2nd GEOSS AP Symposium
Tokyo Apr. 15 2008

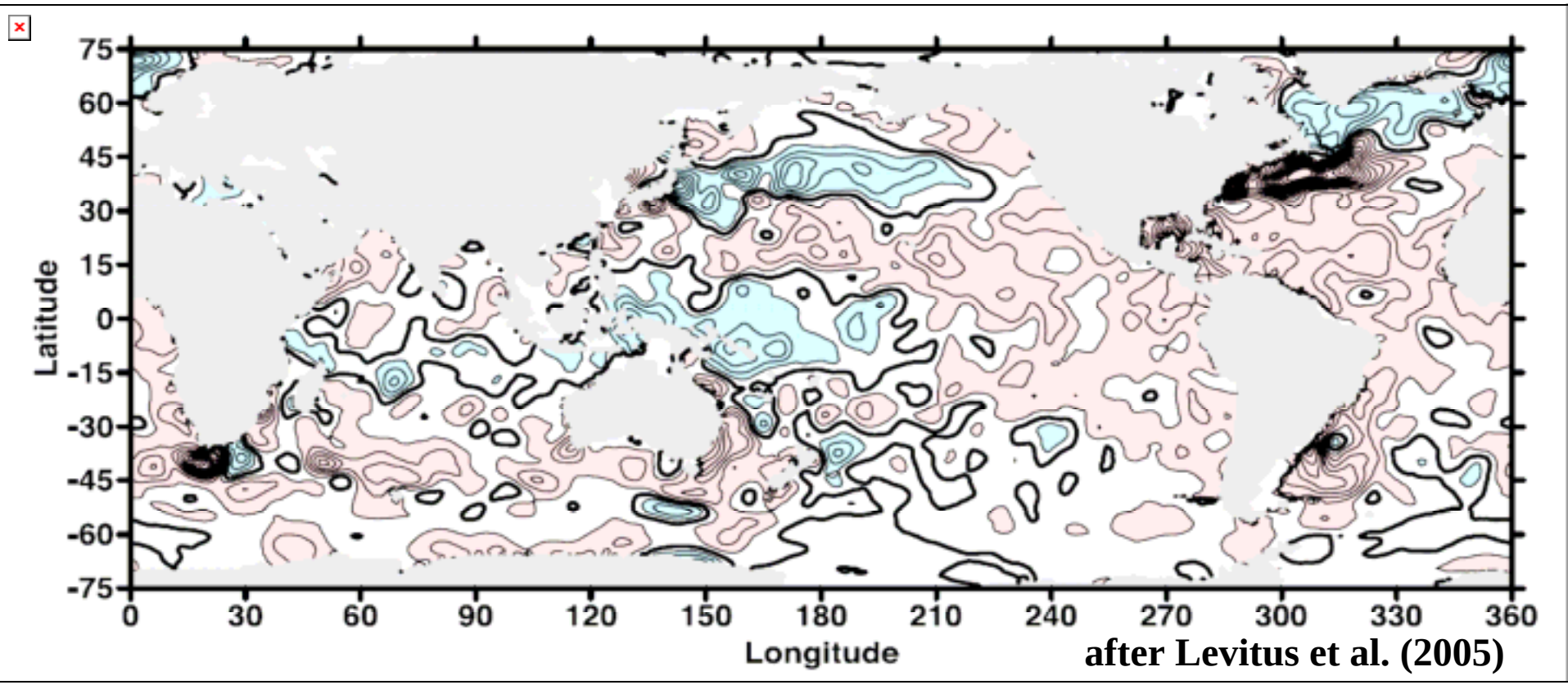
Recent Progress in the in-situ ocean observing system in the Asia-Pacific area

Keisuke Mizuno (JAMSTEC)

1. **Argo Array; Monitoring system for**
   Global climate change (heat content, watermass change)
   Ocean circulation (heat & material transport)
   Water cycle change (ocean salinity change)

2. **Tropical mooring buoy Array; Monitoring system for**
   Short term Ocean Climate change (El Nino, I OD, etc.)

Linear trends of change in ocean heat content per unit surface area (Wm^{-2}) for the 0 to 700 m layer (1955-2003)



The contour interval is 0.25 W m^{-2}. Red ; > 0.25 W m^{-2} Blue ; < –0.25 W m^{-2}

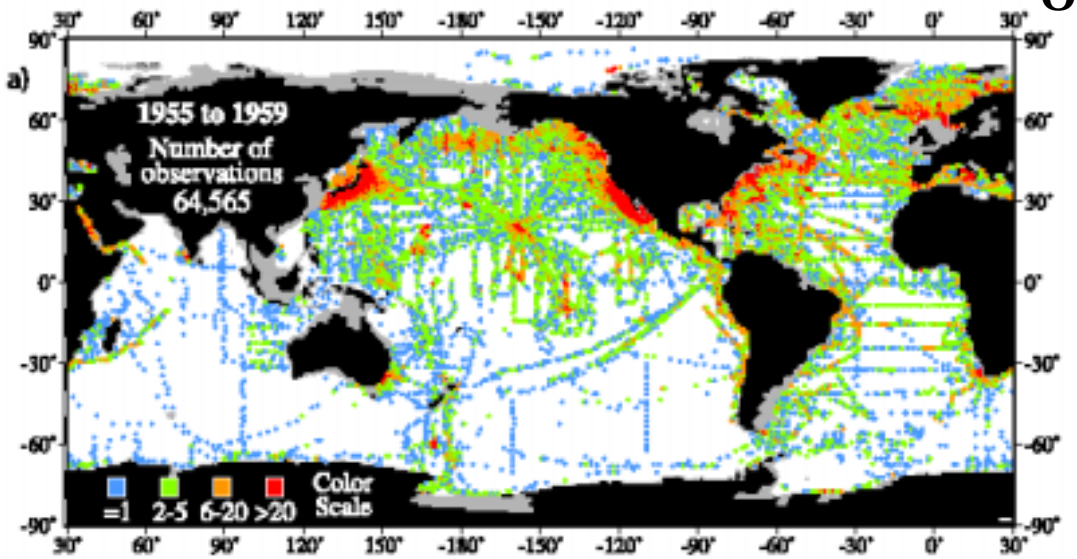
Equivalent to approximately 0．1℃ temperature rising in average

