

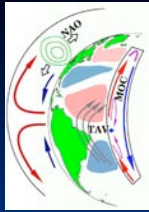
# CLIVAR perspective



(focused on the Atlantic)

Martin Visbeck

Chair of the CLIVAR  
Atlantic Implementation Panel



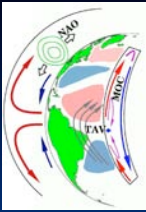
# What is CLIVAR



**CL**imate **VAR**iability and Predictability

**CLIVAR** started in 1995, is an international research program addressing many issues of natural climate variability and anthropogenic climate change.

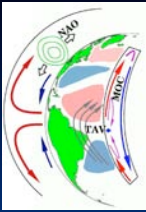
CLIVAR is part of the wider World Climate Research Program (WCRP)



# CLIVAR Objectives

To describe and understand the physical processes responsible for climate variability and predictability on seasonal, interannual, decadal, and centennial time-scales, through:

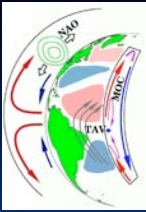
- the collection and analysis of observations
- the development and application of models of the coupled climate system
- in cooperation with other relevant climate-research and observing programmes.



# CLIVAR Objectives



- To extend the record of climate variability over the time-scales of interest through the assembly of quality-controlled paleoclimatic and instrumental data sets.
- To extend the range and accuracy of seasonal to interannual climate prediction through the development of global coupled predictive models.
- To understand and predict the response of the climate system to increases of radiatively active gases and aerosols and to compare these predictions to the observed climate record in order to detect the anthropogenic modification of the natural climate signal.



# CLIVAR focus



Climate  
Forcing



Modes of Climate  
Variability

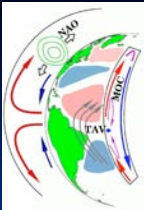


Regional  
Climate

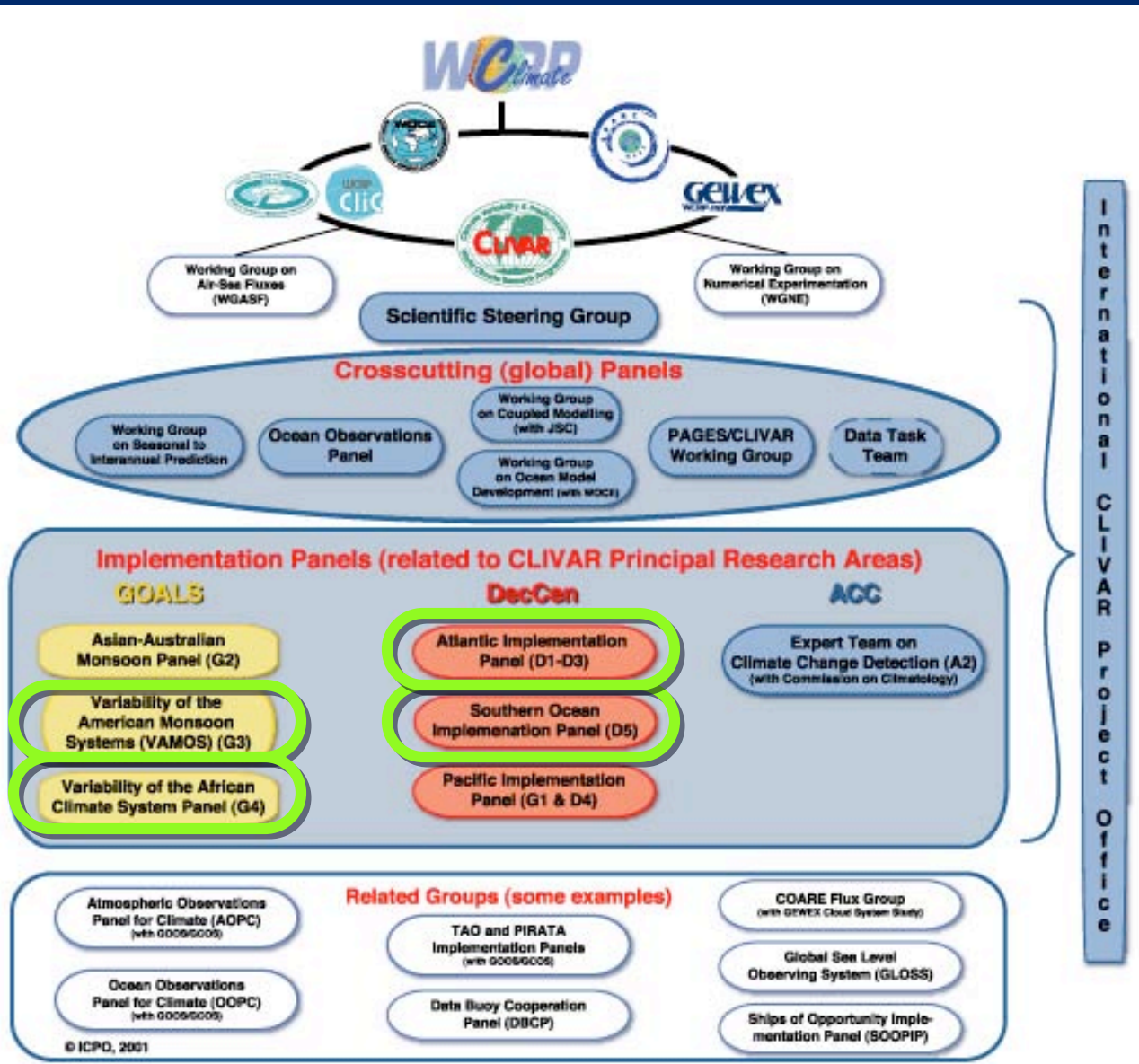
Assessments  
Predictions



Decision Making  
Policy



# CLIVAR Organization





# CLIVAR Atlantic Implementation Panel



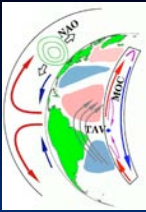


# CLIVAR Atlantic Implementation Panel Terms of reference



To recommend and oversee the implementation of observations in the Atlantic Ocean sector, in order to meet the objectives outlined in CLIVAR's Science and Initial Implementation Plans, particularly with respect to the Principal Research Areas:

D1 (North Atlantic Oscillation),  
D2 (Tropical Atlantic Variability) and  
D3 (Atlantic Thermohaline Circulation).



