DBCP-XXVI 2010 Scientific and Technical Workshop – Programme

WORKSHOP THEMES:

The Workshop requested abstracts that addressed the following themes:

Technological Demands and Developments – 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.

Operational Practices and Enhancements – 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 "Extended marine observing technologies and coastal risk management." Topics of interest are:

- Integration of *in situ* and satellite ocean observing systems (e.g. High Resolution Sea Surface Temperatures). These aspects will be addressed in Session 4.
- Observing practices, including traceability to standards and instrument inter-comparisons. These aspects will be addressed in Session 5.
- Polar observations and their applications. Unfortunately we have not received relevant presentations in this regard. These aspects will be addressed during the main DBCP Session under agenda item 7.
- Collection of instrument/platform metadata from data buoys. These aspects will be addressed in Session 5.

Presentation slots – 15 mins including 12 mins presentation + 3 mins questions / discussion (except where variation agreed)

MONDAY – 27 September 2010

#	TIME	TOPIC	PRESENTER / AUTHOR
	10:00 – 10:10	Opening of DBCP XXVI	Al Wallace, DBCP Chair
	10:10 – 10:15	Technical Workshop Programme (whole) 1st Session - Technical Demands and Developments	Co-Chairs S&T Workshop
1	10:15 – 10:30	Great Race: the study of a tidal race using miniature drifters	David Meldrum, Andy Dale and Keith Jackson (*Scottish Association for Marine Science*)
2	10:30 – 10:45	Evaluations from the Atlantic Oceanographic and Meteorological Laboratory (AOML) Global Drifter Program (GDP)	Shaun Dolk (*NOAA/AOML/GDP*)
3	10:45 – 11:00	Oceanographic Sensor Results from the Wave Glider	Justin Manley and Tom Daniel *(Liquid Robotics Inc.)*
4	11:00 – 11:15	Technical Developments in 2009-2010 according to the DBCP Pilot Projects Plans	Eugene Lunev, Sergey Motyzhev and Alexei Tolstosheev (*Marine Hydrophysical Institute*)
	11:15 – 11:45	**Coffee**	
5	11:45 – 12:00	A Wind Profiling Platform for Offshore Wind Measurements and Assessment	Mark Blaseckie *(AXYS Technologies Inc)*
6	12:00 – 12:15	Efficient and Affordable High Volume Data Telemetry Iridium RUDICS for Ocean Observing Systems	Issac Horn and W. Gary Williams (*Clearwater Instrumentation Inc.*)
7	12:15 – 12:30	The CMR Unmanned Ocean Vessel	David Peddie (*Christian Michelsen Research*)
		2nd Session – Operational Practices and Enhancements	Chair – 2nd Session
8	12:30 – 12:45	How DBCP Data Contributes to Ocean Forecasting at the UK MET Office	Ed Blockley (*UK Met Office*)
9	12:45 – 13:00	JouBeh Technologies – an Iridium Satellite Valued Added Reseller dedicated to Environmental Data Collection	Paul Hill *(JouBeh Technologies)*
10	13:00 – 13:15	Real-time services for the provision of meteorological data	Mac MacLeod (*Scotia Weather Services Inc.*)
	13:15 – 14:00	**Lunch**	

