WORLD METEOROLOGICAL ORGANIZATION

DATA BUOY COOPERATION PANEL

TWENTY-SEVENTH SESSION

GENEVA, SWITZERLAND
26-30 SEPTEMBER 2011

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

DBCP-XXVII/INF. 7 Rev. 1
(7-Oct-11)

ENGLISH ONLY

DBCP-XXVII 2011 Scientific and Technical Workshop – Programme

WORKSHOP THEMES:

The Workshop requested abstracts that addressed the following themes:
Operational Practices and Enhancements – demands for enhanced observations collection technology; innovations or developments in related marine observation systems; developments in buoys/instruments (e.g. wave measurements). These aspects will be addressed in Session 1.

Technological Demands and Developments – evaluation or analysis of operational performance or trials; data communications and data assimilation; performance and efficiency benchmarking; new systems and practices. These aspects will be addressed in Session 2.

Applications of Collected Data – research and operational data applications; case studies. These aspects will be addressed in Session 3.

Special Focus. In addition to the regular themes, this year's workshop will have a major focus on "Requirements for Climate Applications." Topics of interest are:

- Requirements for Climate Services as part of the Global Framework for Climate Services (GFCS). These aspects will be addressed in Session 4.
- Requirements for Climate Monitoring. These aspects will be addressed in Session 4.
- Collection of delayed mode buoy data. These aspects will be addressed in Session 4.
- Observing practices, including traceability to standards and instrument inter-comparison. These aspects will be addressed in Session 4.
- Collection of instrument/platform metadata from data buoys. These aspects will be addressed in Session 4.

Presentation slots – 20 mins including 15 mins presentation + 5 mins questions / discussion (except where variation agreed)

MONDAY – 26 September 2010

#	TIME	TOPIC	PRESENTER / AUTHOR
	09:00 – 09:05	Opening of DBCP XXVI	Al Wallace, DBCP Chair
	09:05 – 09:10	Technical Workshop Programme (whole) 1st Session – Operational Practices and Enhancements	Co-Chairs S&T Workshop
1	09:10 – 09:30	Re-evaluating Drogue Presence and Cause of Death for the Global Drifter Array	Rick Lumpkin (*NOAA/AOML/GDP*)
2	09:30 – 09:50	AOML Data Buoy Comparison Study	Mayra Pazos (*NOAA/AOML/GDP*)
3	09:50 – 10:10	Review of Investigations in 2010- 2011 to Progress Drifter Technology	Sergey Motyzhev, Alexei Tolstosheev, and Eugene Lunev (*Marine Hydrophysical Institute*)
4	10:10 – 10:30	New Technical Developments in Tropical Cyclones Observing Systems: Ocean-Air Observations During Typhoon Fanapi	Luca Centurioni *(Scripps Institution of Oceanography)*
	10:30 – 11:00	**Coffee**	
		2nd Session – Technical Development for Marine Observation Systems	Chair – 2nd Session
5	11:00 – 11:20	"Bai-Long": An Update on the FIO RAMA Buoy Project	Chun Lin Ning, Weidong Yu (First Institute of Oceanography) and Rick Cole *(RDSEA International)*
6	11:20 – 11:40	Inter-Laboratory Calibration Traceability for Temperature, Conductivity, Pressure and Dissolved Oxygen	David Murphy *(Sea-Bird Electronics)*
7	11:40 – 12:00	Improvements made to the barometric pressure port on their drifters and new technology improvements made in 2010-2011	Andy Sybrandy (Pacific Gyre)
8	12:00 – 12:20	The Argos Real-Time Antenna Upgrade Project: Status and Expectations	Bill Woodward *(CLS America)*, Michel Guigue *(CLS Toulouse)* and Yann Bernard *(CLS Toulouse)*
9	12:20 – 12:40	The Next Generation Easy-To-Deploy (ETD) Tsunami Assessment Buoy	R. Lawson and D. Graham (*SAIC*), S. Stalin, C. Meinig, D. Tagawa, N. Lawrence-Slavas (*PMEL*) and R. Hibbins and B. Ingham (*Australian Bureau of Meteorology*)
	12:40 – 14:00	**Lunch**	

