

# The need for ship resources to support global ocean observations



**Gustavo Jorge Goni**

Gustavo.Goni@noaa.gov

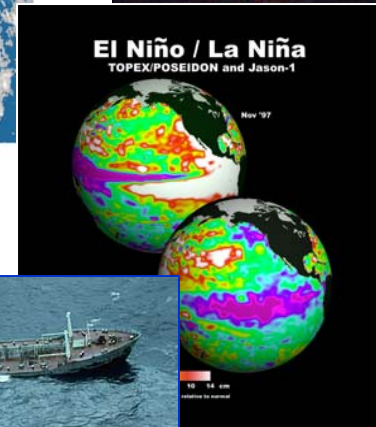
National Oceanic and Atmospheric Administration  
Atlantic Oceanographic and Meteorological Laboratory  
Miami, FL

Fourth International Port Meteorological Officer Conference (PMO-IV)  
and Support to Global Ocean Observations Using Ship Logistics

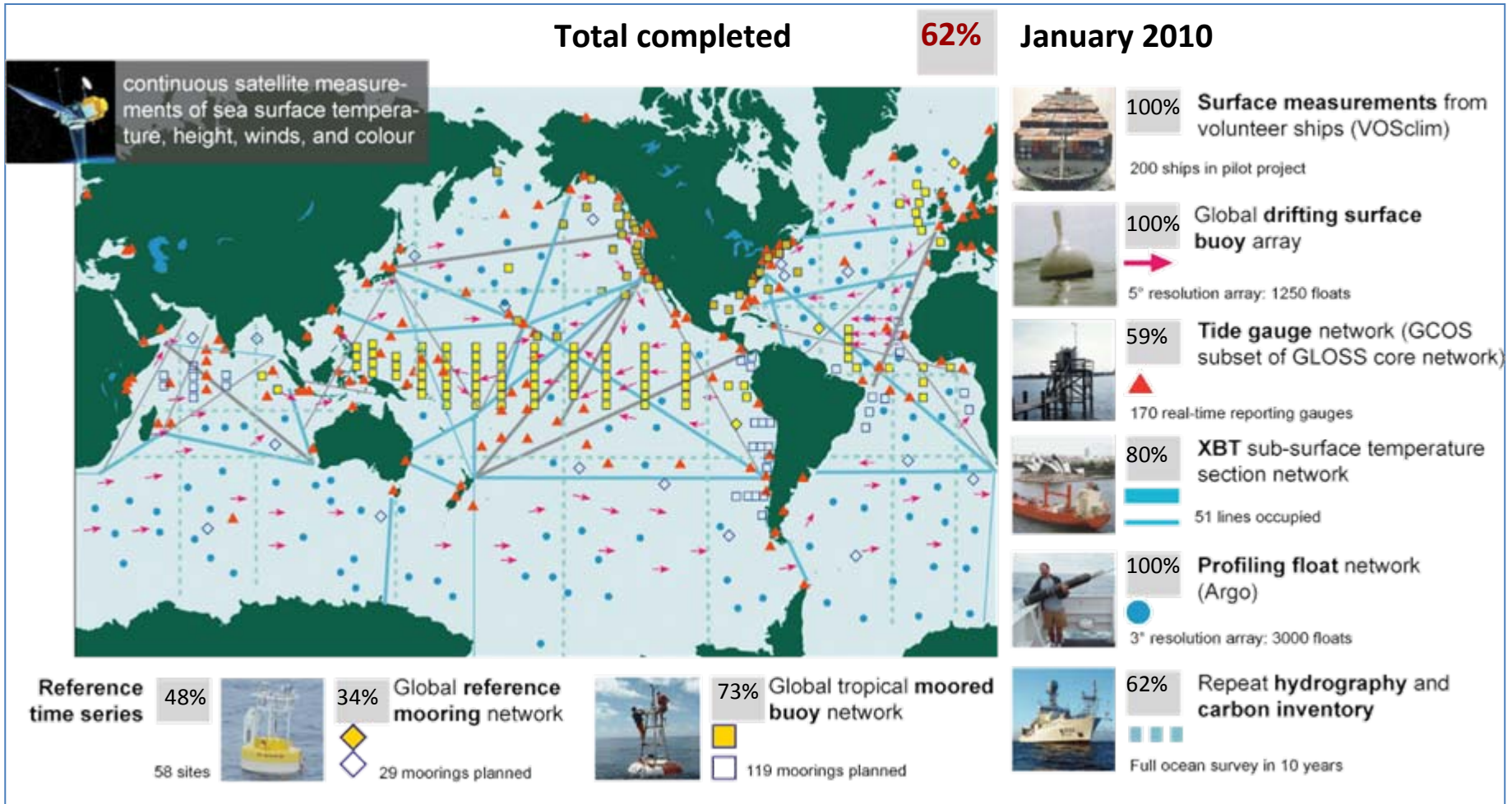
# Why are we doing ocean observations ?

Curiosity  
Obligation

Climate  
Weather  
Fisheries  
Marine mammals  
Search and Rescue  
Navigation  
Recreation  
Transportation  
Port operations  
Debris tracking  
Oil spill monitoring  
Corals  
CO2  
...



# Global Ocean Observing System: What is it ?



# Ocean Observations

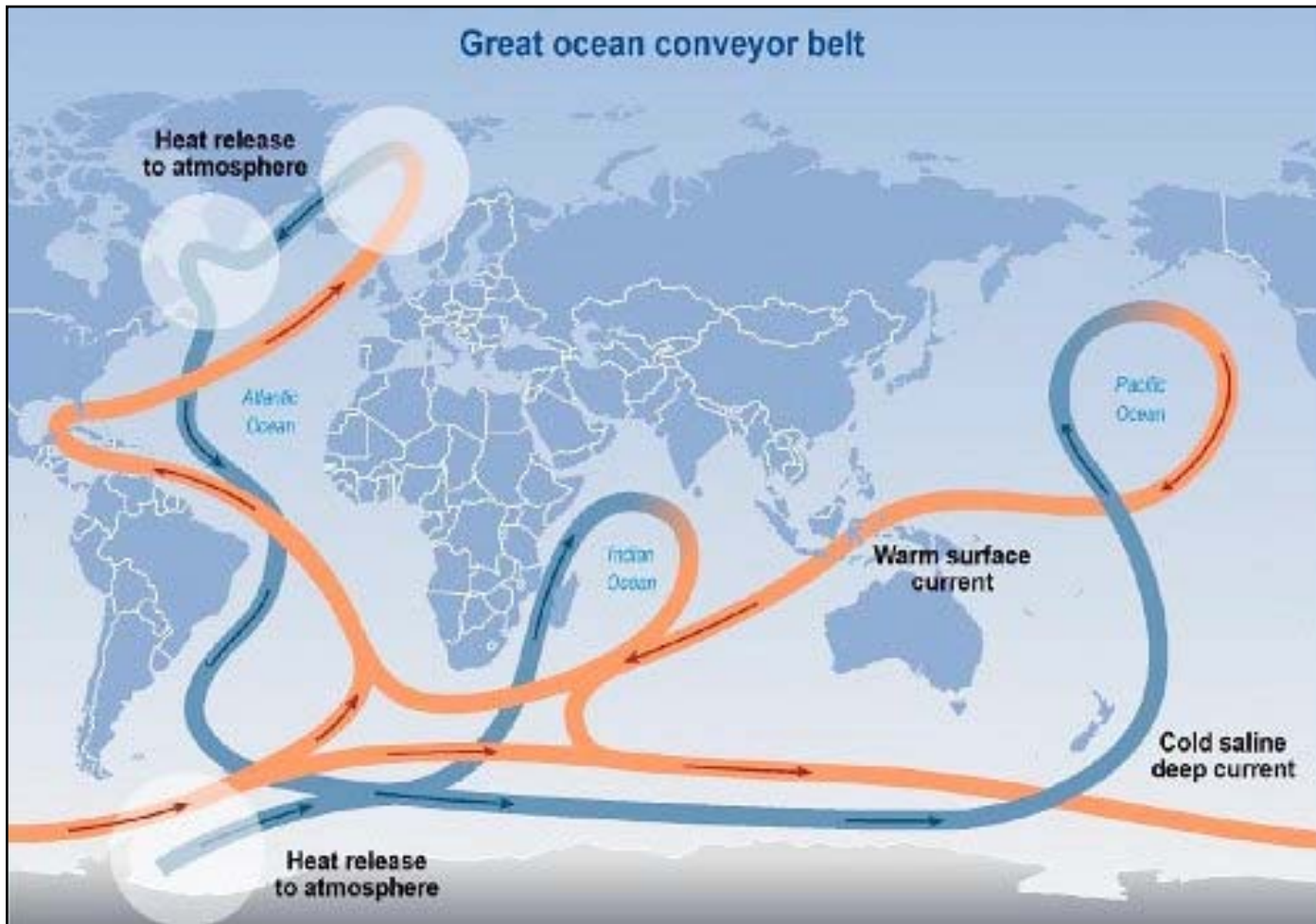
	Research	SOO
XBTs	X	X
Drifters	X	X
Argo Floats	X	X
CTDs	X	
ADCP	X	X
TSGs	X	X
Moorings	X	
Repeat	X	X
Targeted	X	

