

Report of the  
**Tropical Moored Buoy  
Implementation Panel**  
to the  
**24<sup>rd</sup> Session of the  
Data Buoy Cooperation Panel**  
October 13-16, 2008  
Cape Town, South Africa

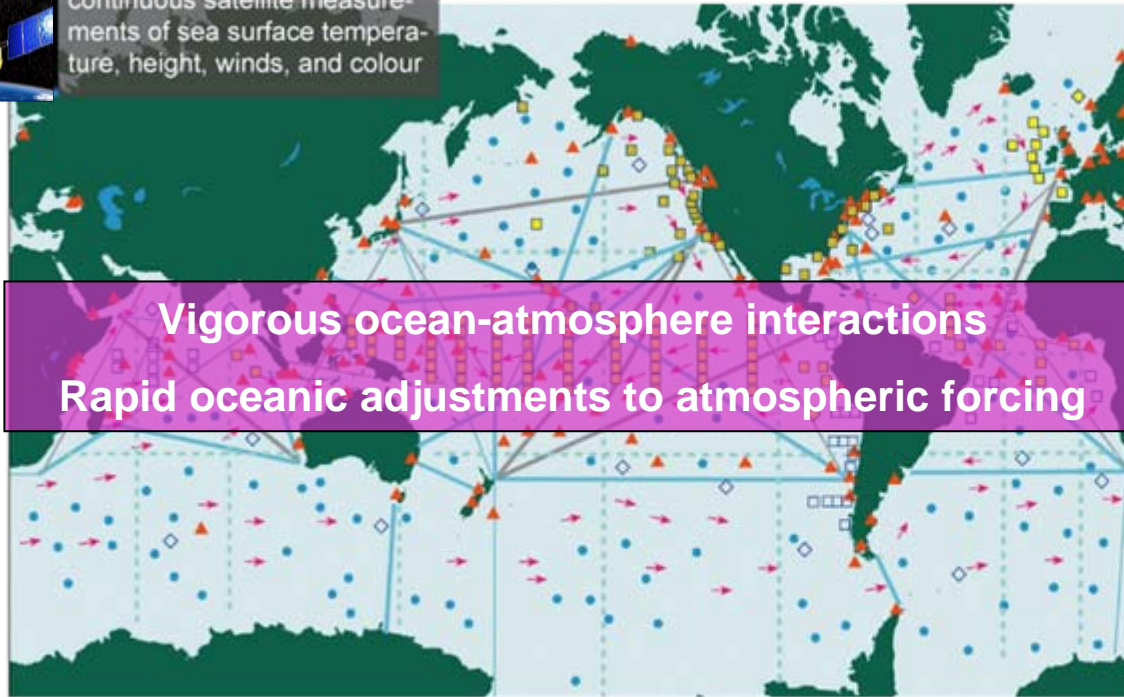
# Initial Global Ocean Observing System for Climate

## Status against the GCOS Implementation Plan and JCOMM targets

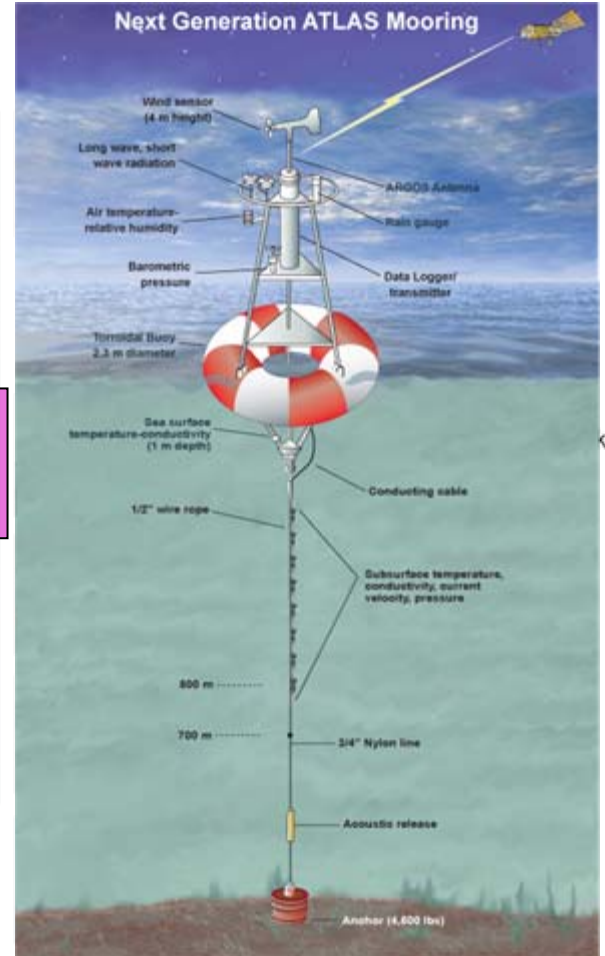


continuous satellite measurements of sea surface temperature, height, winds, and colour

Total *in situ* networks **60%**



**Vigorous ocean-atmosphere interactions**  
**Rapid oceanic adjustments to atmospheric forcing**



Reference time series **24%**

58 sites



**48%** Global reference mooring network



29 moorings planned



**79%** Global tropical moored buoy network

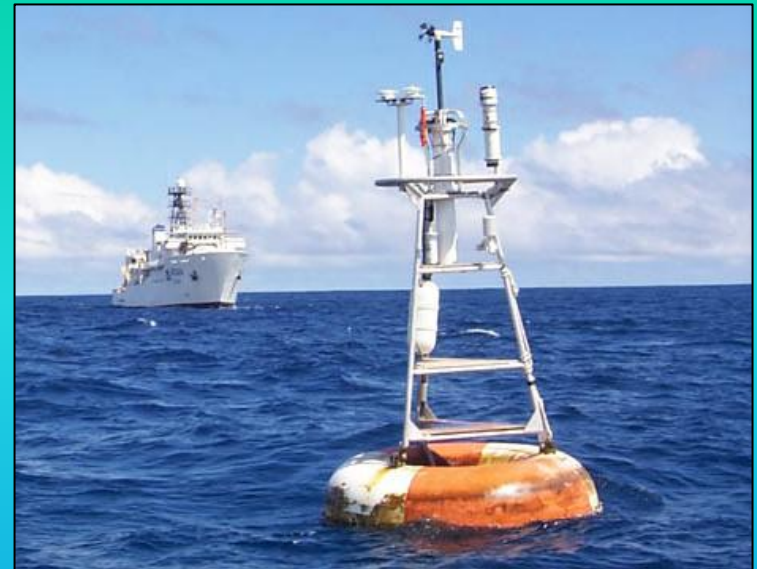


119 moorings planned

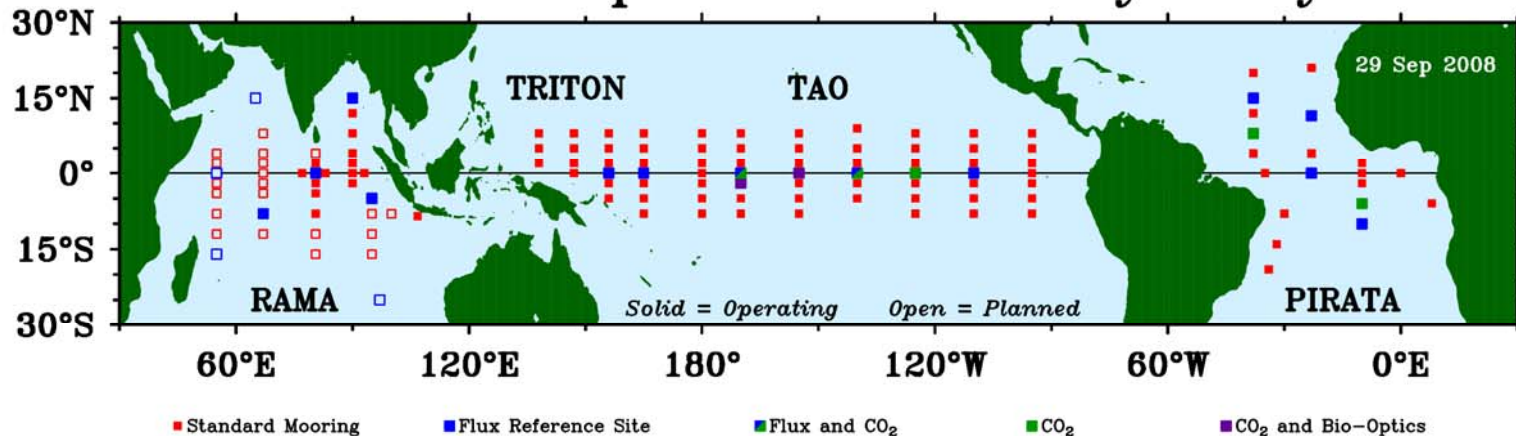


## Global Tropical Moored Buoy Array:

*A coordinated, sustained, multi-national effort to develop and implement moored buoy observing systems for climate research and forecasting throughout the global tropics*