#	TIME	TOPIC	PRESENTER / AUTHOR
11	14:00 – 14:15	The Korean Ocean Gate Array Project	Gwan-Chang Lim (*KHOA*)
12	14:15 – 14:30	Upgrading the Argos Real-Time Antenna Network: Plans and Impacts	Bill Woodward (*CLS America*), Michel Guigue and Yann Bernard (*CLS Toulouse*)
13	14:30– 14:45	Argos 3: Experiences with Drifter Data Quality and Management	W. Gary Williams and Isaac Horn (*Clearwater Instrumentation Inc.)*
		3rd Session – Applications of Collected Data	Chair – 3rd Session
14	14:45 – 15:00	The Global Drifter Program's Assessment of Drogue Presence	Erik Valdes *(NOAA/AOML/GDP)*
15	15:00 – 15:15	Results from Drifter Comparison Study conducted in 2010 and other DAC activities	Mayra Pazos *(NOAA/AOML/DAC)*
16	15:15 – 15:30	Scientific Results using a Decade worth of Data Collected by the PNBOIA Program in the South Atlantic	Olga Sato (*University of Sao Paulo, Brazil*)
	15:30 – 16:00	**Afternoon Break – 30 mins**	
17	16:00 – 16:15	Partnerships for New GEOSS Applications (PANGEA)	Sid Thurston (*NOAA/CPO*)
18	16:15 – 16:30	The Burn Release Drifter	L.R. Centurioni, P.P. Niiler, C.J. McCall and L. Braasch (*Scripps Institution of Oceanography*)
		4th Session – Integration of In Situ and Satellite Observations	Chair – 4th Session
19	16:30 – 16:45	GHRSST Science activities and its interest in SST measurements from drifting buoys	Andrea Kaiser-Weiss (*GHRSST Project Office*)
20	16:45 – 17:00	Examining the Long Term Stability of Sea Surface Temperature Measurements made by Drifting Buoys	R.O. Smith, J.J. Kennedy and Nick Rayner (*Met Office Hadley Centre*)
		5th Session – Observing and Data Management Practices – Traceability to standards	Chair – 5th Session
21	17:00 – 17:15	Highlights of the NOAA TAO Program's Technology Refresh Project	Shannon McArthur and Richard Crout (*National Data Buoy Center*)
22	17:15 – 17:30	A "TAO" Hybrid for the Indian Ocean	Rick Cole (*RDSEA Int.*), Ning Chunlin (*First Inst. of Oceanography*), Jeffery Kinder (*Down East Instruments*), Weidong Yu (*First Inst. Of Oceanography*), and Yang Chao (*Proteus Inc.*)
23	17:30 – 17:45	Proper Data Management Responsibilities to Meet the Global Ocean Observing System (GOOS) Requirements	William Burnett (*National Data Buoy Center*)
		WORKSHOP CLOSE	

PROVISIONAL AGENDA FOR

THE SCIENTIFIC AND TECHNICAL WORKSHOP

OF THE DATA BUOY COOPERATION PANEL (DBCP) XXVI

VENUE: ***Oban, Scotland, United Kingdom***

DATE : ***27 September 2010***

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

David Meldrum, *Scottish Association for Marine Science*

PRESENTATION ABSTRACTS

1. Great Race: The study of a tidal race using miniature drifters

Authors: David Meldrum, Andy Dale and Keith Jackson *(Scottish Association for Marine Science)*

Abstract: The Gulf of Corryvreckan is infamous in Scottish nautical legend for the power of its tidal race, characterised by strong eddies and overfalls extending up to 10km west of the gulf, and creating a spectacular natural laboratory as a well as a significant marine hazard. SAMS is building a fleet of mini-drifters using GPS, GSM and the latest Iridium modems to measure how these eddies evolve and interact. The aim is to improve model representations of the complex tidal systems that typify western Scotland.

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2. Evaluations from the Atlantic Oceanographic and Meteorological Laboratory (AOML) Global Drifter Program (GDP)

Author: Shaun Dolk (*NOAA/Atlantic Oceanographic and Meteorological Laboratory)*

Abstract: With the increasing number of drifter sensor types (i.e. salinity, wind, GPS, etc.) there have been changes in packaging, activation and shipping methods. While the additional data provided by these new instruments is an obvious advantage, there are also concerns to be addressed. Additionally, the GDP would like to discuss current and future collaborations for the deployment of these instruments, and the impacts these new drifters are having on the community.

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3. Oceanographic Sensor Results from the Wave Glider

Authors: Justin Manley and Tom Daniel *(Liquid Robotics)*

Abstract: The Wave Glider autonomous unmanned maritime vehicle (UMV) represents a unique approach to persistent ocean presence. Wave Gliders harvest the abundant energy contained in ocean waves to provide essentially limitless propulsion while solar panels continuously replenish batteries that power the vehicle's control electronics, communications systems and payloads. Wave Gliders can serve many complementary functions to traditional ocean moorings and buoys.

