

GODAE since OOPC-9

- **GODAE Second Symposium – User Focus**
- **GODAE Summer School – Capacity Building**
- **GODAE Comparison Projects progress**
- **GODAE Servers progress**
- **GHR SST Products availability**

<http://www.bom.gov.au/bmrc/ocean/GODAE/>

GODAE STATUS

- **In third year of Demonstration Phase. 2004 was a very active year incl. Summer School**
- **Begins Consolidation Phase next year. Ends in 2008.**
- **Support to continue GODAE-developed infrastructure is needed.**
- **Evaluation of GODAE products needs more user community attention**
- **Are GODAE products getting to all potential users?**

GODAE Second Symposium – GODAE in Operation; Demonstrating Utility

www.bom.gov.au/GODAE/Symposium%20II/

Break out session topics:

Nat. Hazards & coastal impacts

Integrated coastal management

Marine Ecosystems mgmt: fish & biogeochem

Crisis Mgmt: SAR & emergency response

Risk Mgmt: Industry, engineering & other at-sea ops

Climate: Assess & predict climate var & change



Synopsis and Summary – Neville Smith

**A personal view on the take-home
messages and initiative arising from the
GODAE Symposium II**



Global Ocean Data Assimilation Experiment

See: <http://www.bom.gov.au/GODAE> *GODAE in operation: demonstrating utility*

GODAE



Outline

- **General**
 - ❖ **Basic approach**

- **Elements**
 - ❖ **Product lines**
 - ❖ **Applications**
 - ❖ **Services**
 - ❖ **Communication**
 - ❖ **Scientific and technical issues**

- **GODAE and beyond**
 - ❖ **New initiatives**
 - ❖ **Business case**



Service architecture

- **Data and information services**
 - ❖ Priority confirmed and enhanced
 - ❖ Information services may be weakness – GUI (G=GODAE)
 - ❖ Our “industry” standard
 - ❖ Open GIS links; web services
 - ❖ Metadata standards
- **Benchmarks**
 - ❖ For product lines
 - ❖ For information delivery
 - ❖ For interfaces



Communication

- **Q? What are the appropriate forums for communication with users?**
 - ❖ Symposia work well for some, not others
 - ❖ Many have enjoyed this opportunity: formalised forum?
 - ❖ Knowledge of our “market place” remains too vague
 - ❖ Communication strategy?
- **GODAE Help**
 - ❖ Better information on availability
 - ❖ Better response mechanism
 - ❖ The user interface
- **Promotion**
 - ❖ With supporting organisations
 - ❖ With partners
 - ❖ With user community
 - ❖ Presently a weakness

GODAE



Scientific Issues

- **Estimates of uncertainty**
 - ❖ Intercomparisons have key role
- **Ensembles**
 - ❖ Scientific
 - ❖ User aspects
- **Predictability for sub-systems**
 - ❖ Nested coupling (1- and 2-way)
- **Extreme ocean events**
 - ❖ Have not received a great deal of attention
- **Observing system**
 - ❖ Design
 - ❖ New technology
 - ❖ Adaptive, esp. for crisis m'ment, hazards



Beyond GODAE

- **GODAE \equiv Ocean Prediction**
 - ❖ Delivering information on the past, present and future state of the ocean
 - ❖ Need business case for ocean prediction
 - ❖ Better knowledge of “market”
- **Scientific extensions**
 - ❖ Options
 - (Global) biogeochemistry, ecosystems
 - Extended weather (and marine met) prediction
 - Coastal assimilation and predictability
 - ...
- **Sustaining and extending R&D**
 - ❖ Lack global R&D focus for future

GoDAE



Business case, model

- **Providing information on the past, present and future state of the ocean**
- **Must clarify lines of business, from direct to public to commercial**
 - ❖ **Partnerships with private sector fundamental**
 - ❖ **Partnerships with government sector**
 - ❖ **Articulate about benefit to stakeholders and patrons**
- **Investment**
- **Notion of benefiting the global (ocean) commons**
 - ❖ **Must have associated capacity building**
- **Must embrace decision making**
 - ❖ **Integration with decision making tools**
 - ❖ **How to “enter” the decision making process**



New initiatives

- **Clarification**
 - A Pilot Project is autonomous with clear goals, schedules, legacy, etc.
 - GODAE capacity relies on work, projects: demonstration of capability
 - Many suggestions fall into the latter category
- **CODAE**
- **Weather prediction including hurricanes, TCs: THORPEX initiative?**
 - ❖ TC/Hurricane prediction
 - ❖ Improved predictability of extreme events
- **Formal link with CLIVAR for assessment**
- **Capacity building**
 - ❖ Contributions from GODAE: Lead and operate with a broad perspective
 - ❖ E.g., IOGOOS

**INTERNATIONAL SUMMER SCHOOL OF
OCEANOGRAPHY
"AN INTEGRATED VIEW OF OCEANOGRAPHY :
OCEAN WEATHER FORECASTING IN THE 21ST
CENTURY"**