**SOO=**  
**Cargo ships**  
**Cruise ships**  
**Ferries**  
**etc**



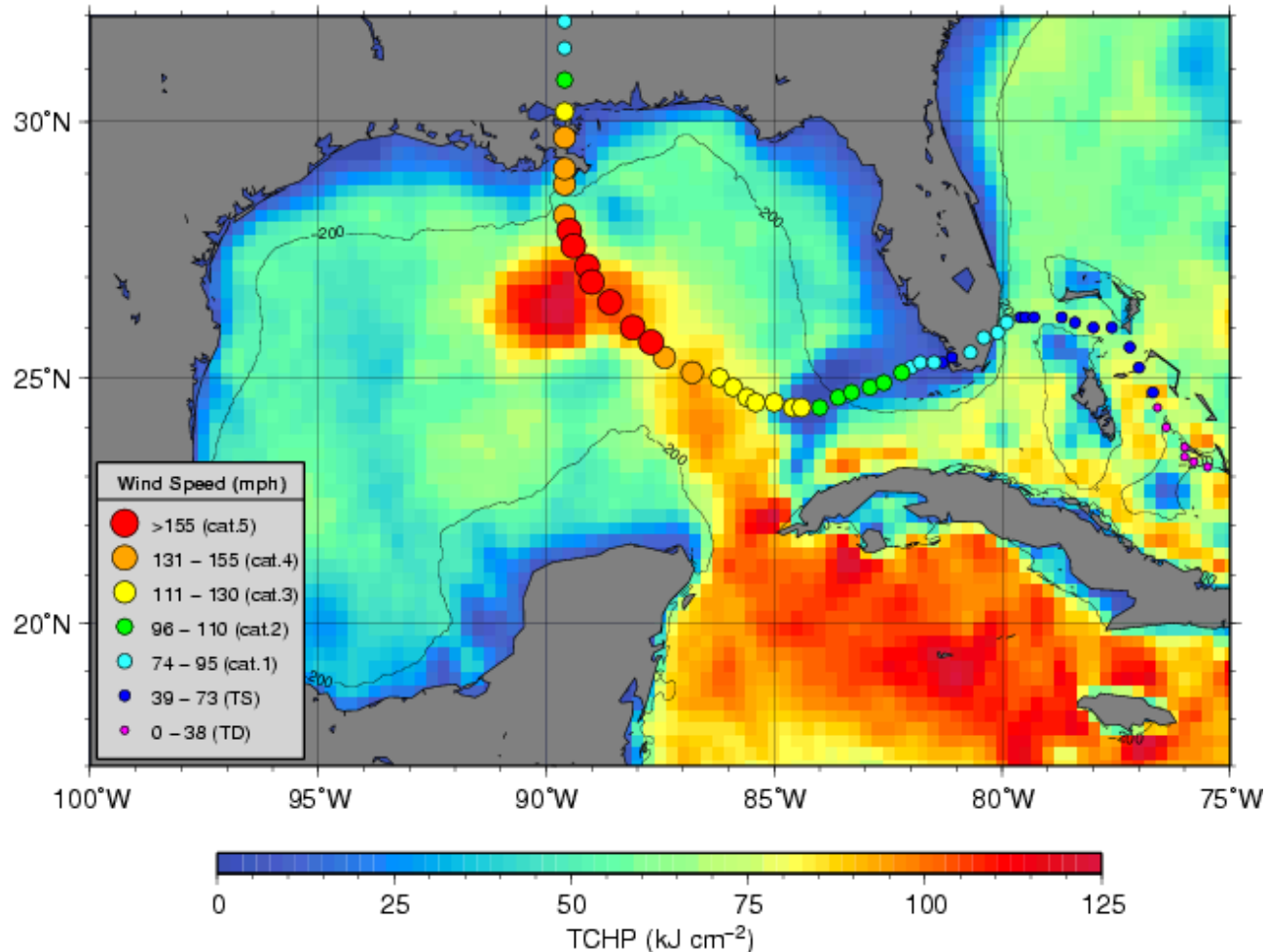


# Global Ocean Observing System: Why do we implement it and maintain it ? Climate Studies



# Global Ocean Observing System: Why do we implement it and maintain it ? Extreme weather studies

Gulf of Mexico – Tropical cyclone heat potential (TCHP) 08/28/2005



# Surface Drifters: deployment

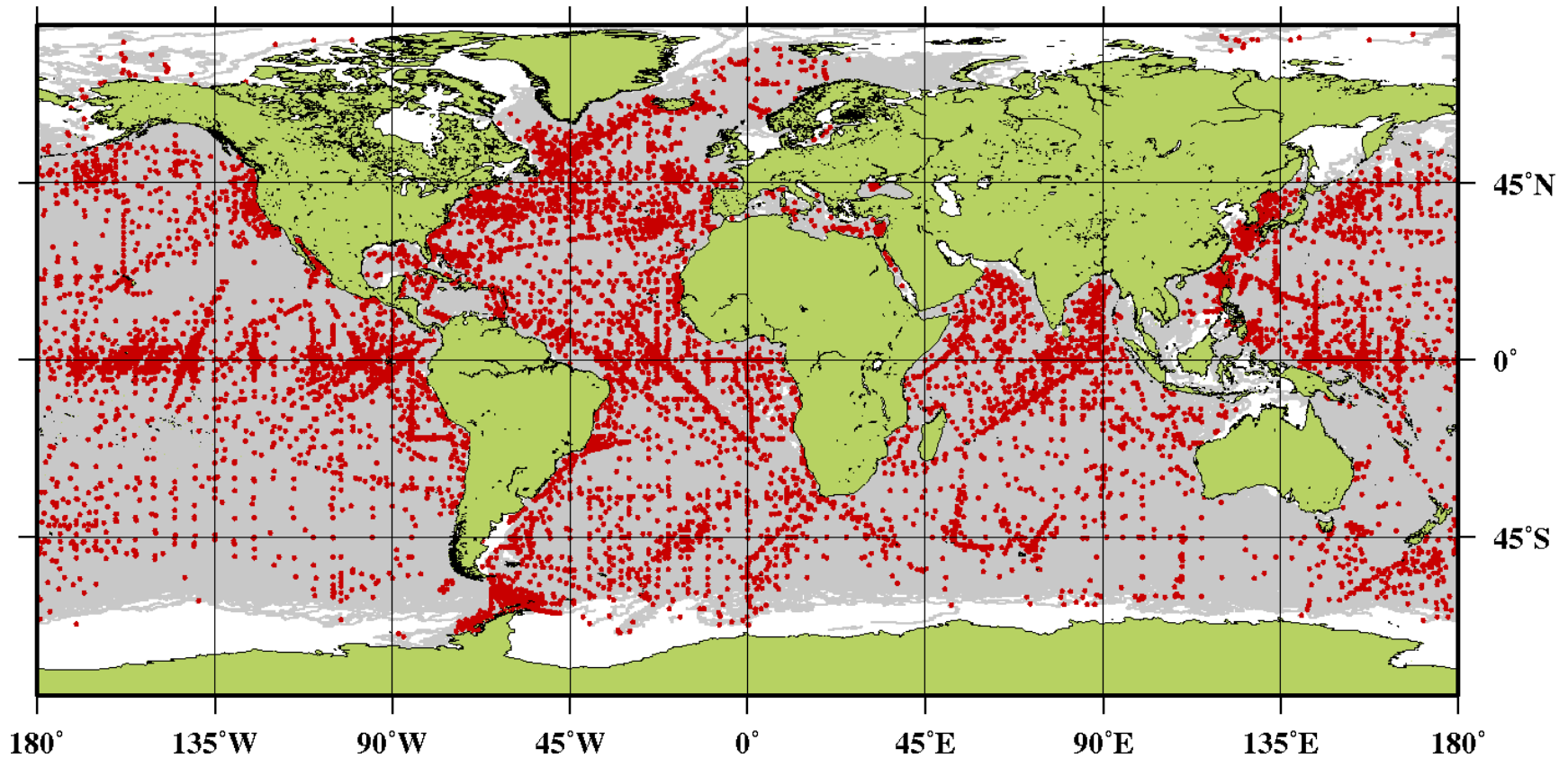
SVP Drifter with Mini Drogue  
Photo by: GDP / GOOD HOPE II