#	TIME	TOPIC	PRESENTER / AUTHOR
		3rd Session – Applications of Collected Data	Chair – 3rd Session
10	14:00 – 14:20	Wave Measurements using GPS	Dong-Kyu Lee *(Scripps Inst.)* , Kwan-Chang Lim (*Korea Hydrographic and Oceanographic Administration*) and Luca Centurioni (*Scripps Inst.)*
11	14:20 – 14:40	Wave Measurement Evaluation and Testing	Robert Jensen (*USACE*), Val Swail (*Environment Canada*) and Boram Lee (*WMO*)
12	14:40 – 15:00	Salinity Drifters in the Subtropical North Atlantic – SPURS Experiment "Salinity Process in the Upper Ocean Regional Study"	G. Reverdin (*LOCEAN, CNRS/INSU*)
13	15:00 – 15:20	A Plan for a Spanish Contribution to the GDP in the Western Mediterranean Sea, SOCIB, a New Open Infrastructure in the Balearic Islands	Pedro Vélez-Belchí (*Instituto Español de Oceanografía*) and Joaquin Tintoré (*Balearic Islands Coastal Observing and Forecast System*)
14	15:20 – 15:40	Use of Wind Stress and Altimetric Data to Detect the Anomalous Loss of SVP Drifter's Drouge	Rio Marie-Helene (*CLS-DOS*)
	15:40 – 16:10	**Afternoon Break – 30 mins**	
		4th Session – Requirements for Climate Applications	Chair – 4th Session
15	16:10 – 16:30	Partnerships for New GEOSS Applications (PANGEA)	Sid Thurston (*NOAA/CPO*)
16	16:30 – 16:50	Observed Changes at the Surface of the Arctic Ocean	Ignatius Rigor (*Applied Physics Laboratory, University of Washington*)
17	16:50 – 17:10	Significance of Met-Ocean Subsurface Indian OMNI Buoy Measurements in the Bay of Bengal	V.R. Shamji, Simi Mathew, R. Venkatesan (*National Institute of Ocean Technology*)
		WORKSHOP CLOSE	

PROVISIONAL AGENDA FOR

THE SCIENTIFIC AND TECHNICAL WORKSHOP

OF THE DATA BUOY COOPERATION PANEL (DBCP) XXVII

VENUE: ***Geneva, Switzerland***

DATE : ***26 September 2011***

WORKSHOP CO-CHAIRS: Bill Burnett, *U.S. National Data Buoy Center*

Jean Rolland, *Météo-France, CMM*

PRESENTATION ABSTRACTS

1. Re-evaluating Drogue Presence and Cause of Death for the Global Drifter Array

Author: Rick Lumpkin (*NOAA/Atlantic Oceanographic and Meteorological Laboratory)*

Abstract: At least half of the World Ocean now has drifter velocity observations extending back more than 15 years, allowing climate-scale fluctuations to be studied. However, examination of these data reveals evidence of an apparently spurious acceleration of global surface drifter currents in a pattern reflecting the geographic distribution of mean surface winds. This is likely due to time variations in undiagnosed drogue loss, which was most severe in the time period January 2004 through December 2008.

This study highlights the need to continuously monitor the drifter and drogue lifetimes from various manufacturers. However, properly monitoring drifter lifetimes requires discriminating between drifters that cease transmitting due to internal failure, and those that cease due to external factors such as running aground or being picked up. An accurate assessment of where drifters run aground can also be used to quantify which shores are most prone to the deposit of marine debris. While the drifter Data Assembly Center maintains a metadata file which includes cause of death, most deaths (68%) are due to "quit transmitting". A re-evaluation of these data suggests that a significant fraction of these drifters likely ran aground or were picked up, and a statistical estimate that each drifter actually ran aground is derived.