**20 September to 1st October 2004
Lalonde les Maures -France**

,

CNES GODAE MERSEA

INTERNATIONAL SUMMER SCHOOL

	Monday 20 Sept.	Tuesday 21 Sept.	Wed. 22 Sept.	Thursday 23 Sept.	Friday 24 Sept.	Saturday 25 Sept.
08.45	Welcoming remarks					
09.00	J.F. MINSTER	Models S. GRIFFIES	Observations I. ROBINSON	Models A. M. TREGUIER	Observations S. POULIQUEN	Data Assimilation J. SCHROETER
09.45	N. SMITH					
10.00						
10.30	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
11.00						
11.30	Models S. GRIFFIES	Observations I. ROBINSON	Models A. M. TREGUIER	Observations U. SEND	Data Assimilation J. SCHROETER	Observations W. LARGE
12.00						
12.30	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch
14.00						
14.30						
15.00						
15.30	Free time	Free time	Student exercises	Free time	Student exercises	Free time
16.00						
16.30						
17.00	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
17.30	Systems P. BAHUREL	B. HACKETT	Systems N. PINARDI	E. BLAYO	DEBATE	Systems M. BELL
18.00						
18.15						
18.30	M. ALTAO	Customers J. HARDING	Systems A. SCHILLER	P. GASPAR		Biochemical A. OSCHLIES
19.00						
19.15						
19.30						
20.00	Welcome Cocktail Reception					
20.30						
21.00						

SECOND WEEK AGENDA

	Monday 27 Sept.	Tuesday 28 Sept.	Wed. 29 Sept.	Thursday 30 Sept.	Friday 1 st Oct.
09.00					
09.30	Observations W. LARGE	Models R. BLECK	F. RABIER	Data Assimilation P. BRASSEUR	Coastal J. WILKIN
10.00					
10.30	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
11.00					
11.30	Models R. BLECK	Data Assimilation I. FUKUMORI	Data Assimilation P. BRASSEUR	Coastal J. WILKIN	D. ANDERSON
12.00					
12.30	Lunch	Lunch	Lunch	Lunch	Lunch
14.00					
14.30					
15.00	Student exercises	Free time	Student exercises	Free time	
15.30					
16.00					
16.30					
17.00	Coffee break	Coffee break	Coffee break	Coffee break	
17.15					
17.30	Student posters	Systems E. CHASSIGNET	DEBATE	L. CROSNIER	
18.00					
18.15					
18.30	Student posters	Customers R. STEPHENS		Report on student exercises	
19.00					
19.15					
19.30	Buffet dinner			Closing dinner	
20.00					
20.30					
21.00					

INTERNATIONAL SUMMER SCHOOL OF OCEANOGRAPHY

LECTURES - 1

A view of operational oceanography by J.F. Minster

The GODAE perspective by N. Smith

Space activities in oceanography by E. Thouvenot

A Selection of Ocean Model Fundamentals by S. Griffies

MERCATOR, global to regional ocean monitoring and forecasting system by P. Baharel

Applications of ocean forecast information for economic advancement in developed and developing societies by M. Altalo

Measuring the ocean from space : principles of measurement using altimetry and radiometry by I. Robinson

Forecasting the drift of things in the ocean by B. Hackett

Operational Oceanography in the U.S. Navy by J. Harding

Measuring the ocean from space : opportunities and limitations of sampling from satellites by I. Robinson

Models of the ocean: which ocean? (Part 1) by A.M. Treguier

The Mediterranean forecasting system : real time observing system and marine forecasting from the overall basin to the coastal scales by N. Pinardi

BLUELink - Large-scale operational oceanography in the Southern hemisphere by A. Schiller

Models of the ocean: which ocean? (Part 2) by A.M. Treguier

Summer School Lectures - 2

In-situ observations : processes and methods by U. Send

Nesting ocean models by E. Blayo

Developing commercial applications of operational oceanography by P. Gaspar

CATSAT: a satellite system to support fisheries by P. Gaspar

Operational oceanography helps understand the behavior of marine animals by P. Gaspar

In-situ observation: operational systems and data management by S.

Pouliquen Ocean surface fluxes (Part 1) by W. Large

The Forecasting Ocean Assimilation Model (FOAM) system by M. Bell

On the use of data assimilation in biogeochemical modelling by A.

Oschlies

Ocean surface fluxes Principles of data assimilation (Part 1) by J.

Schroter

Principles of data assimilation (Part 2) by J. Schroter

Finite-element ocean circulation model by J. Schroter

(Part 2) by W. Large

Summer School Lectures - 3

Quasi-Lagrangian vertical coordinates in ocean modeling : the isopycnic and hybrid-isopycnic option by E. Chassignet

Sequential methods for ocean data assimilation. From theory to practical implementations (Part 1) by P. Brasseur

U.S. GODAE: global ocean prediction with the Hybrid Coordinate Ocean Model (HYCOM) by E. Chassignet

Importance of data : a meteorological perspective by F. Rabier

Sequential methods for ocean data assimilation. From theory to practical implementations (Part 2) by P. Brasseur

Prescribing and estimating model error : what is assimilation really solving ? by I. Fukumori

Ocean forecast and analysis models for coastal observatories by J. Wilkin

The MERSEA comparison exercise and metrics by L. Crosnier

The ECMWF perspective by D. Anderson

Metrics have been defined
for the **North Atlantic** and the **Mediterranean Sea**

