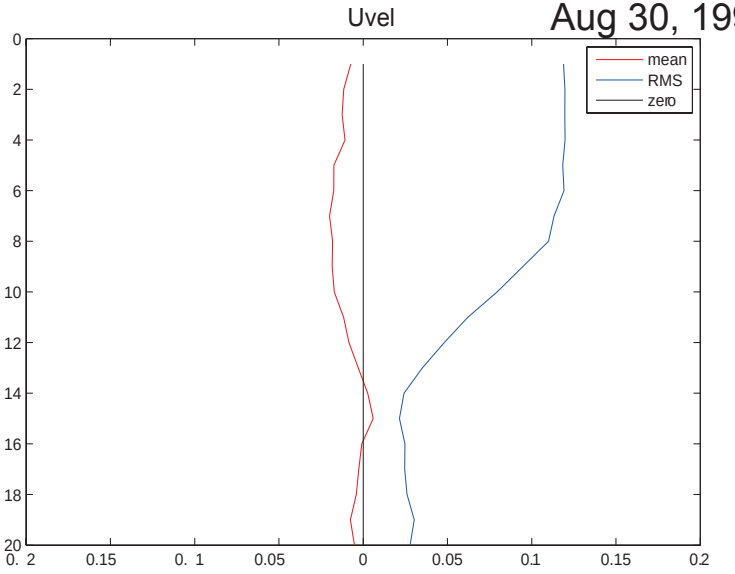


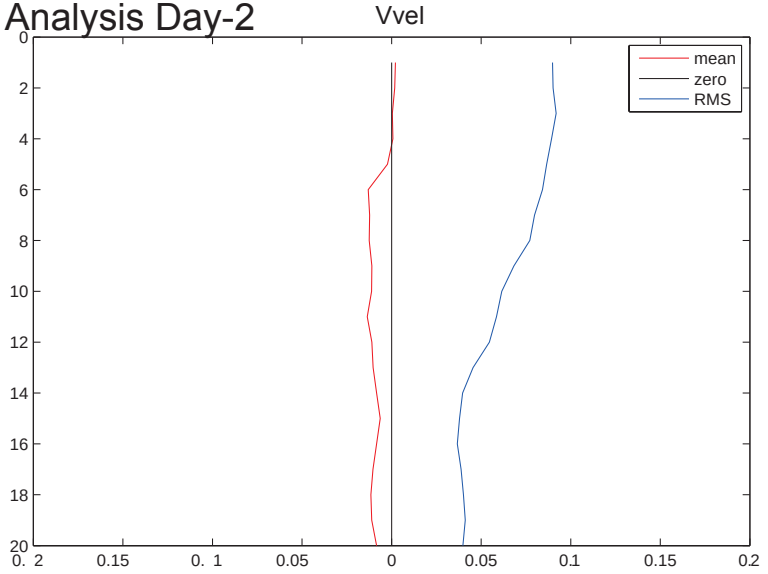




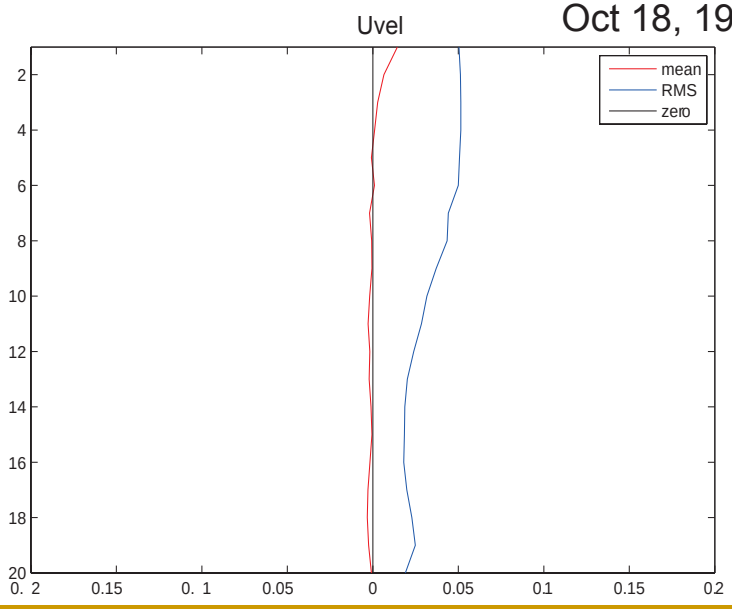
Mean and RMS ERRORS (ROIF)

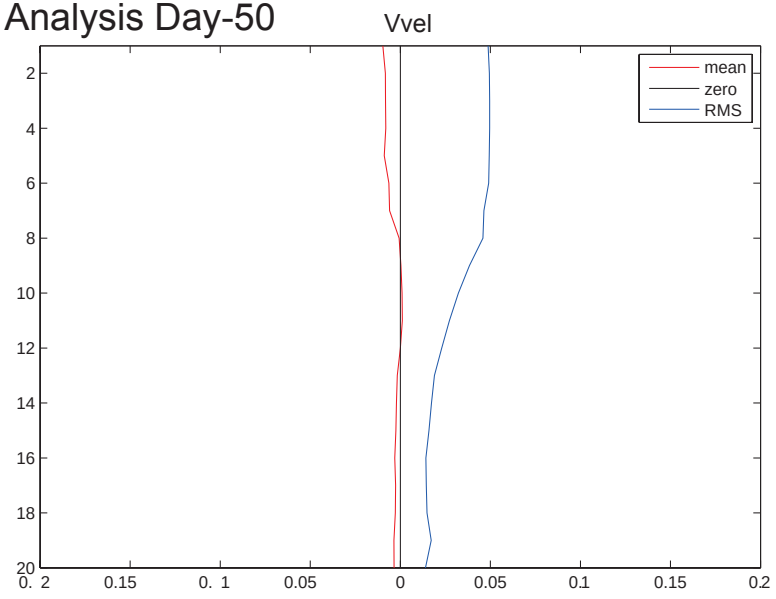
Aug 30, 1999 Analysis Day-2





Oct 18, 1999 Analysis Day-50





The "HYDAE" Data Server

- The data management group is putting together a dedicated server called "HYDAE Data Server" along the lines of GODAE server to facilitate this experiment with the following features

- Basic data access and visualization
- access to all data via OPeNDAP
- arbitrary 4D data subsets in NetCDF
- download any of the raw files via FTP
- access to boundary conditions in native hycom format.
- able to visualize any of the fields from any of the models on any principle planes or axes
  - lat-long maps
    - at surface
    - at constant depth
    - along layers
  - vertical sections (lat-depth/layer, long-depth/layer)
  - time series
  - vertical profiles
  - Hofmuller plots of time versus lat, lon or depth axes
- Comparison capabilities
- visual comparison:
- abilility to create arbitrary "image spreadsheets" to compare the ensemble of model outputs in any of the views discussed above
- difference (anomaly):
  able to compute differences between any two model runs and visualize in any of the ways described above.