# Surface Drifters: location of deployments

Period: 1988–2010

Number of Deployments: DRIFTERS– 14226

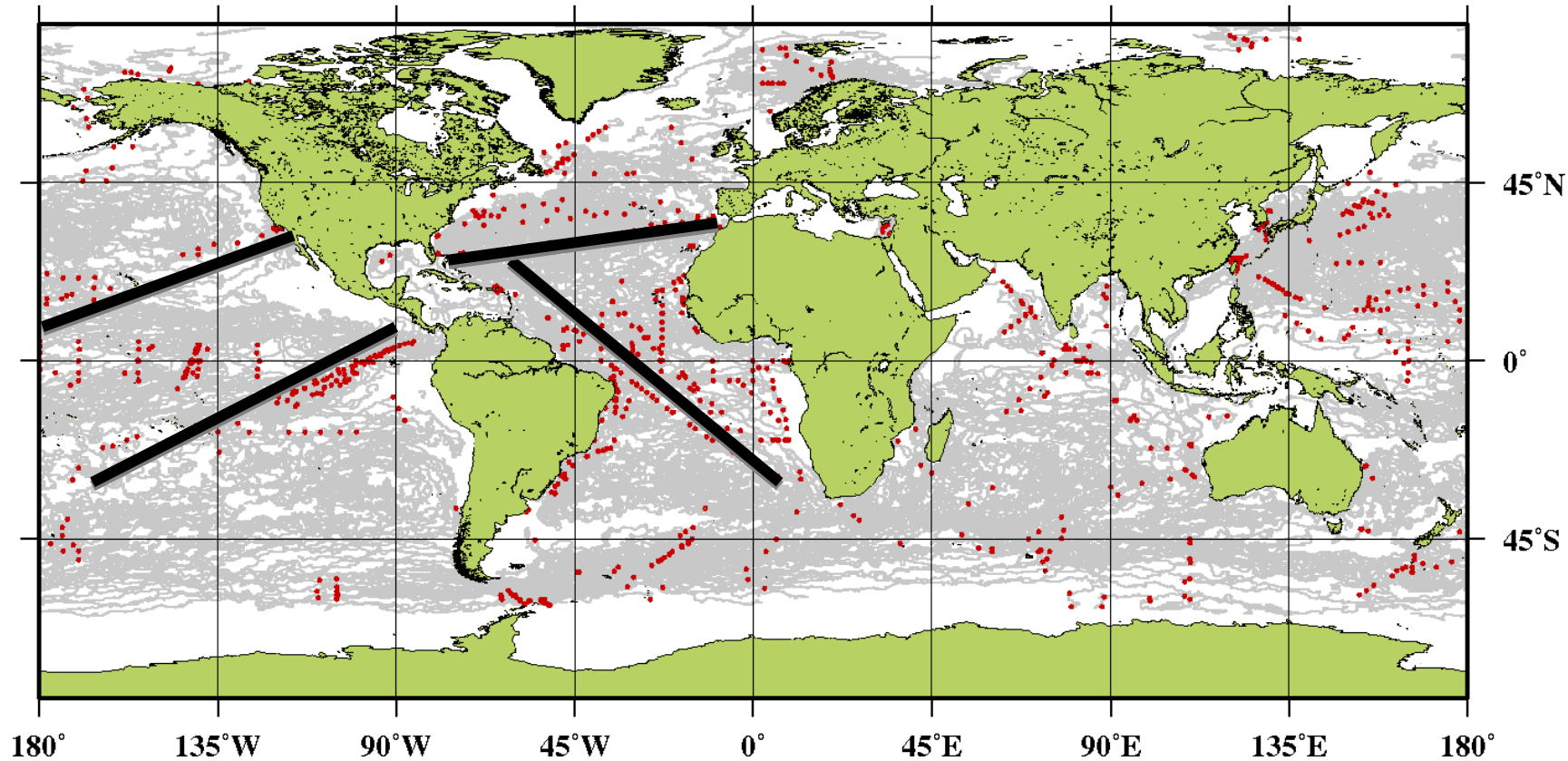




# Surface Drifters: location of deployments

YEAR 2009

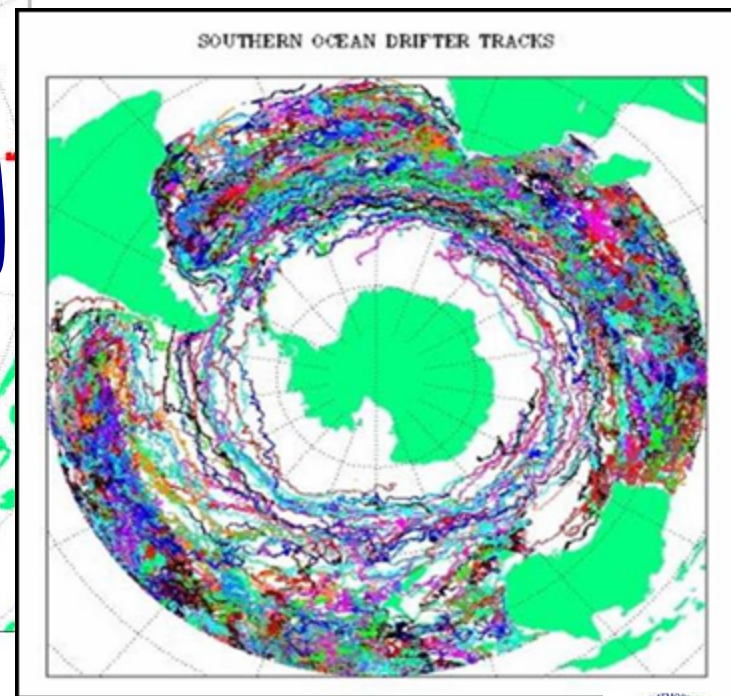
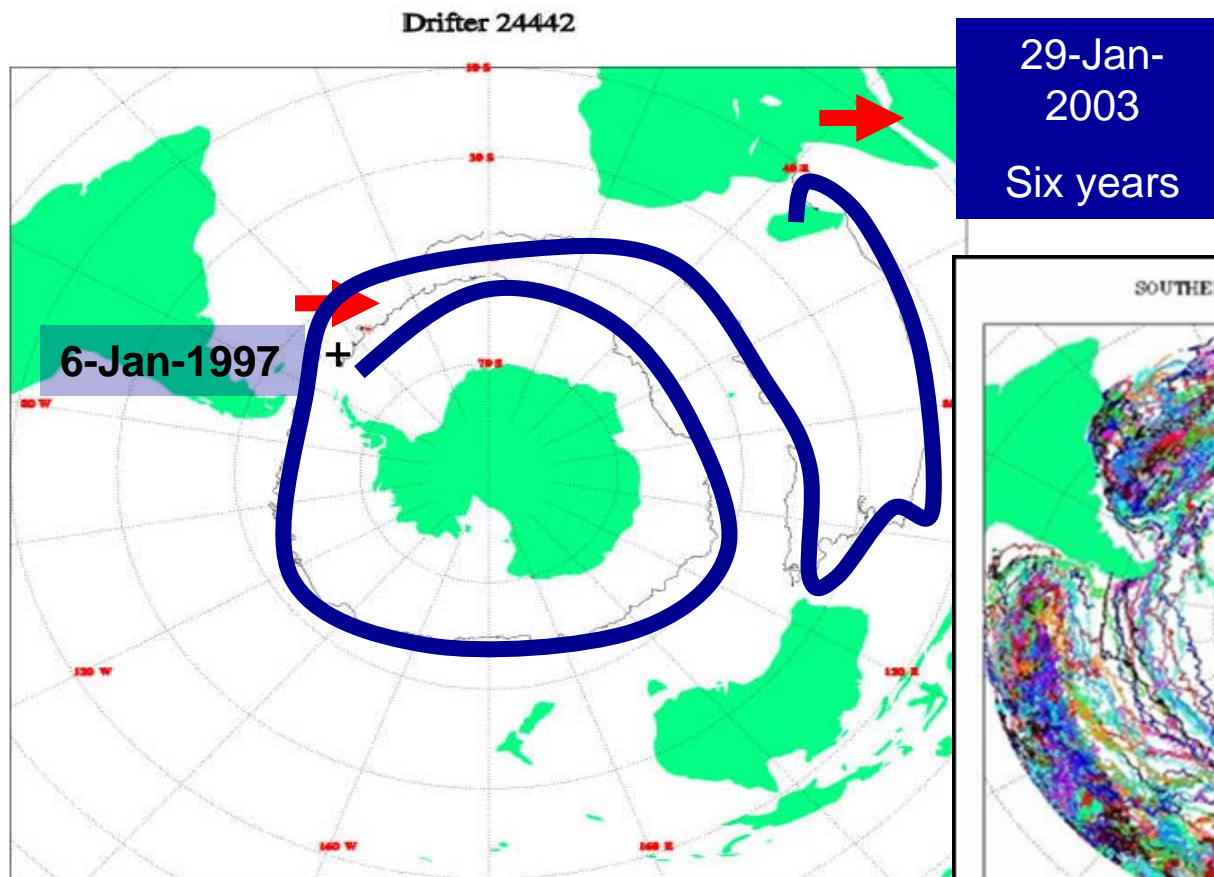
Number of Deployments: DRIFTERS- 1095