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2. AOML Data Buoy Comparison Study

Author: Mayra Pazos (*NOAA/Atlantic Oceanographic and Meteorological Laboratory)*

Abstract: At this year's DBCP meeting, the Global Drifter Program will discuss results of the2010 AOML Data Buoy (ADB) Comparison Study, where 5 SVP and 5 SVPB clusters were deployed in various regions throughout the world. We will take a closer look at the transmitter and drogue lifetimes, as well as SST and Barometer data quality. As this comparison study is done annually, we will also address the 2011 deployment plans. Additionally, a summary of the performance of Argos-3 deployed drifters during 2010/2011 as well as AOML purchased, DBCP Iridium upgraded drifters deployed in the Indian Ocean will be presented.

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3. Review of Investigations in 2010-2011 to Progress Drifter Technology

Authors: Lunev E., Motyzhev S., Tolstosheev A. *(Marine Hydrophysical Institute/Marlin-Yug)*

Abstract: Continued study of drogued Iridium SVP-B/RTC/GPS drifters, deployed in 2010 in South Atlantic, showed that buoys provided failure free set of hourly samples and GPS fixes under any weather condition for near 2-year interval. The Argos-3 SVP-B mini drifters, deployed in 2010, demonstrated that they have less power consumption in contrast with Argos-2 buoys. New system to have tether line laid on radials of drogue decreased probability to have the Holey Sock drogue lost quickly. Analysis was completed to determine the reasons, which have an influence on air pressure samples accuracy for drifters with 41-cm and 34-cm hulls. Experiment with Iridium SVP-BTC80/RTC/GPS temperature-profiling drifter, carried out together with Meteo-France in Bay of Biscay, demonstrated that last prototype of this buoy can keep its operational status up to one year. Additional study was completed to prepare the technical proposals for wave-estimating WOCE drifters. New versions of the drifters with 20-cm hull were developed. The buoys with Tristar drogues can be used for study of shallow water currents with depth less than 1 m; for tracking of drifting ice-floe by means of parachute drop and for study of oil pollution movement. On basis of drifter technology the water level gauge was developed to monitor water level inside boreholes, drilled in regions, which are difficult of access.

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4. New Technical Developments in Tropical Cyclones Observing Systems: Ocean-Air Observations During Typhoon Fanapi

Author: Luca Centurioni *(Scripps Institution of Oceanography)*

Abstract: In 2003 we have begun air-deploying drifters of various types and with different sensors' configurations to make measurements of upper ocean temperature, surface currents, atmospheric pressure, wind velocity, and, more recently, of subsurface ocean currents and solar radiation, within tropical cyclones and in their cold wakes. The co-ordination of multiple projects sponsored by the Office of Naval Research and by NOAA has led to the accumulation of a dataset that includes drifter observations of six hurricanes and four typhoons, covering the Cat 1 through Cat 5 range. The air-deployment success rate of the drifters is 93%.

This presentation will focus on new sensors and instruments which were deployed in front of typhoon Fanapi in September 2010 during the ITOP/TCS10 field project in the Western Pacific. We will discuss wind and atmospheric pressure measurements obtained with a new meteorological package, as well as upper ocean temperature changes.

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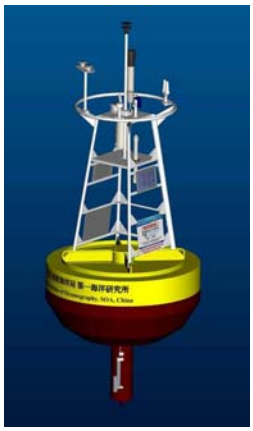
5. "Bai-Long": An Update on the FIO RAMA Buoy Project

Authors: Chun Lin Nung, Weidong Yu *(First Institute of Oceanography)* and Rick Cole *(RDSEA International Inc.)*



Abstract: China's State Oceanic Administration (SOA), First Institute of Oceanography (FIO), Qingdao, in collaboration with the Ministry of Marine Affairs and Fisheries (Agency of Marine Fisheries Research, AMFR) in Jakarta, Indonesia, recovered two air-sea interaction buoy systems in February of 2011 on the "The Research Moored Array for the African-Asian-Australian Monsoon Analysis and Prediction Program" (RAMA), a component of the Indian Ocean Observing System (IndOOS). A new complete buoy system was deployed in the 8°South / 100°East region of the eastern Indian Ocean, west of the island of