Progress in Ocean Obs. network

Late 50's

Small number of Res. vessels

Obs. points 15,000/year

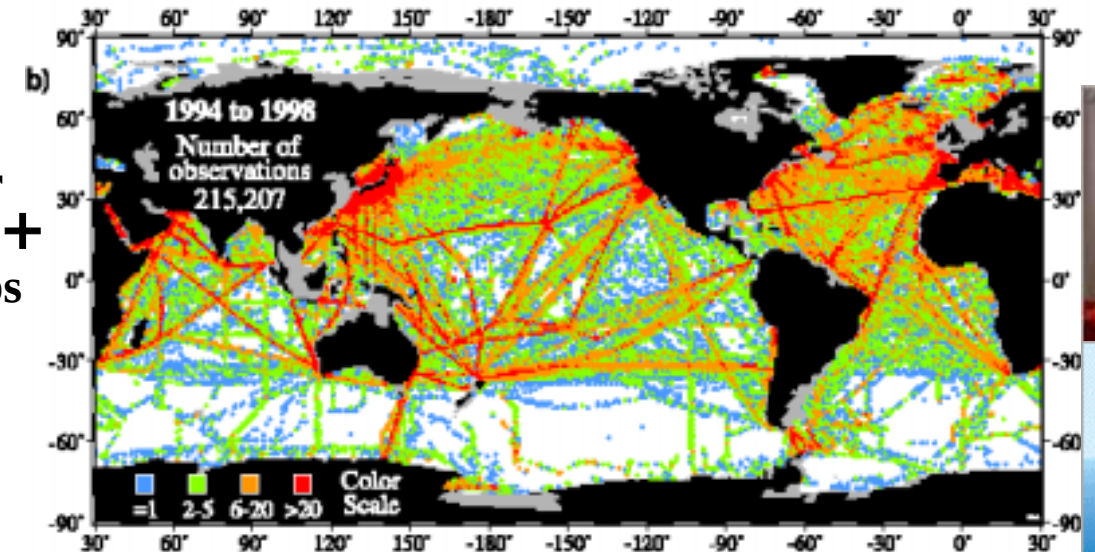


Ocean obs. in 50's-60's

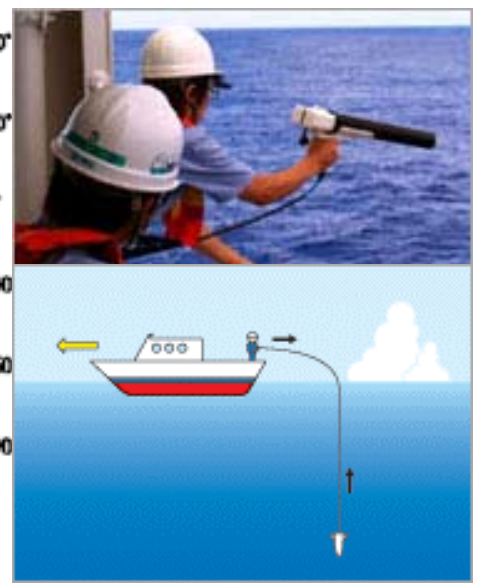
Late 90's

Small number of Res. vessels + volunteer ships

Obs. Points 40,000/year



XBT obs. In 70's



IPCC Fourth Assessment Report (AR4) Fig.5A.1

Argo Programme

– revolution of Ocean observation –

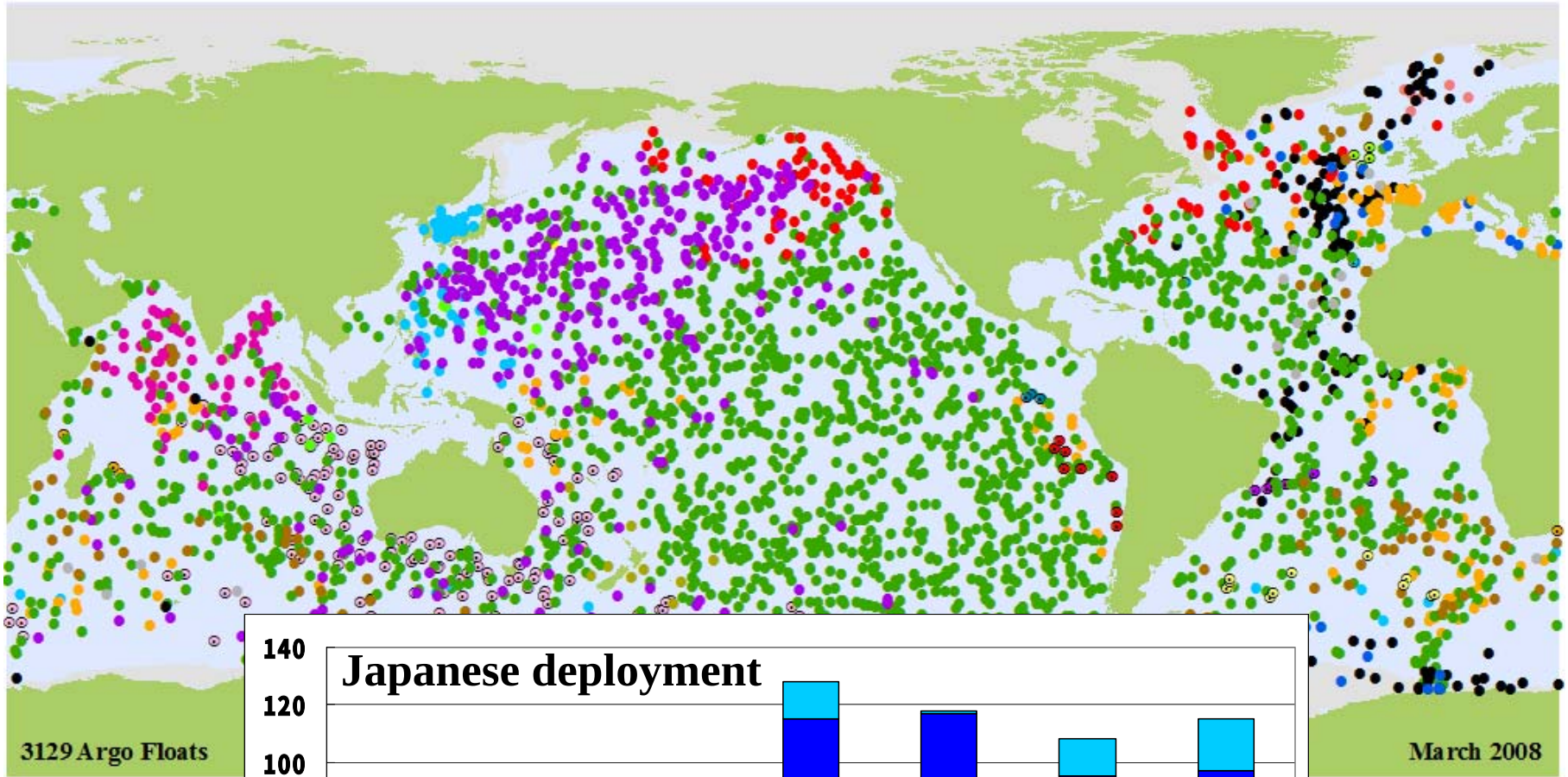
- **Argo is a global array of 3,000 free-drifting profiling floats that measure temperature and salinity of the upper 2000 m of the ocean.**