- **Fields provided** : Daily mean Best Estimate + (T0+6) forecast.
- **1YEAR Time period** : JUNE 2003-JUNE 2004.
- **2 BASINS** : Atlantic + Mediterranean Sea
- **CLASS1** T, S, U, V, SSH, MLD, BSF, Tx, Ty, Qtot+relax., E-P-R +relax., MSSH

Interpolation on 1/8° horizontal grid

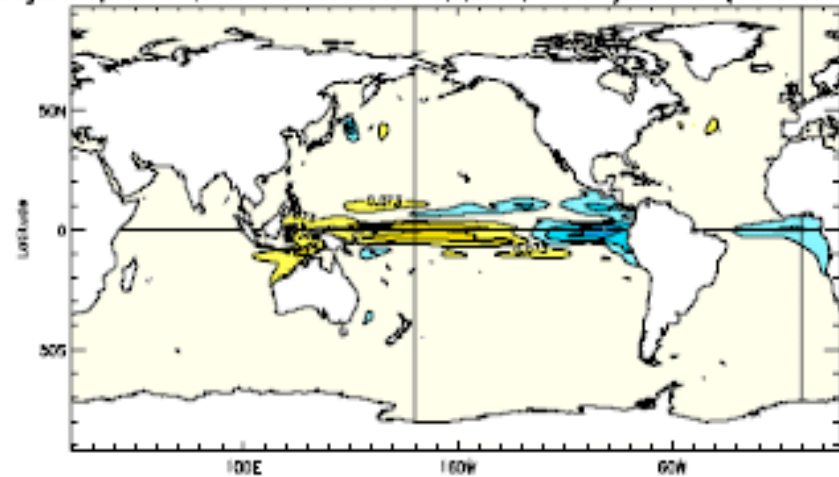
with 12 vert. levels in ATL (5;30;50;100;200;400;700;1000;1500;2000;2500;3000m)
8 vert. levels in MED (5;30;50;100;200;500;1000;2000m).

- **CLASS2** High resolution (T,S,U,V) sections/moorings.
- **CLASS3** Daily mean volume transports through sections
Meridional Heat Transport
Overturning Stream Function $l_z/\sigma/\theta$
- **CLASS4** Test performance of analysis and forecasts.
- **Available : CLASS1 + CLASS2 + CLASS3**
- **working on CLASS4**

Observing System Experiments (ECMWF)

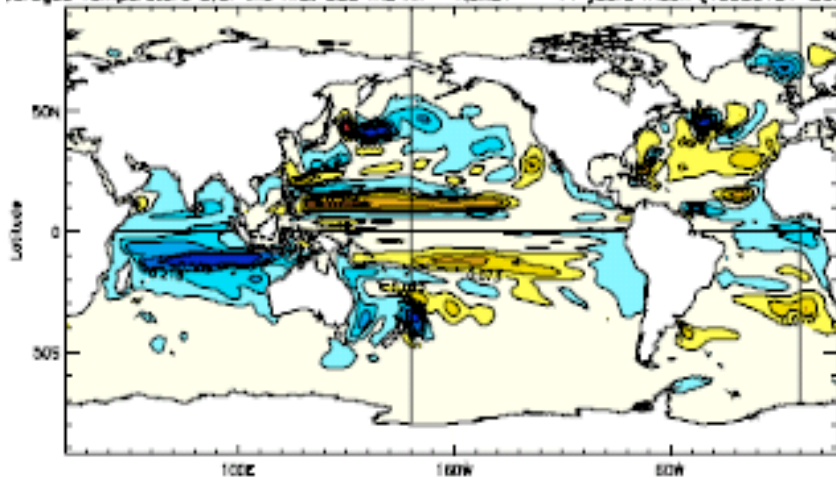
The Three main components of the in situ observing network have been withdrawn one after the other from our system, in order to assess their impact. Figures show the impact on the mean temperature over the first 300m from:

Averaged Temperature over the first 300 m.: All - NoMOORING 11 years mean (19930101-20040101)



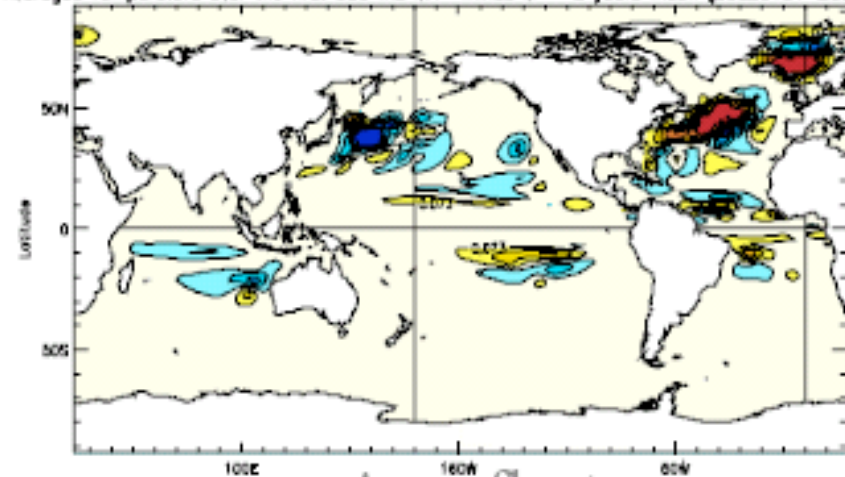
MOORINGS

Averaged Temperature over the first 300 m.: All - NoXBT 11 years mean (19930101-20040101)