More to come: Shaun Dolk

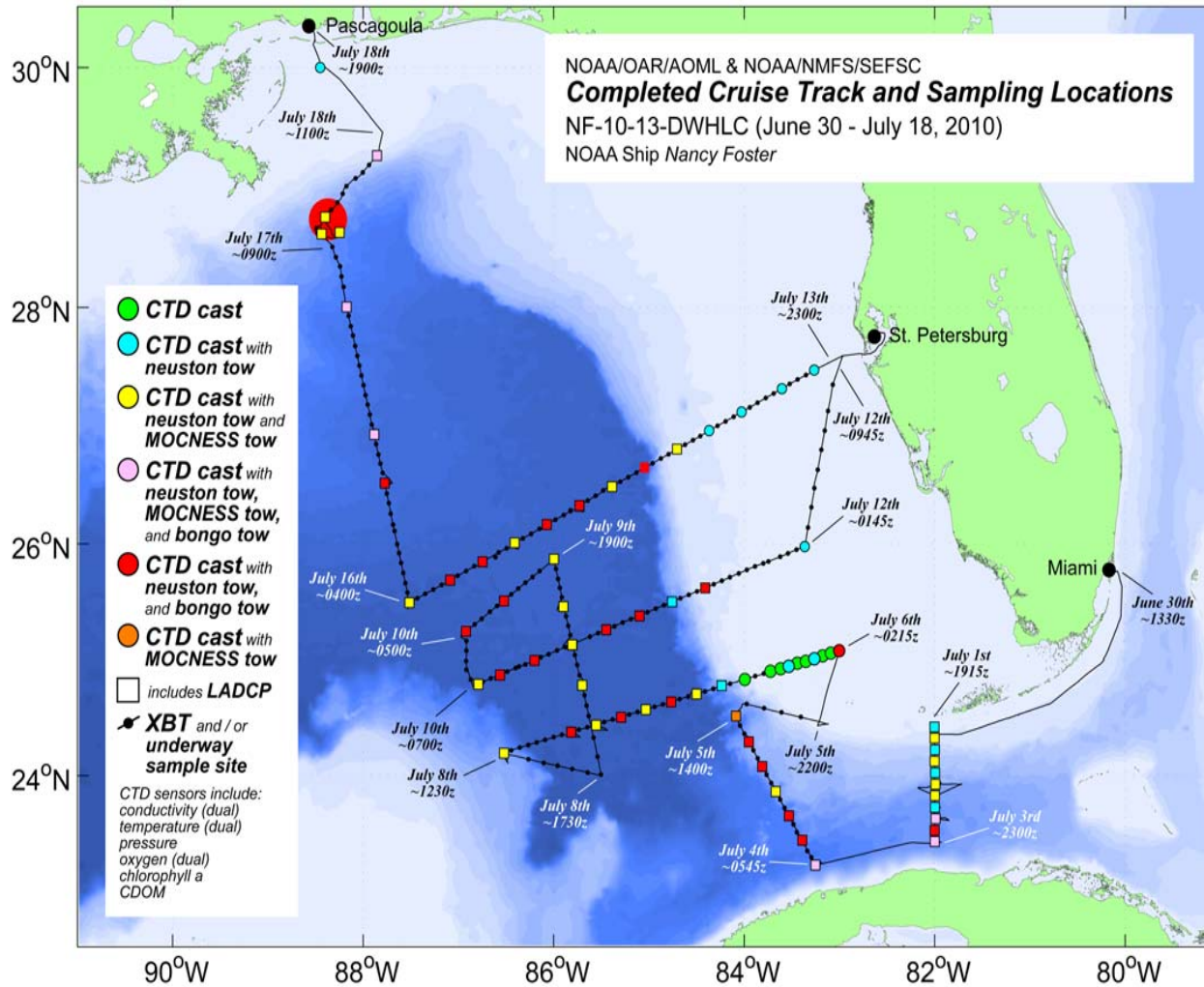


# Surface Drifters: trajectories



$v=20$  cm/s

# DWH Oil Spill event

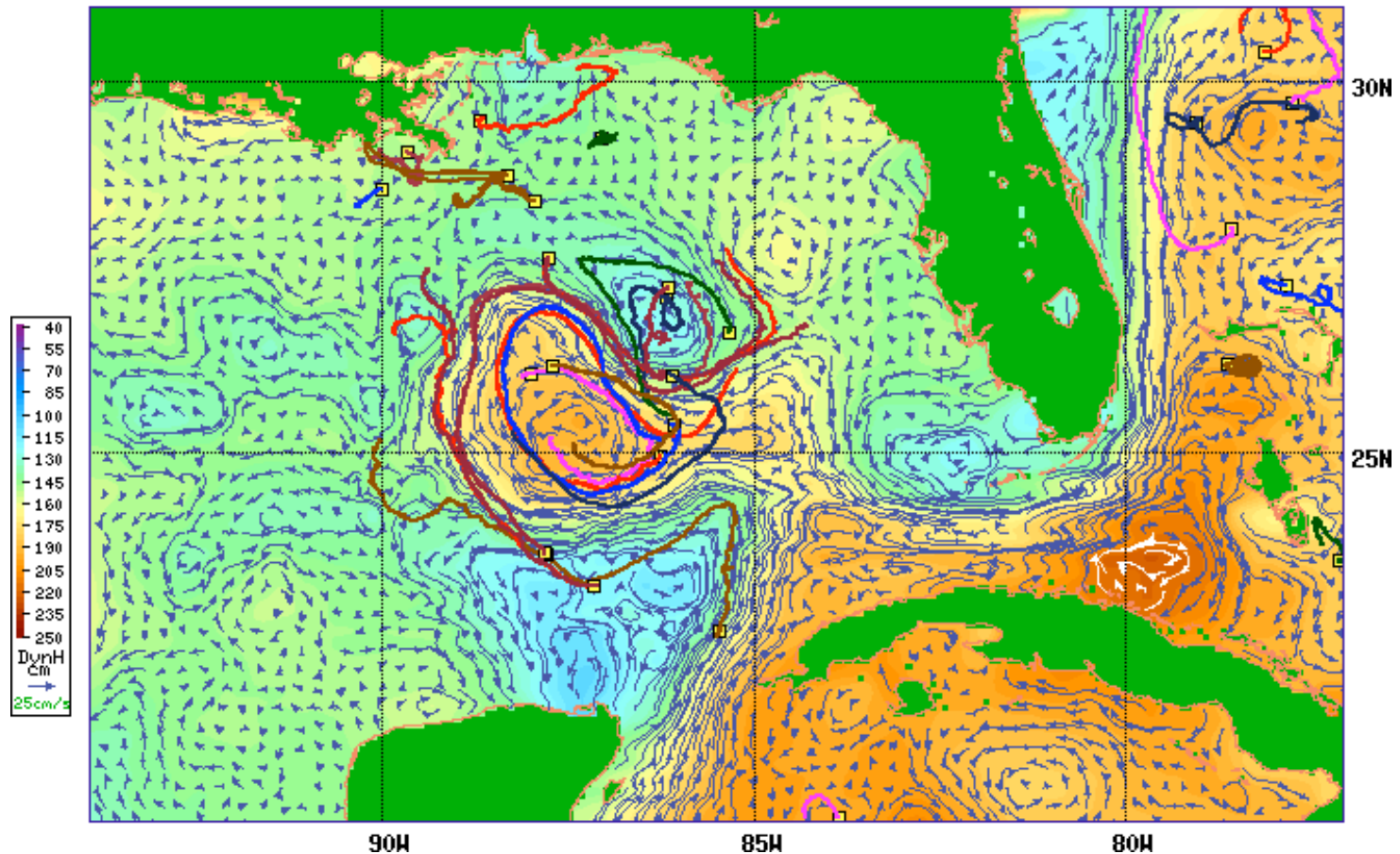




# Surface Drifters in Support of DWH Oil Spill event

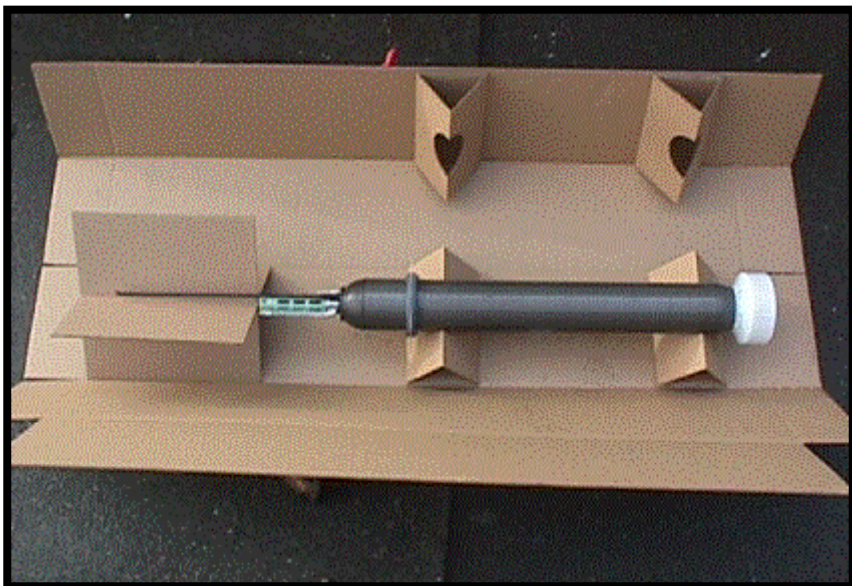
JUL-1-2010

CoastWatch NOAA/AOML  
Altimeter/GTS Interface





# Profiling Floats

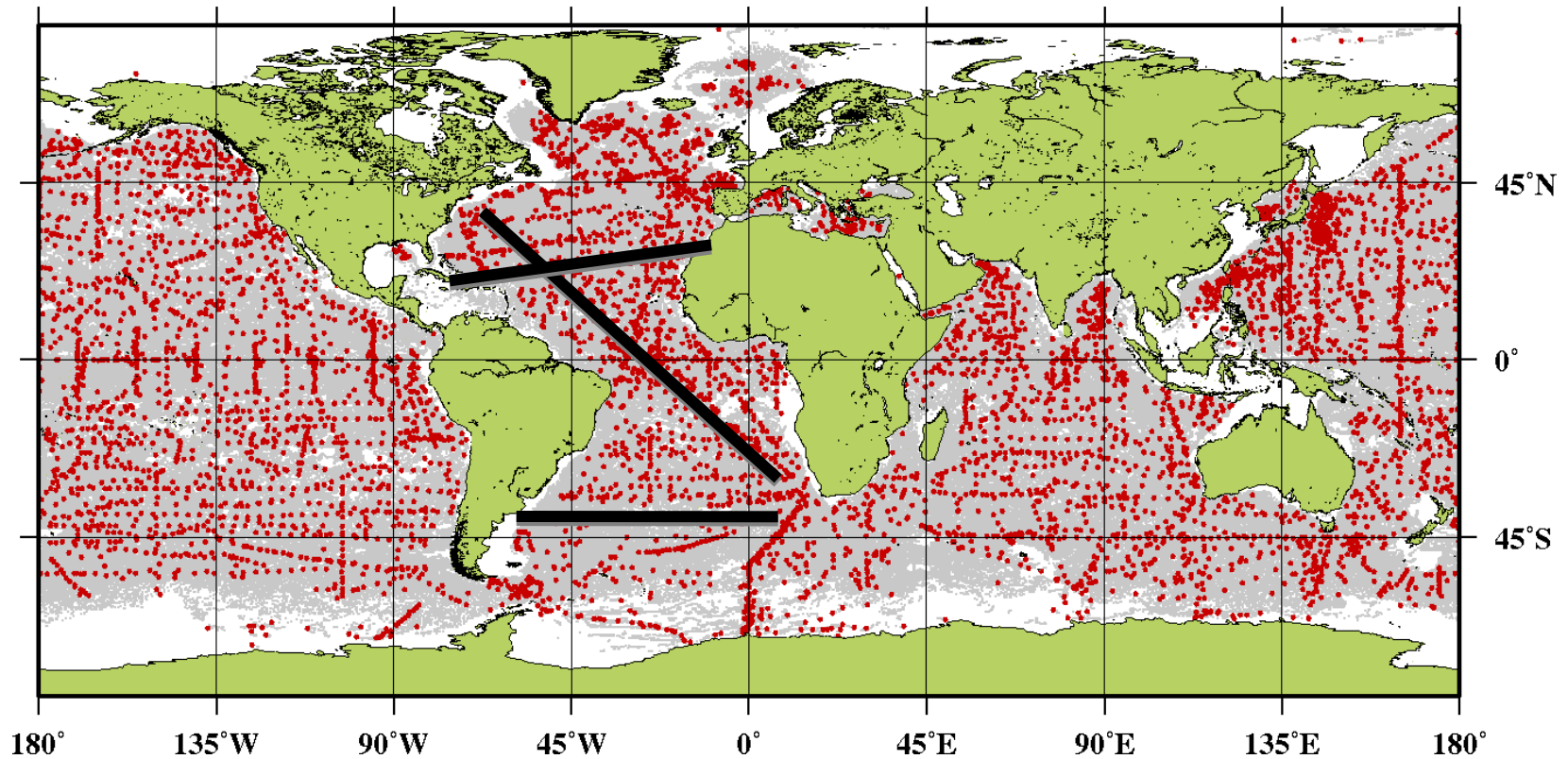


More to come: Robert Roddy

# Profiling Floats: Location of deployments

Period: 1995–2010

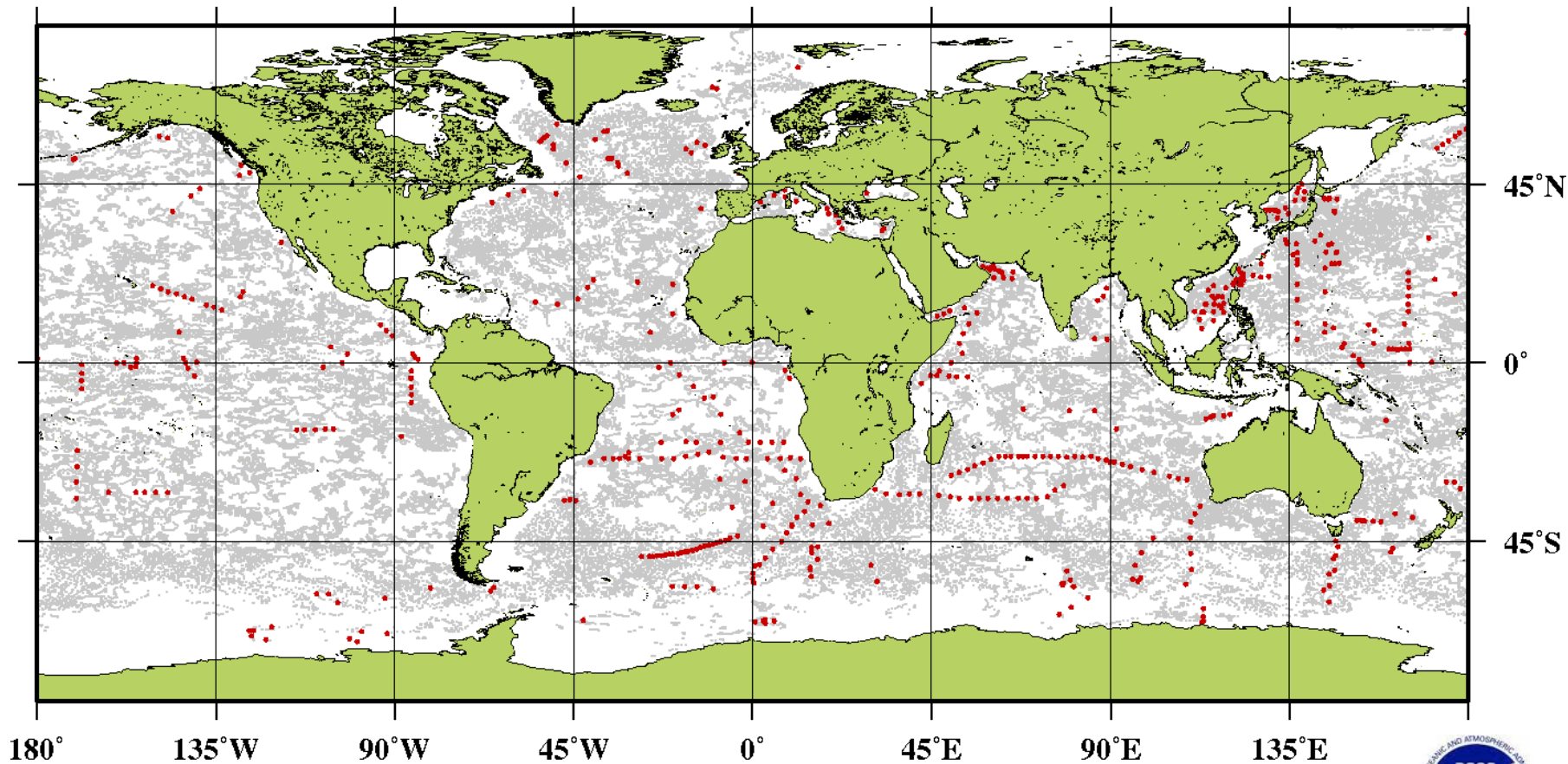
Number of Deployments: ARGO– 6905