## Global Tropical Moored Buoy Array



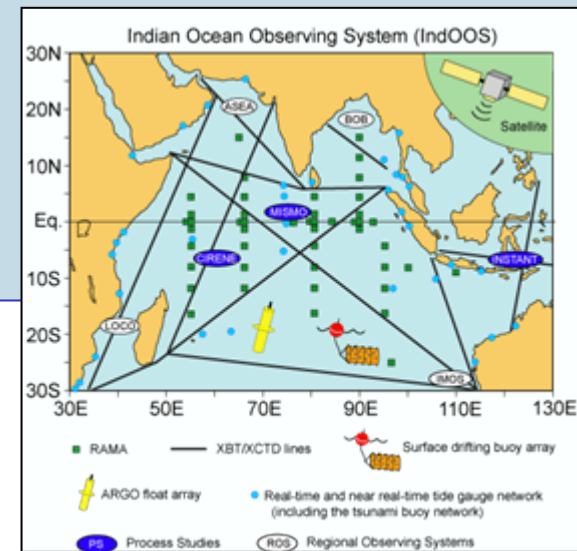
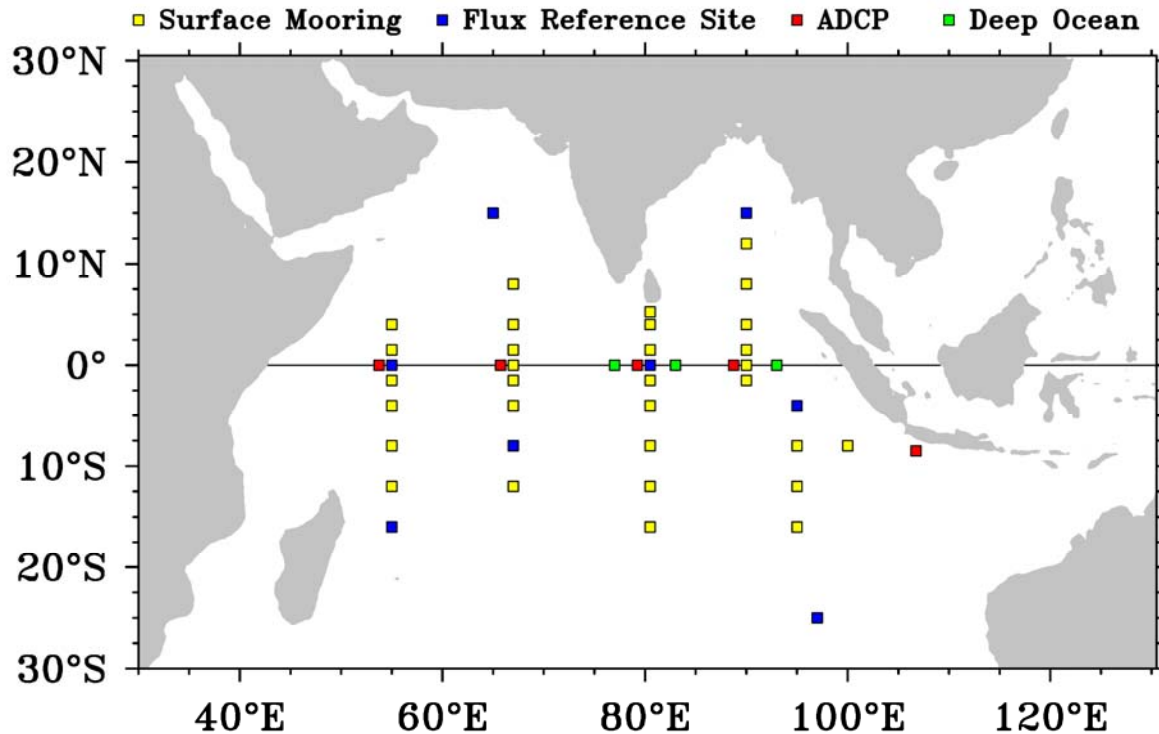
TAO Project Office, NOAA/PMEL

**A contribution to GOOS, GCOS, and GEOSS**



# RAMA

## Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (*RAMA*)



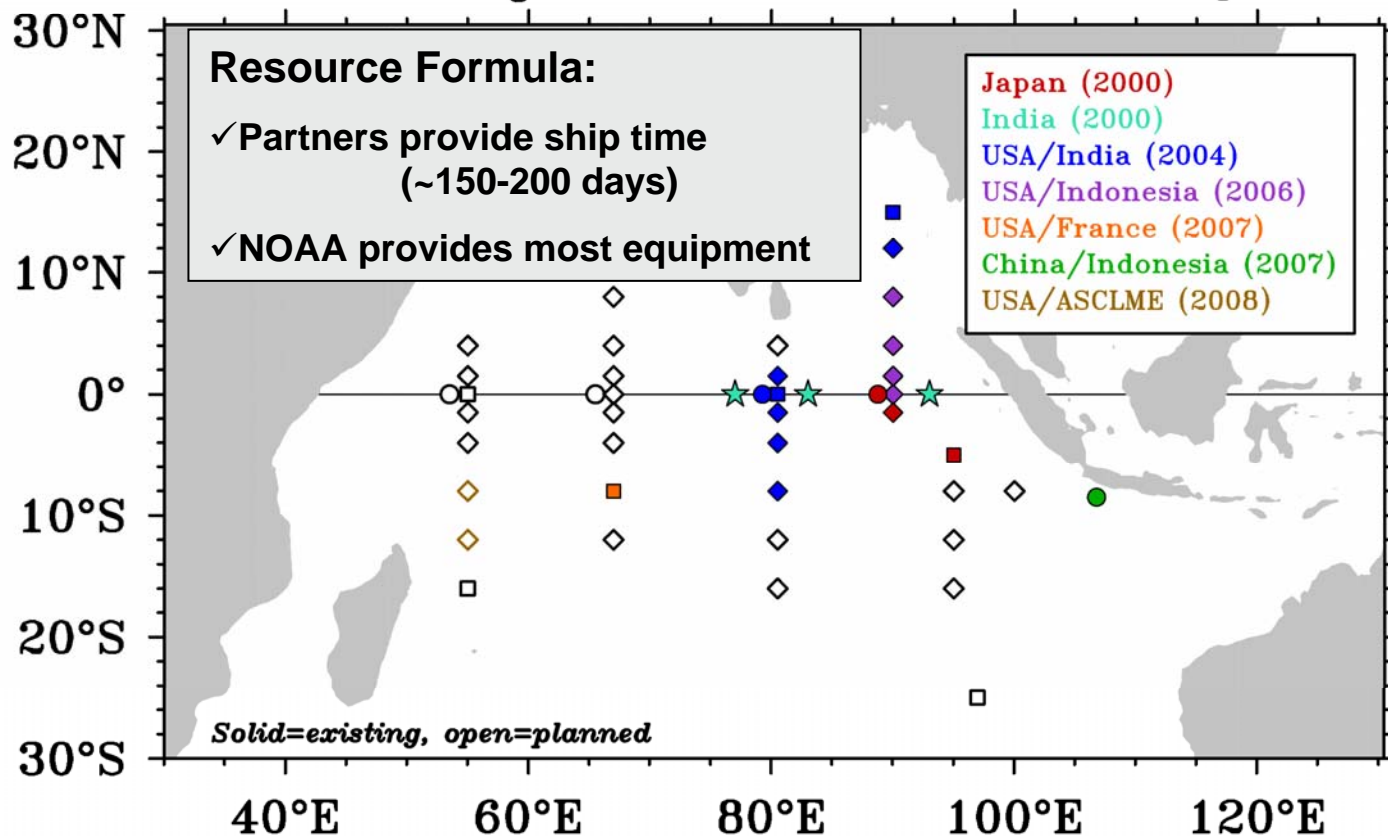
- Plan developed by the International CLIVAR/GOOS Indian Ocean Panel in 2004 as part of “IndOOS”
- Basin scale, upper ocean (~500 m) focus.
- Design supported by numerical model observing system simulation studies.