XBTs

Averaged Temperature over the first 300 m.: MA - minus M - 2 years mean (20020101-20040101)



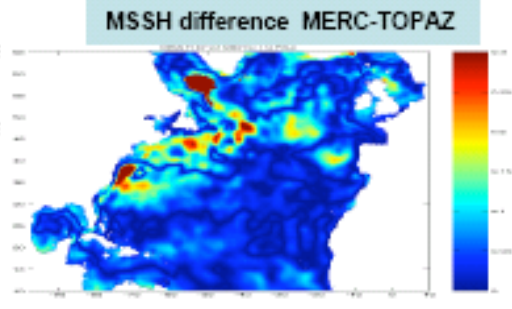
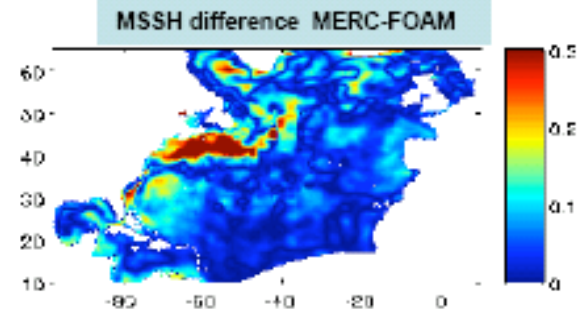
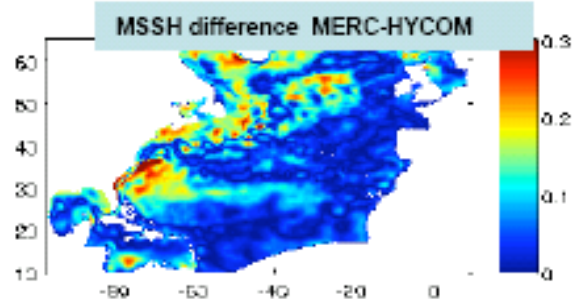
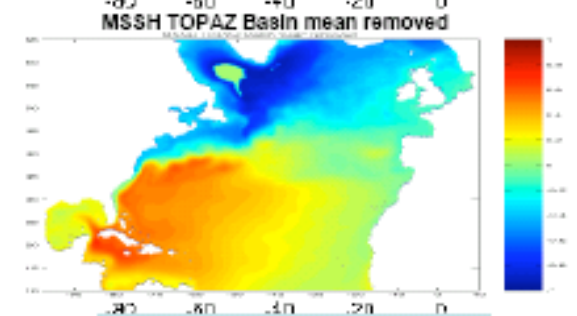
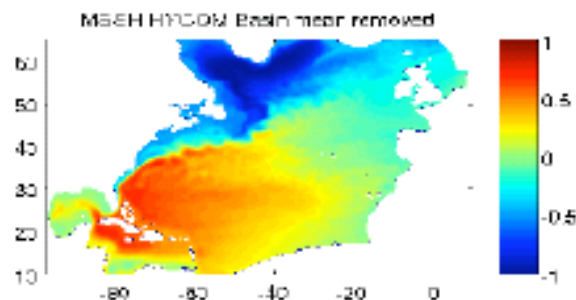
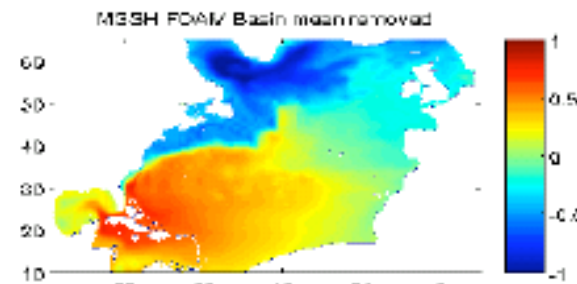
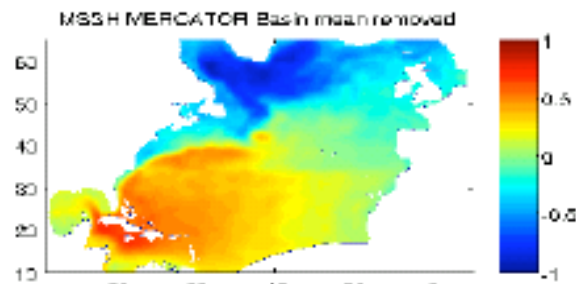
Argo floats

Mean Sea Surface Height (MSSH) (in meters)

Basin Mean Removed

- MERCATOR → MSSH based on gravity, altimetry and In Situ observations, (Rio et al.)
- FOAM → MSSH based on previous run + observations in GS (Singh & Kelly)
- TOPAZ → MSSH based on previous run
- HYCOM → MSSH based on previous 1/12° MICOM free run (ECMWF)

Birol et al. 2004 : Hard to judge which MSSH is best for assimilation (depends on region considered).