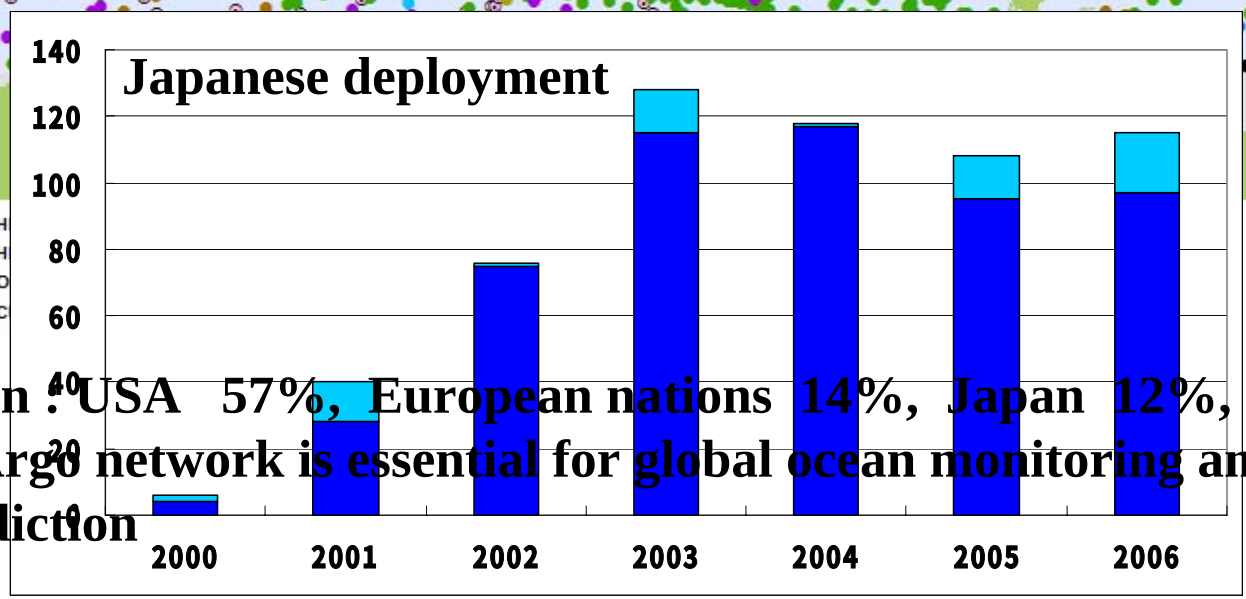
- **Argo allows continuous monitoring of the global upper ocean, with all data being made open to public.**

- **Argo is the sum of national contributions, coordinated by an international Steering Team, and endorsed by the WMO and IOC/UNESCO.**