Java, Indonesia maintaining the flow of data from the site. Updated discussions on the project, buoy recoveries, fishing vandalism, systems redeployment and data collected is planned.
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6. Inter-laboratory calibration traceability for temperature, conductivity, pressure and dissolved oxygen

Author: David Murphy *(Sea-Bird Electronics)*

Abstract: Sea-Bird Electronics is opening a service and calibration center in Kempten Germany in November of 2011. Best climate monitoring practices will require a guarantee of calibration continuity and accuracy between the remote site and the factory calibration facility, including traceability to primary standards held at the main facility. To achieve this, exemplar sensors of each type have been built and a calibration history started at Sea-Bird's main facility. These exemplars are shipped to the satellite calibration facility for a continuation of the calibration history and then returned to the main laboratory for calibration and drift evaluation. By critical evaluation of observed calibration errors and drift trajectories a laboratory validation can be made. Perpetuating this inter-laboratory assessment ensures accuracy irrespective of the location of the calibration. This is an expansion of efforts in inter-laboratory comparisons between Sea-Bird and other calibration laboratories for temperature and dissolved oxygen. Preliminary results will be discussed including a comparison of Sea-Bird's electrode and optical oxygen sensors.

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7. Unmanned Bathymetry Vehicle (UBV)

Authors: Don Darling and Rich Musco *(SeaRobotics Corporation)* K. Premkumar *(Win Marine Consultancy Services, India)*

Abstract: The Unmanned Bathymetry Vehicle is a robotics boat of Catamaran hull design with Composite material construction, capable of being remotely piloted utilizing a radio frequency communication device, or operating autonomously based on a pre-programmed mission plan which an operator downloads into the UBV control computer. UBVs are powered by DC electric thrusters draw power from small DC generator through DC converter/regulator. UBVs are fitted with primary and secondary RF communication links to achieve remote operation. For position up keeping RTK GPS system is built in. Besides, in the event of both primary & secondary remote communication failures, Safety rescue implement like Iridium TX or Argos PTT is fitted to recover the unit. UBVs are unique in their ability to provide a wealth of survey data in hazardous or sensitive areas where manned vessels cannot navigate, where the personnel in the manned vessel would be at risk, or where the endurance required would put undue strain on personnel in a manned craft. Additionally, the weight and associated draft of the unmanned vessel can be minimized, reducing the potential for grounding and requiring less energy. The ability of the UBV to navigate within a approximately 1 meter of a desired survey transect and station keep for extended periods improves the quality of data gathered in both Bathymetry and water current or flow rate and volume flow rate studies.

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8. The Argos Real-Time Antenna Upgrade Project: Status and Expectations

Authors: Bill Woodward *(CLS America)* Michel Guigue and Yann Bernard *(CLS Toulouse)*

Abstract: CLS continues to be committed to globally decreasing the delivery times of Argos data and to be particularly responsive to the expressed needs of the DBCP. The comprehensive CLS Antenna Upgrade Project was unveiled at the DBCP-26 Scientific and Technical Workshop. The overall objective of the Project is to establish a reliable global network of real-time antennas that will optimize the regional collection of real-time Argos data. This presentation will briefly review the objectives and schedule of the Project and will specifically highlight the data timeliness improvements that can be expected by the DBCP community.

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9. The Next Generation Easy-to-Deploy (ETD) Tsunami Assessment Buoy

Authors: R. Lawson and D. Graham *(Science Applications International Corporation)* S.E. Stalin, C. Meinig, D. Tagawa and N. Lawrence-Slava *(NOAA/PMEL)* R. Hibbins and B.Ingham *(Australian Bureau of Meteorology)*

Abstract: This paper addresses the first commercial operations of the next-generation tsunami assessment system. Over the last five years, NOAA's Pacific Marine Environmental Laboratory (PMEL) developed a next-generation Easy-to-Deploy (ETD) Deep-ocean Assessment and Recording of Tsunamis (DART®) buoy system. Through a technology transfer and license agreement, Science Applications International Corporation (SAIC) produced the first commercial ETD DART® systems in 2010. SAIC ETD DARTs® have been deployed in the Coral Sea on August 27, 2010 and in the Tasman Sea on April 8, 2011. System performance has been exceptional at both locations despite challenging environmental conditions. The Coral Sea system has weathered the impact of a category five cyclone and has detected several tsunami events including the trans-Pacific Honshu tsunami since that time. The ETD DART® is designed to be deployed by small and fast response vessels, requires fewer trained personnel and only minutes of deployment time. The SAIC ETD DART has been certified fully operational and is now an important new technology available to support the global tsunami detection network.