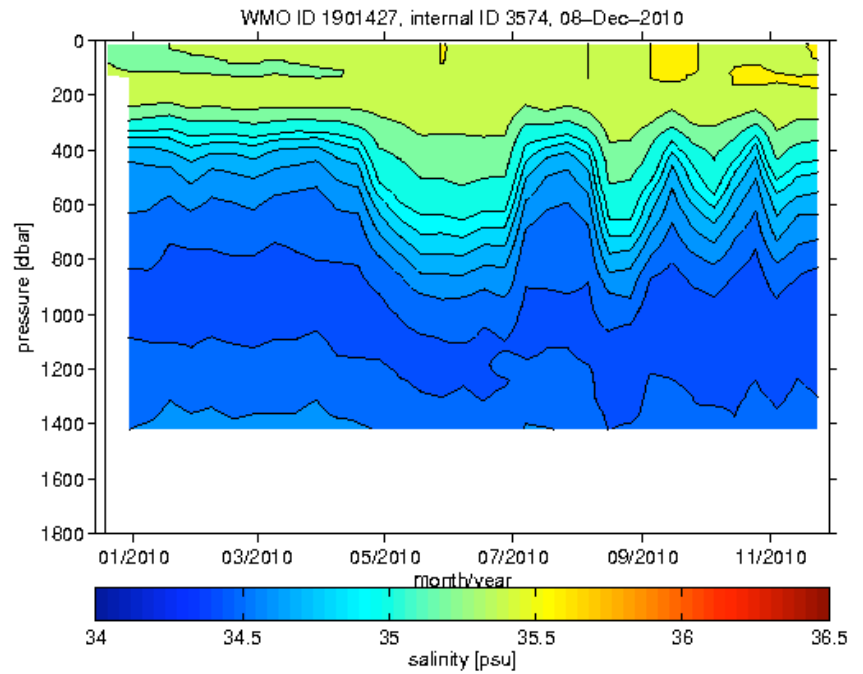
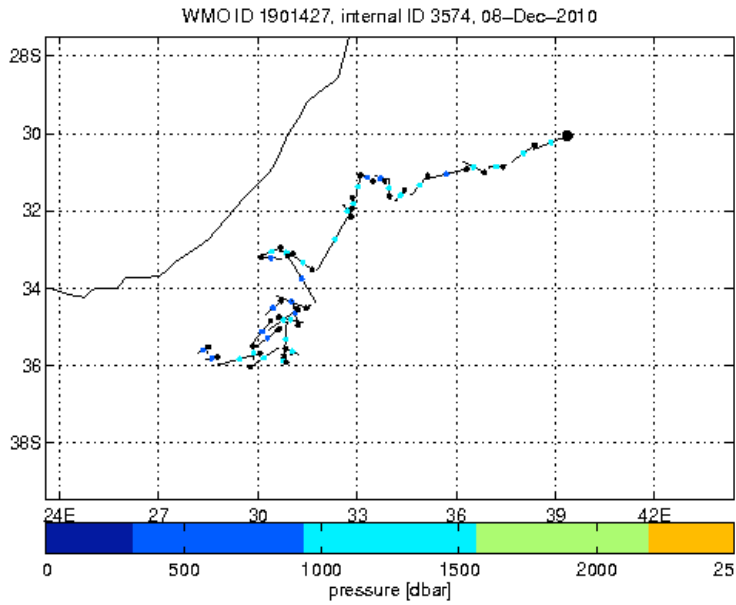
# Profiling Floats: Location of deployments

YEAR 2009

Number of Deployments: ARGO- 537



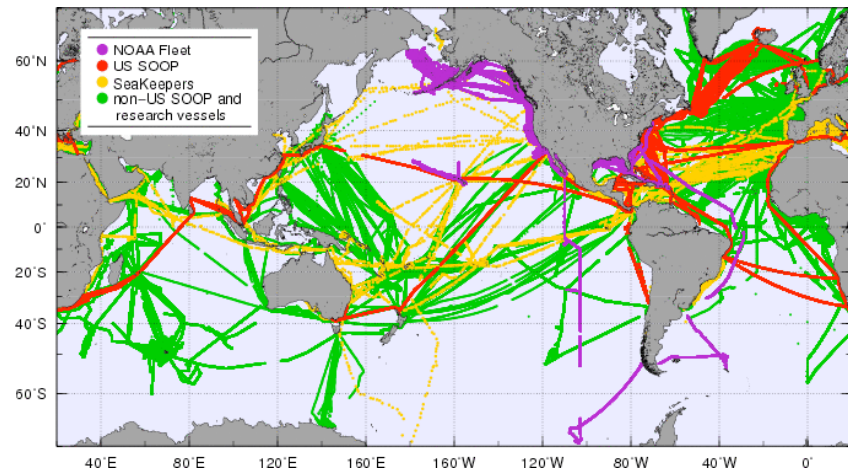
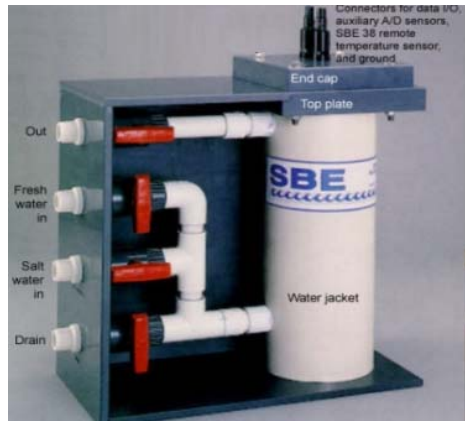
# Profiling Floats





# ThermoSalinoGraphs (TSGs)

Multinational effort to monitor the sea surface salinity along fixed transect

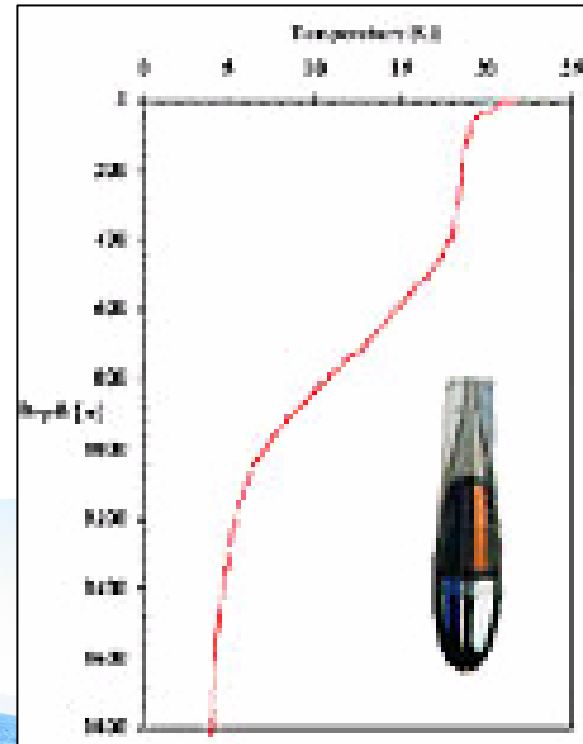


# Expendable BathyThermographs (XBTs)



Plastic body  
Zinc nose  
Thermistor  
Wire

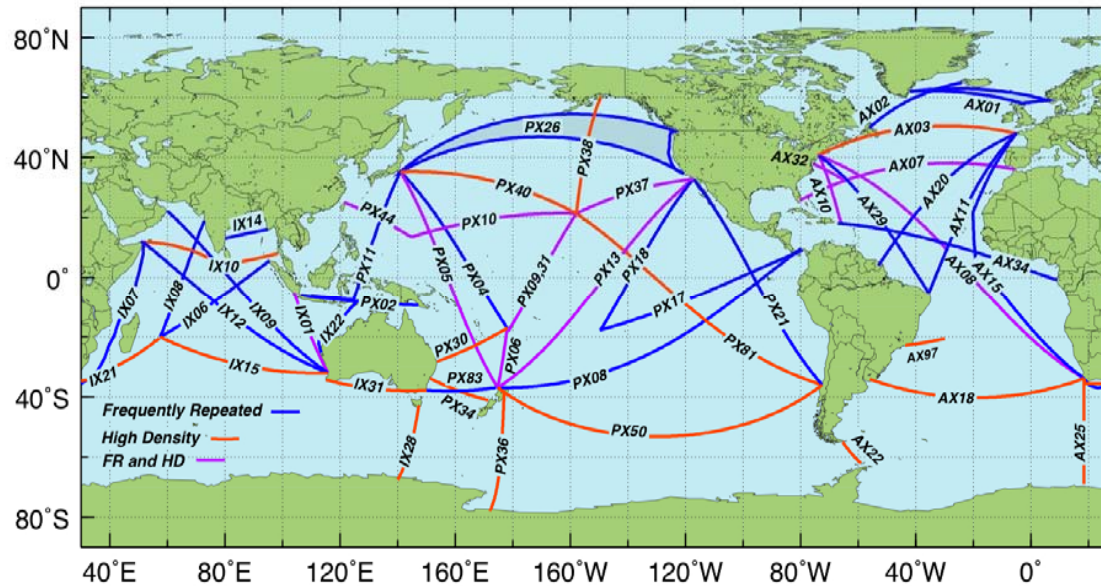
.....