Wave Glider is a hybrid sea-surface and underwater vehicle in that it is comprised of a submerged "glider" attached via a tether to a surface float. The vehicle is propelled by the mechanical conversion of ocean wave energy into forward thrust, independent of wave direction. Directing this mobile system to "hold station" results in a watch circle equalling or exceeding conventional moorings with greatly reduced capital and operations cost.

In this presentation, we review the latest results from operational tests of this unique platform. Analysis of oceanographic sensors deployed on the Wave Glider will include Acoustic Doppler Current Profiler (ADCP), Conductivity Temperature Depth (CTD), fluorometer, and CO2 results.

Operational test of passive acoustic recorders and acoustic telemetry from seafloor sensors such as tsunami warning pressure recorders will also be presented. The focus of this presentation is the actual data collected by these instruments, on Wave Gliders, during late 2009 through summer 2010. We also explore ideas for the application of Wave Gliders with these sensors to ocean science requirements.

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4. Technical Developments in 2009-2010 According to the DBCP Pilot Projects Plans

Authors: Eugene Lunev, Sergey Motyzhev and Alexe Tolstosheev *(Marine Hydrophysical Institute)*

Abstract: New efforts have been undertaken to fulfil the jobs according to the DBCP Pilot Projects plans. Further evaluation of Iridium and Argos-3 satellite communication systems capabilities with reference to drifter observation systems were completed. Temperature-profiling drifters, equipped with Iridium modems, new GPS receivers and Real Time Clocks were successfully tested in the Black Sea to demonstrate that Iridium allows getting of synchronous measurements in depth with high space-time resolution. The drifter with the same parameters was deployed in May 2010 by Météo-France in the Central Atlantic. Iridium SVP-B drifters of the latest prototype with and without GPS were deployed by SAWS in the South Ocean. Two experimental Argos-3 SVP-B drifters were tested in the Black Sea. 2010 prototype of SVP-B drifter with new Argos-3 PMT was developed and 8 buoys were built and shipped for deployments according to the project's goals. The technical suggestions for wave-estimating drifter were developed and sent to the Chair of PP-WMD Steering Team for evaluation. Drifter data have been used by MHI NASU for calibration and validation of remote sensing observations. The method was developed to trace drifters with higher accuracy on the basis of Iridium locations. Small ice meteorological markers were developed. Two experimental markers were built and deployed in the area of the North Magnetic and Geographic Poles.

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5. A Wind Profiling Platform for Offshore Wind Measurements and Assessment

Author: Mark Blaseckie *(AXYS Technologies Inc.)*

Abstract: The Wind Sentinel™ buoy is an innovative solution developed to monitor wind profiles from near sea surface levels to upwards of 300 meters above sea level. The system was designed to meet the monitoring requirements expected of an offshore wind resource assessment platform. The Wind Sentinel™ uses a laser wind sensor mounted on a buoy pointing vertically upwards and is thus capable of measuring wind data at the install heights of conventional offshore wind turbines. The Wind Sentinel™ was developed to provide a mobile platform to reduce the complexity, logistics and cost of performing offshore wind assessments and operational monitoring.

This presentation will review the system design and discuss the results of a deployment and comparison trial undertaken to determine the viability of using a buoy mounted laser wind sensor to accurately and reliably measure wind speeds at typical offshore wind turbine heights.

AXYS Technologies Inc. (ATI) is a Canadian company specializing in the design and manufacture of environmental data acquisition, processing and telemetry systems. Since 1986, we have been responsible for supplying systems for the entire Canadian network of Met/Oceanographic buoys. We apply our extensive knowledge and experience to marine and freshwater buoy platforms that measure aquatic, oceanic and atmospheric parameters. Our systems utilize proven cost-effective technology applications to a wide range of applications. With more than 500 systems successfully deployed and in use around the world, ATI is considered a world leader in buoy based systems for environmental monitoring and data acquisition.

