NOAA's Indian Ocean Capacity Building

DBCP-XXIII Technical Seminar



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National Oceanic and Atmospheric Administration (NOAA), USA
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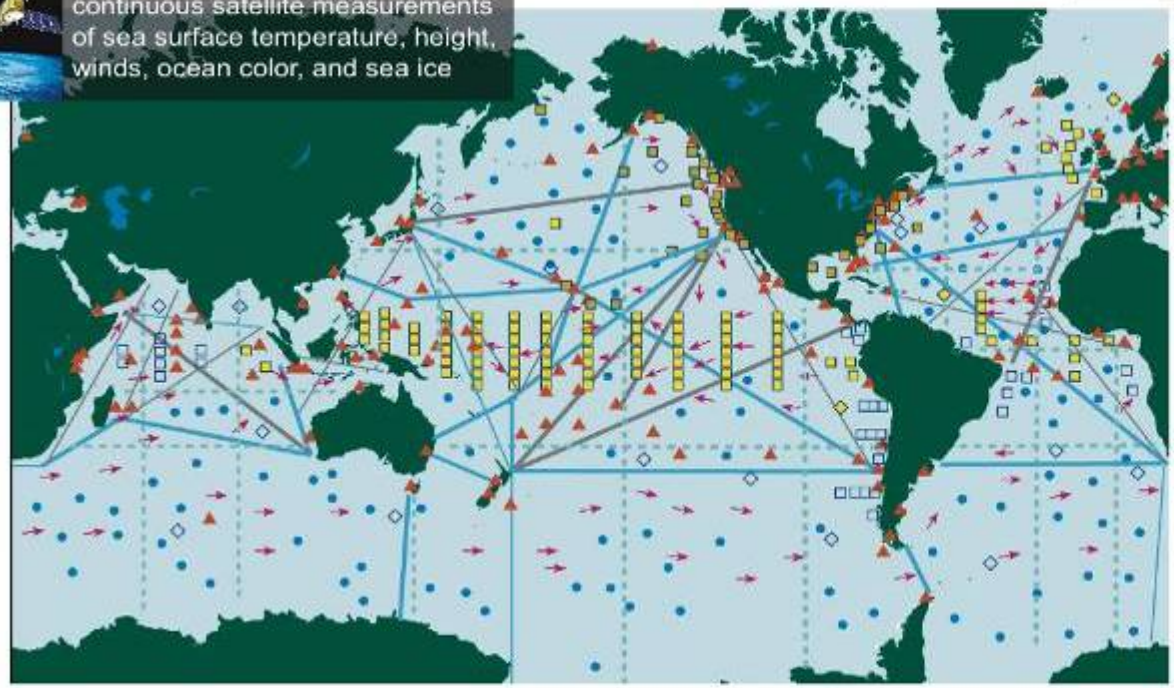
Jeju Do, Republic of Korea

The Open-Ocean component of GOOS

Total *in situ networks* **59%** August 2007

continuous satellite measurements of sea surface temperature, height, winds, ocean color, and sea ice



87% **Surface measurements** from volunteer ships (VOSclim)

200 ships in pilot project

100% Global **drifting surface buoy** array

5° resolution array: 1250 floats

62% **Tide gauge** network (GCOS subset of GLOSS core network)