Global Argo Network

3129 floats as of Mar. 2008

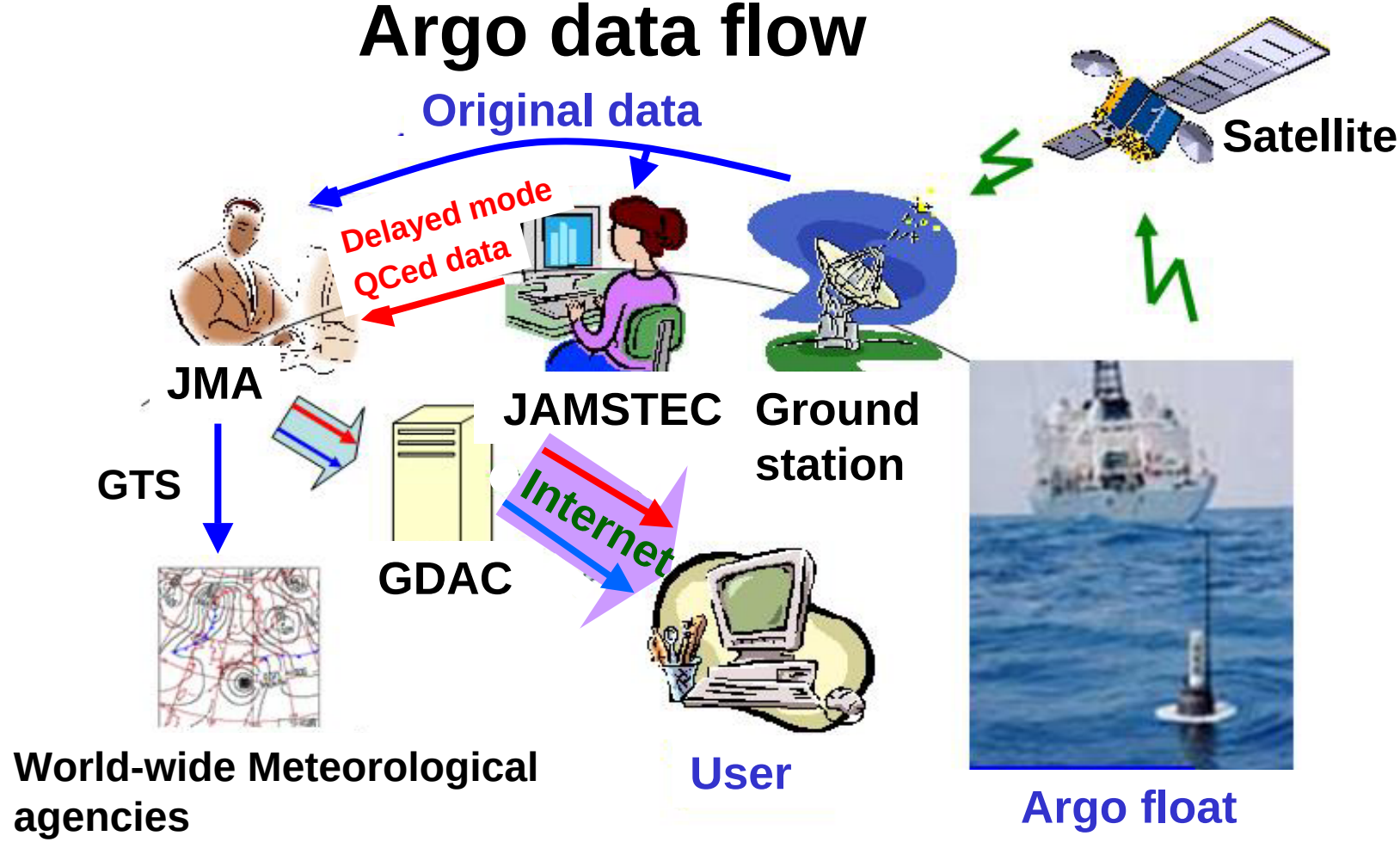




Contribution : USA 57%, European nations 14%, Japan 12%, others 17%

Sustained Argo network is essential for global ocean monitoring and climate change prediction

Argo data flow



Real time data are available within 24 hours

Delayed mode data (High quality data) 6 months

JAMSTEC: Japan Agency for Marine-Earth Science & Technology
JMA : Japan Meteorological Agency
GDAC : Global Data Assembly Center

Argo Information Centre

jcommops

2851 Active Floats,
Target: 3° x3° Array
(~3000 Floats)
95%

Welcome to the International Argo Information Centre.
A source of information on the progress of the Argo project and a component of **JCOMMOPS**, JCOMM in-situ Observing Platform Support Centre.

NEWS

New annual contribution to the AIC: China, Apr 27
The Argo Toolbar, Apr 26
The Scholar Ship Research Institute Programme in Oceanography, Mar 12
POGO-SCOR Visiting Fellowship Programme for 2007, Mar 09
Argentina launched a public awareness/capacity building initiative, Mar 01
IMPORTANT: Problems detected on SOLO / FSI CTD, Feb 16
Argo article in Thalassa french magazine , Nov 28
MetOp-A / Argos-3 launched, Oct 20
Recent cooling of the upper ocean - UPDATE, Oct 14
New AIC website being tested ..., Aug 08

MEETINGS

Argo-France #4, FRANCE, 10/05/07-11/05/07
Argo/GODAE Symposium, ITALY, 10/07/07-11/07/07

The Argo project is supported by :

TESAC Data Report. CALL SIGN: 5900500
Date: 20/04/2007 Time: 18:07
Location: 18.310N-165.592E

KKYY 20047 1807/ 118310 165592 88871 84660 20004 32684 43519
20009 32684 43519 20014 32684 43519 20019 32684 43519 20024
32684 43519 20029 32685 43519 20034 32682 43518 20039 32676
43517 20044 32665 43515 20049 32661 43515 20054 32654 43515
20059 32628 43516 20064 32602 43517 20069 32590 43519 20074
32571 43523 20079 32561 43524 20084 32529 43526 20089 32501
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20109 32431 43523 20113 32416 43525 20118 32390 43525 20124
32344 43520 20129 32321 43522 20134 32313 43522 20139 32293
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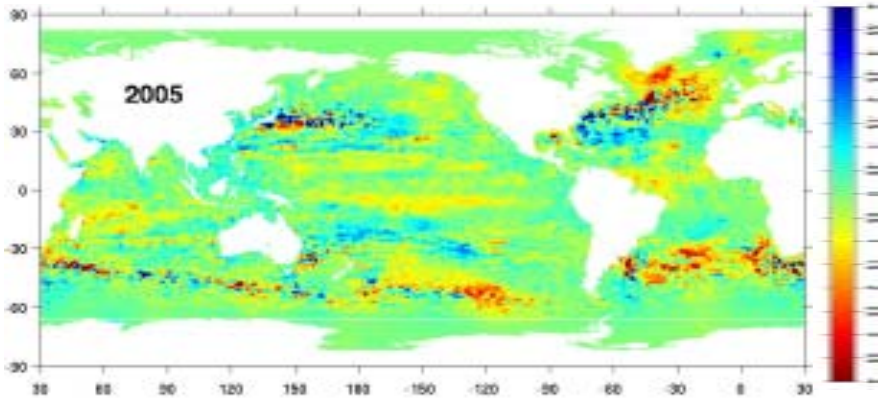
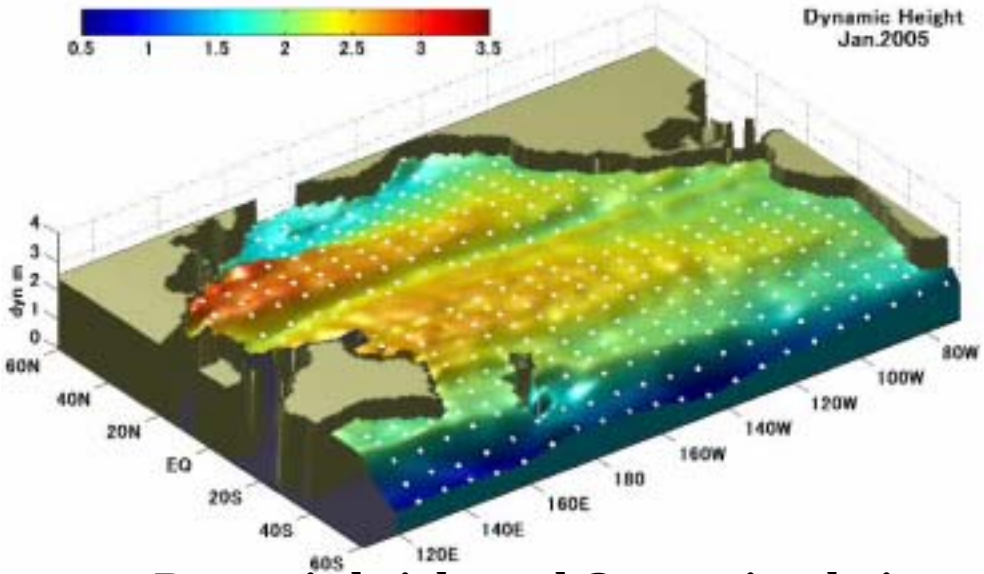
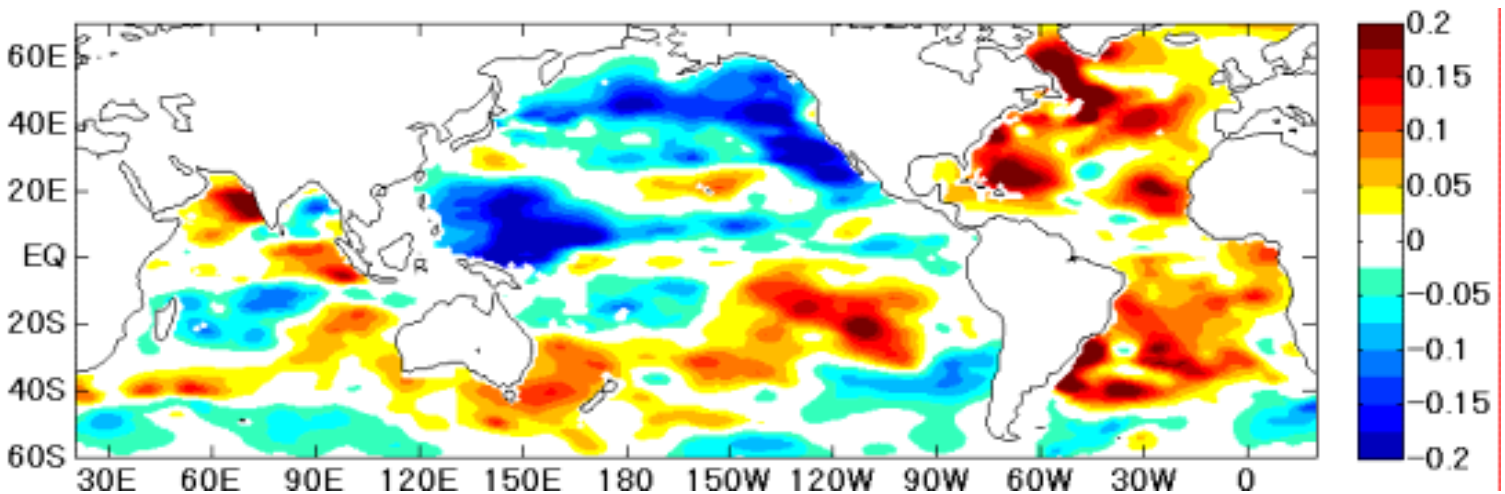
Research products by Argo data