*Manuscript on RAMA in press in the Bull. Am. Met. Soc.*

# RAMA: Present Status

## Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (*RAMA*)

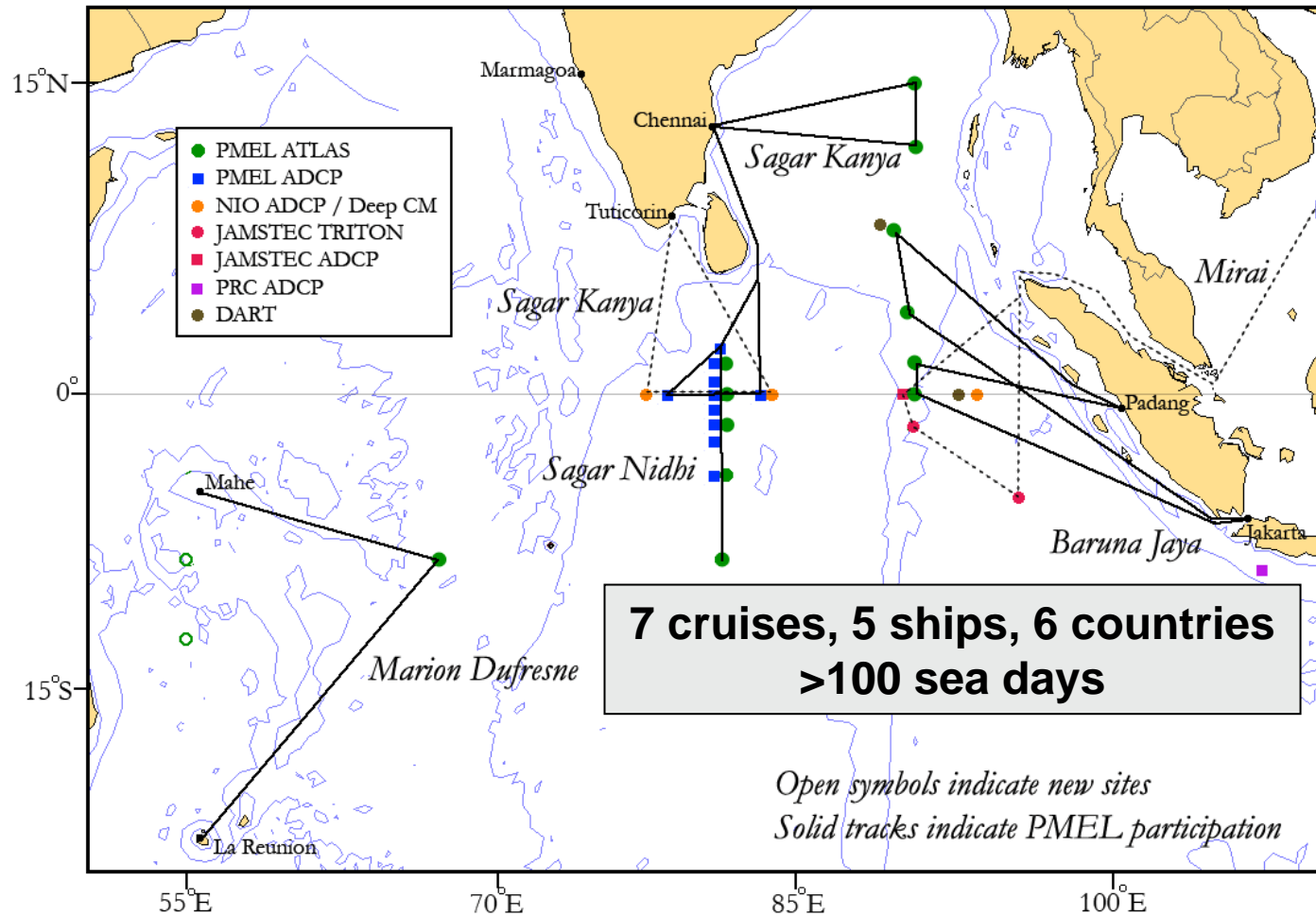
◆ Surface Mooring   ■ Flux Reference Site   ● ADCP   ★ Deep Ocean



47% of sites occupied by end of 2008 (22 of 46)