170 real-time reporting gauges

81% **XBT** sub-surface temperature section network

51 lines occupied

97% Argo **profiling float** network

3° resolution array: 3000 floats

43% Repeat **hydrography** and **carbon inventory**

Full ocean survey in 10 years

Reference time series 24%

29 sites

48% Global **reference mooring** network

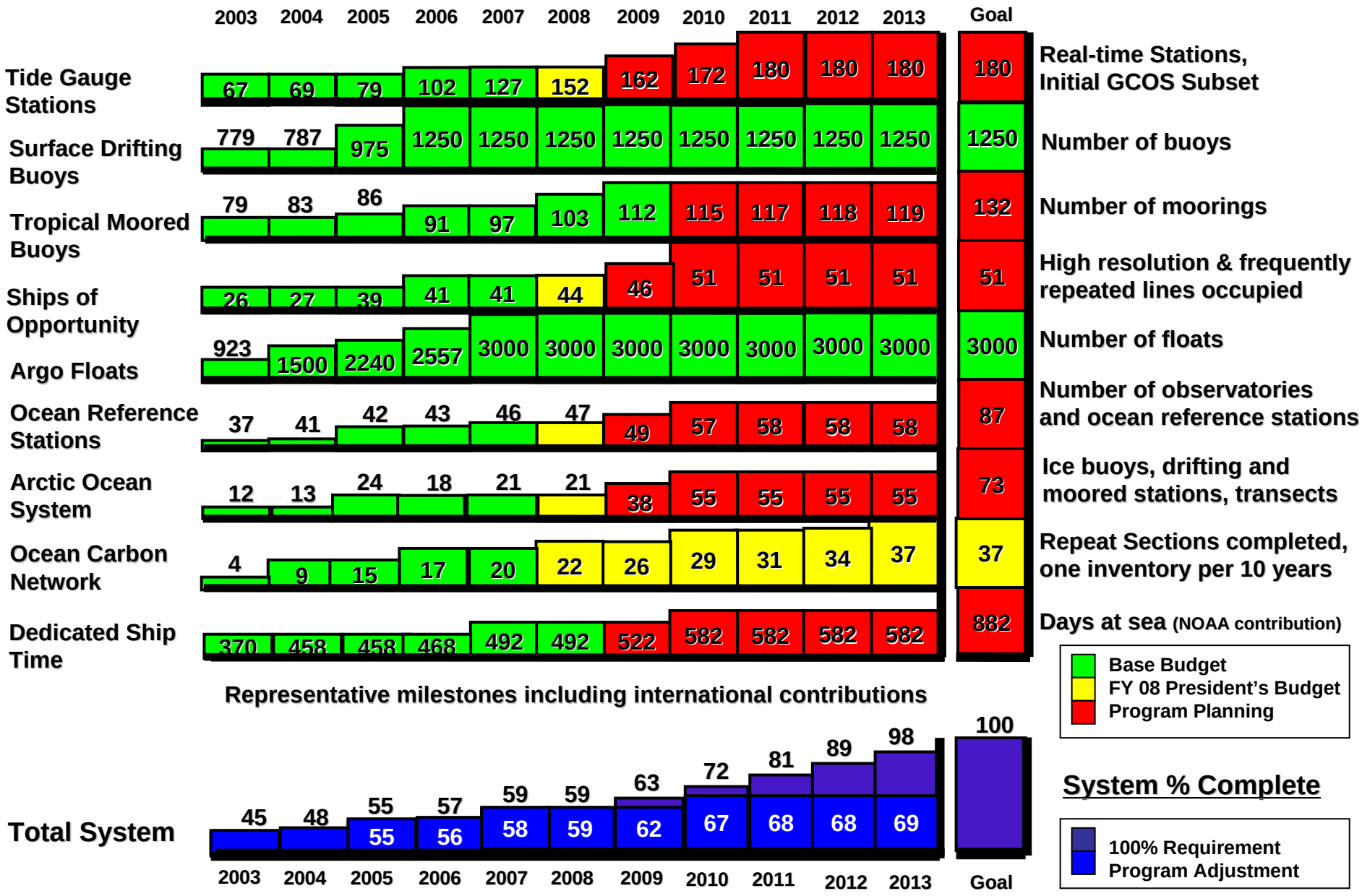
58 moorings planned

74% Global tropical **moored buoy** network

119 moorings planned

GCOS GOOS jcomm

Celebrating the Past, Observing the Present, Predicting the Future



The organizing framework is in place

jcomm
OCEANOGRAPHY & MARINE METEOROLOGY

DBCP WMO – IOC DATA BUOY COOPERATION PANEL

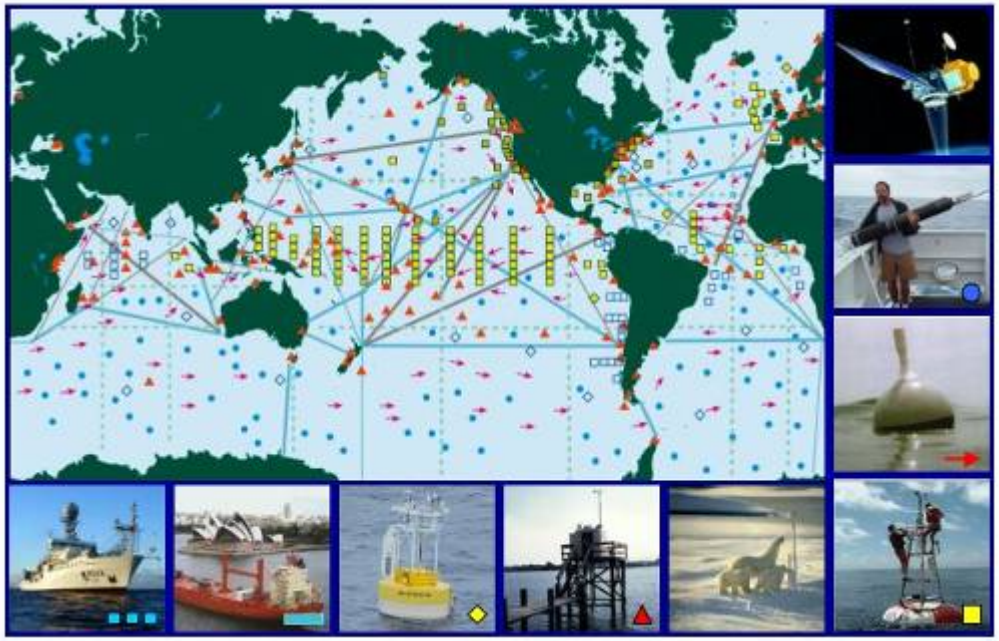
SHIP OBSERVATIONS TEAM JCOMM

GLOBAL SEA LEVEL OBSERVING SYSTEM GLOSS

ARGO

OceanSITES

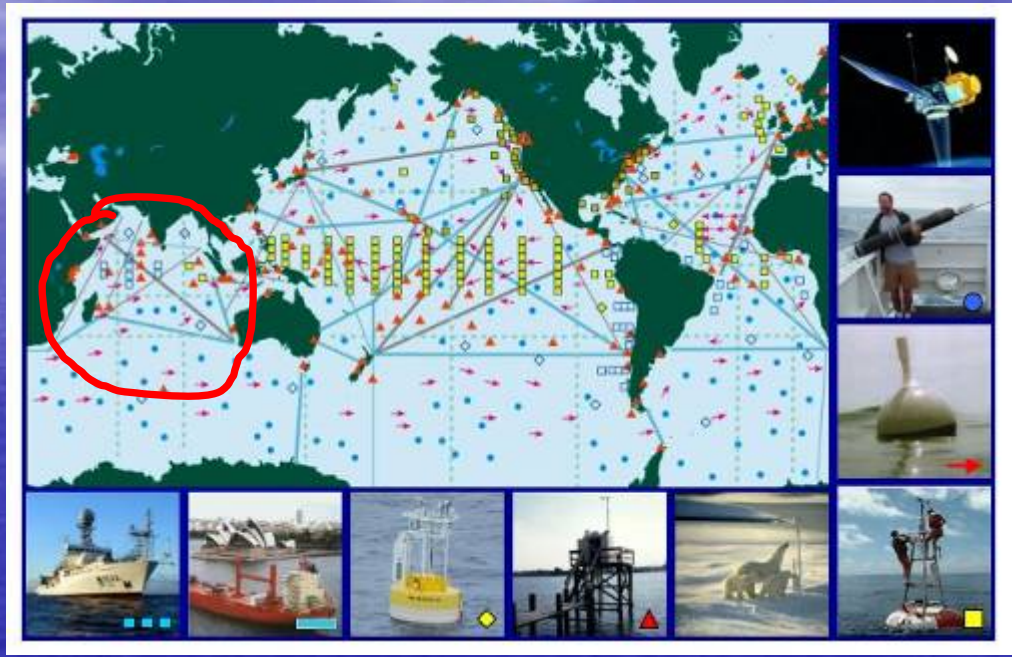
International Ocean Carbon Coordination Project



As of September 2005, all six global *in situ* implementation programs are now linked internationally through WMO/IOC JCOMM coordination

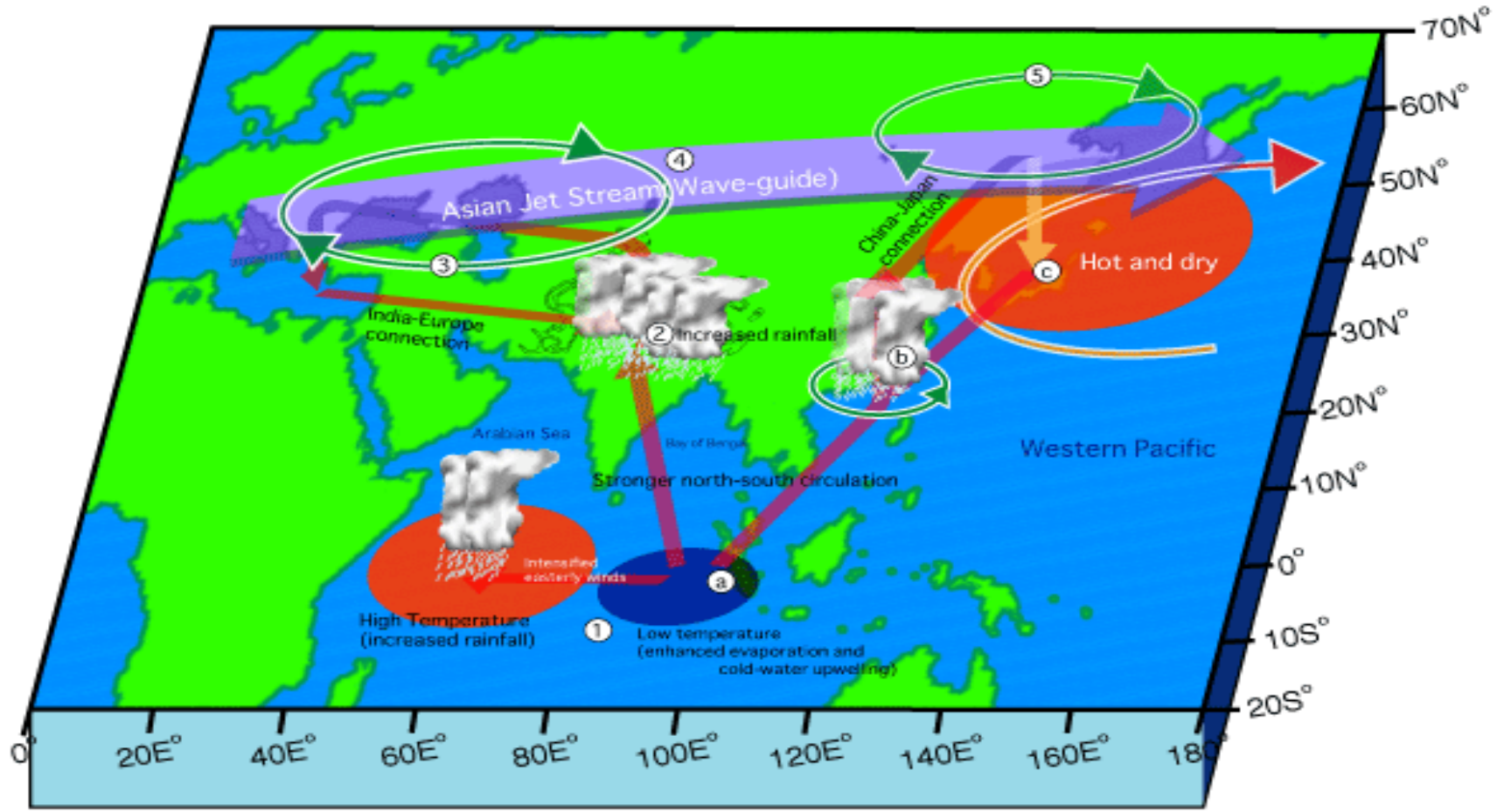
Who are OCO's users?