# CLIVAR Atlantic Implementation Panel Terms of reference



To collaborate with JSC/CLIVAR Working Group on Coupled Modelling (including WGOMD) and CLIVAR Working Group on Seasonal to Interannual Prediction, in order to design appropriate numerical experiments, and to be aware of requirements set by these groups for data sets needed to validate models.

To liaise with the relevant CLIVAR panels, in particular Upper Ocean Panel and PIRATA Steering Group, to ensure that best use is made of resources from the global and equatorial research programs.

To liaise with Ocean Observation Panel for Climate and other relevant groups to ensure that CLIVAR benefits from and contributes to observations in GOOS and GCOS.

To report to the CLIVAR SSG.



# CLIVAR Atlantic Implementation Panel



A. Busalacchi  
T. Delworth  
J. Hurrell  
B. Johns#  
K.-P. Koltermann  
Y. Kushnir  
D. Marshall#  
C. Mauritzen#  
A. Piola  
F. Schott  
R. Sutton  
C. Reason  
M. Visbeck (Chair)  
I. Wainer  
D. Wright#

University of Maryland, USA  
GFDL, Princeton, USA  
NCAR, Boulder, USA  
RSMAS, Miami, USA  
BSH, Hamburg, Germany  
Lamont-Doherty Earth Observatory, Palisades, USA  
University of Reading, UK  
NMI, Oslo, Norway  
Servicio Hidrografia Naval, Buenos Aires, Argentina  
Institut für Meereskunde, Kiel, Germany  
Global Atmosph. Modelling, Univ. of Reading, UK  
University of Cape Town, South Africa  
Lamont Doherty Earth Observatory, Palisades, USA  
Universidade de Sao Paulo, Brazil  
Bedford I. of Oceanography, Dartmouth, Canada

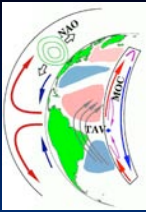


# New panel member in 2003

Retired from panel

A. Clarke (2002)  
R. Dickson (2002)  
G. Reverdin (2002)  
M. McCartney (2001)

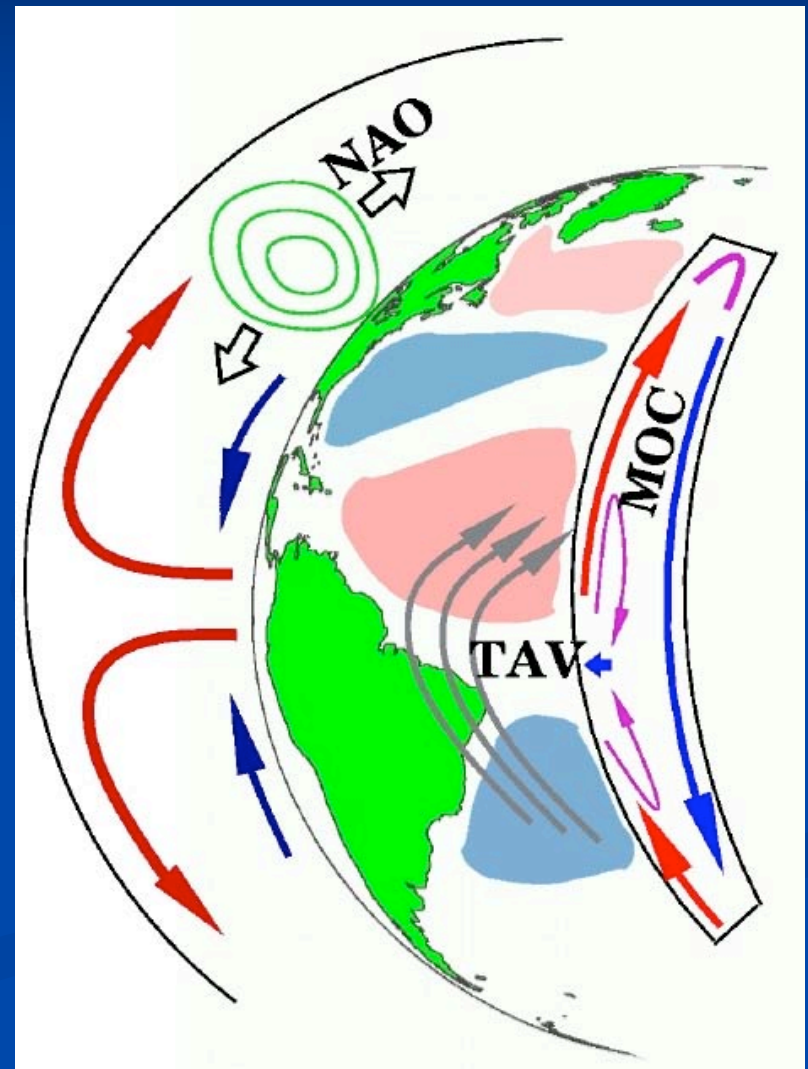
Bedford I. of Oceanography, Dartmouth, Canada  
CFACS, Lowestoft, UK  
LEGOS, Toulouse Cedex, France  
Woods Hole, USA

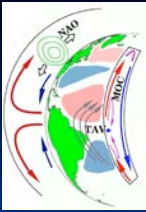


# CLIVAR Atlantic Sector Phenomena



- North Atlantic Oscillation
- Tropical Atlantic Variability
- Meridional Overturning in the Ocean
- With emphasis on interactions with each other and/or other climate forcings including ENSO and ACC





# CLIVAR Atlantic Sector Strategy



Promote a balanced approach to describe, understand and assess predictability of climate phenomena using:

Observations (**joined with OOPC and COOP**):

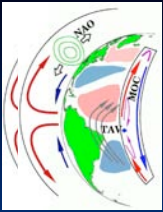
- sustained observations
- regionally enhanced observations
- process studied

Modeling and Theory (**joined with WGCM, WGOMD**):

- global and region GCMs
- process models

Synthesis: (have not done to much about )