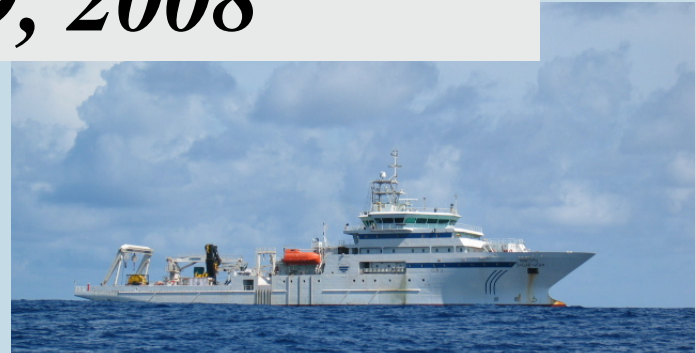
# *RAMA Field Work*

## *October 2007 – September 2008*



# *RV Sagar Nidhi*

## *August 2-29, 2008*



**Deployed 5 ATLAS and 10  
ADCP moorings**



*RV Sagar Nidhi*  
*August 2-29, 2008*



**Recovered moorings heavily fouled with fishing line. Surface instrumentation stripped**



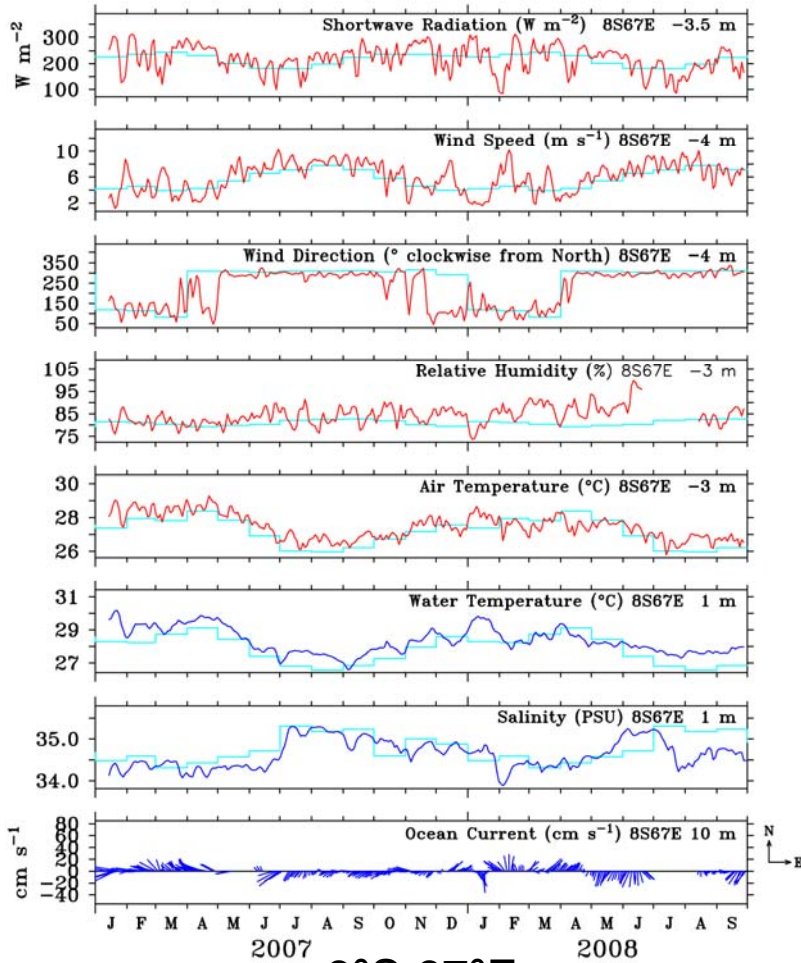
*RV Sagar Nidhi*  
*August 2-29, 2008*



**Two prototype “vandal resistant”  
moorings deployed**

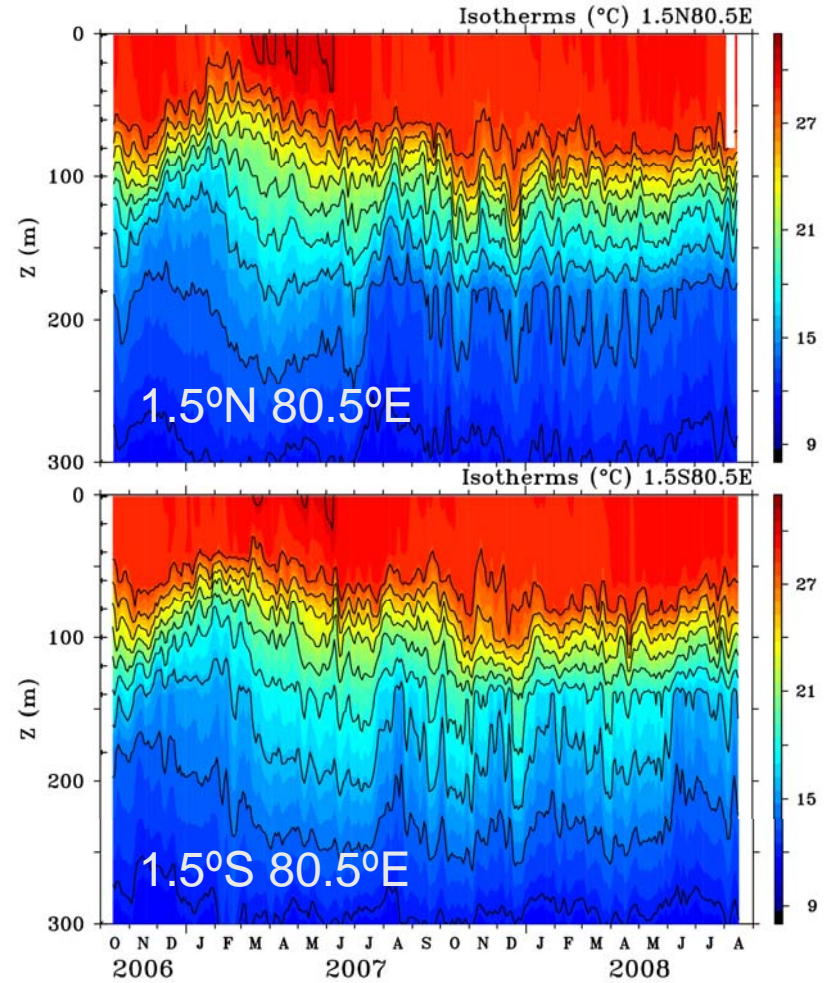
# Sample RAMA Timeseries

Five-Day Data



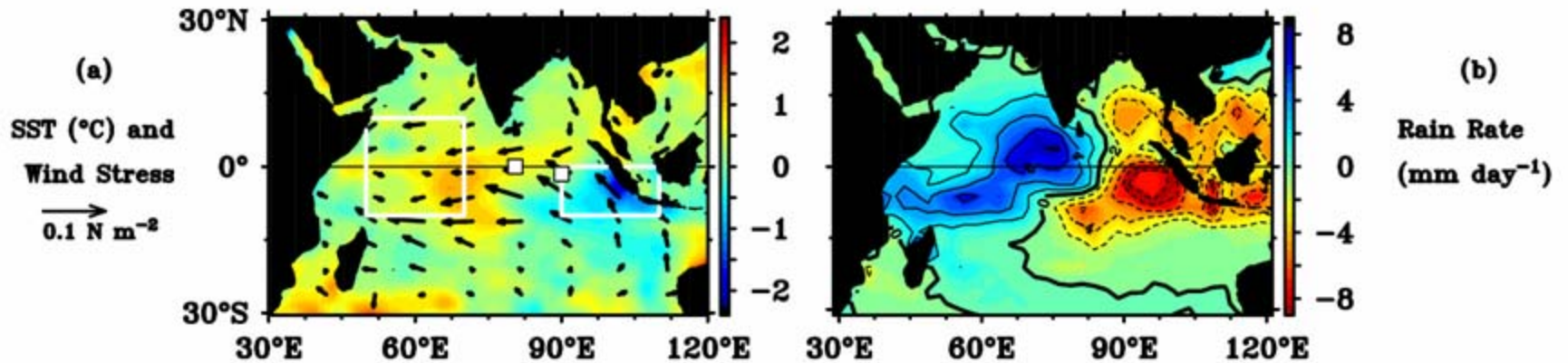
8°S 67°E

Five-Day Data

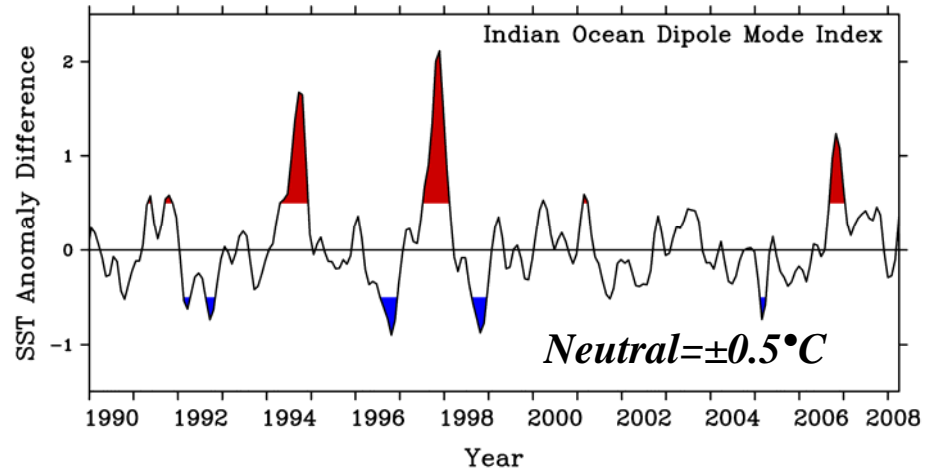
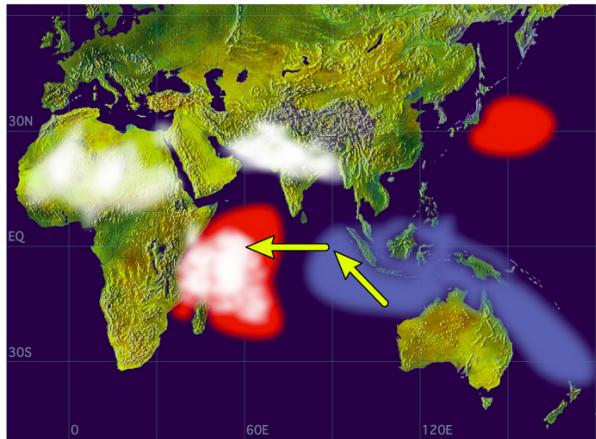