- **Climate:**
  - Operational Forecast Centers
  - International Research Programs
  - Major Scientific Assessments
- **System designed to meet climate requirements but also supports:**
  - Weather prediction
  - Global and coastal ocean prediction
  - Marine hazards warning
  - Transportation
  - Marine environment and ecosystem monitoring

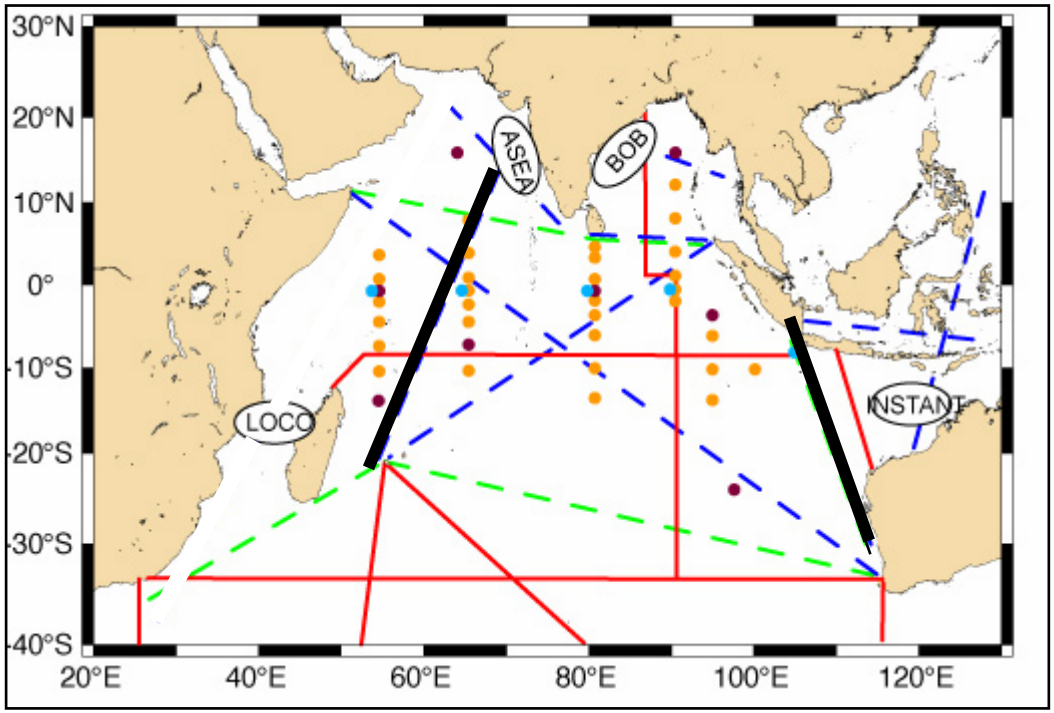


- Tide gauge stations
- Drifting Buoys
- Tropical Moored Buoys
- Profiling Floats
- Ships of Opportunity
- Ocean Reference Stations
- Ocean Carbon Networks
- Arctic Observing System
- Dedicated Ship Support
- Data & Assimilation Subsystems
- Management and Product Delivery
- Satellites (managed outside of IOOS)

A Schematic Diagram of the IOD Influence on the Summer Conditions in the Northern Hemisphere
ダイポールモードとそのテレコネクションの三角関係



IOGOOS/CLIVAR Indian Ocean Observing System (IndOOS)



Emphasis on ocean, but will provide surface met data as well

Mooring Array

Argo floats 3°x 3°
Drifters 5°x 5°

~20 real-time tide gauges for IOTWS

Carbon/hydro cruise

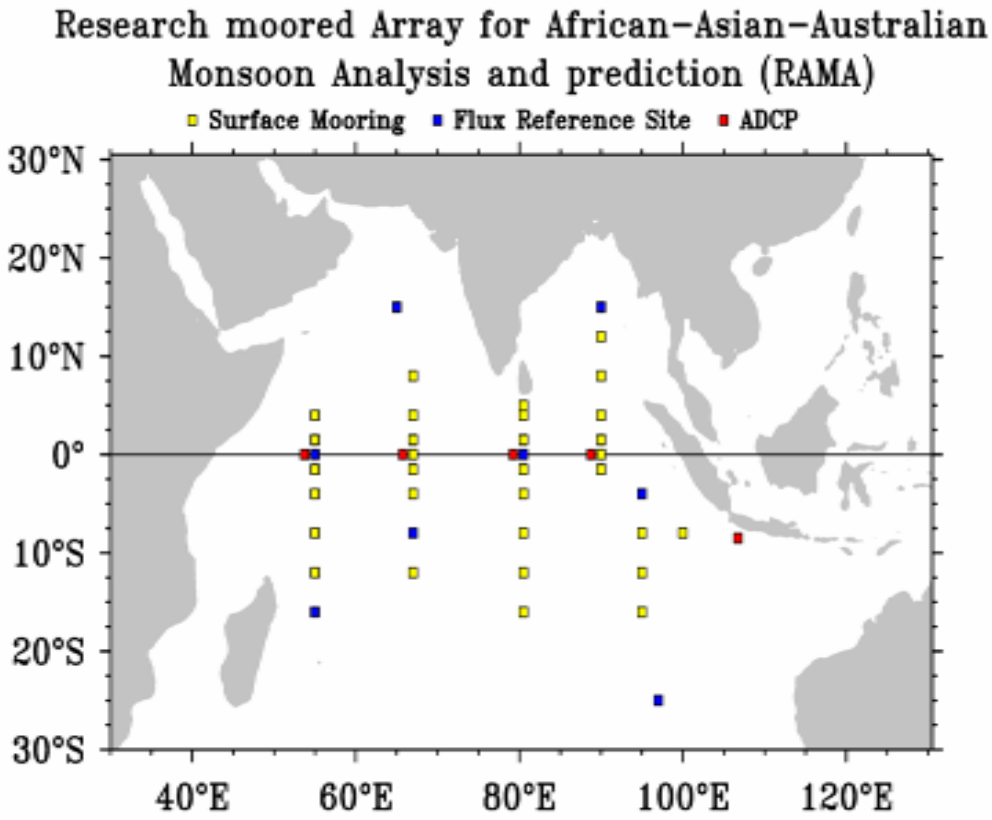
High density XBT

Frequently repeated XBT

Enhanced XBT lines to monitor Indonesian Throughflow, inflow to western boundary, Java upwelling and 10°S thermocline ridge