North Atlantic Intercomparison Results (MERSEA, L. Croznier)

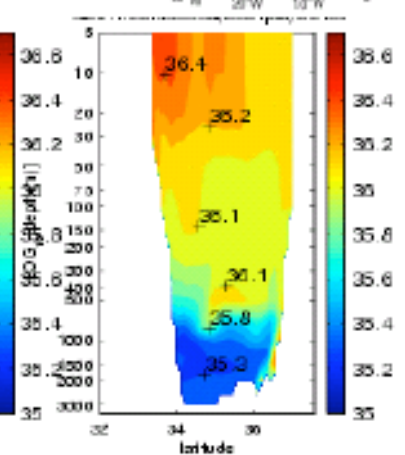
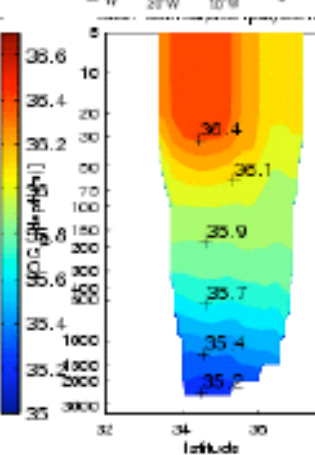
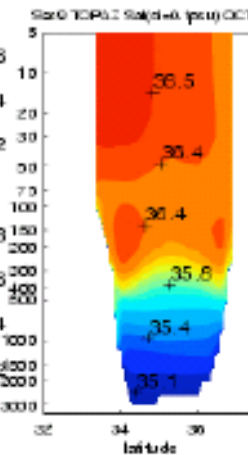
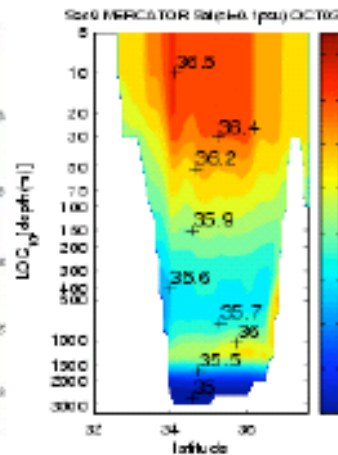
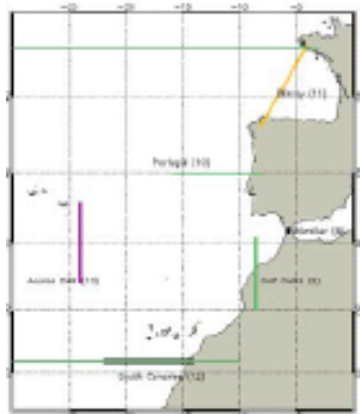
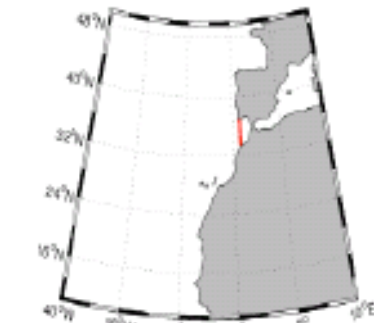
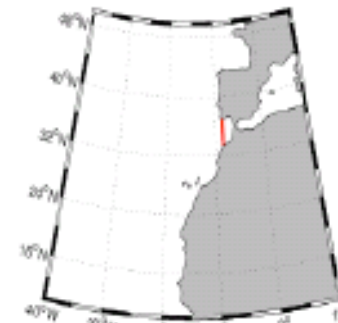
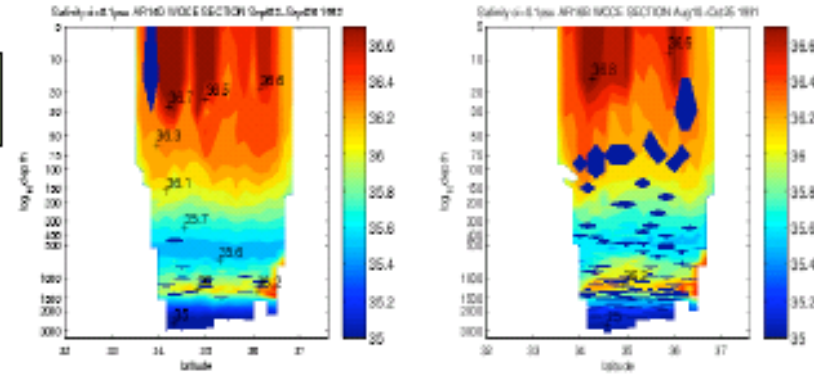
Gulf Cadiz Section 9°W Salinity

North Atlantic Intercomparison

WOCE AR16D SEP 1992

WOCE AR16B AUG OCT 1991

(MERSEA, L. Croznier)