# 2006 Indian Ocean Dipole

## November 2006 Anomalies

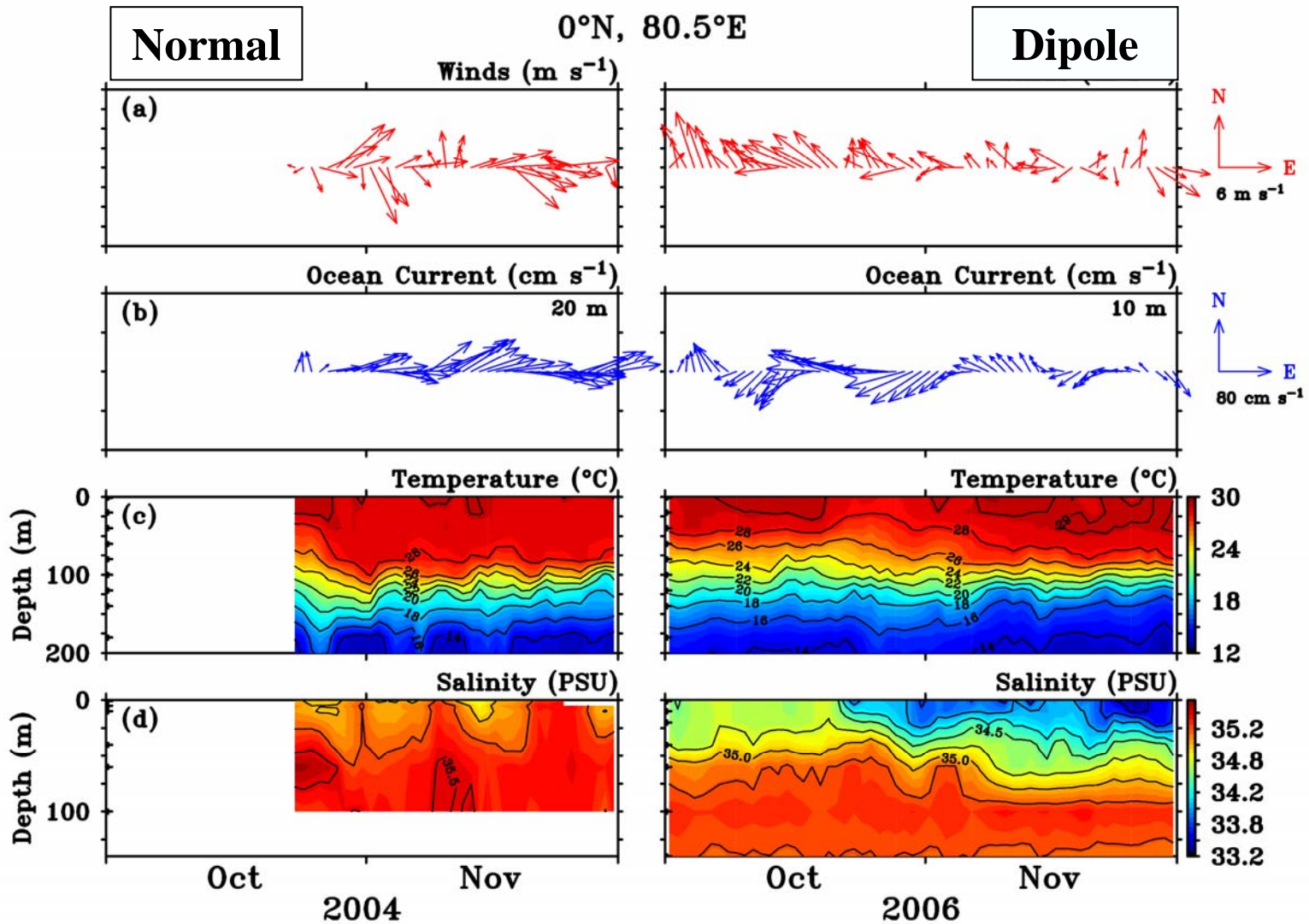


Positive Dipole Mode



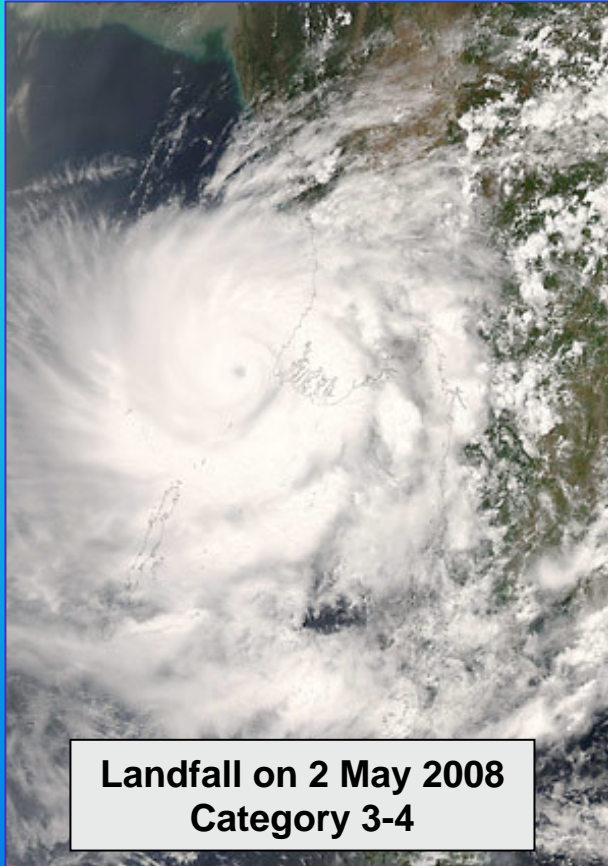


# Comparison of Oct-Nov 2004 (Normal) & Oct-Nov 2006 (Dipole)



# *Cyclone Nargis*

## *April-May 2008*



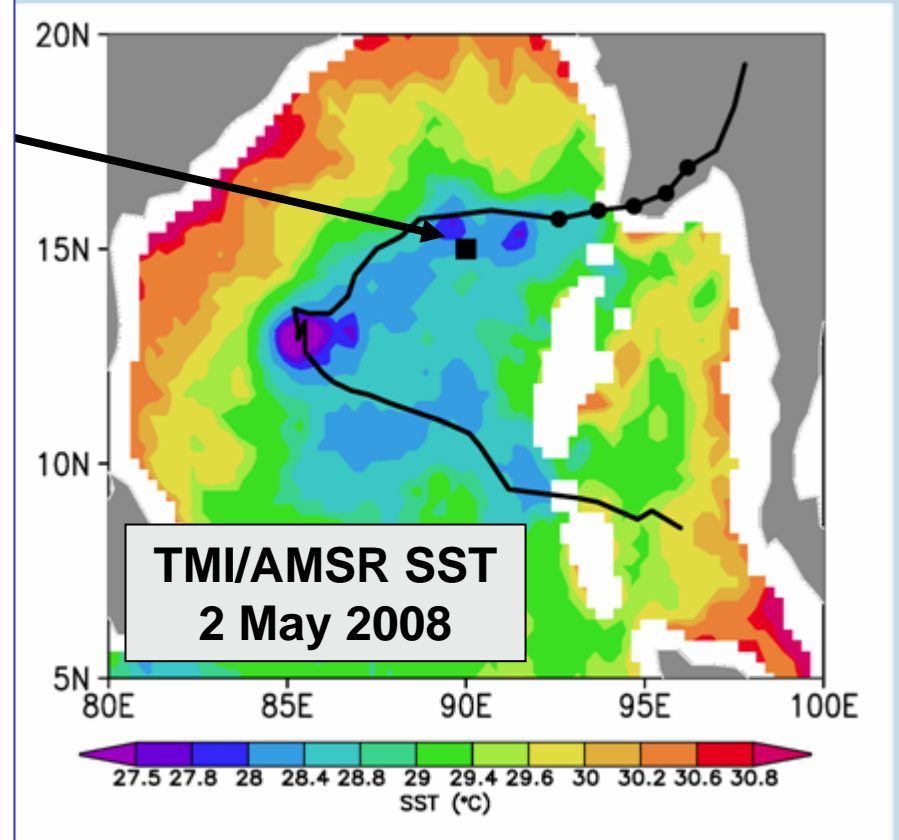
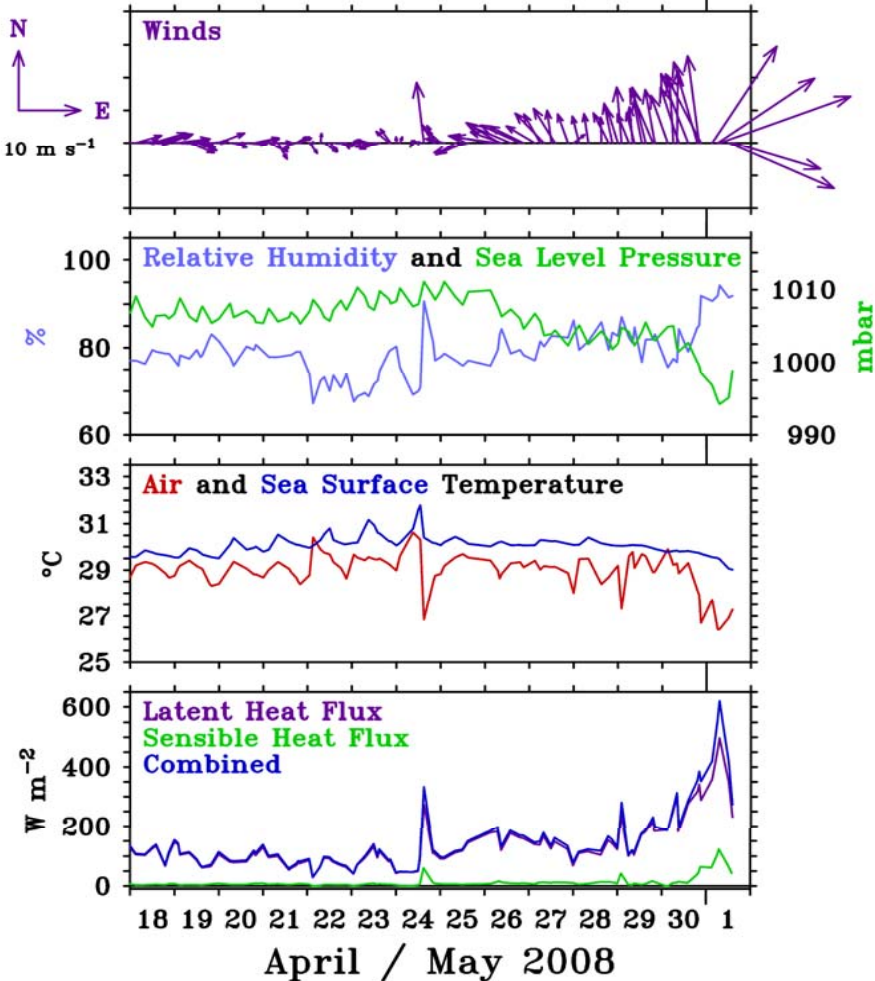
- > 130,000 dead or missing
- > US \$10B in economic losses



# Cyclone Nargis

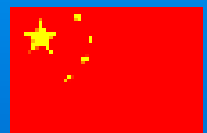
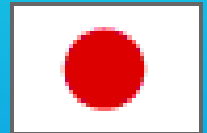
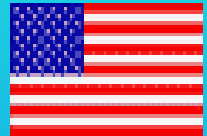
15° N, 90° E