- empirical studies
- atmosphere / ocean / (land) reanalysis
- predictability

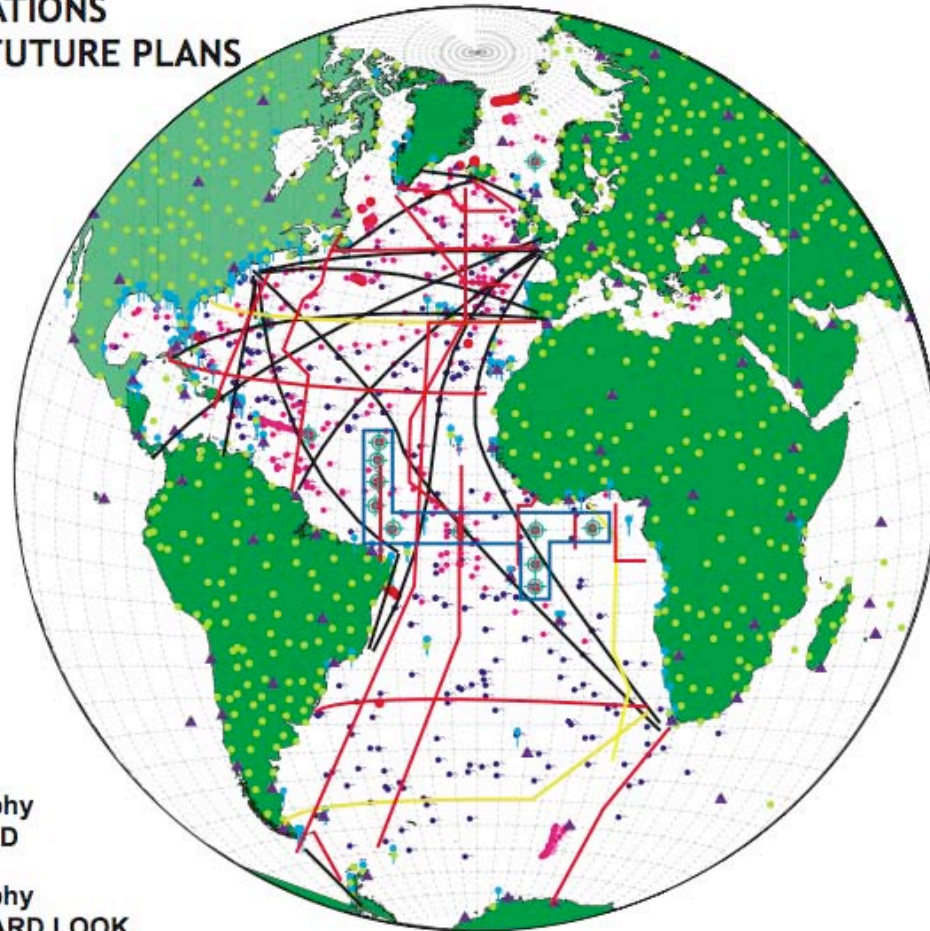


# CLIVAR Atlantic Ocean Observing Network

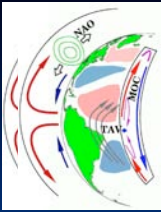


## ATLANTIC OBSERVATIONS PRESENT NETWORK AND FUTURE PLANS

-  PIRATA
-  GUAN
-  GSN
-  SEA LEVEL
-  FLOATS
-  DRIFTERS
-  AIR-SEA FLUX
-  FIXED POINT TIME-SERIES
-  XBT
-  Repeat Hydrography PLANNED/FUNDED
-  Repeat Hydrography PLANNED/FORWARD LOOK



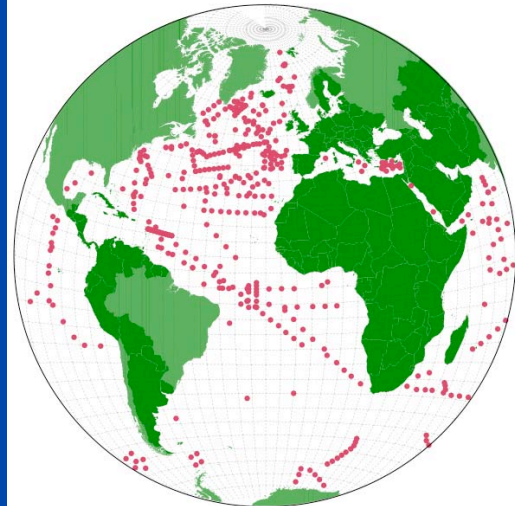
Compiled by R. Boscolo - check CLIVAR [website](#) for details



# CLIVAR Atlantic Ocean Observing Network



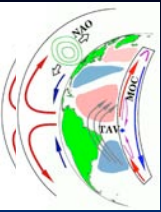
Floats (mostly ARGO) Deployed from 2000 till 2002



Developed a web site linked to our panels web page that lists all the known 'sustained' and 'process' insitu observations relevant to CLIVAR Atlantic.