Regional mooring arrays

Strategy for Indian Ocean Moored Buoy Array



- **Basin scale, tropical upper ocean (500 m) focus.**
- **Arabian Sea, Bay of Bengal, Eq. Waveguide, Thermocline ridge (5°-10°S), subtropical subduction, Java upwelling.**
- **Does not sample western boundary currents, ITF, coastal zones.**
- **Design supported by numerical model observing system studies.**

Designed by the CLIVAR/GOOS Indian Ocean Panel
http://eprints.soton.ac.uk/20357/01/IOP_Impl_Plan.pdf

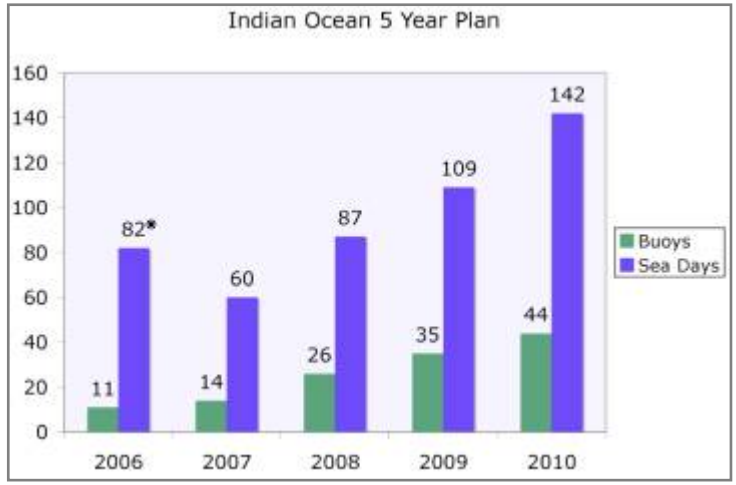
International Objectives

- Optimize Cost-effective resource sharing for Shiptime, instrumentation
- Enhance Regional Capacity and Training for Socio-economic Benefits
- Eliminate Gaps and Overlap Redundancies
- Coordinate Joint Implementation
- Ensure Free & Open Access to Data

Challenges: Ship Time

Requirements:

- ≥ 140 days per year to maintain full array
- Must be available routinely and with regularity
- Assumes 1-year mooring design lifetime and annual servicing cruises



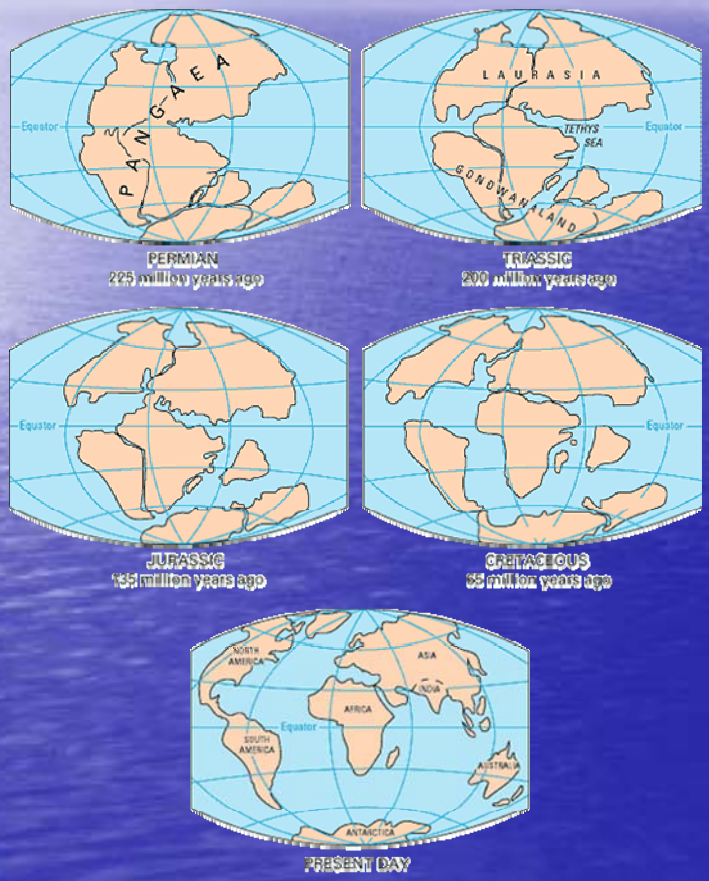
***Actual sea days in 2006: involves more than just mooring work**

International Partnerships are Central

A global system by definition crosses international boundaries

NOAA's contributions are managed in cooperation with the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) -- presently 68 nations.

Partnerships for New GEOSS Applications (*PANGEA)*



- 230M Years ago the Super-continent PANGEA Existed
- Reunite Met/Ocean Institutes to Increase in-situ Ocean Observations
- Demonstrate Socio-economic Applications of Ocean Data

PANGEA Promotes the Use of Ocean Observations for Regional Socio-Economic Benefits Through:

- Sharing required resources such as ship time and training between Partners,
- Annual and repeatable training workshops conducted in exchange for annual sea days aboard PANGEA partner's ships for deployments and routine maintenance of ocean observations,
- In-country practical applications training of ocean data provided to large and diverse groups of regional participants, rather than a few selected individuals traveling to a workshop far away,
- Establishing New sources of ocean observational data by deploying new instruments,

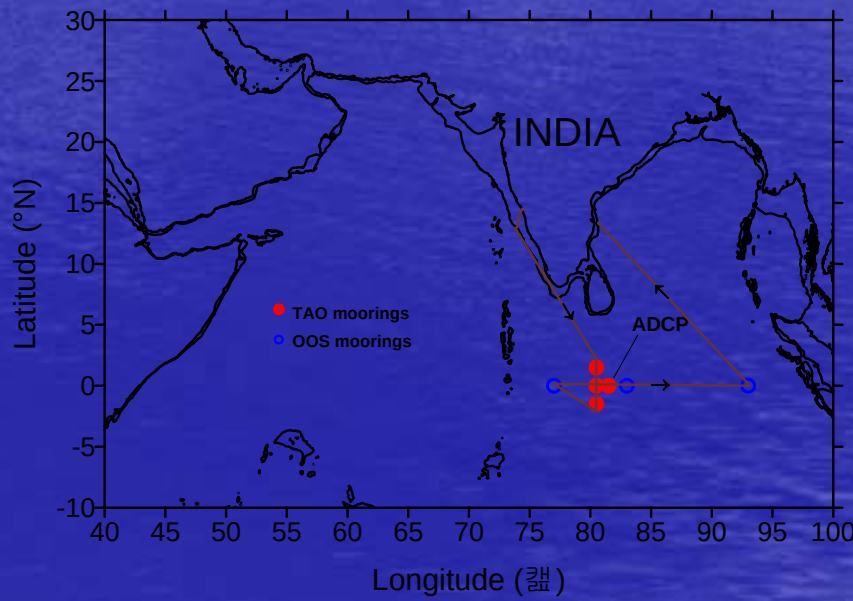
PANGEA Promotes the Use of Ocean Observations for Regional Socio-Economic Benefits Through:

- Developing maritime Nations are invited to effectively contribute to the Global Earth Observing System of Systems (GEOSS)
- Provides opportunities for training of ship crews in the deployment of moorings and instrumentation and the on-site evaluation of data,
- Government Officials responsible for making policy and setting budgets are invited to participate in PANGEA workshops,
- Customs Officials are invited to PANGEA workshops to learn about the science, applications and plans for ocean observations in the region.