Ocean heat content anomaly
(2005; 0-750m; by PMEL/NOAA)



Dynamic height and Ocean circulation
(0m; by JAMSTEC)



Upper Ocean salinity anomaly in 2005 (0-100m; by JAMSTEC)

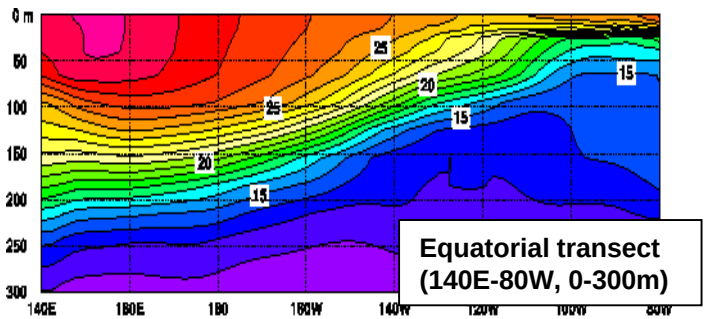
JMA operational systems (Compass-k, ODAS)

ODAS - Ocean Data Assimilation System for ENSO monitoring and predicting and two-tiered seasonal forecast (Global except Arctic and Antarctic Oceans)

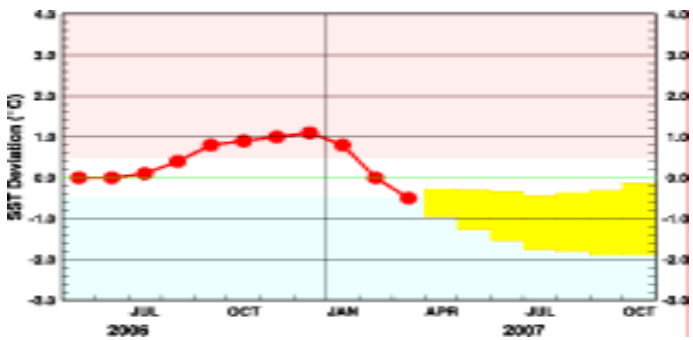
Compass-k - Analysis and forecasting system for the seas near Japan (North Pacific Ocean)