**Panel encourages coordination between various groups and recommends action to various network operators.**

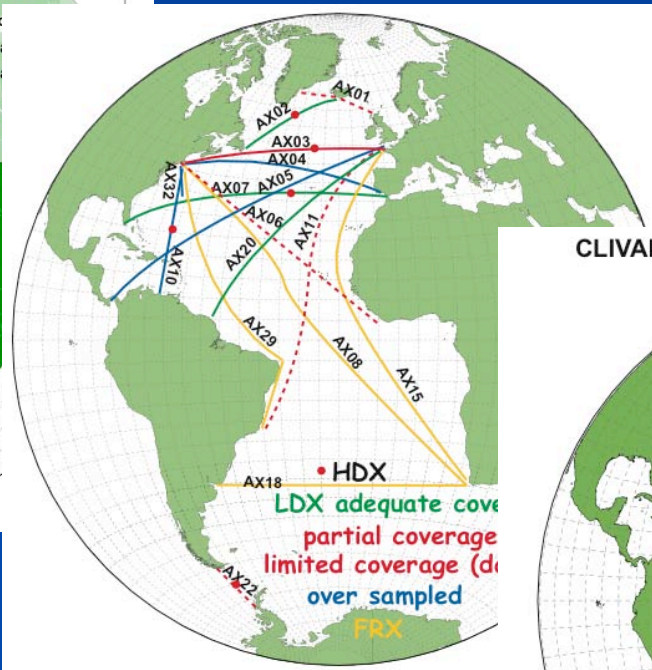
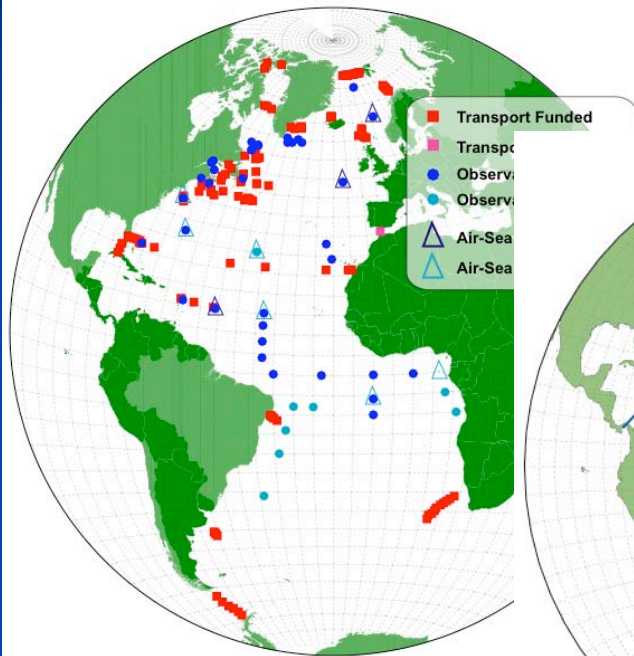
Compiled by R. Boscolo - check CLIVAR [website](#) for details



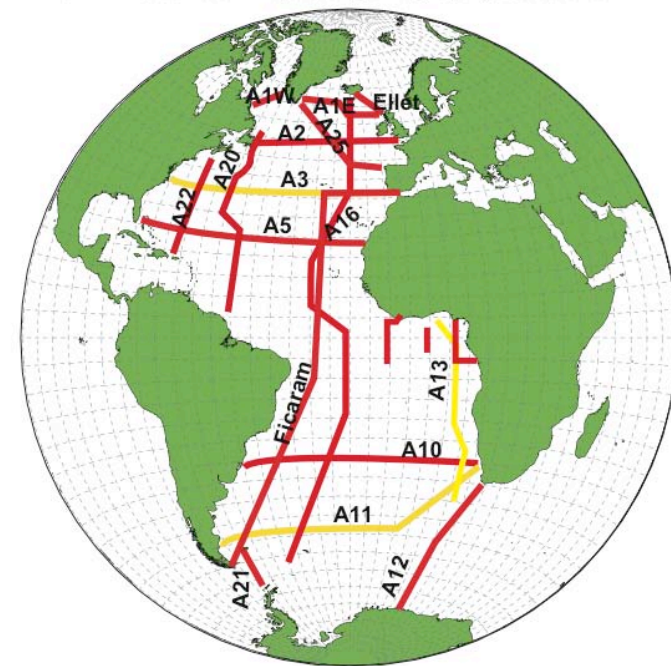
# CLIVAR Atlantic Ocean Observing Network