MERCATOR

TOPAZ

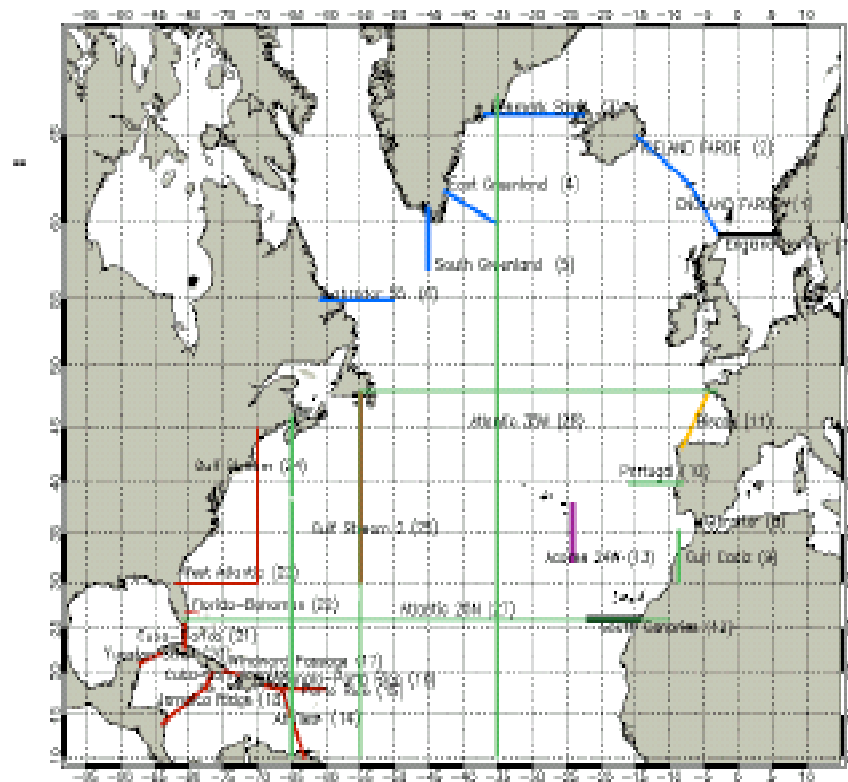
FOAM

HYCOM

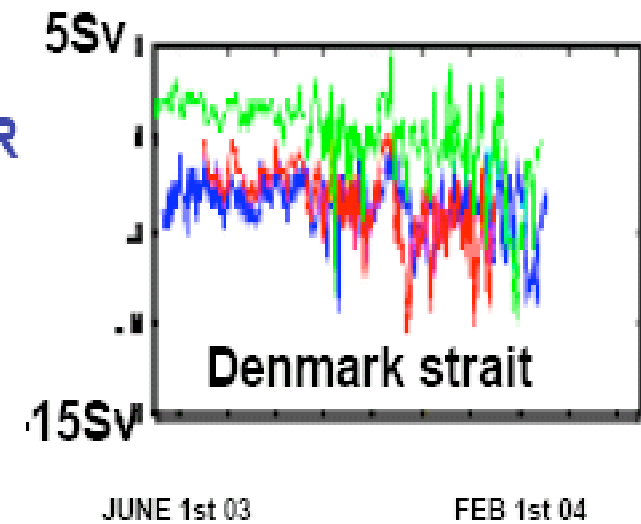
OVERFLOWS SECTIONS TOTAL VOLUME TRANSPORTS

North Atlantic Incomparision