ODAS

Subsurface Temperature Monitoring

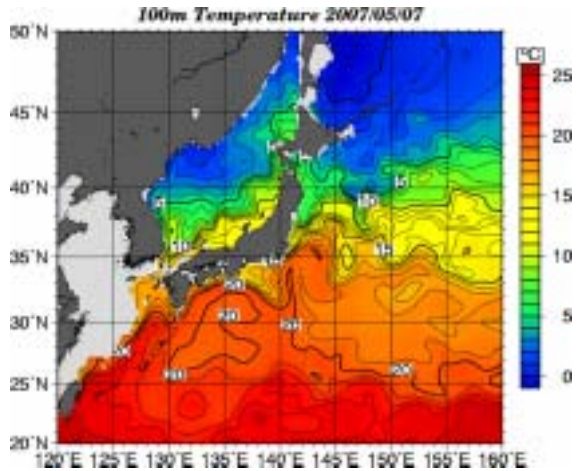


Sea Surface Temperature (NINO3) Prediction

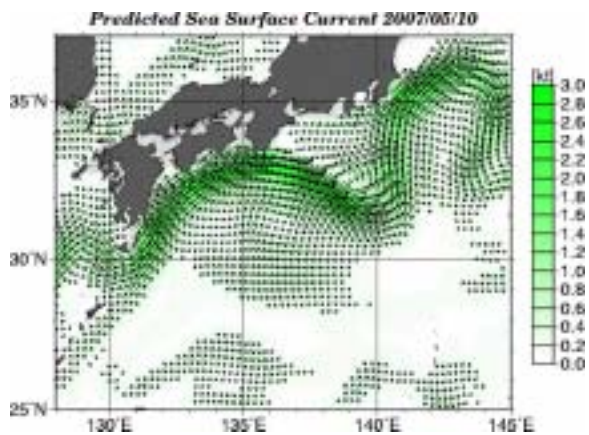


Compass-k

Subsurface Temperature Monitoring



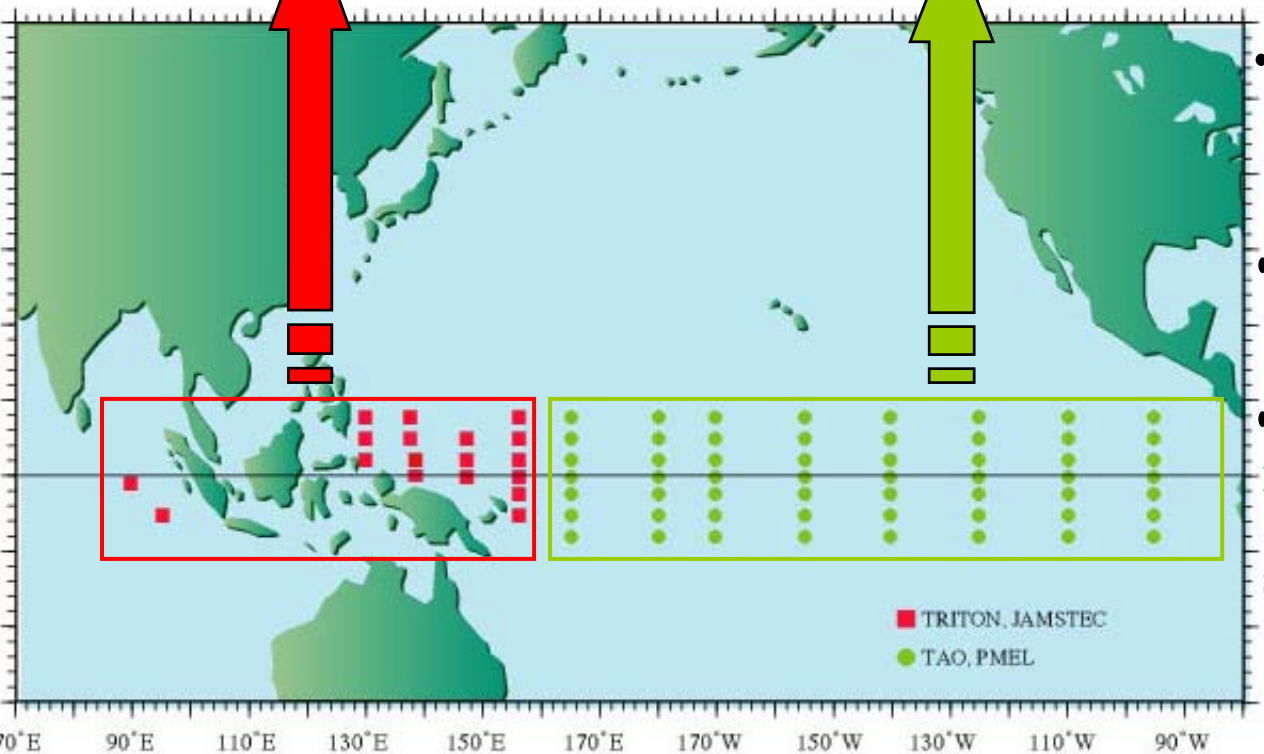
Sea Surface Current Prediction



Tropical mooring buoy Array

JAMSTEC/TRITON Buoy

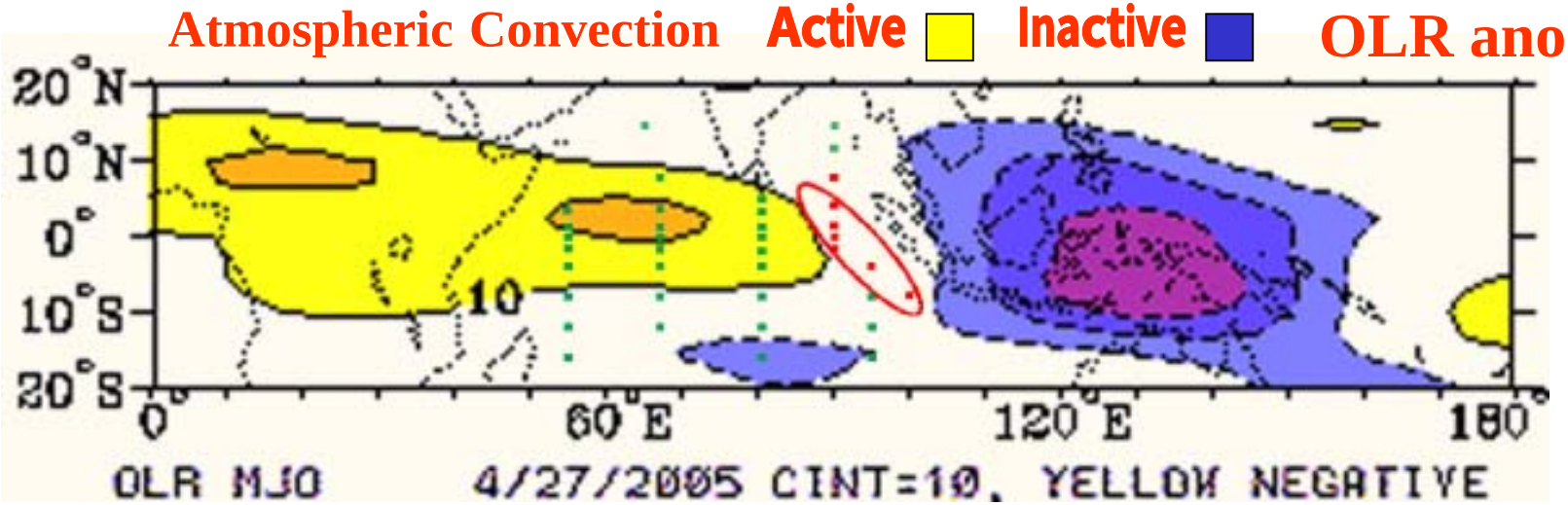
NOAA/TAO Buoy

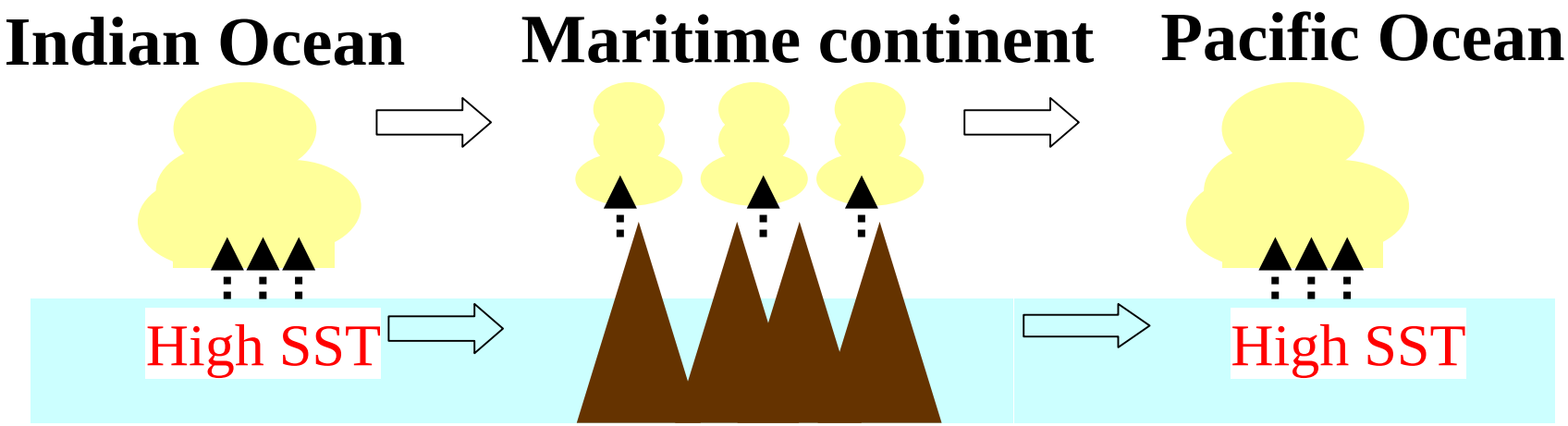


- Data are transmitted to the GTS and also available on web sites.
- The array to monitor ENSO (short term climate change).
- TAO/TRITON array in the Pacific, and PIRATA array in the Atlantic