Fixed Point Time Series

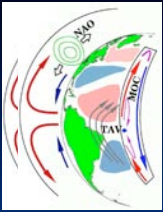


CLIVAR/Carbon Repeat Hydrography Sections

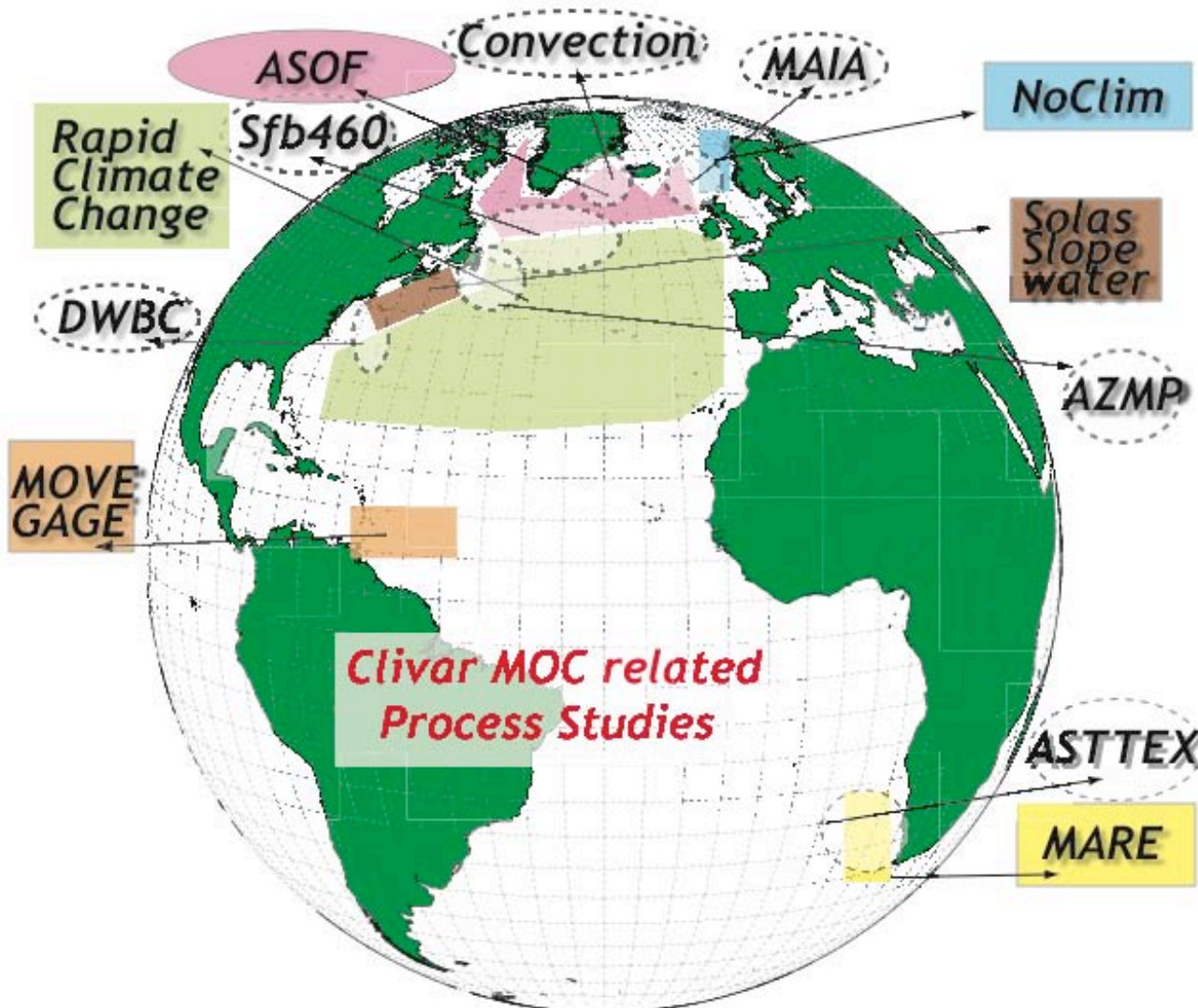


— Planned/Forward look  
— Planned/Funded

Compiled by R. Boscolo - check [CLIVAR website](#) for details



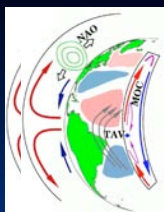
# CLIVAR Atlantic Ocean “Named Programs”



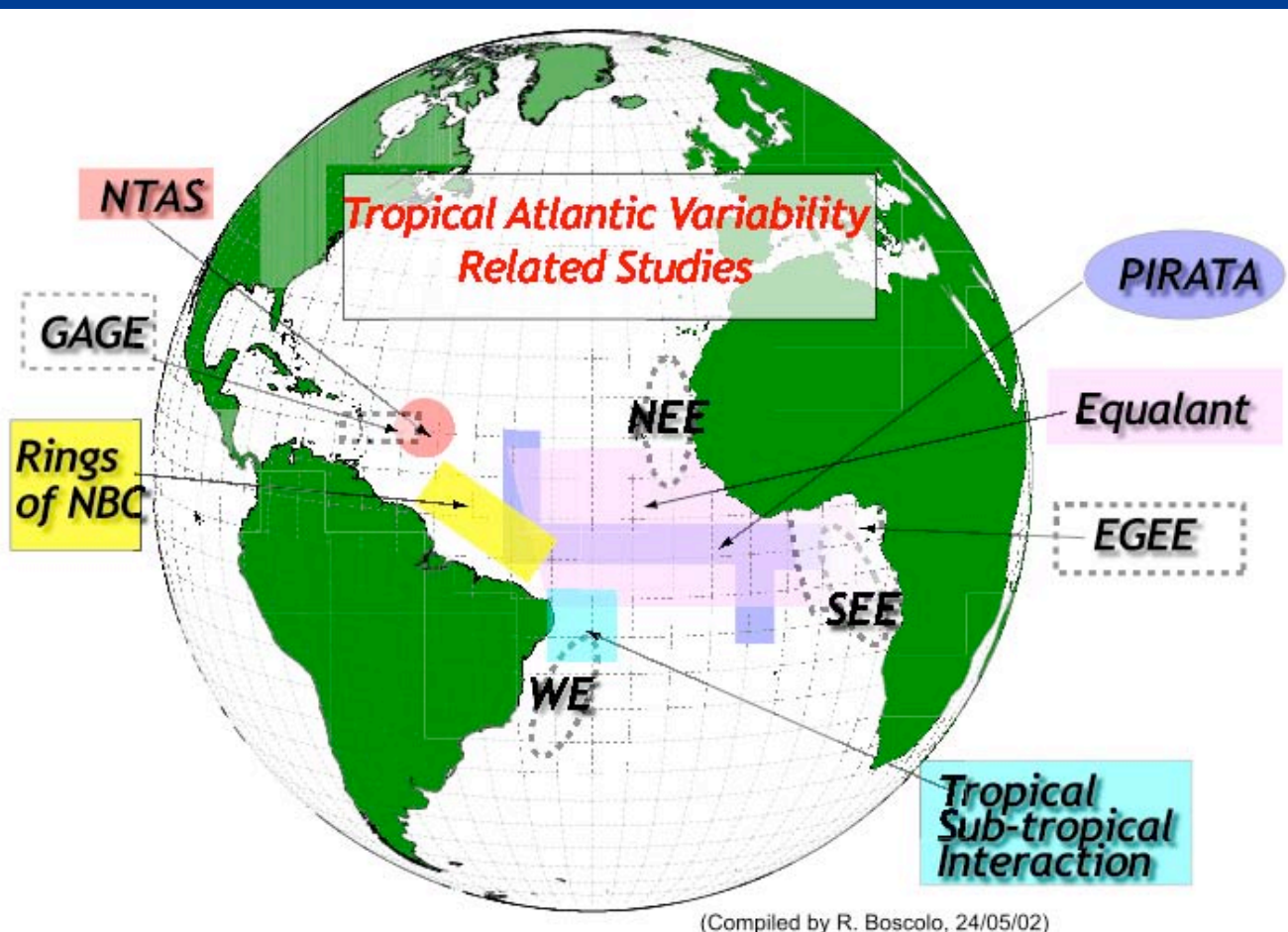
Large Alphabet soup of international "Process Studies / Programs" exists with different levels of relevance to CLIVAR.

Only some of them have been "initiated" in the name of CLIVAR.

Check CLIVAR [website](#) for details



# CLIVAR Atlantic Ocean “Named Programs”



Large Alphabet soup of international "Process Studies / Programs" exists with different levels of relevance to CLIVAR.