India’s Ministry of Earth Sciences MoES

RV Sagar Kanya Cruise
October-November 2004, 2006

- National Institute for Oceanography (NIO) and NOAA-PMEL
- 3 ATLAS & 1 ADCP Mooring 1.5°S, 0°, 1.5°N along 80.5°E
- ATLAS enhanced with current meters, salinity, rainfall, SW; in addition, LW & atmospheric pressure on central mooring
- Expect to continue and expand with Indian (NIO, NIOT, DOD/NCAOR, etc) and other institutions.



Proposed locations of the PMEL TAO and ADCP moorings (red dots) along with the existing Indian OOS mooring locations (blue open circles). Also proposed are the hydrographic stations between 2캭 and 2캳 at 0.5?interval along 80.5캢.

Goa India, Western Indian Ocean Workshop

A SCIENTIFIC FRAMEWORK TO ESTABLISH

A Partnership in Climate Research and Measurements

between

Ministry of Earth Sciences

India

and

Climate Program Office

National Oceanic and Atmospheric Administration

United States of America

20 December 2006

Richard D. Rosen, Ph.D.
Senior Advisor for Climate Research
Climate Program Office/NOAA

Prof. Antonio J. Busalacchi
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University of Maryland
Chair, NOAA Climate Working Group

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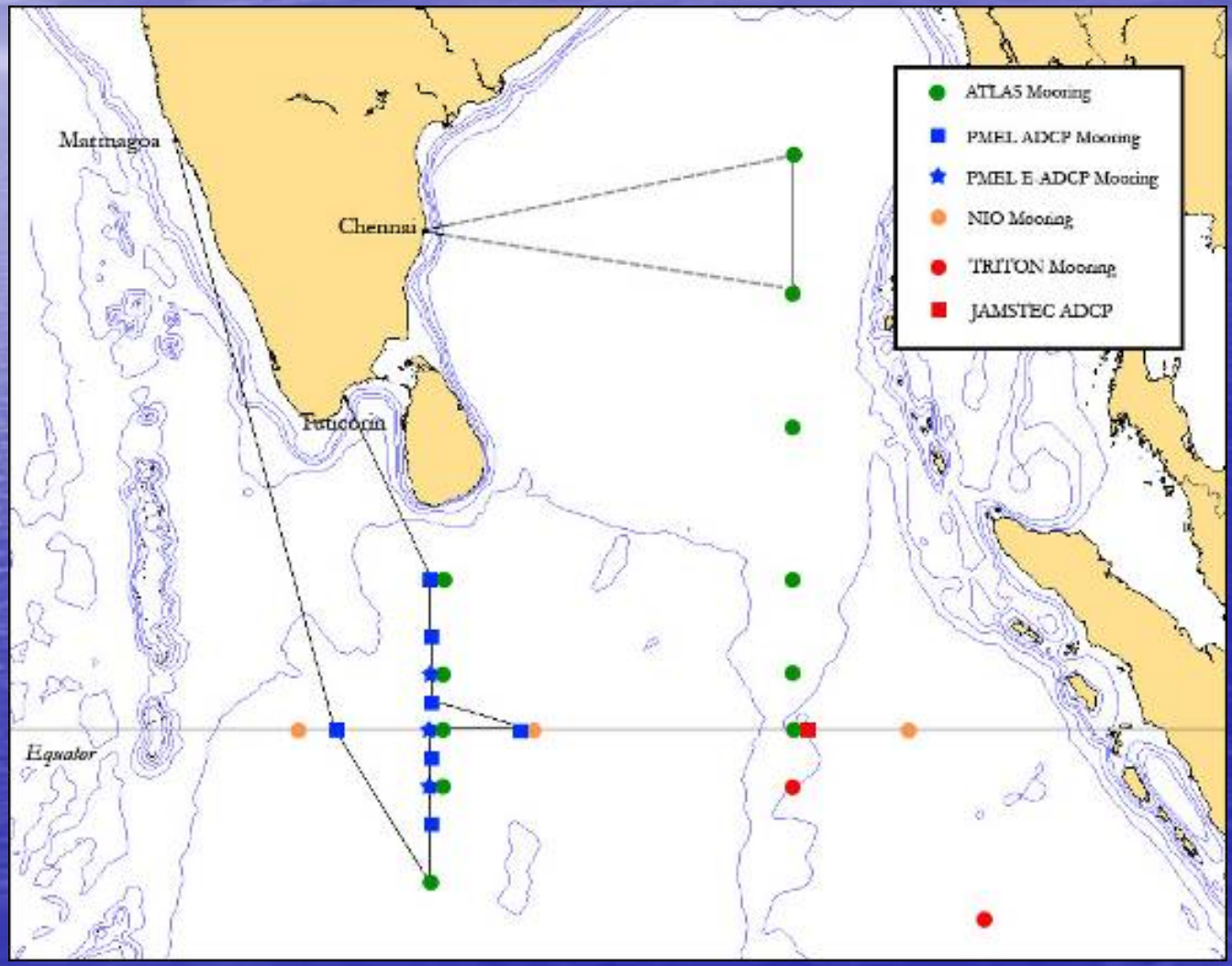
Office of Climate Observation
Climate Program Office/NOAA