- Lack of array in the Indian Ocean.
- Mooring buoy array is a necessary observing sites as a reference sites for satellite Remote Sensing.

TAO/TRITON buoy Array (since 2000)

Atmospheric Intra-Seasonal Variations (MJO)





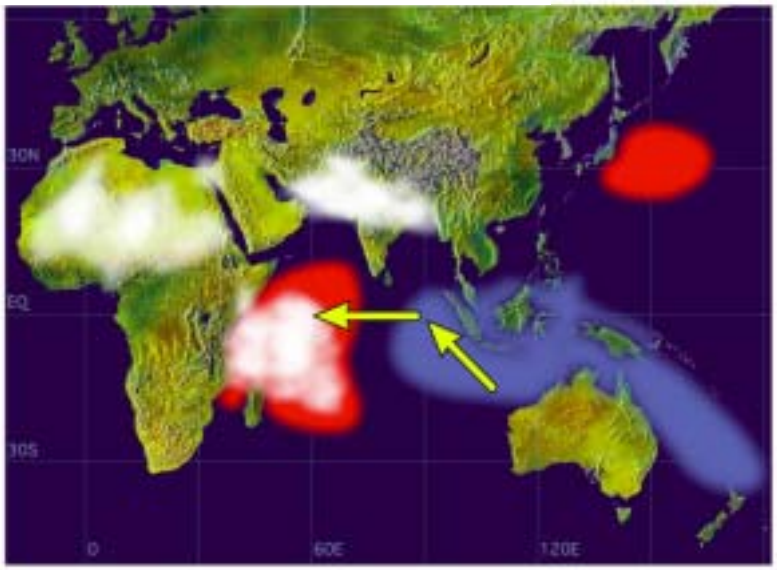
Atmos.-Ocean Coupled Latent heating

Diurnal-cycle heating Sensible heating

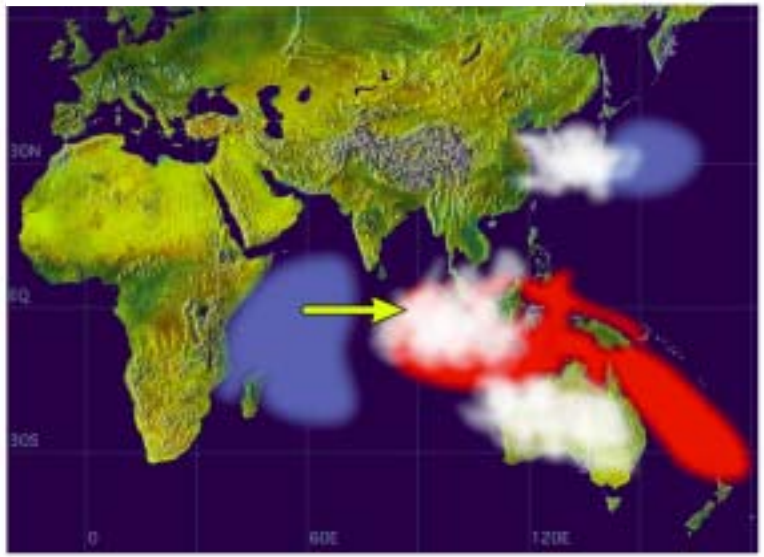
Trigger of El Nino

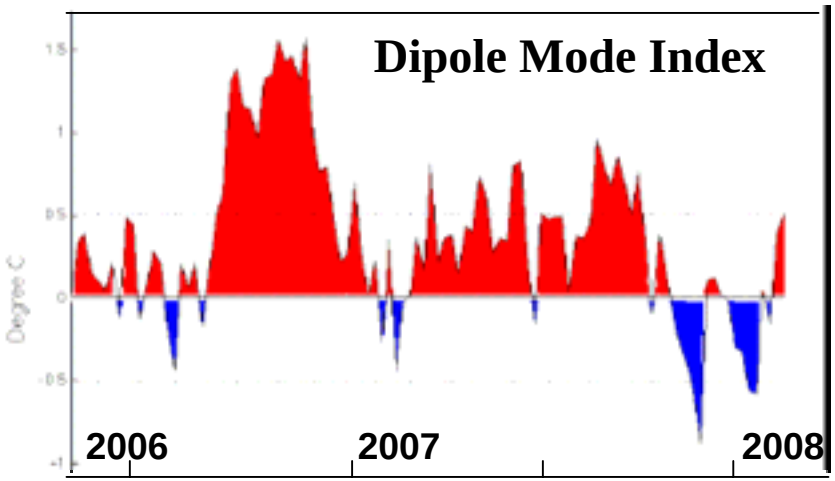
Indian Ocean Dipole Mode (IOD) Phenomena

Positive Dipole Mode



Negative Dipole Mode





Effects of IOD in 2006

Indonesia, Australia

Drought, Forest fires, ….