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6. Efficient and Affordable High Volume Data Telemetry Iridium RUDICS for Ocean Observing Systems

Authors: Isaac Horn and W. Gary Williams *(Clearwater Instrumentation Inc.)*

Abstract: Iridium's Router-based Unrestricted Digital Internetworking Connectivity Solution (RUDICS) has distinct advantages for the drifter and moored buoy market in the form of comparably high volume data reporting at a lower relative cost to other telemetry options. Its applicability to ocean observing systems has been demonstrated with several years of successful use in glider applications. While XMODEM transfers will provide good data transfer rates, the unavoidable problems inherent with transmitting from the sea surface make this a less than optimal protocol. We developed a proprietary duplex protocol, a form of "streaming" data deliver, to minimize the overhead and airtime associated with the RUDICS system. The mechanics of the protocols are discussed. Using a cost per kilobyte metric, we compare results from long-term experiments using a standard XMODEM transfer on RUDICS with similar instruments implementing the improved protocol and other data telemetry options.

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7. The CMR Unmanned Ocean Vessel

Author: David Peddie *(Christian Michelsen Research)*

Abstract: The CMR SailBuoy is an unmanned ocean vessel specially designed for oceanographic and meteorological measurements. It is a sailing vessel designed for autonomous operation for up to one year. Using its onboard computer and servos it automatically navigates following a user defined course.

The CMR SailBuoy uses the Iridium satellite system for communicating measured parameters and diagnostics. Since Iridium is a 2 way communication system, commands such as new waypoints, tracks and sensor parameters can be sent to the vessel underway.

The SailBuoy can be equipped with sensors and has a 10 kg payload for additional instruments. Deployment and retrieval can be conducted with ease since the vessel is remotely controlled. Coastal deployment and retrieval is cost-effective and logistically easy.

The CMR SailBuoy has been through several sea trials, mainly in the North Sea. Further testing and optimization is needed for the SailBuoy to become a successful product catering to the need of meteorologists and oceanographers.

The development of the SailBuoy is at the state where uses input and operational feedback is required for designed optimization.

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8. How DBCP Data Contributes to Ocean Forecasting at the UK Met Office

Author: Ed Blockley *(UK Met Office)*

Abstract: Within the Ocean Forecasting group at the UK Met Office, two operational systems are run daily that assimilate DBCP data: FOAM and OSTIA.

The FOAM system uses the NEMO ocean model, together with an optimal interpolation assimilation scheme, to produce analyses and 6 day forecasts of ocean currents, temperature and salinity. It consists of a global $1/4^{o}$ configuration with three $1/12^{o}$ nested regional configurations in the North Atlantic, Indian Ocean and Mediterranean Sea.

The OSTIA system generates a global, real-time, high-resolution ($1/20^{o}$) SST and sea ice analysis, using both satellite and in-situ SST data, and contributes towards the Group for High Resolution SST (GHRSST).

In addition to this traditional use of the data buoys for SST assimilation and assessment, DBCP floats are now being used to assess the accuracy of FOAM currents by deriving daily-mean float

velocities from buoy positions. Results from this analysis will be presented along with animations of drifter locations against model fields.

Equatorial statistics are similar to those obtained for comparisons against moored buoy array currents. This gives us confidence in the drifter-derived current validation. However a bias is identified in the Southern Ocean and a plausible cause given.

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9. JouBeh Technologies – an Iridium Satellite Valued Added Reseller dedicated to Environmental Data Collection

Author: Paul Hill *(JouBeh Technologies)*

Abstract: *Jou*Beh Technologies is an Iridium Satellite Value Added Reseller service provider based in Nova Scotia, Canada. *Jou*Beh offers data modems, data services and web based processing, control, storage and display. Focused on data-only services and environmental tracking and monitoring applications, *Jou*Beh is serving clients in over 30 countries. *Jou*Beh supports OEM manufacturers of data collection systems and end users alike. As a growing concern within the Iridium network of service supporters, *Jou*Beh is well positioned to help the DBCP by offering competitive costing, network and IT infrastructure and targeted value-added service such as GTS posting.