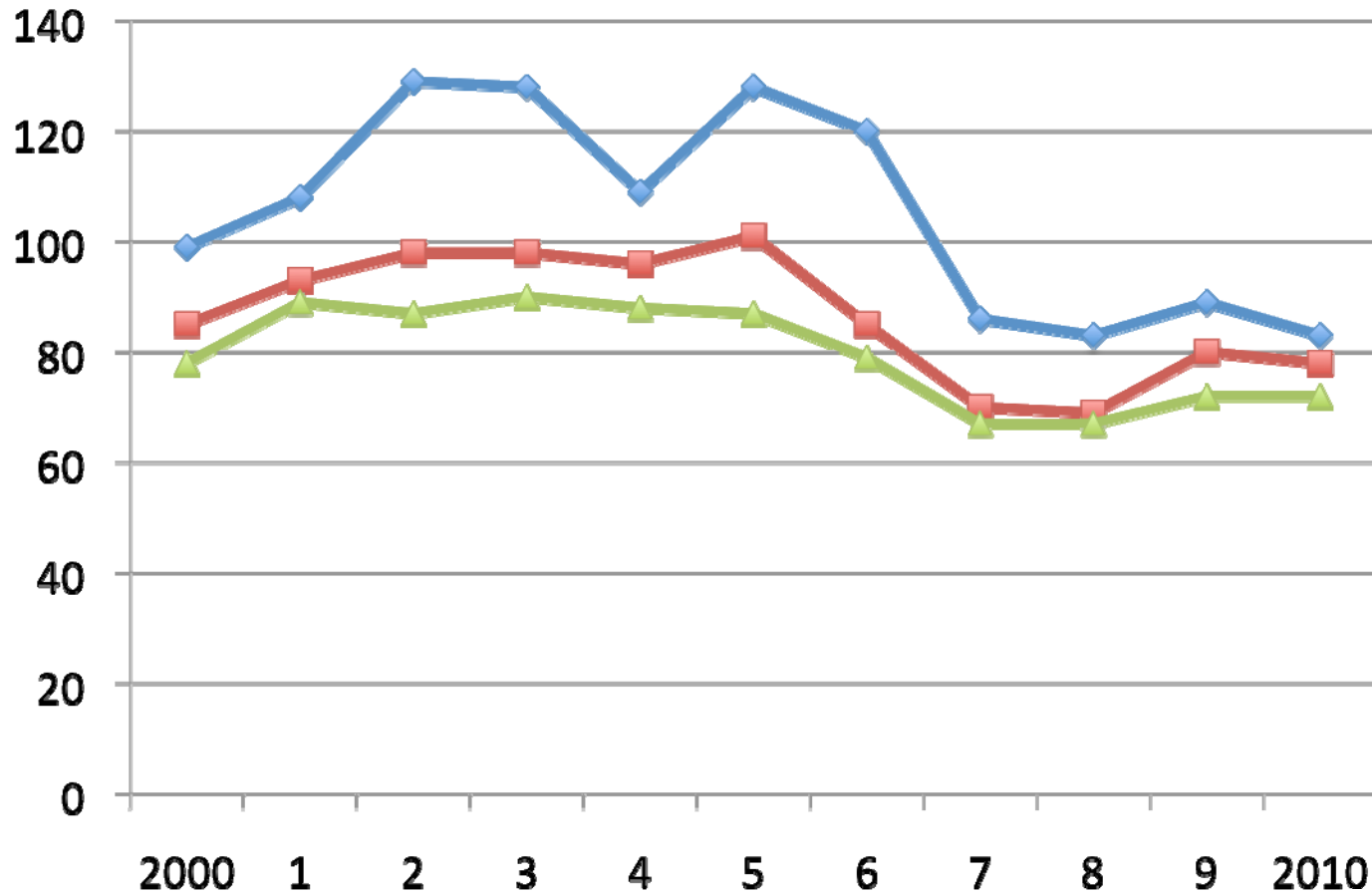
# Expendable BathyThermographs (XBTs)



- Measurements along repeated transects
- Resolves mesoscale features
- Monitors western boundary currents
- Estimates meridional heat advection
- Resolves subsurface currents
- Allows simultaneous observations of other parameters: CPR, TSG, pCO<sub>2</sub>, atm., etc.
- .....



# Ships deploying XBTs



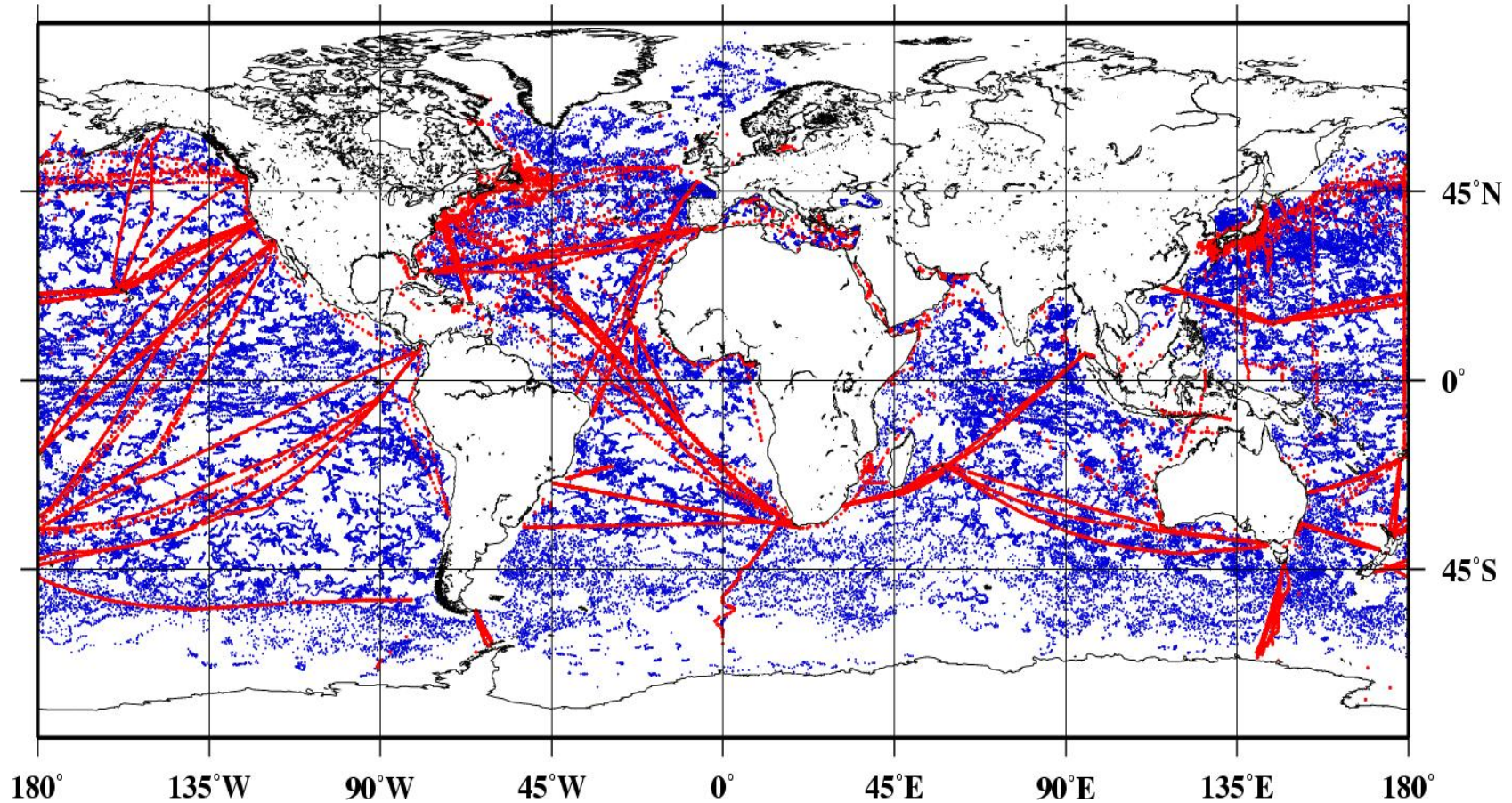
More to come: Francis Bringas



# XBTs and Profiling Floats

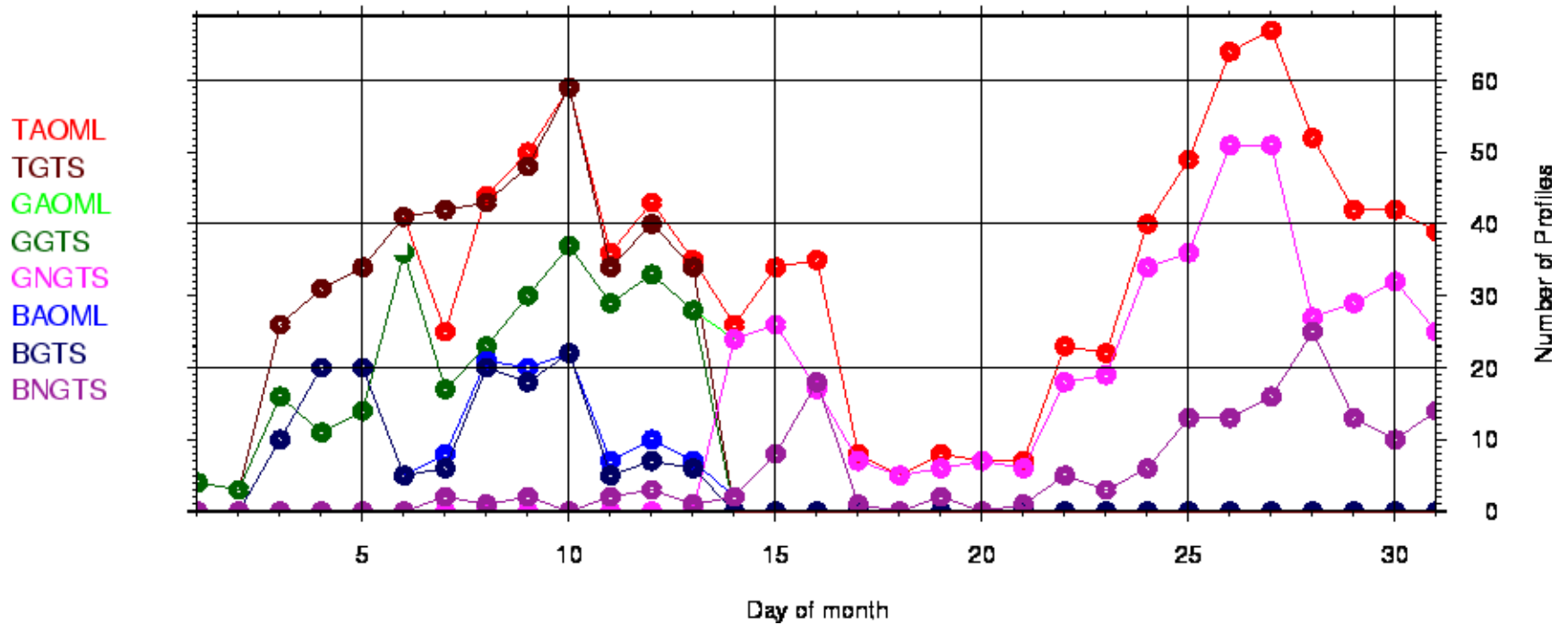
YEAR 2007

Number of Obs: ARGO- 105291 XBT- 17177



# Monitoring Automatic QC

Date: 2010/01



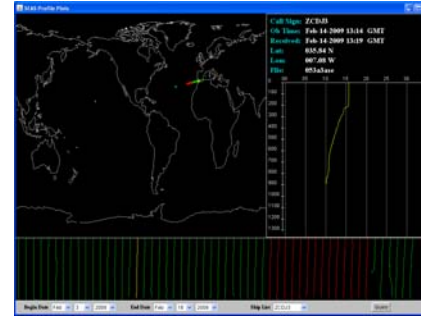




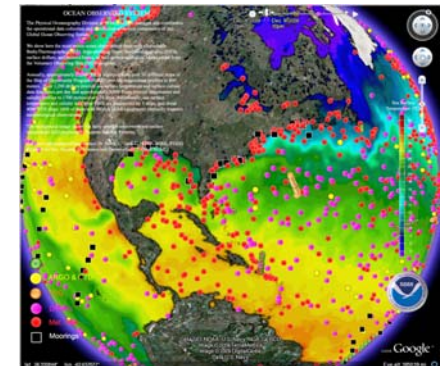
# XBT monitoring and data distribution



[www.aoml.noaa.gov/phod/soop](http://www.aoml.noaa.gov/phod/soop)