Deployment Plan with Ministry of Earth Sciences for 2008

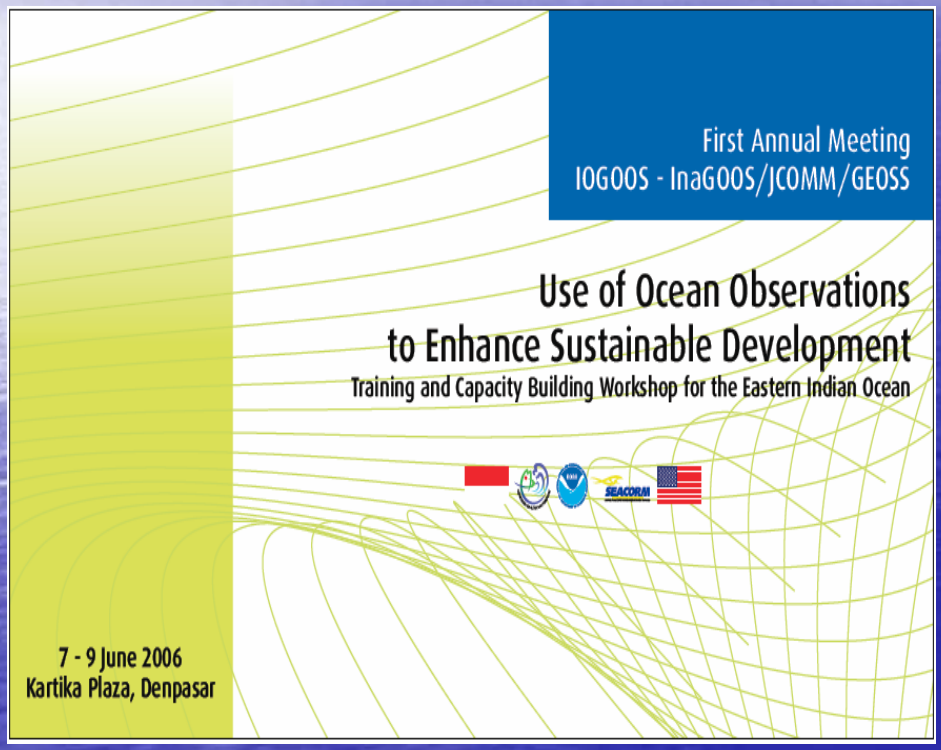


Indonesia's Ministry of Marine and Fisheries (DKP) and Agency for Assessment and Application of Technology (BPPT)

APEC Ocean Ministerial MEETING (AOMM-2) Bali, Indonesia September 2005

- 20 APEC Ocean Ministers Met in Kuta Bali
- “Our Coast, Our Ocean… an Action Plan for Sustainability”
- “Bali Action Plan”
- DKP-NOAA Ministerial Bilateral Discussions
- NOAA-DKP Letter of Intent Signed

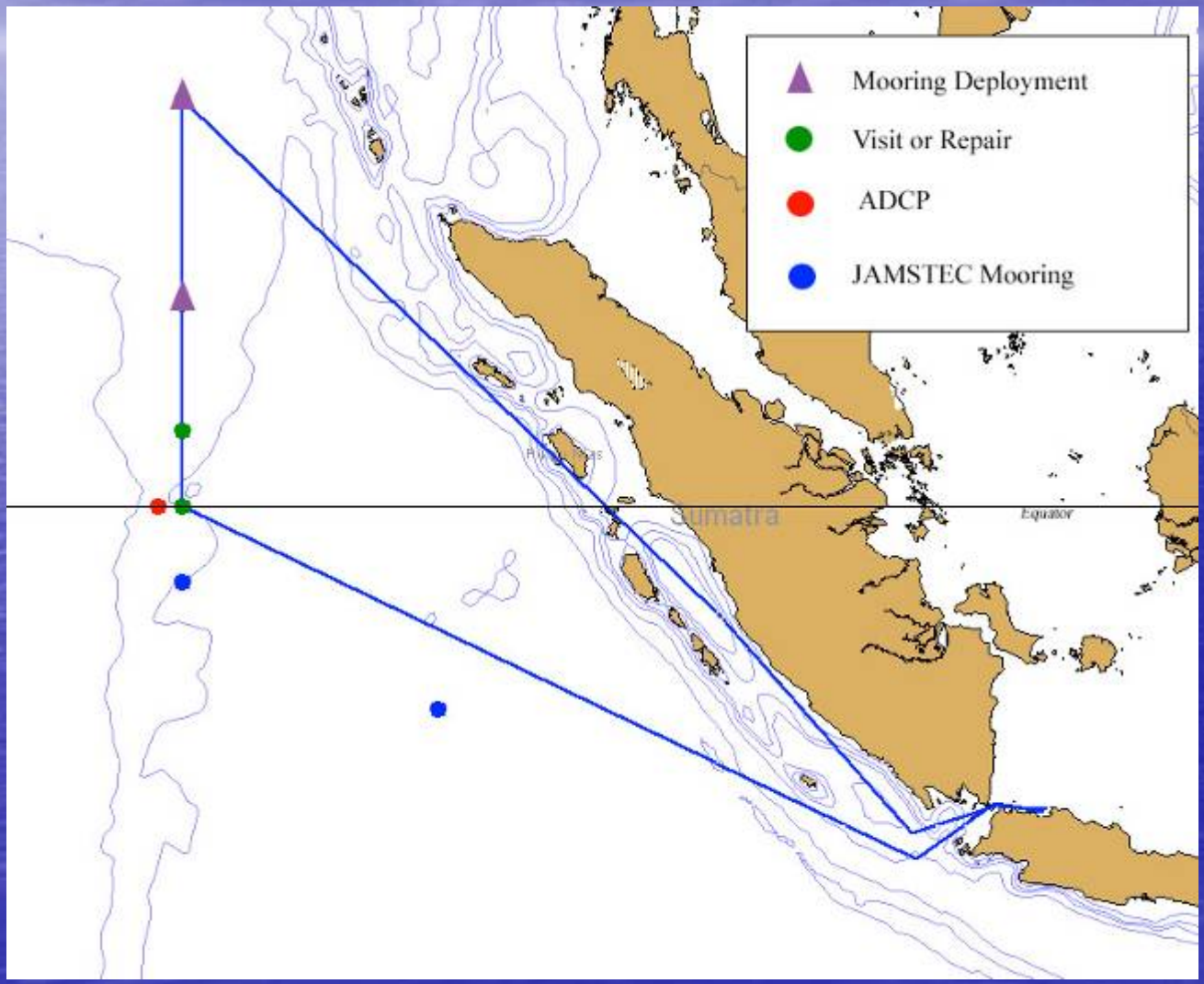
Bali Indonesia PANGEA Workshop June 2006



Bandung Indonesia September 2006

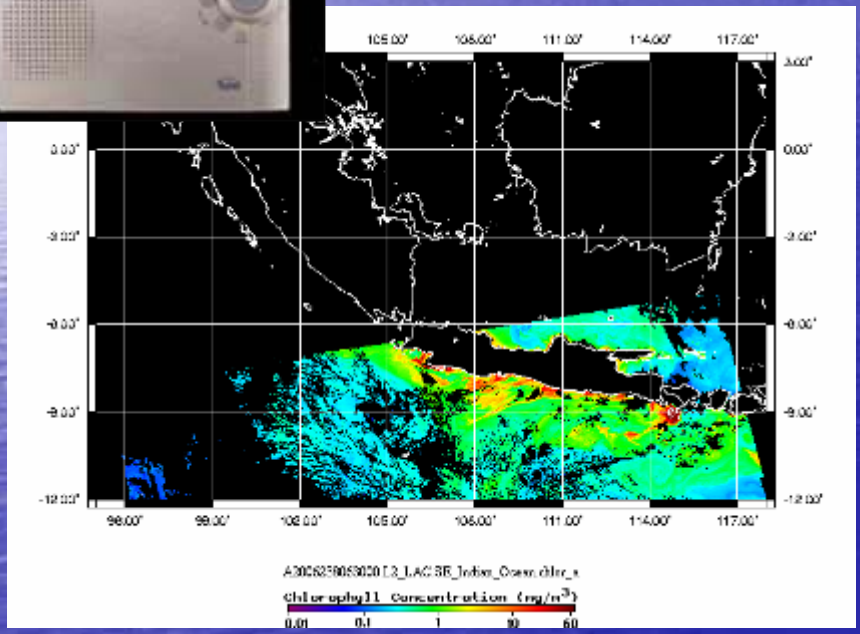
- Fisheries Applications of Ocean Data
- Modeling and Assimilation
- Bandung Institute of Technology