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10. Real-Time Services for the Provision of Meteorological Data

Author: Mac MacLeod *(Scotia Weather Services Inc.)*

Abstract: Scotia Weather Services Incorporated is a private Canadian company that specializes in the field of real time environmental information services for a variety of economic sectors that are sensitive to the variability of the atmosphere and the ocean. It operates a 24/7 weather office staffed by professional meteorologists and IT staff that is linked to the Internet. It uses real-time weather and oceanographic data collected on a world-wide basis through a dedicated link to Environmental Canada, state-of-the-art atmospheric and oceanographic computer model data generated by the national weather services of both Canada and the United States, an ultra-fine scale weather model executed on in-house computers and leading edge computer/communications technologies to deliver its products to clients. Scotia Weather Services has a robust system to process, quality control and communicate drifting buoy data to the GTS via its communications link to Environment Canada. It is well positioned and dedicated to providing a reliable and cost-effective service for provision of data on the GTS in support of the DBCP program.

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11. The Korean Ocean Gate Array Project

Author: Gwan-Chang Lim *(Korean Hydrographic and Oceanographic Administration)*

Abstract: KHOA (Korean Hydrographic and Oceanographic Administration) will install an array of ocean observation buoys called Korea Ocean Gate Array (KOGA) which will be located at the south most part of the Korean jurisdiction under the plan of National Jurisdictional Ocean Observation Buoy Array Formation. The Array will be installed 30° 30´~32°00´N, 125°00´~127°00´E approximately. This location is a key point for typhoons which cause a lot of damage to the Korean Peninsula and is an important oceanic area which requires long-term observations for the origin of oceanic changes which cause climate change in the Korean Peninsula and the Oceanic natural disasters.

The paradigm of the national disaster prevention system shifted to prevention, science, integration, self-control. For the construction of a disaster early warning system through real-time ocean

observations, the ongoing observations for ocean and weather have to be conducted to the open sea system. The KHOA should produce key data for the disaster prevention, industry, energy, social infra-structure, ecosystem, water management and secure the stronghold for national ocean observation point. Through this installation, the KHOA will contribute to the international efforts for the global climate change and KHOA will have a chance to observe the ocean which have no man-made interferences such as industrial complex or human residences which make origin materials for climate change.

The KHOA, through KOGA program, will monitor real-time oceanic and climate data and distribute observed data under the quality control coped with international standard. And the KHOA will support the international ocean research and observation. The KHOA will step ahead to the base for leader-ship of the international society such as IHO, IOC through our technical stage for observing and processing marine data using the leading edge techniques for high quality oceanic observed data and data distribute technique.

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12. Upgrading the Argos Real-Time Antenna Network: Plans and Impacts

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

Abstract: Retransmission to the ground of Argos data immediately upon reception at the satellite enables the real-time receipt of data from users platforms co-located within the footprints of the satellite and local antennas. The current network of 60 strategically located real-time local antennas has been organized by NOAA/CNES and CLS and is capable of receiving the TIP data stream (also called HRPT data) from satellites. The retransmitted Argos data which is imbedded within this data stream is automatically removed at the ground at each antenna and then pushed to CLS as quickly as possible. Most regional receiving stations are owned by National Weather Services and Universities, which use them mainly to acquire and process satellite imagery data. Although absolute operational reliability is not guaranteed for these antennas, in practice performance has been generally satisfactory. About 15% of the antennas belong to CLS and hence are easier to maintain reliable operations. To offset the possibility that a station might become unavailable, we constantly strive to expand the network of local antennas thereby increasing data redundancy.

CLS is committed to global decreasing the delivery times of Argos data and to be particularly responsive to the expressed needs of the DBCP. To accomplish this, a new Project has been created with the purpose of establishing an optimized and reliable global network of real-time antennas. The Project approach is to: **A)** upgrade most of the existing L-Band Antennas so they can receive data from all of the satellites carrying Argos (METOP, SARAL and JPSS, as well as the NOAA satellites) and **B)** to install new antennas and/or connect to others where needed. This presentation will outline the project schedule and will specifically: **1)** illustrate the distribution of the existing antennas and identify those being selected for upgrade, **2)** show the intended locations of new antennas and **3)** discuss the impacts of the optimized network to Argos users.