Real-time data



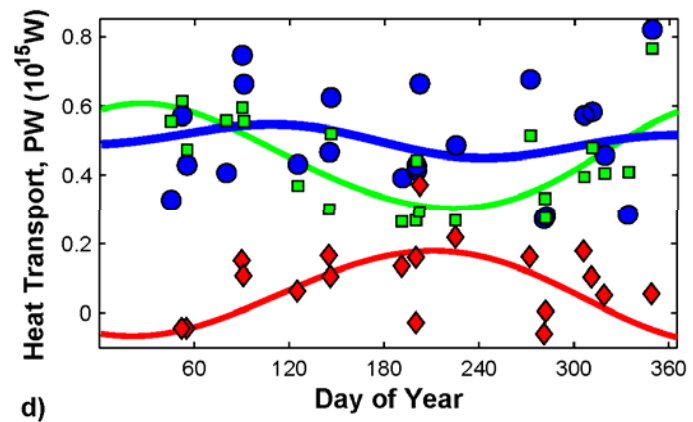
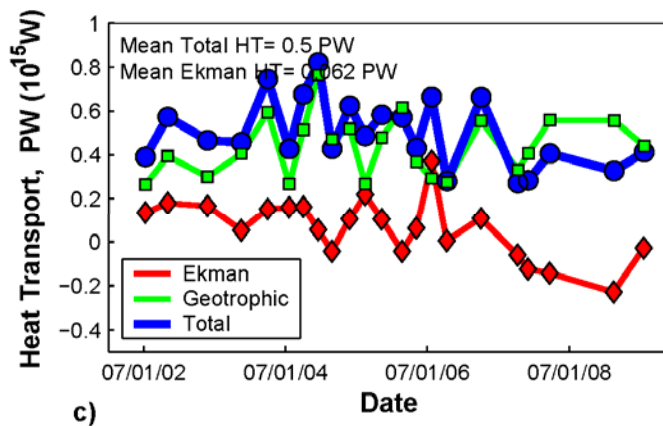
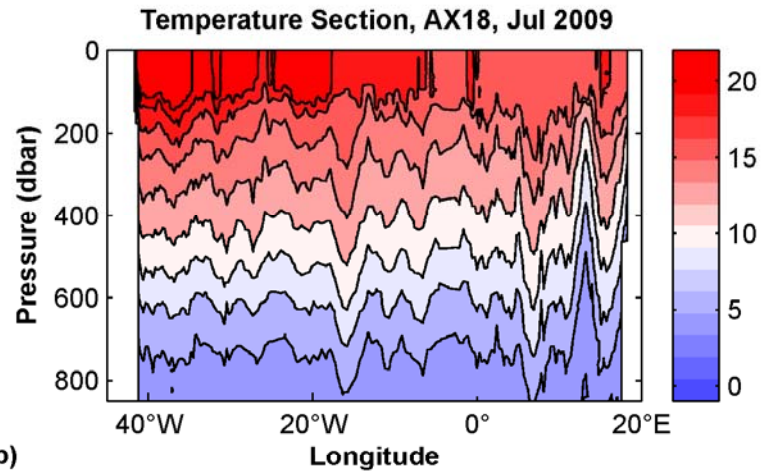
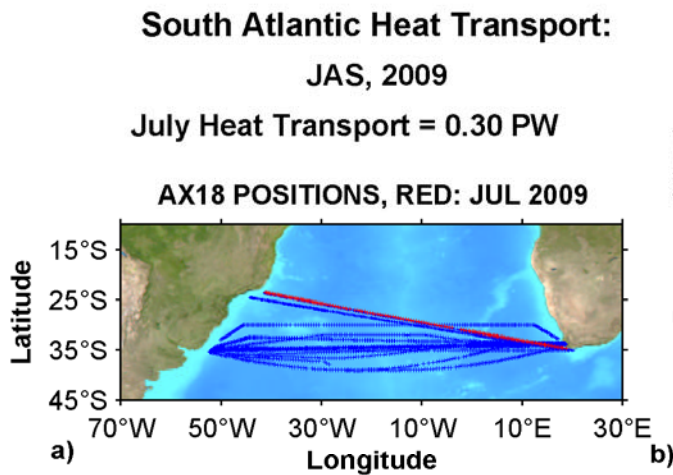
Real-time  
GE application



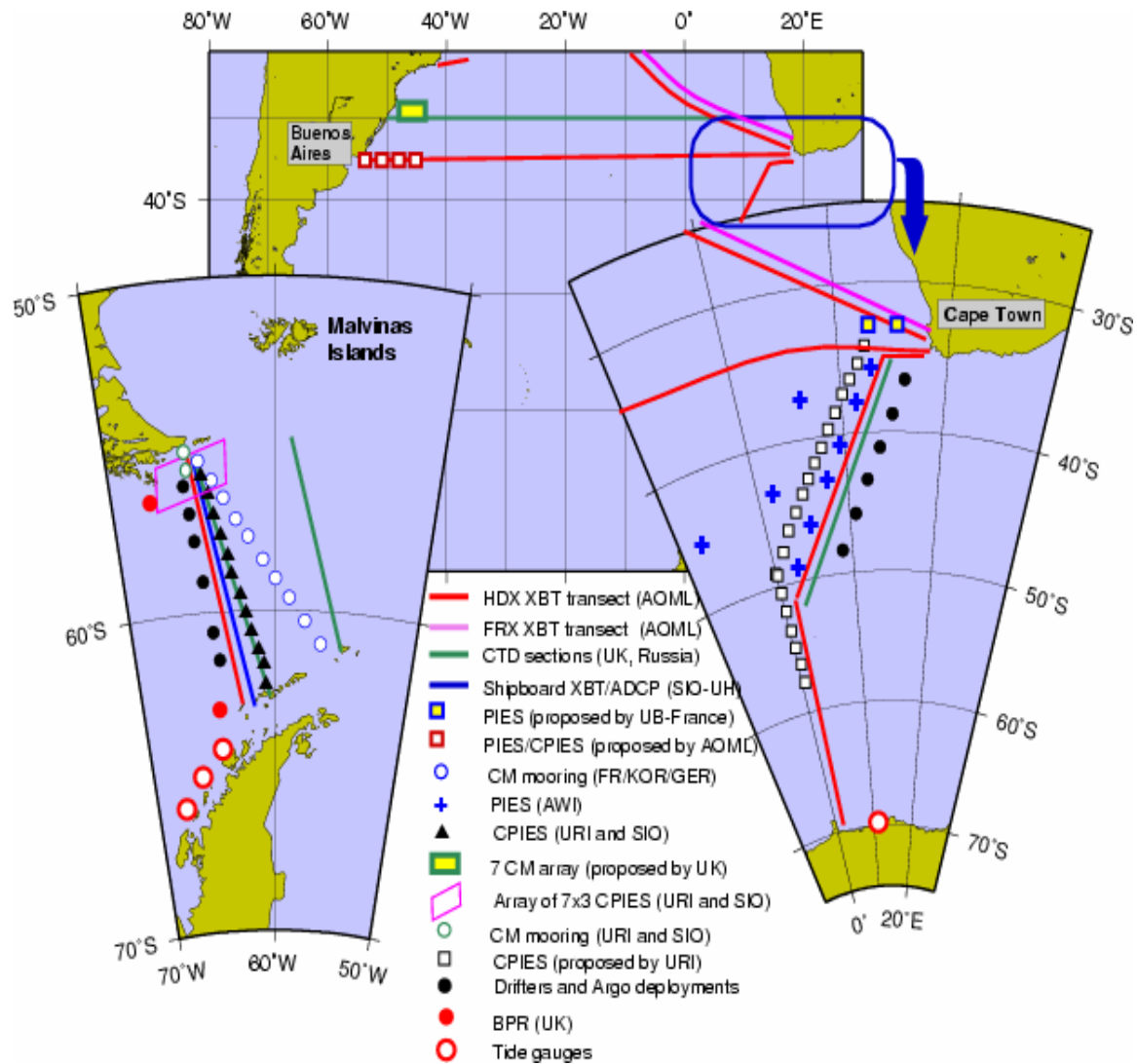
<http://www-hrx.ucsd.edu/>



# Expendable BathyThermographs (XBTs)

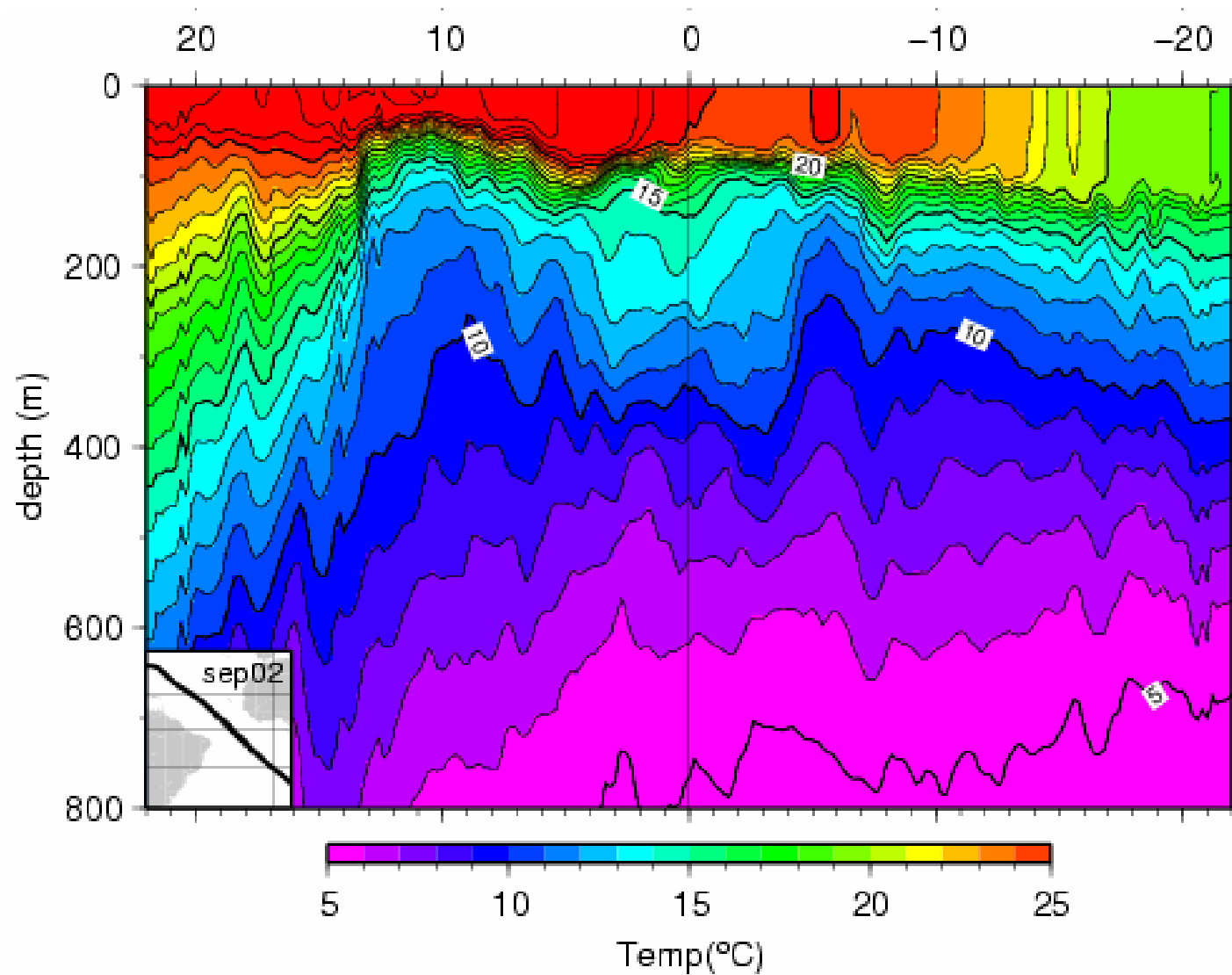


# South Atlantic Meridional Overturning Circulation



Garzoli (2007)