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10. Wave Measurements using GPS

Authors: Dong-Kyu Lee *(Scripps Institution of Oceanography)* Kwan-Chang Lim *(Korea Hydrographic and Oceanographic Administration)* and Luca Centurioni *(Scripps Institution of Oceanography)*

Abstract: Wave measurement using a commonly available and high frequency sampling (over 2 Hz) capable GPS is developed, deployed and compared with conventional wave measuring sensor. The GPS gives x-y-z positions with ten centimeter level accuracy when adequate high-pass filter is used to filter out low frequency positioning error. Most of surface waves have periods shorter than 20 seconds but the GPS positioning error occurs in periods larger than 50 seconds. High pass filter and FFT are developed for onboard microprocessor for ocean observing buoy or drifter. The mooring buoy was deployed in the East China Sea and it produced the comparable significant wave heights, periods and direction to the wave rider moored nearby. The wave measurement by GPS on drifter is under development.

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11. Wave Measurement Evaluation and Testing

Authors: Robert Jensen *(US Army Corps of Engineers)* Val Swail *(Environment Canada)* and Boram Lee *(World Meteorological Organization)*

Abstract: The JCOMM Expert Team on Wind Waves and Storm Surges (ETWS) is presently carrying out a Pilot Project (www.jcomm.info/WET) for the Data Buoy Cooperation Panel to address potential biases in in-situ wave measurements from buoys. Previous comparisons with satellite altimeter data suggest that there may be significant biases between operational buoy networks operated by different national agencies, even with the same platforms. Biases are a serious concern in climatology, especially in computation of trends, but are also relevant for example in wave forecast verification, comparisons of wave model performance and regional statistics.

This presentation will describe the preliminary results from various components of the wave measurement testing and evaluation program being carried out in various regions by the project partners, based on the "First-5" intercomparison methodology adopted by the project. In particular, the presentation will describe results from the first two Pilot Project co-deployments, on the east and west coasts of Canada, where a Datawell Directional Waverider was located beside an operational Canadian 3m discus buoy and an operational 6m NOMAD; TriAxys wave sensors were also located on both operational buoys. Preliminary results from other partners will also be included.

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12. Salinity Drifters in the Subtropical North Atlantic – SPURS Experiment "Salinity Processes in the Upper Ocean Regional Study"

Author: Gilles Reverdin (*LOCEAN, CNRS/INSU*)

Abstract: The SPURS experiment is designed to better understand the hydrological cycles of the earth planet and its evolution on different time scales. The principal questions asked are : how well do we know the evaporation from the world oceans, and can appropriate surface salinity field or satellite measurements contribute to closing this budget? The focus will be on one area of the subtropical North Atlantic (centered near 38°W/26°N) close to the climatological maximum of the surface salinity distribution, and for a period of roughly a year. The spatial scales investigated will be from the large scales (1000 km) to the satellite foot-print (from the Aquarius and SMOS satellite mission) on the 50-200 km scale, and to the sub-meso scales of a few to 10 km. We will briefly present the implementation plan of the experiment and the in situ array, which will in particular include on the order of 100 SVP salinity-measuring drifters. We will first present these drifters, and the preliminary work done in the last few years to evaluate the different drifter models, their working-life expectancies and the accuracy of the drifter data (in particular with the GLOSCAL CNES-supported effort, German (ZMAW/IFM-Hamburg) and Spanish (ICM/CSIC, Barcelona) SMOS drifter programs for the SMOS calibration-validation phase). We will also discuss new prototypes developed to improve long-time performance (R. Schmitt, WHOI) or measure wave spectra (S. Morisset, LOCEAN). Then, we will present the SPURS drifter deployment strategy, and how we plan to use the opportunity of this intensely observed region for surface salinity to further qualify the drifter observations, both their salinity, but also their temperature or other ancillary measurements.