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13. Argos 3: Experiences with Drifter Data Quality and Management

Authors: W. Gary Williams and Isaac Horn *(Clearwater Instrumentation Inc.)*

Abstract: Argos 3 and the technical advances in the PMT Argos 3 transceiver radically change the user's data experience. The advent of downlink messaging of general information on time and satellite status, and specific information on drifter location, PMT operation and manufacturer specific state commands improve data quality, allow strategic in-situ sampling adjustments, dramatically reduce data redundancy yet improve data volumes. These improvements in drifter data will be demonstrated with data from deployed drifters and tests on land.

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14. The Global Drifter Program's Assessment of Drogue Presence

Author: Erik Valdes *(NOAA/AOML/GDP)*

Abstract: With the implementation of tether strain complemented by adjustment to Technocean's submergence sensor, the GDP has been able to assess drogue presence more reliably, but the number of days drifters have had their drogue on has dropped dramatically. The concern is that drogues for most drifters of certain manufacturers are lasting less than six months over the last couple of years. Tether strain has been implemented for all the manufactures except for Pacific Gyre. Also, Clearwater drifters have had issues with SST sensors and drifters failing on deployment. Technocean also has had issues involving delayed activations after deployment. This talk will evaluate transmitter and drogue lifetimes for each manufacture and the issues with SST sensors and delayed activations after deployment.

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15. Results from Drifter Comparison Study Conducted in 2010 and Other DAC Activities

Author: Mayra Pazos *(NOAA/AOML/DAC)*

Abstract: For the sixth consecutive year, AOML conducted drifter deployments in clusters for inter-comparison. During January and March 2010, AOML deployed 4 clusters of 4 SVP drifters at the same time and location and from 4 different manufactures (Clearwater, Technocean, Metocean and Pacific Gyre). Five more clusters of five SVP-B drifters are planned for deployment during August/September to include five DBCP funded drifters manufactured by Marlin Yug Inc. This talk summarizes results from the SVP/SVP-B cluster deployments, some results from Argos-3 drifters deployed in 2009 and will give an update on other DAC activities.

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16. Scientific Results using a Decade of Data Collected by the PNBOIA Program in the South Atlantic.

Author: Olga Sato *(IOUSP)*

The Programa Nacional de Bóias (PNBOIA) is the Brazilian national program to implement an array of drifters and coastal moorings, both monitored by satellite, and to make the data available to the scientific community in near real time. The focus of PNBOIA is to improve the knowledge of the oceanic circulation of the South Atlantic ocean by analyzing the lagrangian trajectories and the data collected by the drifting buoys and moorings. This program has been responsible for deploying over 150 surface drifters since 1996 and it is part of the Brazilian contribution to the GOOS program.

The mean ocean temperature and currents are determined by analyzing the lagrangian drifters' data deployed in the South Atlantic ocean. The methodology is based on the statistics of the near-surface circulation by grouping the observations into bins. The measured temperature is compared to climatology from both in situ and satellite sources. Our focus is concentrated on determining the mean velocity on the western side of the South Atlantic. A large portion of the drifters was deployed closer to this boundary; in addition, some of the floats were advected there by the ocean currents. We observe an increase of the variance of the near--surface velocities measured by the drifters after 2006 which are dominated by the Ekman component. The comparison with altimeter-based mean geostrophic shows an increase as well. The analysis of multi-scale dynamical processes including the inertial motions, meso--scale eddies, waves, and interannual trends will provide the much needed quantitative estimates of the variability of the regional oceanic currents.

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17. Partnerships for New GEOSS Applications (PANGEA)

Author: Sid Thurston *(NOAA/CPO)*

Abstract: Partnerships for New GEOSS Applications (PANGEA) 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 by U.S. experts 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) 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 recent NOAA collaboration with India, Indonesia, The Agulhas-Somolia Current Large Marine Ecosystem (ASCLME) Project for the Western Indian Ocean, and opportunities to expand this concept beyond the Indian Ocean.