## Spot Hourly Data (~ 8 per day)





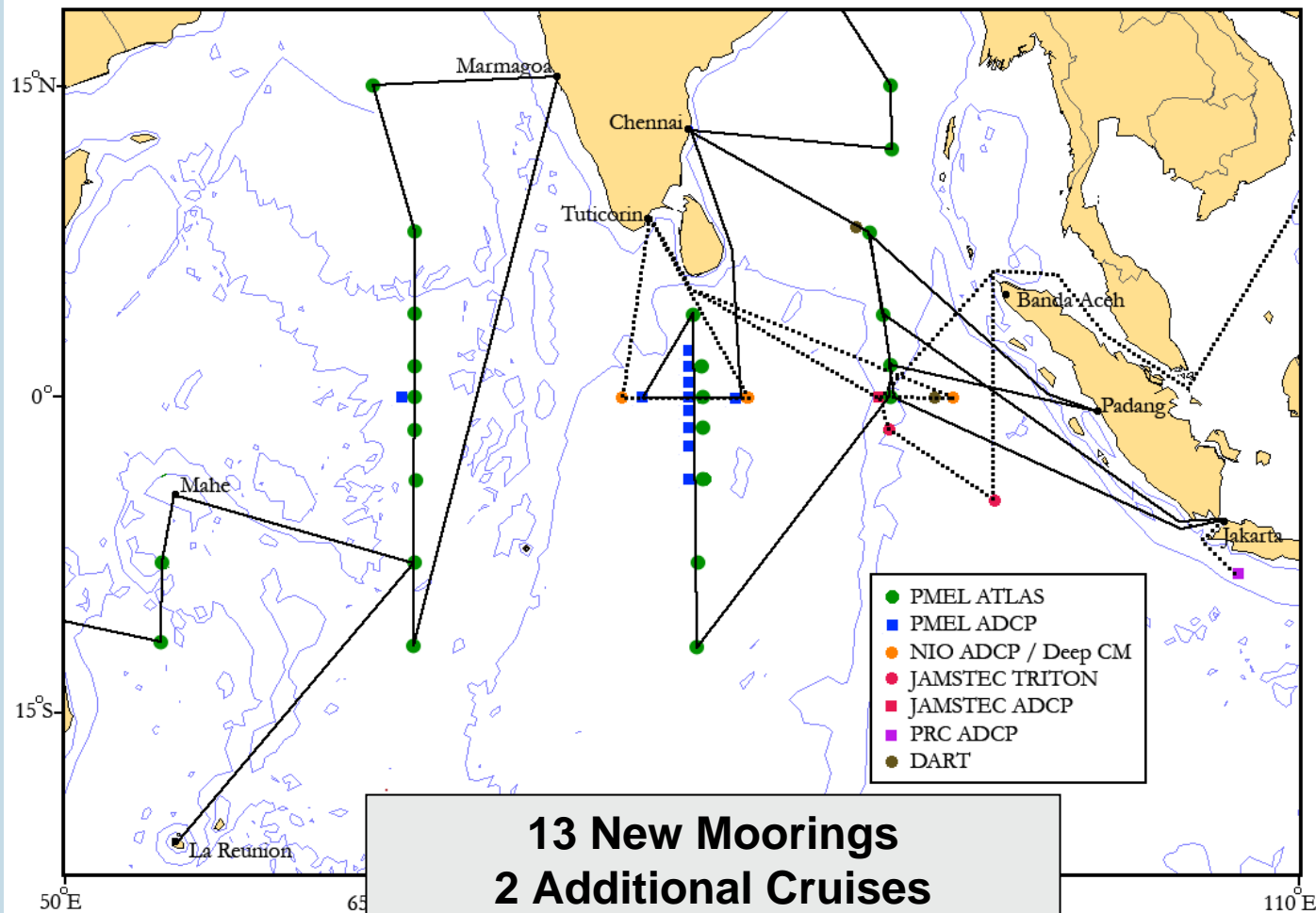
# International Cooperation



- **USA (NOAA) and India (MoES) sign MOU in 2008**
- **USA (NOAA) and Japan (JAMSTEC) sign MOU in 2008**
- **USA (NOAA) and Indonesia (DKP and BPPT) sign MOU in 2007**
- **China (SOA) and Indonesia (DKP) sign MOU in 2007**
- **U. Paris and ASCLME are committing ship time to expand RAMA into SW Indian Ocean/MOU's under discussion**

# *Proposed RAMA Field Work*

## *October 2008 – September 2009*



**13 New Moorings**  
**2 Additional Cruises**  
**New collaboration - ASCLME**

# RAMA/ASCLME Collaboration



Agulhas and Somali Current Large Marine Ecosystems

search...

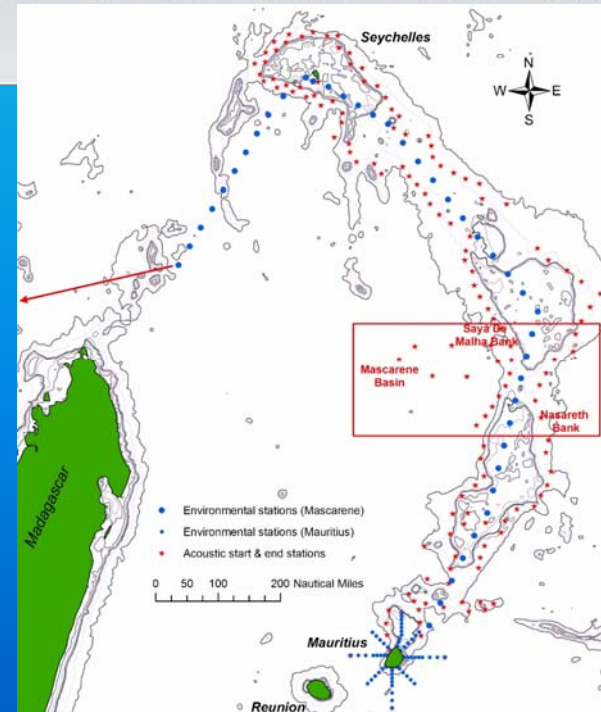


## Welcome to the ASCLME Project

Over the next five years, the nine countries of the western Indian Ocean region, including Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa and Tanzania, will work together through the Agulhas and Somali Current Large Marine Ecosystems (ASCLME) project.



*Dr Fridtjof Nansen*

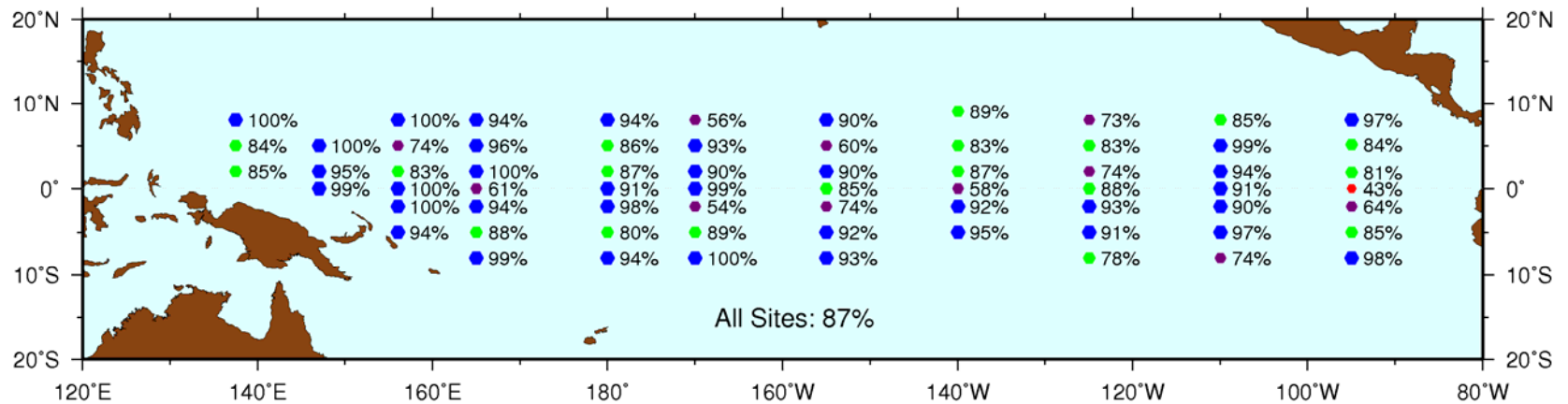




# TAO STATUS

## TAO/TRITON Mooring Real-Time Data Return

October 2007 - September 2008



### Primary Sensors

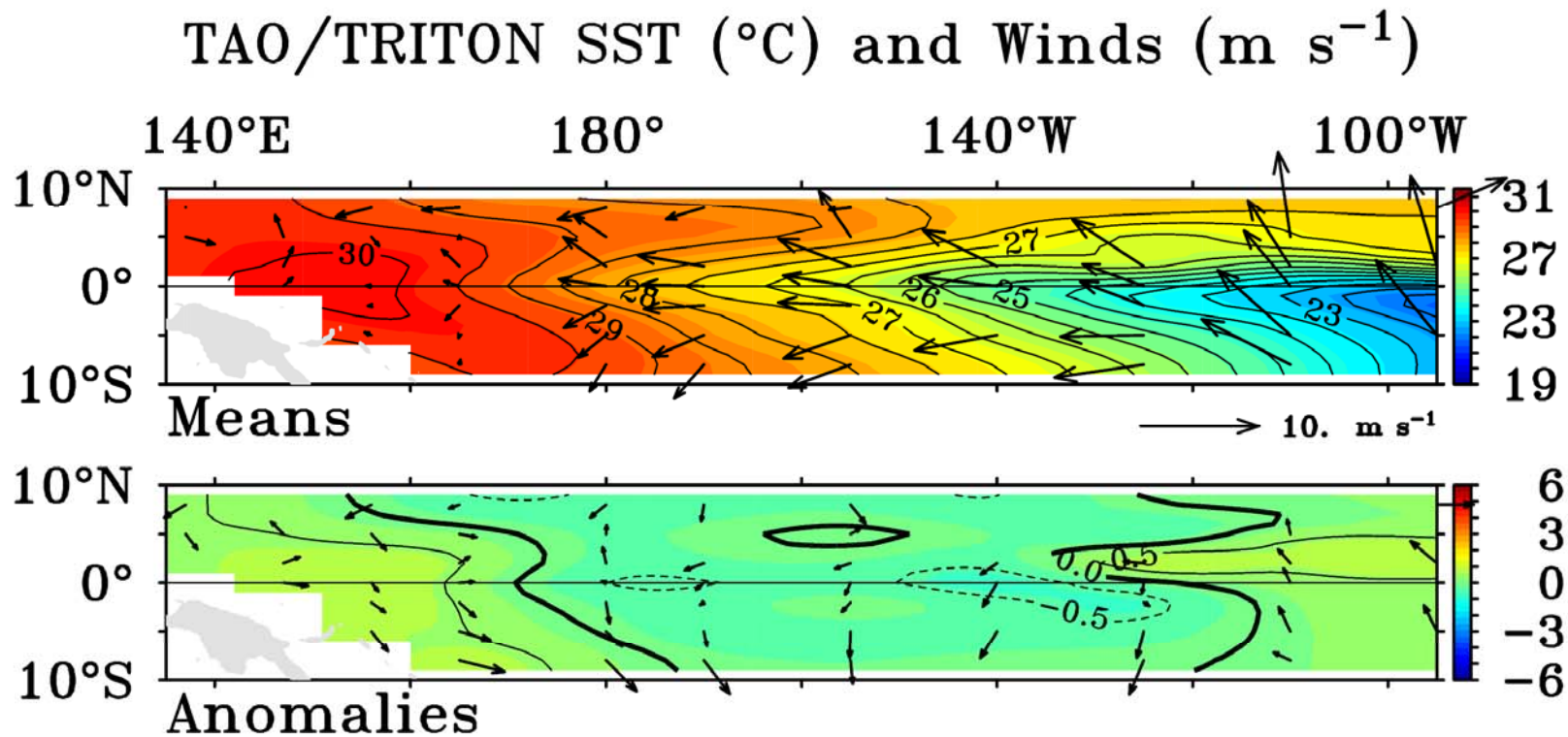
- 0% - 50% Data Return
- 50% - 75% Data Return
- 75% - 90% Data Return
- 90% - 100% Data Return