MERSEA, L. Croznier



MERCATOR
FOAM
TOPAZ

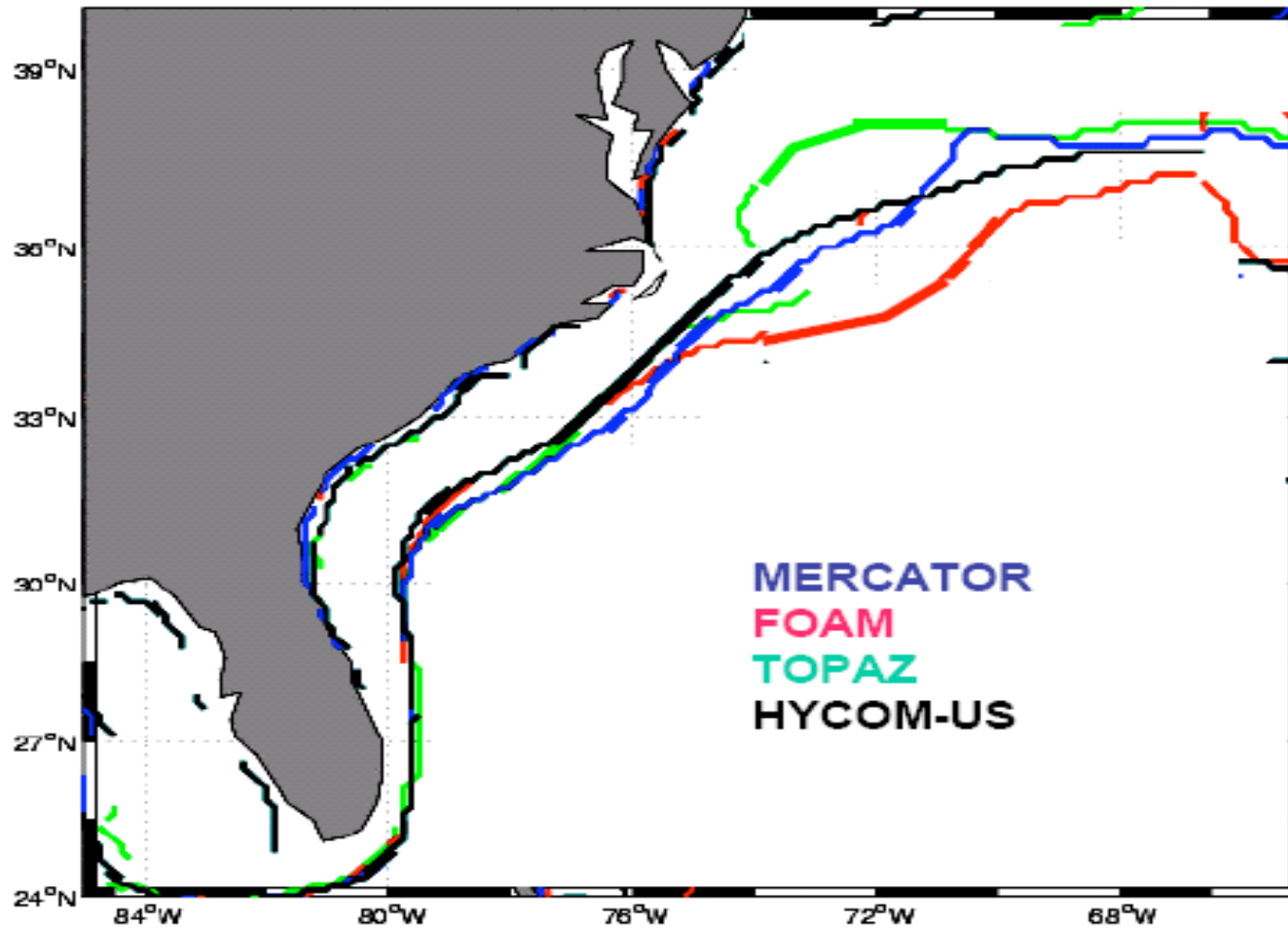


JUNE 1st 03

FEB 1st 04

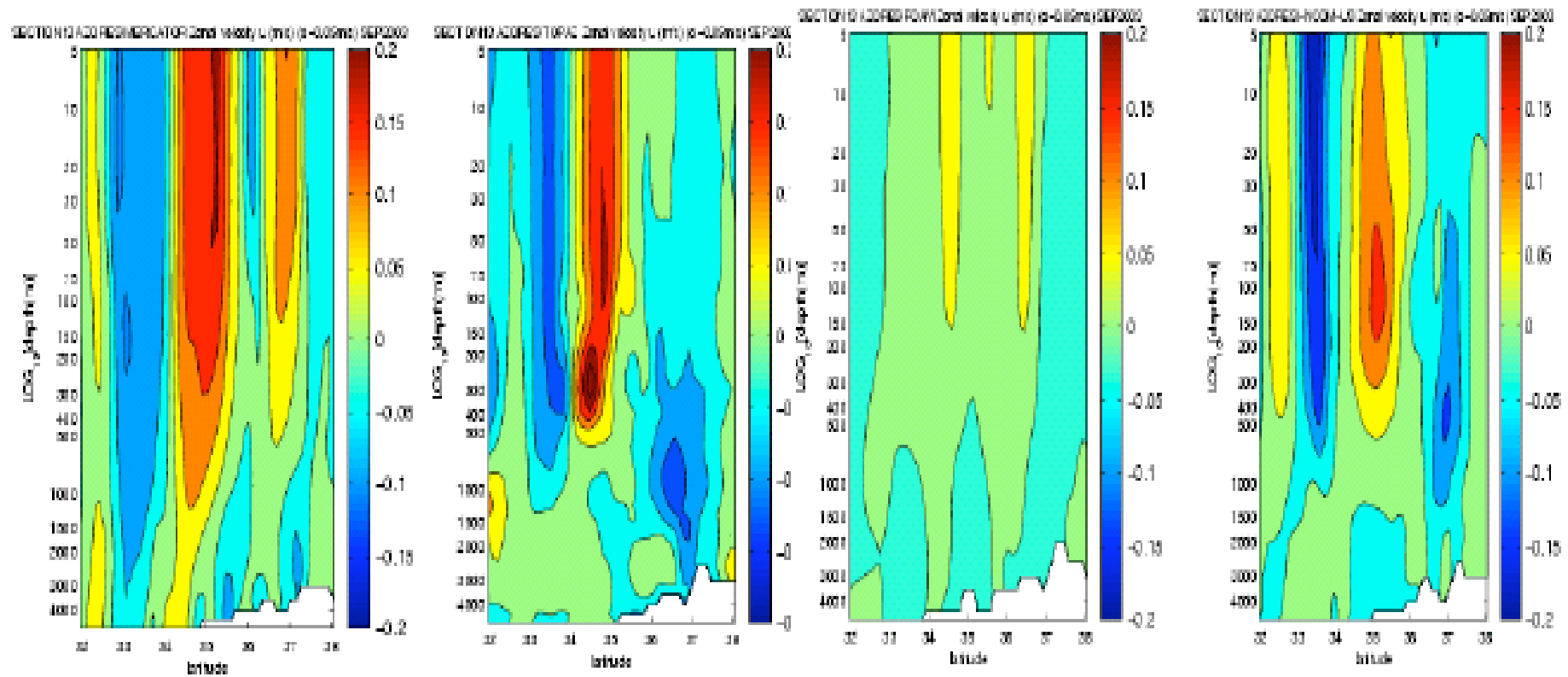
North Atlantic Intercomparison. MERSEA, L. Croznier