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18. The Burn Release Drifter

Authors: L.R. Centurioni, P.P. Niiler, C.J. McCall and L. Braasch *(Scripps Institution of Oceanography)*

Abstract: This presentation describes the design and testing of a new drifting buoy, termed the Burn Release Drifter. The instrument consists of a drifting buoy whose drogue is carefully tucked in a plastic cone and strapped to it. A pyramidal anchor is connected to the device through a 5-10 m long cable. Once deployed, the drifter-cone package sinks to the ocean floor. The length of the anchor cable is such to keep to drifter package above mud layer. The drifter's buoy is connected to the anchor with straps and a burn-wire loop. The drifter controller activates the burn-wire circuit on a pre-set schedule, the wire burns and the drifter rises to the surface and begins its mission. The drifter is based on the SVP design and the surface buoy, in order to resist the pressure at the ocean floor, is made of a glass ball shrouded in a flooded plastic shell, of the same type used for deep-water oceanographic moorings. The glass ball contains the electronics and batteries, and provides buoyancy to the drifter. The deployment package measures 42"X42"X42" and can be hand deployed. Applications include the implementation of time-series of drifter's releases from locations which are not often visited by research and commercial vessels. Eight drifters were deployed in approximately 2000 m of water off the coast of northern California in April 2010. Of these, six reached the ocean's surface on schedule and within 200 m of the deployment location. At the time of writing of this abstract five of the six drifters are still reporting valid argos positions.

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19. GHRSST Science activities and its interest in SST measurements from drifting buoys

Author: Andrea Kaiser-Weiss *(GHRSST Project Office)*

Abstract: The Group for High-Resolution Sea Surface Temperature (SST) (GHRSST) provides a new generation of global high-resolution (<10km) SST products to the operational oceanographic, meteorological, climate and general scientific community. The GHRSST global processing systems operate by combining several complementary satellite and in situ SST data streams together and deliver integrated SST products with supporting data in a common netCDF format.

Several working groups concentrate on the science frontiers related to SST, of which especially the Diurnal Variability working group (GHRSST- DVWG) and the SST Validation working group (GHRSST-STVAL) have special interest in the drifting buoy measurements. As further progress with improving the satellite retrievals is currently limited by the accuracy and resolution of the in

situ observing system, GHRSST is interested in improving the drifting buoy system with respect to accuracy, resolution and pre-deployment calibration system monitoring.

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20. Examining the Long Term Stability of SST Measurements made by Drifting Buoys

Authors: R.O. Smith, J.J. Kennedy and N.A. Rayner *(Met Office Hadley Centre)*

Abstract: Sea Surface Temperature (SST) retrievals from the Advanced Along Track Scanning Radiometer (AATSR) satellite instrument provide an estimate of SST independent from the *in situ* observing network. This independent SST data source can be compared with near co-incident SST measurements made by drifting buoys to monitor performance and relative biases associated with those measurements.

Our results suggest that up to 10% of drifting buoys within this sample of the population have average offsets or calibration drifts in their temperature measurements relative to the AATSR data that exceed $\pm 0.1^{o}C$ and $\pm 0.1^{o}C\ yr^{-1}$ respectively.

These relative biases suggest that error estimates assigned to retrievals of SST from satellite platforms validated using drifting buoy measurements, may be overestimates and the suspect buoy should be removed from match up data bases used for this purpose. However, we detect no significant effect on the global or large regional average SST anomalies calculated from combined *in situ* measurements.

Nonetheless, rigorous quality control of drifting buoys through their lifetime using an approach of this kind would be beneficial and feasible. However, limitations of this approach mean that we would also encourage more studies using buoys with dual temperature sensors to directly monitor sensor quality.

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21. Highlights of the NOAA TAO Program's Technology Refresh Project

Authors: Shannon McArthur and Richard Crout *(National Data Buoy Center)*

Abstract: The NOAA Tropical Atmosphere Ocean (TAO) Program maintains 55 operational moored buoy stations located in the equatorial Pacific Ocean which provide near real-time, high quality meteorological and oceanographic observations. These observations enable a better understanding of the climate variations associated with El Niño and La Niña. To manage the risk associated with aging components and continually evolving technology, the TAO Program will periodically initiate projects to update or "refresh" the technology utilized in the TAO system. The TAO Program is presently planning and executing such a project and wishes to share the technology enhancements and to communicate the highlights of the project.