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13. A Plan for a Spanish Contribution to the GDP in the Western Mediterranean Sea, SOCIB, a New Open Infrastructure in the Balearic Islands

Authors: Pedro Vélez-Belchí (*Instituto Español de Oceanografía*) and Joaquin Tintoré (*Balearic Islands Coastal Observing and Forecast System*)

Abstract: The Coastal Ocean Observing and Forecasting System located in the Balearic (SOCIB), foresee to deploy, every year, between 5-10 drifters in the western Mediterranean Sea. The deployments of the SOCIB's Argo and surface drifter facility will be part of the Spanish contribution to the Global Drifter Program. The deployments will begin at the end of 2011 and are orientated to fulfill specific scientific objectives in the framework of research projects. During the first three years, the deployments will be focused to monitor the North/South exchange of Mediterranean and Atlantic waters through the Balearic channels and will contribute to the overall objective of understanding the environmental factors that determine the spawning areas of the Atlantic Bluefin tuna stock in the Western Mediterranean Sea.

SOCIB is a new observing system that implements up-to-date monitoring technologies to deliver new insight into coastal ocean variability. It will trigger new theoretical and technological developments, increasing our understanding of open ocean, coastal and near shore processes; contributing to a more science based and sustainable management of the oceans and coastal areas. SOCIB is a facility of facilities, covering from the coast to the open sea, that includes, among others a nearshore beach monitoring facility, HF radar, gliders and AUV's, moorings, satellite, drifters, Argo profilers and modeling. SOCIB will provide streams of oceanographic data and modeling services to support operational oceanography in a European and international framework, therefore also contributing to the needs of marine and coastal research in a global change context. SOCIB takes profit of the strategic position of the Balearic Island at the Atlantic/Mediterranean transition area, one of the 'hot spots' of biodiversity in the world's oceans.

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14. Use of Wind Stress and Altimetric Data to Detect the Anomalous Loss of SVP Drifter's Drogue

Author: Rio Marie-Helene *(CLS-DOS)*

Abstract: The response of ocean currents to wind forcing as measured by SVP drifting buoys has been shown to present a linear trend from the late nineties to today (Rio et al, 2011), with an linear increase of the response amplitude, coupled with a linear decrease of the angle to the wind direction. Recently, a major problem of drogue loss detection has been identified on SVP drifting buoys by Grodsky et al, 2011. Consequently, a new Ekman model has been computed using only the first three months of each drifter trajectory, as suggested by Grodsky et al, 2011. The new model is steady all through the 1993-2010 period, showing that the unsteady behavior observed by (Rio et al, 2011) is fully explained by this drogue loss detection anomaly.

The new, steady Ekman model is used in an iterative process in order to detect for each drifter the time of the drogue's loss: It is first used to remove the Ekman component from the drifter's velocities. A three days low pass filter is subsequently applied to get rid of the tidal currents, the inertial oscillations and other ageostrophic currents. The obtained geostrophic velocity component is correlated both to the simultaneous wind stress and to the simultaneous geostrophic velocity estimated from altimetry for 3-months length moving segments along the drifter trajectory. A sudden increase of the vectorial correlation between the drifter geostrophic velocity and the wind stress, coupled with a sudden decrease of the vectorial correlation between the drifter geostrophic velocity and the altimeter geostrophic velocity, may be a good indicator of the drogue loss.