FRONT DETECTION for mean JUL-DEC 03 SSH



North Atlantic Intercomparison. MERSEA, L. Croznier

ZONAL VEL -SECTION 13 - AZORES - SEPT2003



MERCATOR

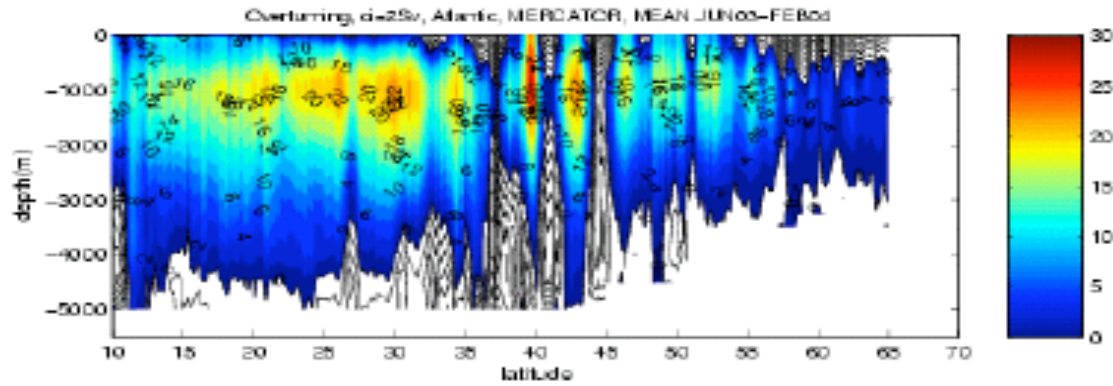
TOPAZ

FOAM

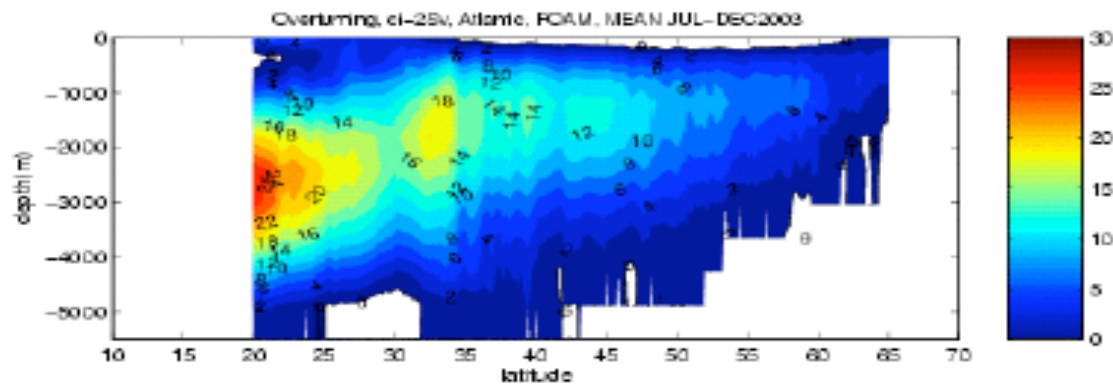
HYCOM-US

OVERTURNING STREAM FUNCTION $CI=2sV$

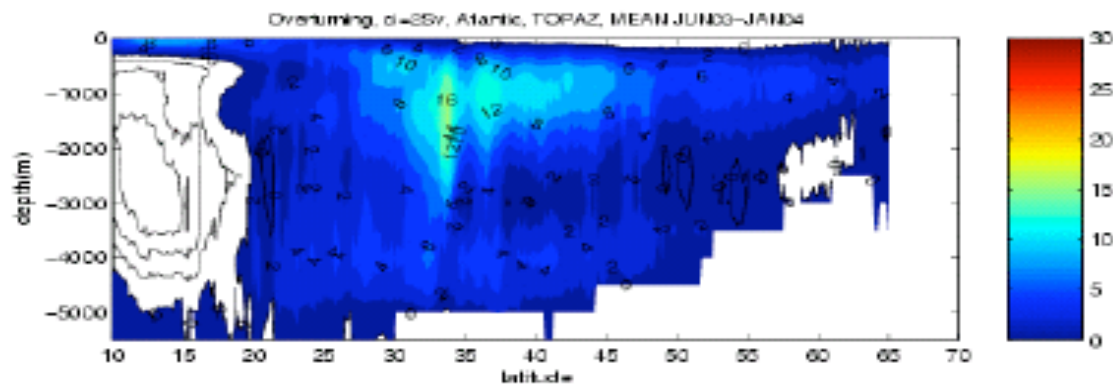
MERCATOR



FOAM



TOPAZ



No AABW=
No Isobaric effect
in Hycom
Sigma_0 discretization
(Sun et al. 1999)



Some NAtl. Intercomparison Findings

- **Comparison takes a lot of work but identifies issues very quickly**
- **Model bias**
- **Model physics and numerics**
- **Mean sea level uncertainty effects large**
- **Overflows challenging**
- **Lots of R&D ahead**
- **Applications metrics needed**



GHR SST Status

- **6th Science Team meeting May 05**
- **Some products are accessible from web site now**
- **Progress continues**
- **More info from SST/Sea Ice WG report**