Report from IOP

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Interacting Variations in Time and Space

Indian Ocean Dipole

Monsoons

Biogeochemistry & Ecosystems

Ocean Circulation

Cyclones

Trends
Indian Ocean Observing System (IndOOS)

- Planned by CLIVAR/GOOS Indian Ocean Panel in 2004
- Basin scale with regional elements
- Supports short term process studies
- Design supported by numerical model observing system simulation studies

Multi-platform
Long-term
Observation
Network

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Map of the Indian Ocean with various observation stations and markers indicating different types of data collection equipment.
Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA)

- 67% complete
  (31 out of 46 Sites; 5 Flux Reference Sites)
- All the moorings were serviced
- Recent deployments
  ATLAS: 25° S, 100° E,

Resource Formula:
- NOAA provides most equipment (+JAMSTEC, NIO, FIO)
- Regional partners provide ship time (INCOIS, KKP/BPPT, ASCLME, CSIRO, ...)

IndOOS Resources Forum (IRF) is important function for this achievement.
Meteo-France Pressure Sensors

Research Moored Array for African–Asian–Australian Monsoon Analysis and Prediction (RAMA)

- Surface Mooring
- Flux Reference Site
- ADCP
- Deep Ocean

Oct 2012
67% Complete

Meteo-France initiated support for sea level pressure measurements at 4 RAMA sites to improve cyclone forecasting in 2010.
RAMA Biogeochemical Measurements:
In Collaboration with SIBER*

Objectives:

A) Define & understand biogeochemical variability;

B) Develop models of ocean-atmosphere-biosphere interactions;

C) Assess the impacts of climate change on ocean primary productivity and air-sea CO₂ exchange.

Key Measurements: CO₂, pH, Fluorescence, Particle Backscatter, O₂

Monthly SeaWiFS Chl-a Concentrations (Solid Dots are RAMA Flux Reference Sites)

*SIBER=Sustained Indian Ocean Biogeochemical and Ecosystem Research Program
First Biogeochemical Measurements in RAMA

Deployment of a similar system on an ATLAS mooring in the Pacific from a NOAA ship

Fluorescence @ 25 m (UTAS)

Deployment of a similar system on an ATLAS mooring in the Pacific from a NOAA ship
First CO₂ Measurements in RAMA

Research Moored Array for African–Asian–Australian Monsoon Analysis and Prediction (RAMA)

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Oct 2012
67% Complete

Chinese “Bailong” mooring
pCO₂ System @ 8°S, 100°E

CO₂ in air

CO₂ in water
7 cruises
6 ships
7 nations
27 moorings
153 days

RAMA Cruises Oct 2011 - Sept 2012

Open symbols indicate unoccupied sites

RV Southern Surveyor

25°S, 100°E
Planned RAMA Cruises Oct 2012 - Sept 2013

- 9 cruises
- 7 ships
- 6 nations
- 36 moorings
- 211 days

Open symbols indicate unoccupied sites
Challenges

• **Increasing data return (64% now)**
  – Securing and coordinating ship time
  – Mitigating vandalism
  – Piracy

• **Implementing biogeochemical measurements**
RAMA Data Access

Data display and delivery

To select monitoring 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 when 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 if slower networks are used.

Time Series Profiles Time Section Lat Lon Map Depth Section

One Variabl One Site Separate Plot Overlay

SW Rad LW Rad Rain Wspd Uwmd Vwmd Wdir Wnd 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

files by site ascii None

RAMA Data Files Delivered via the Web (Total=95379)

Fiscal Year (Oct-Sept)

+ FTP/WEB: 458,386
Journal Publications


2012


Maneesha, K., V. S. N. Murty, M. Ravichandran, T. Lee, Weidong Yu, and M. J. McPhaden, 2012: Upper ocean variability in the Bay of
Status of Active floats in the Indian Ocean

- 769 floats are active in the Indian Ocean (about 491 floats north of 40 S)
- 68% profiles subjected to DMQC
- New deployments during past one year: 175
Bio-Argo

- Temperature
- Salinity
- Oxygen
- Chlorophyll-a
- Backscatter @ 700 nm
- Nitrate
2012 (144)


Drifters: Trajectories in June 2012

233 drifters deployed during last one year
## Indian Ocean XBT Transects

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1. USA-NOAA/AOML
2. USA-SIO
3. AUS-CSIRO
4. ZAF-UCT
5. AUS-BOM
6. IND-NIO

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Source: Francis Bringas
Tide gauge locations

67 Tide gauges are active in the Indian Ocean
**Process studies (CINDY2011 / DYNAMO)**

**Purpose:**
To collect in-situ observations to advance our understanding of the MJO initiation process and to improve the MJO simulation and prediction.

**Periods:**

**Participants:**
Over 60 institutes/universities/agencies from
- US, Japan, India, Indonesia, France,
- Kenya, Seychelles, Maldives, Sri Lanka, Singapore,
- Papua New Guinea,
- UK, Taiwan, Korea, Poland, and Australia

**Early results:**
Captured 3 MJOs during IOP, but Dec case is controversial.
Preliminary analyses suggest the following factors may key;
- Behavior of dry air during moistening process
- Interaction between ITCZ and MJO
- Influences on moisture from the maritime continent

Other interesting findings;
- Unseasonal Wyrtki jet,
- Meander of SCTR, etc.
Thank you for your attention