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15. Partnerships for New GEOSS Applications (PANGEA)

Author: Sid Thurston *(NOAA/CPO)*

Abstract: Partnerships for New GEOSS Applications (PANGEA) www.jcomm.info/pangea-concept in the Indian Ocean Region are underway to help build sustainable capacity for ocean observations and their societal applications. By convening in-country, practical, socio-economic applications training for Regional decision-makers, policy and budget administrators, scientists, end-users and other stakeholders, Partners are providing NOAA with ship time for the deployment of new in-situ ocean observations for IOGOOS/CLIVAR IndOOS *Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction* (RAMA) www.pmel.noaa.gov/tao/rama/ and other in-situ ocean-climate deployments. By building on and complementing existing capacity building programs, a sustainable capacity for the region is being achieved through the increases in both near real-time in-situ ocean observational data and information as well as demonstrating the more effective applications of, and access to, these existing and new data. This presentation will provide an updated brief on NOAA's collaboration with India, Indonesia, the Agulhas-Somali Current Large Marine Ecosystem (ASCLME, nine East African Nations) Program, salient results of the DBCP's Second In-Region Capacity Building Workshop for the Western Indian Ocean www.jcomm.info/wio-dbcp2 and opportunities to expand the PANGEA concept beyond the Indian Ocean for Data Buoy implementation.

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16. Observed Changes at the Surface of the Arctic Ocean

Author: Ignatius Rigor *(Applied Physics Laboratory, University of Washington)*

The Arctic has been in dramatic transition due to changes in weather and climate. Observations from buoys have been critical in documenting these changes. In this presentation, we will: 1) review the changes in Arctic climate; 2) discuss how the International Arctic Buoy Programme (IABP) has been evolving to maintain the observing network covering the Arctic Ocean; and 3) present some new results from a new buoy that we have been developing to measure the heat content of the upper layer of the Arctic Ocean.

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17. Significance of Met-Ocean-Subsurface Indian OMNI Buoy Measurements in the Bay of Bengal

Authors: V.R. Shamji, Simi Mathew, R. Venkatesan (*National Institute of Ocean Technology*)

Abstract: The important role of Sea surface temperature (SST) and near surface heat content on the evolution of monsoons and cyclones has been reported in many recent publications. There was a scientific need to augment met – ocean buoys with underwater sensors to record vertical profiles of temperature, salinity and current in the Bay of Bengal. Six moored buoys were deployed having equipped with subsurface sensors to measure the vertical structure of temperature and salinity at discrete depths (5, 10, 15, 20, 30, 50, 75, 100, 200, 500 m) and current sensors to measure vertical profiles of currents at discrete depths (1.2, 10, 20, 30, 50 , and 100 m). Now these buoys have been providing valuable data for operational agencies and serve sea truth validations of satellite data. The OMNI data buoys serve as observatory, which provide all this surface marine, meteorological parameters that go into weather prediction models for improved forecasts. These OMNI buoy data would be very useful to predict the evolution of summer and winter monsoons, the life cycle of monsoon lows, depressions, deep depressions, cyclone and severe cyclones, which mostly originate over the Bay of Bengal. The subsurface measurements can be used to study the Kelvin and Rossby waves in the Indian Ocean. The availability of time series data on surface met-ocean parameters and near surface thermohaline structure provides unlimited opportunities for research scientists to

describe and explain the variability on different time scale across the basin. Studies related to warm and cool pools and fresh water pool are being carried out to explain their genesis, evolution and decay in certain regions of the Arabian sea and the Bay of Bengal. The Bay of Bengal is a region of intense haline stratification in near-surface layer primarily due to heavy discharge of fresh water from major rivers. In the northern Bay of Bengal large number of monsoon lows and depressions originates and then propagate along the monsoon trough to provide copious amount of rainfall over Indo-Gangetic plains. These buoy net-work provide very valuable sea truth data to validate the satellite measurements and model prediction. It is proposed to include pCO2 sensor to few of these buoy systems to evaluate the potential for direct covariance gas flux measurements. This will also augment RAMA moorings in Bay of Bengal. Tropical oceans are the main source of CO2 from the ocean to the atmosphere because of tropical upwelling. These upwelling systems are also an important factor in regulating strong biological activity in the tropical oceans. These long time series measurements can reveal significant correlation between CO2 outgassing and tropical circulation change on decadal or longer time scales. Engineering is important not only for development of vandal-resistant moorings but also to ensure that mooring designs keep pace with advances in technology. This paper describes significance of this moored buoy system in Bay of Bengal relevance to climate change.

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