November 2006 NOAA Baruna Jaya-1 ATLAS Deployments

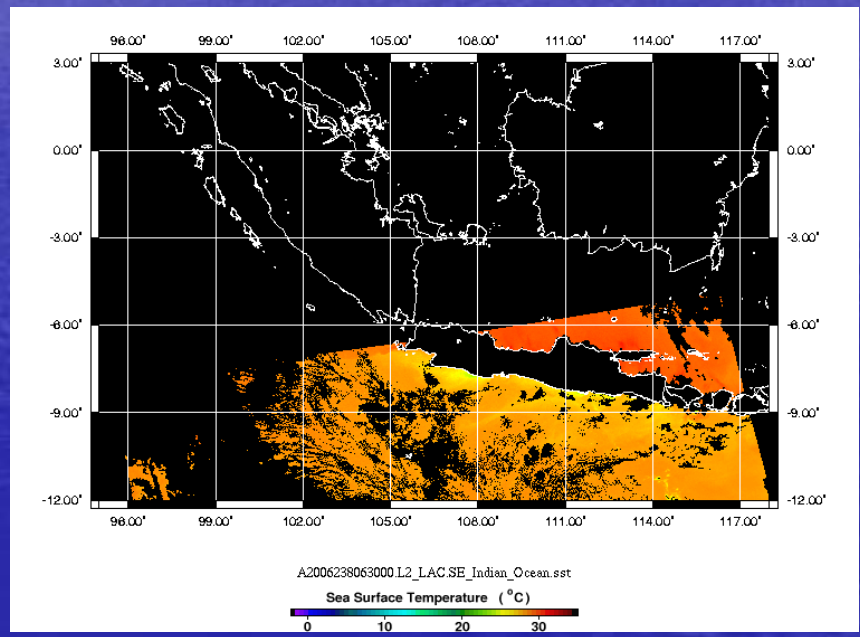


RANET Infrastructure Development Workshop Bali September 2007

Chlorophyll



Sea Surface Temperature



Education Task Team Overview

Researching options for Indonesians to study in U.S.

Objectives

- Indonesian students studying at U.S. Universities (2008)
- U.S. students studying in Indonesia (2009 or 2010)

NOAA Approach

- NOAA is identifying partners and options
- Identifying existing options
- Will present findings, options, suggestions at RANET and Education Capacity Building Workshop in Bali (August 27-31, 2007)

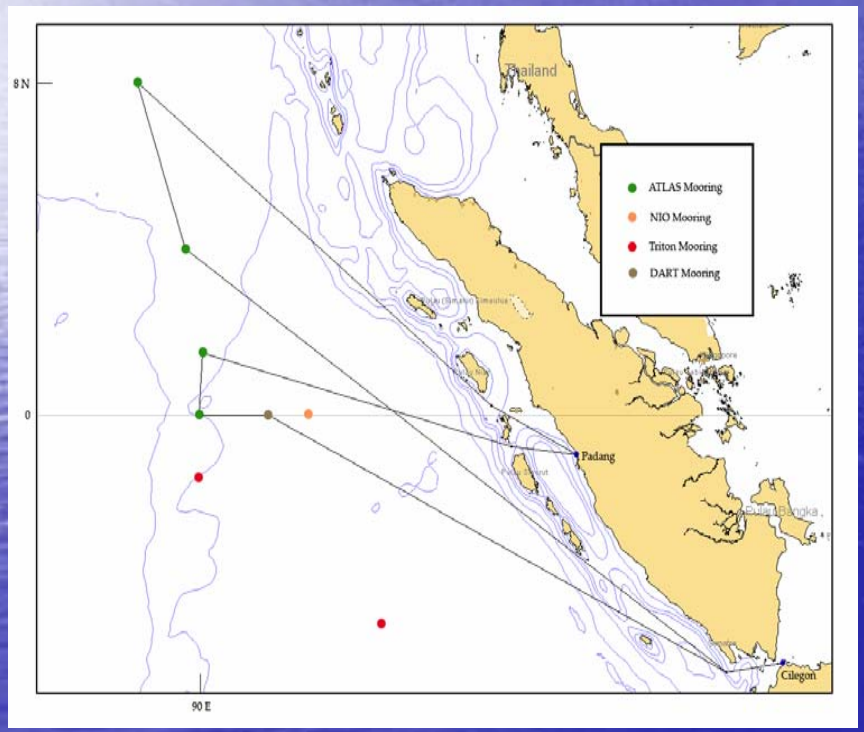
Possible DKP Approach

- Identify Indonesian University partners to help *groom* students
- Academic requirements/prerequisites; selecting students; funding
- Identify an office to coordinate with NOAA and Universities (GRE, TOEFL, etc)
- Present findings at the workshop in Bali—August 27-31, 2007

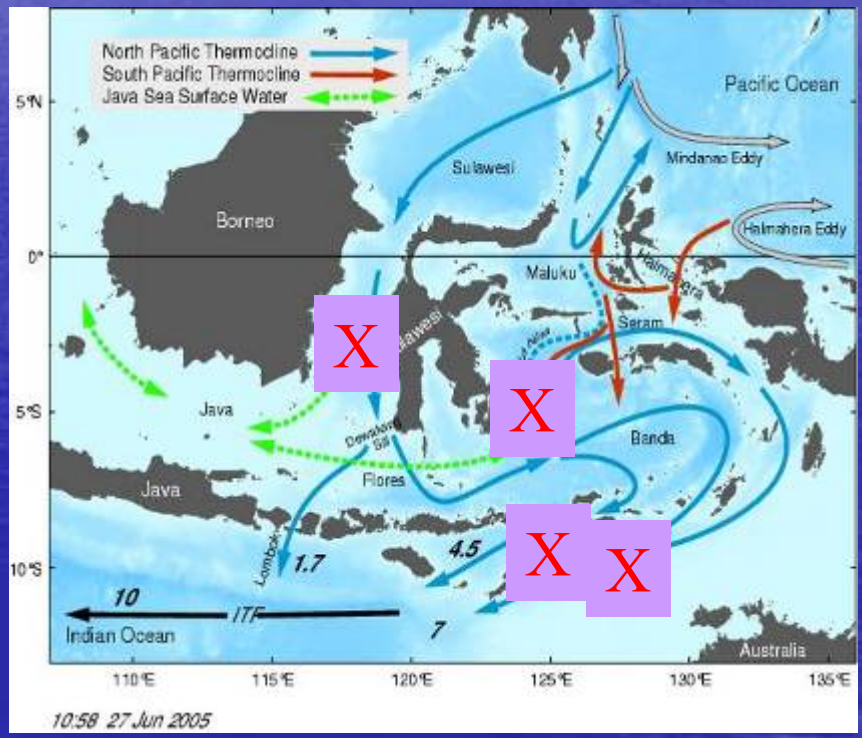
High-Level NOAA-DKP-BPPT Signing Ceremony Jakarta September 2007

NOAA's 2008 Investment in Regional Ocean Observations (Climate, USD1M)