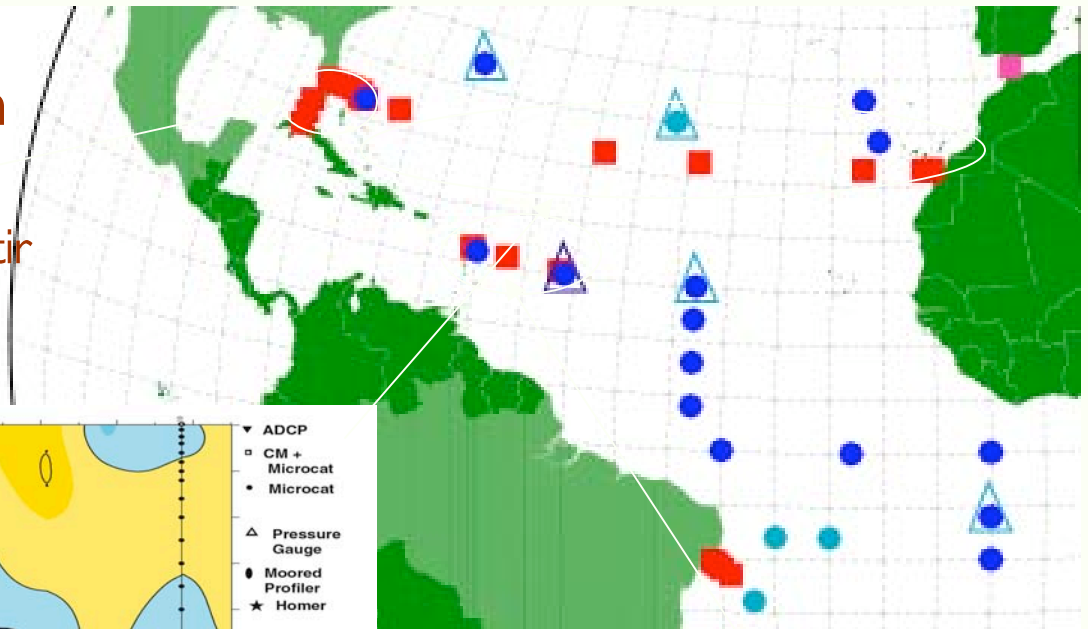
Only some of them have been "initiated" in the name of CLIVAR.

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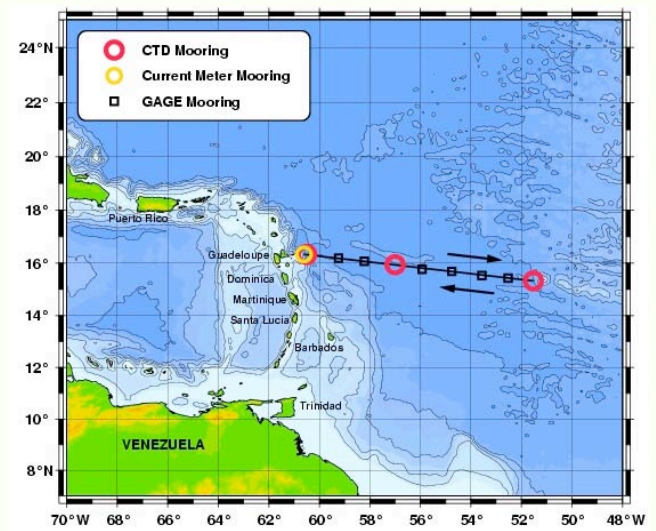
# Florida Transport from Cable measurements