Kenya, Somalia,

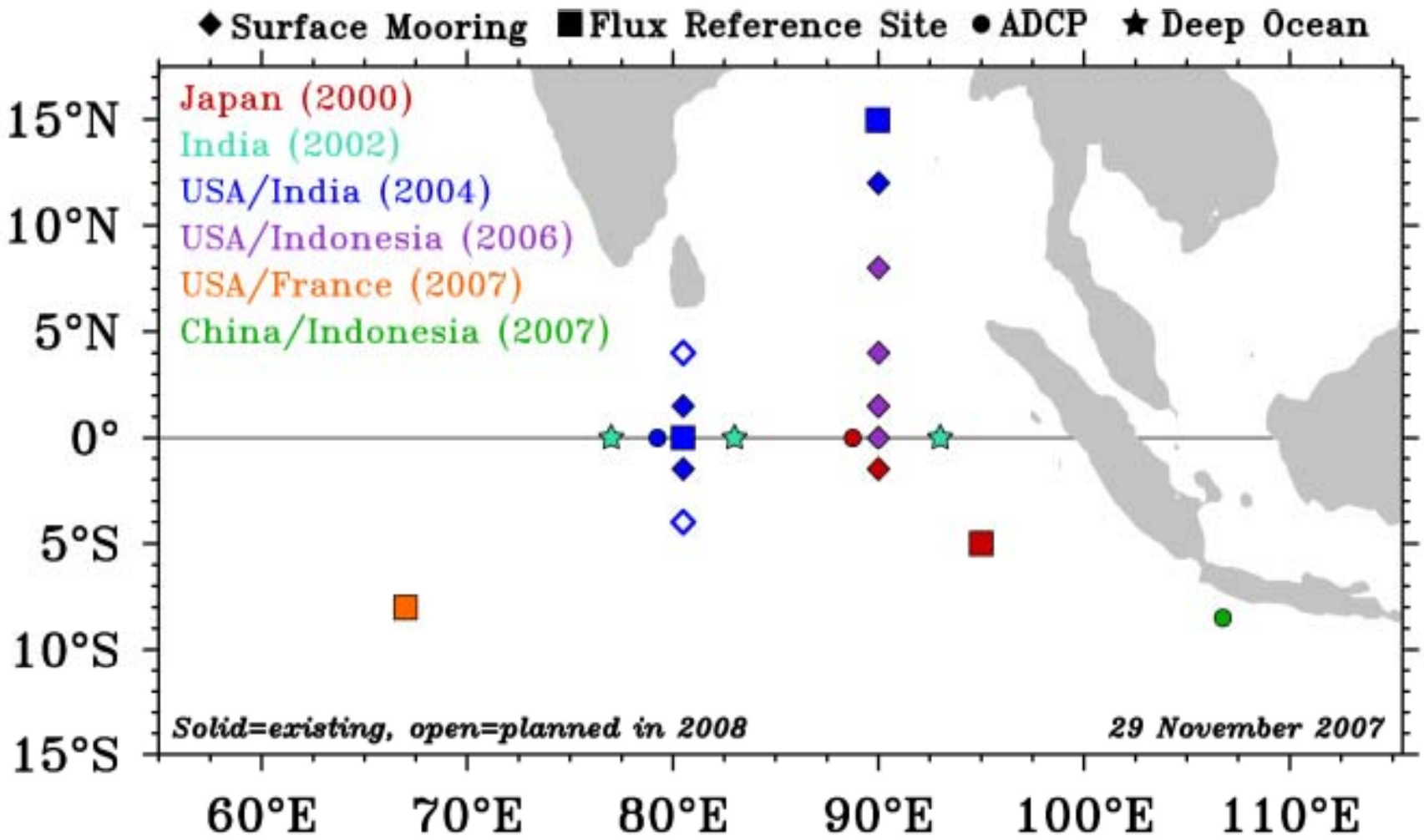
Floods, ….

Japan Earth Observation System Promotion Program (JEPP)

Program 2-1：Indian Ocean Moored Buoy Network Initiative for Climate Studies (IOMICS; FY 2005-2009)

- To develop a new mooring buoy system for sustainable observation network in the Indian Ocean
- To obtain better understanding on the mechanism of ocean/atmosphere variability of using the observation system
- Major target; Role of ocean on intra-seasonal, seasonal (monsoon), and interannual (zonal dipole mode) variation

Present Status



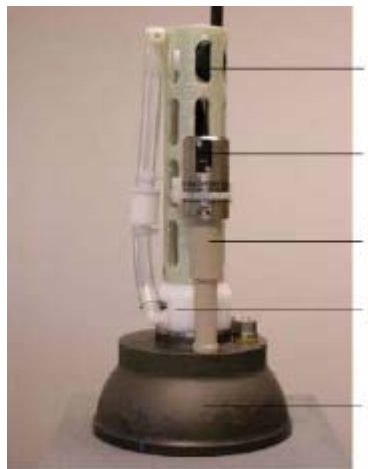
Platforms for biogeochemical measurements

Mooring buoy

pCO_2 sensor

Photo sensor

Argo float



Oxygen sensor

Chlorophyll-a sensor

Conclusion

- Argo is a powerful tool for climate monitoring, prediction, disaster prevention, etc. and is a major component of ocean observing system for GEOSS.
- Argo array is an infrastructure for not only physical ocean climate study but also bio-geochemical studies.
- Global mooring buoy array in the tropical band is inevitable for short term climate variation (i.e. ENSO, IOD, etc.).
- Full development of the Indian Ocean buoy array is needed for better prediction of Monsoon/IOD and ENSO impact.
- Mooring buoy is a suitable in-situ observation reference sites for remote sensing
- Mooring buoy and Argo are complementary ocean observing system.