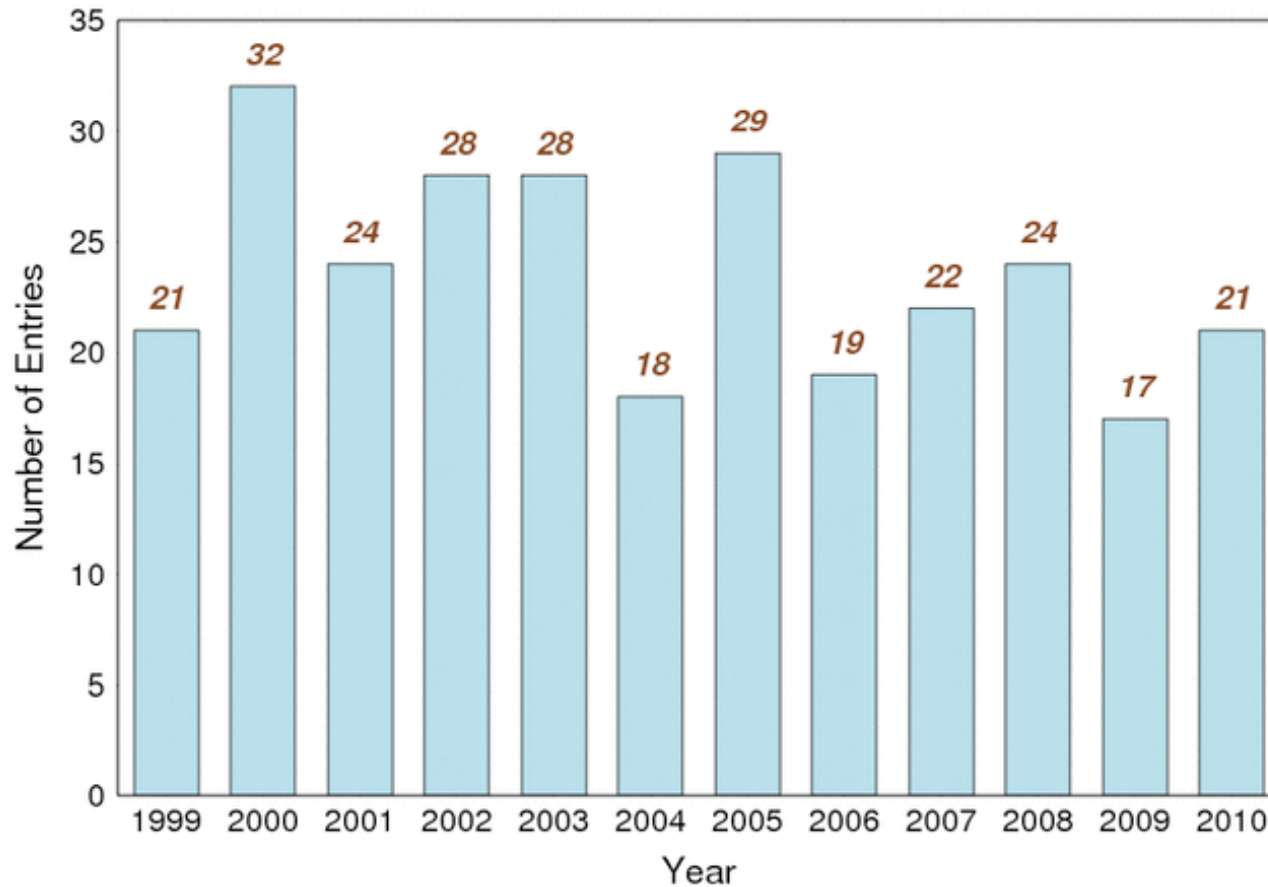
# Expendable BathyThermographs (XBTs)





# XBT Publications

XBT Bibliographic Entries, 1999–2010, Total Entries = 283



# Ship availability for Climate/P.O. Research Programs – Global Class (Class 1) research vessels

## Estimates 1990-1995:

**UNOLS – 270+ days at sea** each for Knorr, Melville, Revelle, and Thompson

**NOAA – 240+ days at sea** each for Oceanographer, Discoverer, and Researcher

## Estimates 2000-2001:

**UNOLS – 270+ days at sea** each for Knorr, Melville, Revelle, and Thompson

**NOAA – 240+ days at sea** for Brown

## Estimates 2010-2011:

**UNOLS – 270+ days at sea** each for Knorr, Melville, Revelle, and Thompson

**NOAA – 120-130 days at sea** for Brown

Some University National Oceanographic Laboratory System (UNOLS) Ships are planned for retirement in the near future (e.g. Knorr), and planning is underway for replacements. NOAA does not yet have a replacement plan for the Brown, as it is expected to operate for 10+ more years. Ship-time needs are likely to significantly increase over the next few decades as the Global Ocean Observing System is broadened to include more of the deep ocean and involves more time series observing systems in key choke points and other important regions.

Info by Dr. C. Meinen (NOAA/AOML)



# The need for ship resources to support global ocean observations

- Deploy XBTs
- Deploy drifters
- Deploy Argo floats
- Perform CTD casts
- Install pCO<sub>2</sub> systems
- Install Thermosalinographs
- Install ADCP
- Install Continuous Plankton Recorder
- Carry hydrographic sections
- Deploy, service, and retrieve moorings
- ...



# The need for ship resources to support global ocean observations

**Observations from ships or from probes deployed from ships allow us to:**

- Assess mean surface currents and their variability (drifters, XBTs)
- Correct satellite temperature biases (drifters)
- Assess mean subsurface currents and their variability (floats, XBTs)
- Monitor western boundary currents (XBTs)
- Estimate meridional heat transport (XBTs)
- Tropical ocean variability (moorings, drifters)
- Determine frontal areas (TSGs, XBTs)
- Monitor upper ocean heat content (floats, XBTs)
- Monitor salinity fields (floats, TSGs)
- Assess CO<sub>2</sub> intake (pCO<sub>2</sub> instrumentation/TSGs)
- Initialize and validate weather and climate numerical models (most obs)
- Validate and calibrate satellite observations (TSGs, drifters, ...)
- ...





# The need for ship resources to support global ocean observations

There is always need for more observations: to make analysis, to measure new variables, to initialize models, to enhance current observations.

Funding for ship time, observing network maintenance and enhancements, is problematic

Less ship time (\$) in research vessels, may translate into increased need for ships of the SOOP.

Enhanced technology with less human participation to make measurements, may translate into more opportunities for deployments from ships of the SOOP.

However, cargo ship routes are highly dependant on countries economic changes, and industry is not always willing to participate.



# PhOD Administration

**G. Goni**, Division Director

**R. Lusic**, Division Assistant Administrator

## Research Scientists

**M. Baringer**  
**S. Dong**  
**D. Enfield**  
**G. Goni**  
**G. Halliwell**  
**E. Johns**  
**S.-K. Lee**  
**H. Liu**  
**Y. Liu**  
**R. Lumpkin**  
**C. Meinen**  
**R. Perez**  
**C. Schmid**  
**C. Thacker**  
**C. Wang**  
**H. Yang**

NOAA  
CIMAS/UM  
CIMAS/UM  
NOAA  
NOAA  
NOAA  
CIMAS/UM  
CIMAS/UM  
CIMAS/UM  
NOAA  
NOAA  
CIMAS/UM  
NOAA  
CIMAS/UM  
NOAA  
CIMAS/UM

## Instrumentation Group

**P. Peña**  
**G. Rawson**  
**U. Rivero**  
**R. Roddy**  
**K. Seaton**  
**A. Stefanick**

NOAA  
CIMAS/UM  
NOAA  
CIMAS/UM  
CIMAS/UM  
NOAA

## Administrative Support

**J. Festa**  
**C. Stephens**  
**R. Lusic**

CIMAS/UM  
NOAA  
NOAA

## Research and Operational Support

**D. Aranda**  
**F. Bringas**  
**C. Chen**  
**P. Chinn**  
**Y-H. Daneshzadeh**  
**P. Di Nezio**  
**S. Dolk**  
**J. Farrington**  
**E. Forteza**  
**R. Garcia**  
**C. I. Gonzalez**  
**V. Halliwell**  
**L. Lin**  
**D. Lindo**  
F. Mckay  
**N. Melo**  
**J. Molina**  
**M. Pazos**  
**J. Roseli**  
**R. Sabina**  
**R. Smith**  
**J. Trinanes**  
**E. Valdes**  
C. Wolfe  
**Q. Yao**

CIMAS/UM  
CIMAS/UM  
CIMAS/UM  
NOAA  
NOAA  
CIMAS/UM  
CIMAS/UM  
NOAA  
CIMAS/UM  
CIMAS/UM  
CIMAS/UM  
CIMAS/UM  
CIMAS/UM  
Contractor  
CIMAS/UM  
CIMAS/UM  
NOAA  
Contractor  
CIMAS/UM  
NOAA  
CIMAS/UM  
CIMAS/UM  
Contractor  
CIMAS/UM

## IT Specialists

**J. Harris**  
**E. Ramos**

NOAA  
NOAA



# The need for ship resources to support global ocean observations



**Gustavo Jorge Goni**

Gustavo.Goni@noaa.gov

National Oceanic and Atmospheric Administration  
Atlantic Oceanographic and Meteorological Laboratory  
Miami, FL

Fourth International Port Meteorological Officer Conference (PMO-IV)  
and Support to Global Ocean Observations Using Ship Logistics