1982 operational, A. Flosadottir



# MOVE

2000-2005 U. Send



MOC  
at 26.5°N  
Planned  
Funded  
2004-2008  
J. Marotzke  
B. Johns

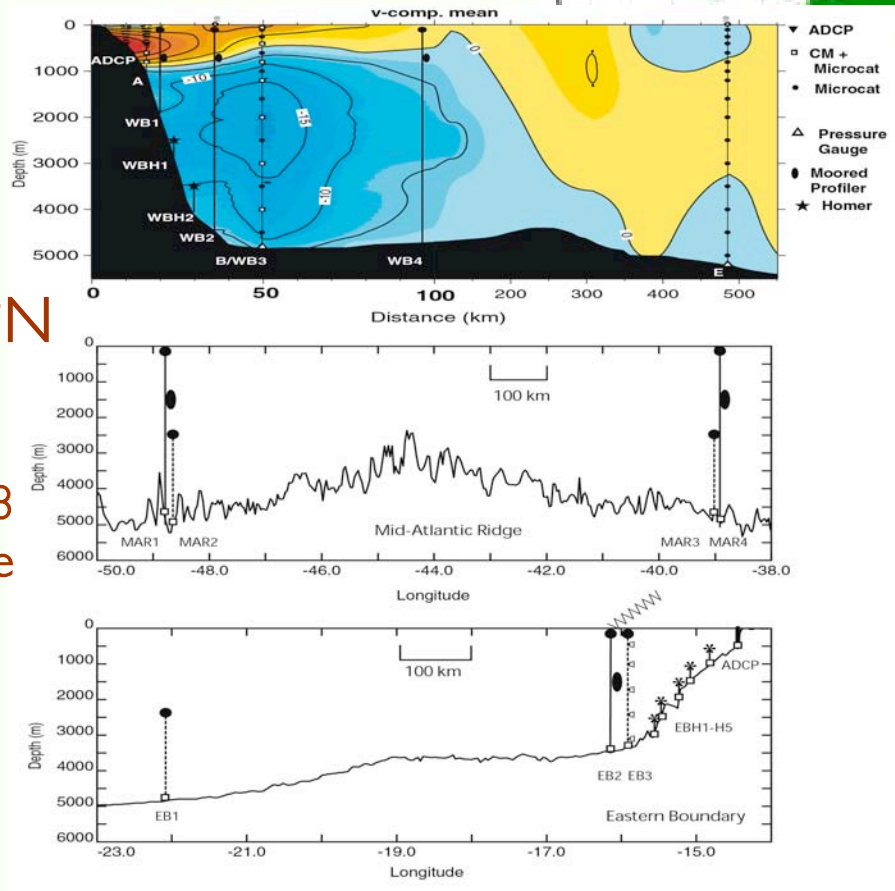
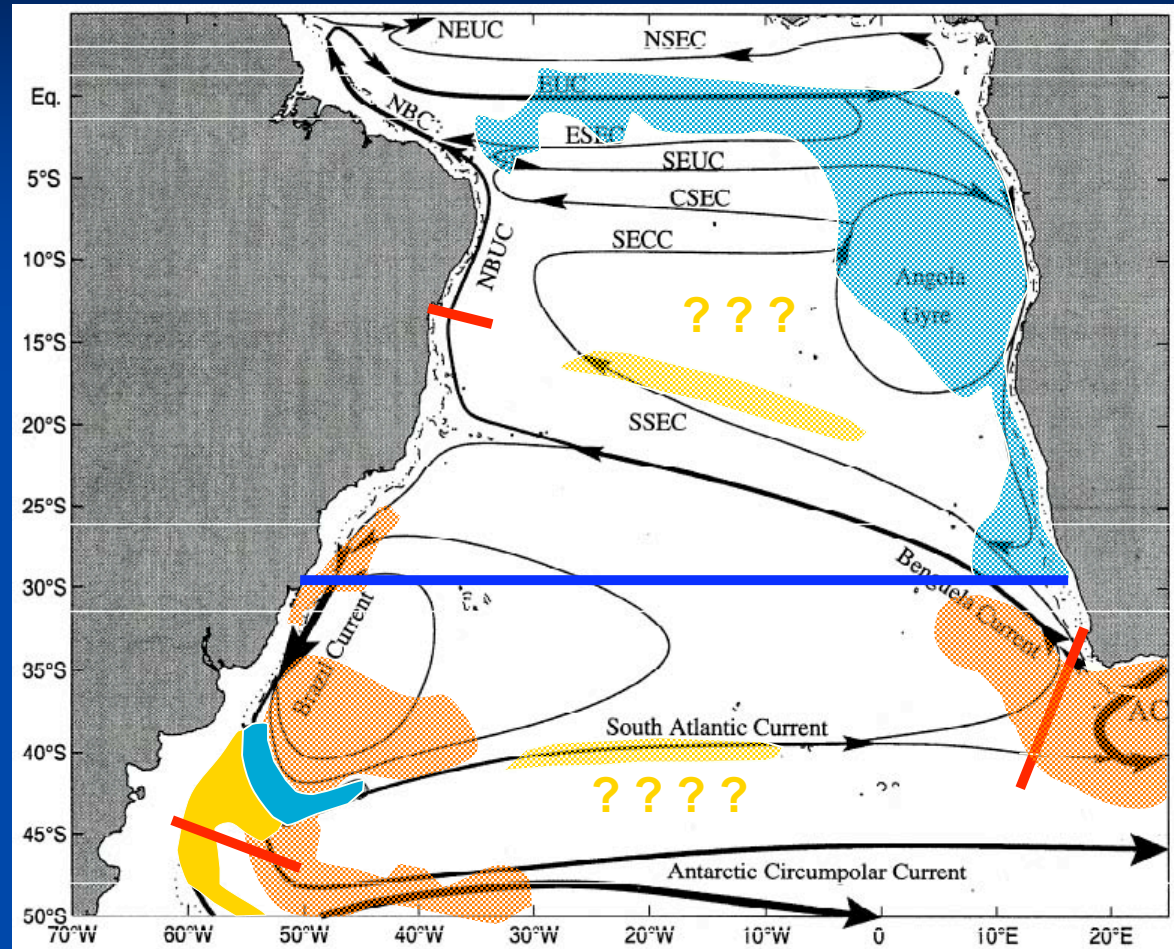
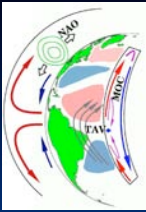
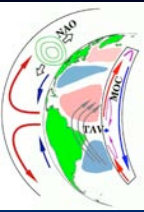
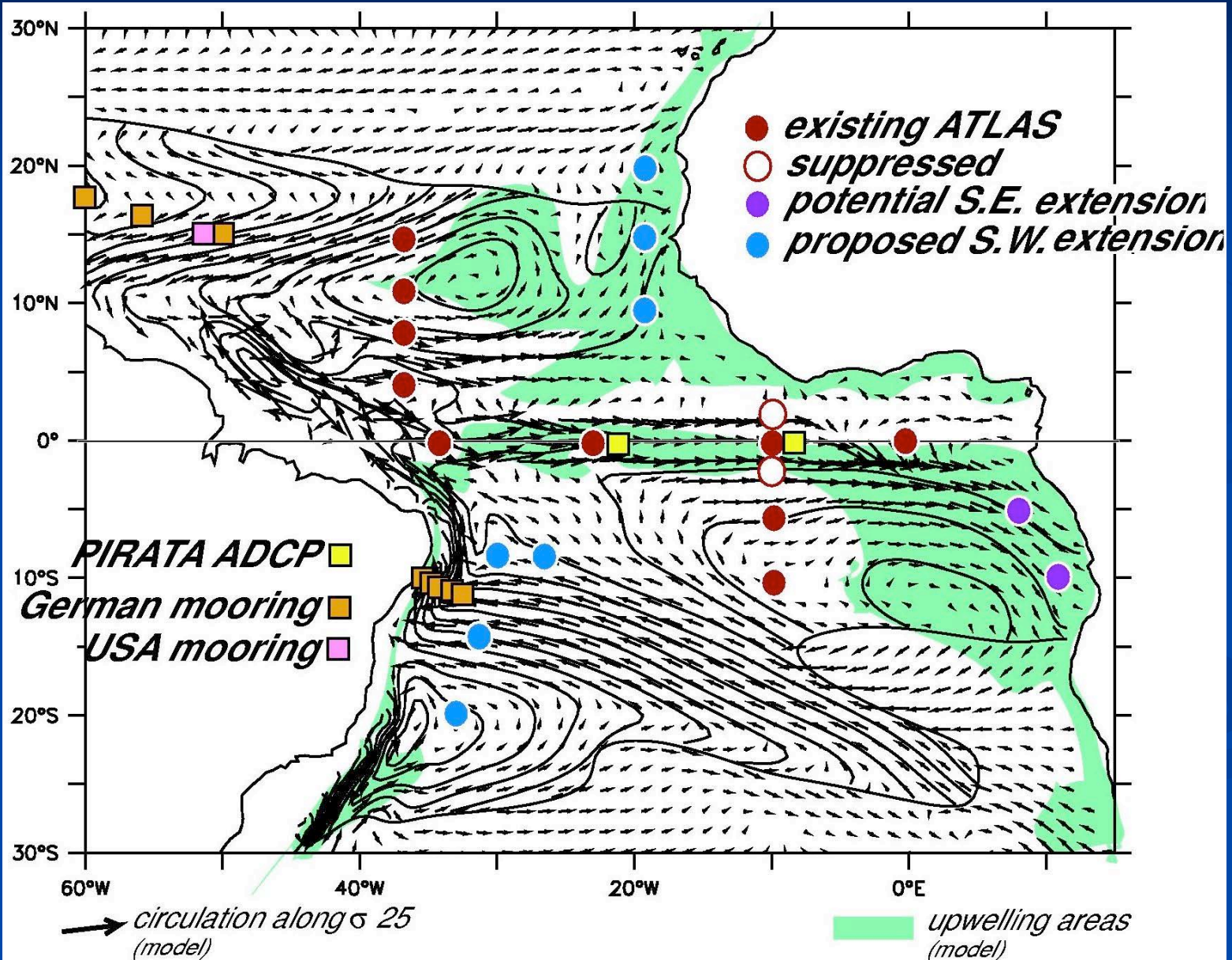