# Current ENSO Conditions

*ENSO-neutral conditions are expected to continue through the end of 2008.*

**EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION  
CLIMATE PREDICTION CENTER/NCEP/NWS**

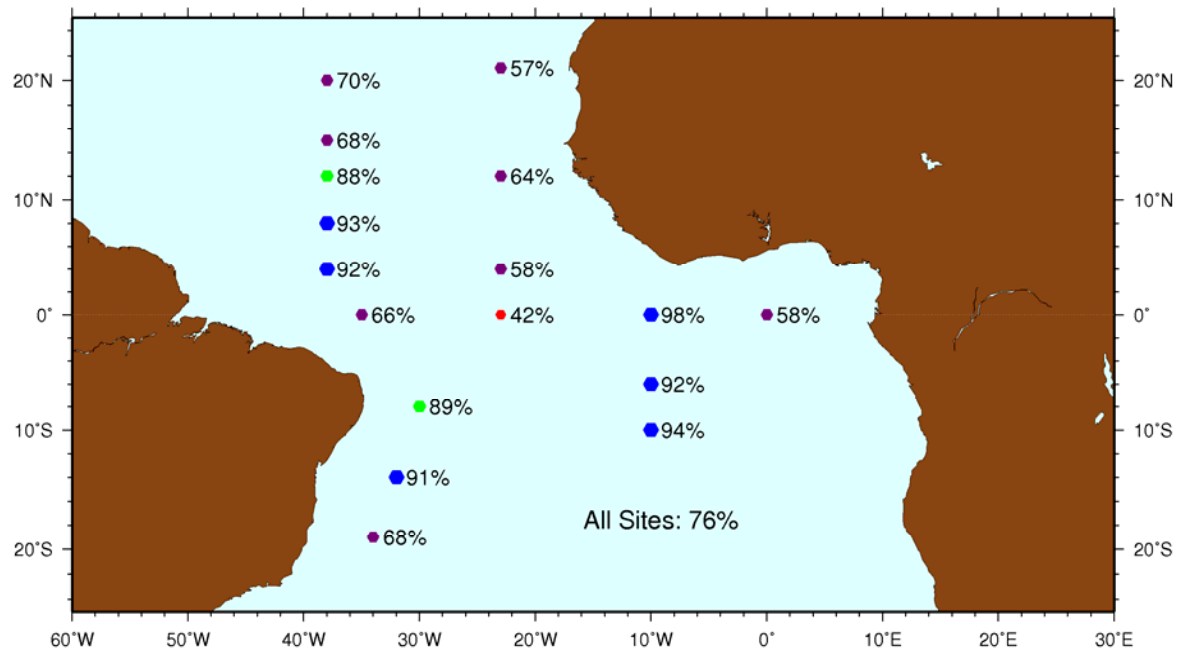
**11 September 2008**



# PIRATA STATUS

## PIRATA Mooring Real-Time Data Return

October 2007 - September 2008



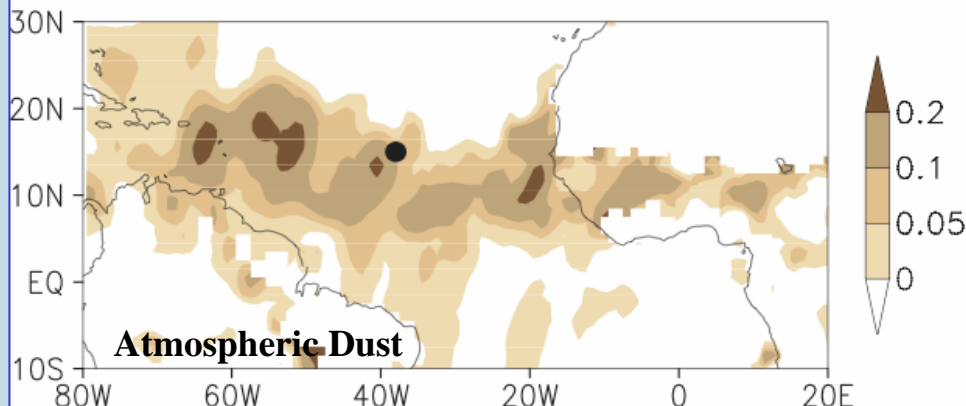
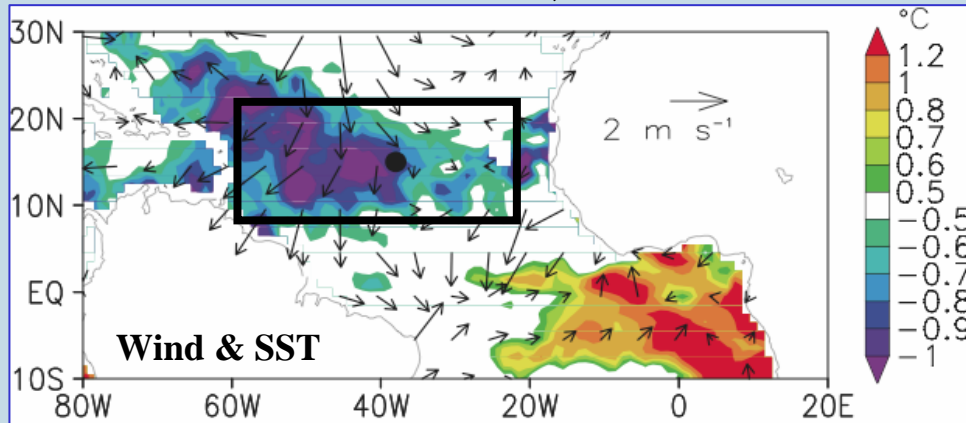
Primary Sensors

● 0% - 50% Data Return    ● 50% - 75% Data Return    ● 75% - 90% Data Return    ● 90% - 100% Data Return