Our presentation will highlight the major refreshed components of the deployed TAO system, which include enhancements to the data logger, the subsurface conductivity/temperature (CT) sensors and the compass for measurement of wind direction. We will highlight the operational and user benefits of changing the TAO data collection relay system from ARGOS to IRIDIUM and we will discuss shore-side data processing enhancements that will improve data quality assurance and control.

In order to support our customers and stakeholders while protecting the continuity of the long-term ocean climate data, the NOAA TAO Program is committed to transparently managing our inevitable technology change requirements while adhering to the Climate Monitoring Principles established by the Global Climate Observing System (GCOS). Our presentation will highlight the inter-comparison results that have collected thus far between the in situ technology and the "refreshed" technology. We will discuss our plans for further testing and how the results of these tests will be communicated to the stakeholder community.

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22. A "TAO" Hybrid for the Indian Ocean

Authors: Rick Cole (*RDSEA International*), Ning Chunlin (*First Institute of Oceanography*), Jeffery Kinder (*Down East Instrumentation*), Weidong Yu (*First Institute of Oceanography*) and Yang Chao (*Proteus Inc.*)

Abstract: China's State Oceanic Administration (SOA), First Institute of Oceanography (FIO), Qingdao, in collaboration with the Ministry of Marine Affairs and Fisheries in Jakarta, Indonesia, has recently partnered with U.S. Corps. RDSEA International Inc. (St. Pete Beach, FL) and Down East Instrumentation, LLC (Cary, NC) on a major climate study in the Indian Ocean in support of the Indian Ocean Observing System (IndOOS) and its mooring component; The Research Moored Array for the African-Asian-Australian Monsoon Analysis and Prediction Program (RAMA). Emphasis is on the role of the ocean for prediction of the Asian Monsoon, Indian Ocean Dipole (IOD) and ENSO (El Niño), all contributing factors to global climate. RDSEA and Down East, both with a long standing history of designing and implementing oceanographic monitoring systems for deep and coastal water applications has provided FIO's Ocean-Atmosphere Interaction and Climate Change Group, under the direction of Dr. Weidong Yu, with a set of complete "Air-Sea Interaction" buoy systems that will measure a variety of oceanographic parameters from the upper water column to full surface meteorology at the sea-surface. These buoy systems are modeled after NOAA's very successful real-time monitoring program in the tropical region of the Pacific Ocean: The Tropical Atmosphere Ocean Project (TAO). Each buoy and mooring consist of a state-of-the-art suite of "off-the-shelf" (OEM) sensors that will transmit subsurface oceanographic data: currents, temperature, conductivity and pressure from seventeen instruments (700-meters to the surface) along with full MET: wind speed/direction, precipitation, relative humidity, sea surface temperature, barometric pressure and air temperature at the surface. Wet and dry pCO^2 measurements are planned for future deployments. The first of multiple schedule research cruises was recently completed at Latitude 8^o South and Longitude 100^o East vicinity, Indian Ocean, depl;oying the initial system with data streaming via the Iridium Satellite Constellation back to China and the U.S.. These data will ultimately be disseminated to the RAMA data base for worldwide distribution. Continued science and technology transfer to the Indian Ocean-Rim countries helps establish observing capabilities in the region and to promote an observing level to understand its role in the global climate system. Discussion on the project, buoy and mooring system design, build, instrumentation, testing, deployment, data collection and telemetry is planned for the Data Buoy Cooperation Panel (DBCP) technical session in Oban, Scotland in September of 2010.

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23. Proper Data Management Responsibilities to Meet the Global Ocean Observing System (GOOS) Requirements

Author: Bill Burnett *(NOAA/NWS National Data Buoy Center)*

Abstract: A strategic thrust of JCOMM is to improve service quality and service delivery. The expected result is enhanced capabilities of Members to deliver and improve access to high quality weather, climate and water and related environmental predictions. Due to recent events in the climate community that resulted in some scientists questioning the archived weather/ocean observation record, the DBCP community should focus on improving their data management structure to alleviate these concerns. NDBC is making improvements to their data delivery and archive system – and will treat all their observations as climate observations – even if those observations were not seen as such in the past.