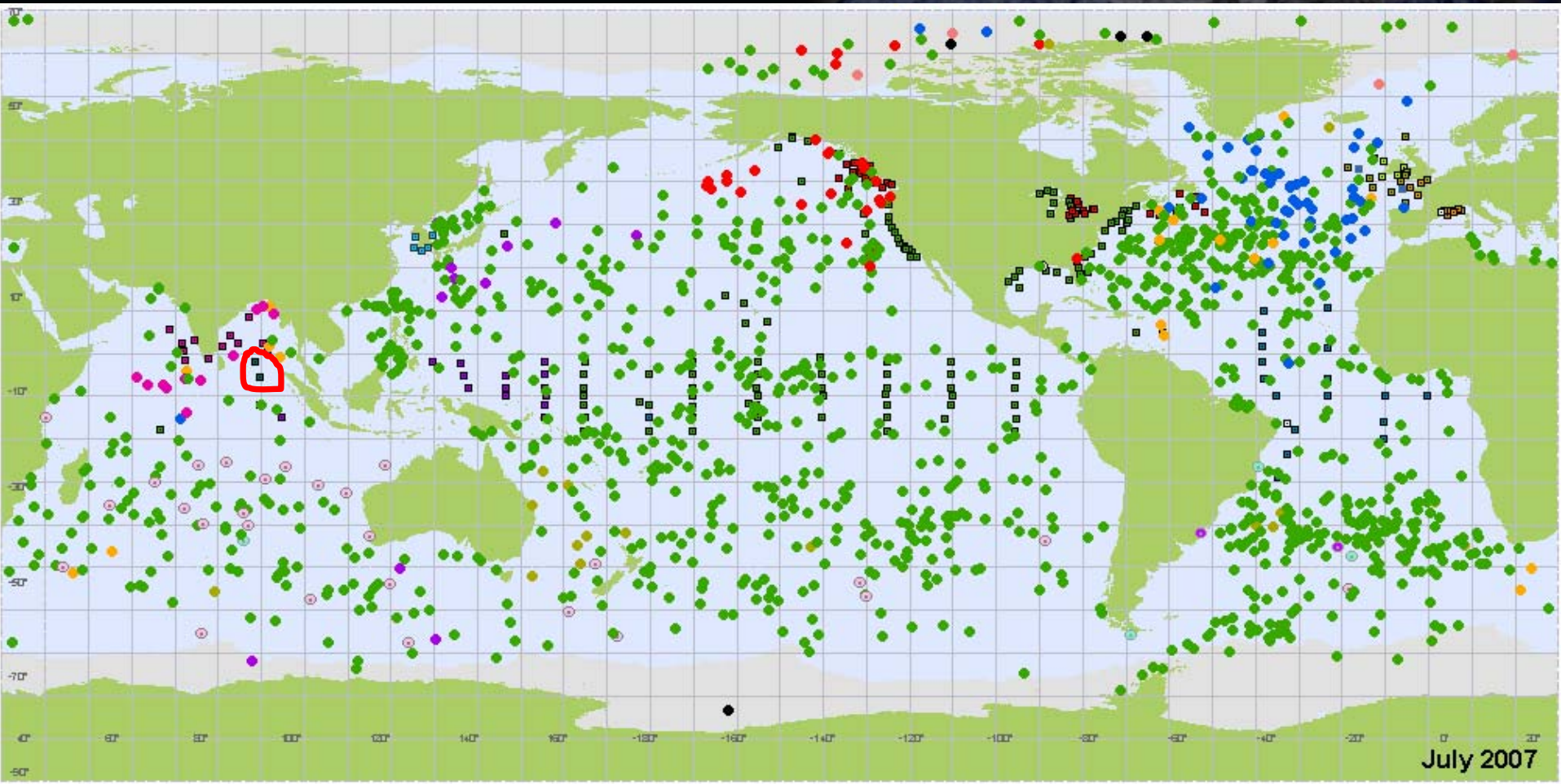
ATLAS Climate & DART Tsunami Moorings



Indonesian Throughflow Monitoring



US/Indonesia Moorings on JCOMMOPS WebSite

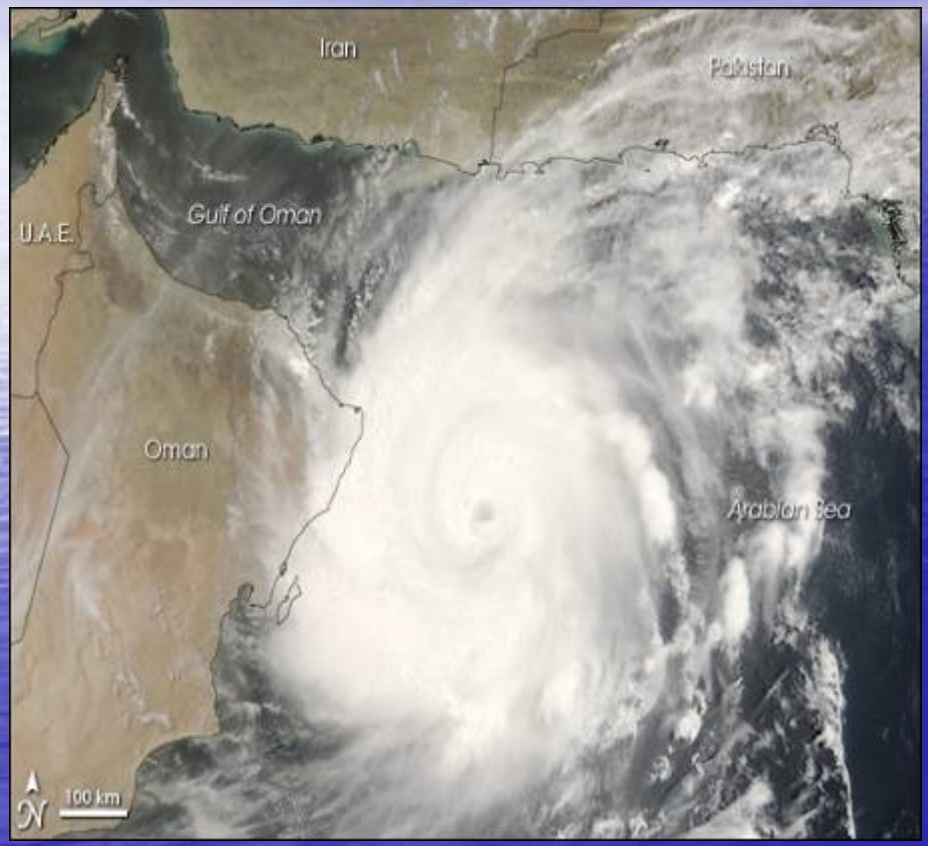


South Africa Weather Service

- Broached Partnership During IOP-4 in Pretoria April 2007
- Scoping Workshop November 2007

Meteorology and Environmental Protection Administration (MEPA)

Tropical Cyclone *Gonu* June 2007



- Caused torrential rain and flooding and its winds have been measured at a maximum of 160 mph.
- Major gas and oil terminals have been shut as a precautionary measure, reports Reuters.
- An executive based in Muscat told the news agency: "It's quite common to have heavy rains at this time of year in Oman. But this weather is quite unusual and they're calling it the worst in Oman's history."
- Oil prices surged in the region following the reporting of the cyclone and the closure of the Mina al Fahal oil terminal.

Summary

- Sustainable capacity building fosters both an increase in observations while developing the socio-economic applications of the data
- The Indian Ocean is advancing nicely in the Central and Eastern Regions, the West remains a Challenge

Thank You

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