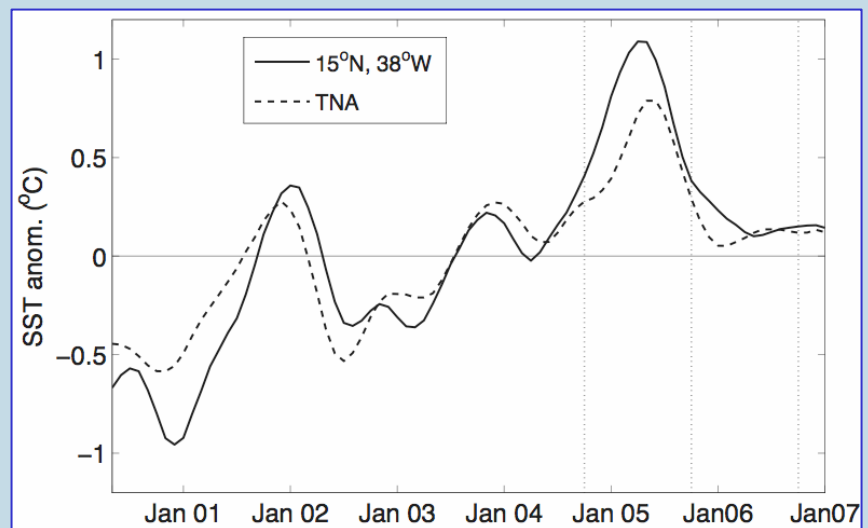
# North Atlantic SSTs in 2006

## JJA Differences, 2006-2005



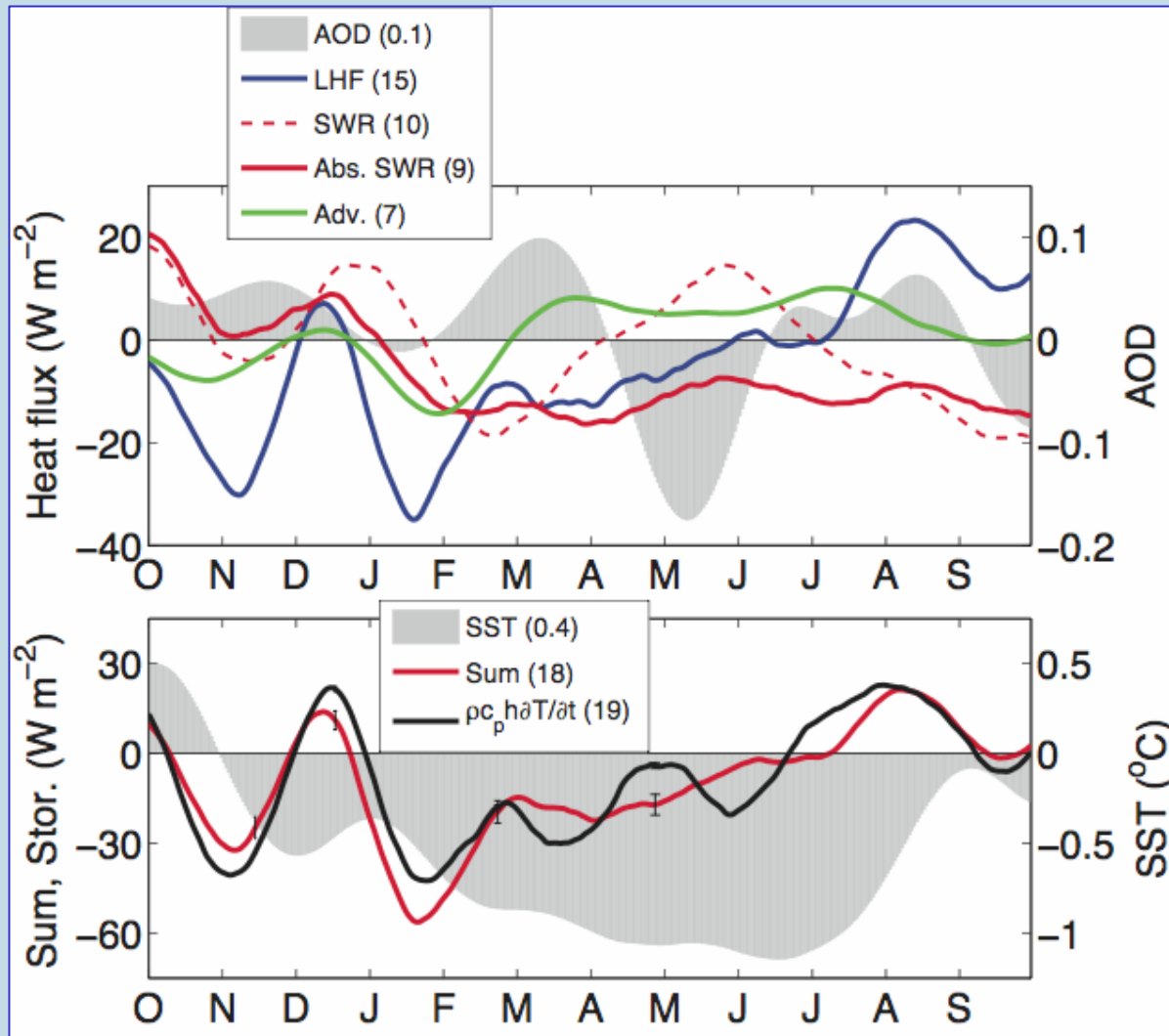
“Increased atmospheric loading of **Saharan dust** over the North Atlantic during the 2006 hurricane season...initiated **rapid cooling** and suppressed tropical storm and hurricane activity...”

*Lau & Kim: How Nature Foiled the 2006 Hurricane Forecast. EOS, 2007.*



# Mixed Layer Heat Balance


## 15 °N, 38 °W



**“...most of the anomalous cooling occurred prior to the period of enhanced dustiness and was driven primarily by wind-induced latent heat loss...dust-induced changes in short wave radiation did not play a major direct role in the cooling that led up to the 2006 Atlantic hurricane season.”**

**Foltz, G.R., and M.J. McPhaden, 2008: Impact of Saharan dust on tropical North Atlantic SST. *J. Climate*, in press.**


# Tropical Moored Buoy Web Pages



Pacific Marine Environmental Laboratory

## Tropical Atmosphere Ocean project

Michael J. McPhaden, Director




Home
Project overview
Data display
Data delivery
El Niño & La Niña
Site map

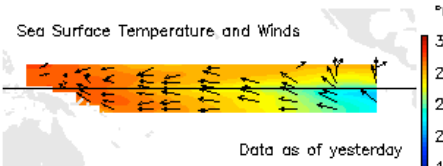
Find

Tuesday August 5, 2008 (PDT)

**Real-time data from moored ocean buoys for improved detection, understanding and prediction of El Niño and La Niña.**



Sea Surface Temperature and Winds




Data as of yesterday

[The TAO Story](#)

**NEW!** [The Global Tropical Moored Buoy Array](#)

Try our combined [Display and Delivery Page](#) which includes more comprehensive data and features, like the ability to download what you view

Learn about [Warm Water Volume and ENSO](#)



U.S. Department of Commerce Gold Medal in 1997 "For...bringing on line an unparalleled oceanographic and atmospheric observing system of global importance"

Home
[Project overview](#)
[Data display](#)
[Data delivery](#)
[El Niño & La Niña](#)
[Site map](#)

TAO Project Office

NOAA | [Pacific Marine Environmental Laboratory](#)

7600 Sand Point Way NE

Seattle, WA 98115

[atlasrt@noaa.gov](mailto:atlasrt@noaa.gov)

[Credits](#) | [Disclaimer](#) | [Privacy Policy](#)

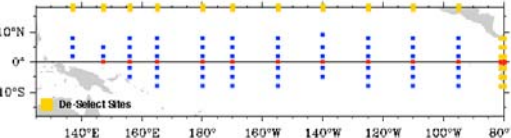
Tropical Atmosphere Ocean project

Home | Project overview | Data display and delivery | El Niño & La Niña | Site map

### T.A.O. Data display and delivery

Find

To select mooring sites, click orange boxes to select lines of sites, click and hold on your mouse to draw a box around sites, or click single sites. Red indicates which sites are selected. Solid squares show where all selected variables are available. Half filled squares show where some are available. Empty squares show where none are available. This page may take a few moments to load on slower networks and computers.



Time Series
Time Section
Lat Lon Map
Depth Section

One Variab
  One Site
  Separate Plot
  Overlay

SW Rad
  LW Rad
  Rain
  Wspd
  Uwnd
  Vwnd
  Wdir
  Wind Ve
  RH

Air T
  SLP
  SST
  T(z)
  SSS
  S(z)
  SSD
  D(z)
  Heat

Dyn Ht
  20C
  Ucur
  Vcur
  Cur Vec
  Uadcp
  Vadcp
  Long
  Lat

TAO/TRITON (Pacific) | Monthly

1979 | January | 20 | 2008 | August | 14

files by site | ascii | None

[Definitions](#)
[Availability](#)
[Clear](#)
[Deliver](#)
[Display](#)

Non-JAVA Version | Old Data Display | Old Data Delivery | Trouble-shooting | Comments or Suggestions? | Mac OS X Users: Safari and Firefox are the recommended browsers | Acknowledgment for use of TAO, PIRATA, and RAMA data

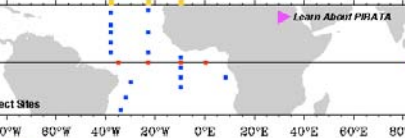
Tropical Atmosphere Ocean project

Project overview | Data display and delivery | El Niño & La Niña | Site map

### Data display and delivery

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Time Series
Time Section
Lat Lon Map
Depth Section

One Variab
  One Site
  Separate Plot
  Overlay

Uwnd
  Vwnd
  Wdir
  Wind Ve
  RH

SSS
  S(z)
  SSD
  D(z)
  Heat

Cur Vec
  Uadcp
  Vadcp
  Long
  Lat

RAMA (Indian) | Monthly

2008 | August | 6

files by site | ascii | None

[Clear](#)
[Deliver](#)
[Display](#)

Old Data Delivery | Trouble-shooting | Comments or Suggestions? | Mac OS X Users: Safari and Firefox are the recommended browsers | Acknowledgment for use of TAO, PIRATA, and RAMA data

<http://www.pmel.noaa.gov/tao/>



# Summary

- Progress towards RAMA implementation:

  - October 2007 – 15 sites (33%)

  - October 2008 – 20 sites (43%)

  - October 2009 – 33 sites (72%)

- International partnerships
- Engineering development
- Open access data policy