Figure 1: Mooring array for monitoring the Atlantic meridional overturning circulation at 26.5 N. a) Western boundary; b) Mid-Atlantic Ridge; c) Eastern boundary



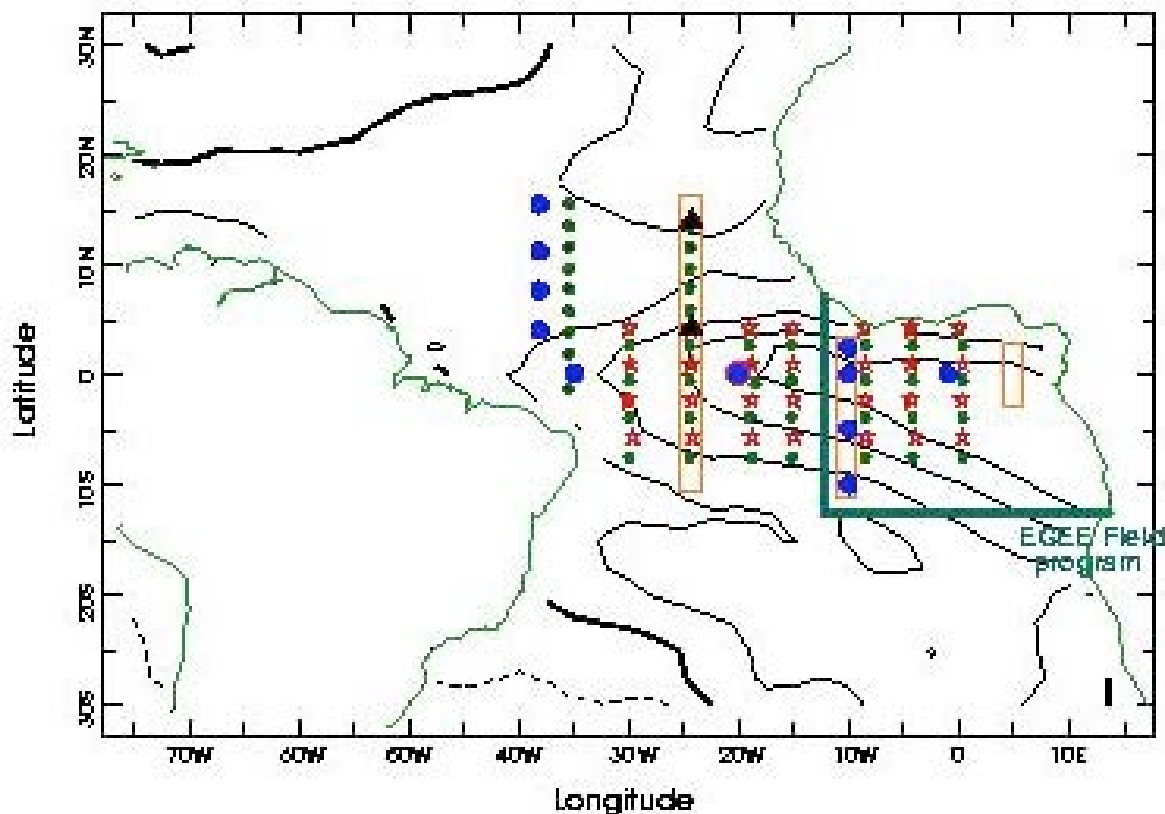


# SA Atlantic "PIRATA Extension" in the Tropical Atlantic (preliminary)





# Enhanced Observations in the Tropical Atlantic (preliminary)



- PIRATA/ATLAS mooring
- ATLAS mooring with ADCP
- ★ Cold Tongue surface drifter experiment
- Lagrangian and profiling floats
- ▲ Proposed surface flux moorings
- ▭ Array of current meter moorings

Contours represent the regression of SST onto the first EOF of JJAS West African rainfall (previous panel). The contour interval is 0.1 degrees C and the dark line is the zero contour.



# CLIVAR Atlantic Implementation Panel Issues

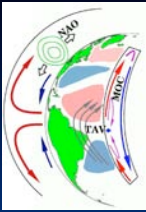


## ■ Synthesis

- panel supports strongly CLIVAR wide strategy for model based synthesis
- Feedback on observing system optimisation
- Data should also be available for other more empirical studies

## ■ Data Management

- CLIVAR strategy is piecemeal at best
- needs some “new” ideas
- Can we build upon emerging data centre in support of “operational” oceanography and “operational” meteorology?



# CLIVAR - OOPC Issues



- **How to maintain existing networks?**
  - CLIVAR is one of the scientific users of the existing networks. But all the users should speak with one voice when it comes to defend observing systems. Will OOPC be the voice with input from CLIVAR when needed?
  - How to evaluate the overall usefulness of a particular array in the context of other data and a variety of users?
  
- **How to transition pilot efforts to sustained?**
  - CLIVAR has pilot projects in the water that, if proven useful, should be sustained. How will we accomplish that? PIRATA, GAGE, 25N, etc.
  
- **Rich mixture of data types (state, flux) (shallow/deep)**
  - How to come to global/regional synthesis
  - How to manage data