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REPORT BY THE TASK TEAM ON INSTRUMENT BEST PRACTICES AND DRIFTER TECHNOLOGY DEVELOPMENTS(TT-IBPD)

(Submitted by William Burnett, Chair TT-IBP, USA)

Summary and purpose of the document

This document contains the report by the chairperson of the DBCP Task Team on Instrument Best Practices and Drifter Technology Development.

ACTION PROPOSED

The Panel will review the information contained in this report and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

Appendices:
A. Report by the Task Team on Instrument Best Practices and Drifter Technology Development
B. Terms of Reference of the DBCP Task Team on Instrument Best Practices and Drifter Technology Development

APPENDIX A

REPORT BY THE DBCP TASK TEAM ON INSTRUMENT BEST PRACTICES AND DRIFTER TECHNOLOGY DEVELOPMENT
(Report for 2011)

1. During the intersessional period, the DBCP drifters did not perform as well as in the past, and work has been ongoing to identify and fix the problems. Pierre Blouch (Meteo France) highlighted the issues related to reliable drifters in December 2011 that elicited a vigorous discussion within the Task Team.

2. Based on a recent study that was carried out on Technocean buoys, Pierre performed the study with other manufactures. He used the GDP deployment log and identified all the Argos-2 SVP-B drifters which have been deployed since the 1st of April 2010 and analyzed their air pressure measurements. Out of a total of 244 buoys that were deployed, the share by manufacturers goes from 5 (Marlin) to 135 (Technocean). The number of buoys which completely failed during the period was huge : 34% in average, 42% for **Technocean.** The Task Team had never seen such hecatomb. Among other problems, they observed:

- Many air pressure measurement failures on **Pacific Gyre** buoys (30%). The concerned buoys continue to correctly measure SST during, at least, a certain time.

- Other buoys from this manufacturer (17%) present very inaccurate values.

- Important biases on many buoys built by **Clearwater** (21%). It is possible these buoys could report correct values if they would be well calibrated. It is also possible that observed biases are actually due to a trend. In that case, corrections would be inefficient.

3. In total, the number of buoys which no longer measure air pressure correctly (53%) is higher than this of buoys reporting correct values (47%). The task team found this unacceptable for buoys which are only 8.5 months old for the oldest. The conclusion was that manufacturers may no longer know how to build reliable SVP-Bs.

4. Based on feedback from the initial e-mail, in order to facilitate future studies on buoy performances, the task team recommended to have the date of manufacture or a manufacturing number/name within the GDP deployment log. A manufacturing number - or name - would be preferable probably because several series of buoys having different characteristics may be built in parallel (e.g. Argos and Iridium fitted with Alkaline or lithium batteries...). Buoys having rigorously the same characteristics would have the same number/name.

5. The Task Team recommends to AOML to add the related column in the log. Then, it would be up to the manufactures to provide AOML with these numbers or names for buoys which have been deployed up to 5 years ago for instance. Manufacturers' services should be called.

6. The Task Team also recommends that the best exercise is to assess the performances of buoys remains with the AOML comparisons, which is performed every year on batches of buoys from different manufacturers deployed in clusters. Buoys deployed in those experiments must be as new as possible. Meteo-France could organize the deployment of such clusters as they already did it a few years ago.

Best Practices

7. The Task Team reviewed a draft Technical Document (DBCP #42) entitled “Sea Surface Salinity Quality Control Processes for Potential use on Data Buoy Observations” and approved the document for publication.

Global Drifter Program/Data Assembly Center Evaluation

8. The Global Drifter Program / Data Assembly Center (DAC**)** continued to monitor drifter's performance by deploying clusters of drifters from different manufacturers at the same time and at the same location, (ADB study). During 2010/2011 there were a total of 10 clusters deployed, five clusters were all Surface Velocity Program (SVP) type drifters from four different manufacturers (**Clearwater, Technocean, Metocean and Pacific Gyre**), as of July 2011, there are 6 of a total of 20 SVP still transmitting, 3 from **Metocean**, 2 from **Pacific Gyre** and 1 from **Clearwater**. Three from **Technocean** failed on deployment and one from **Pacific Gyre** ran aground after 317 days. Sea Surface Temperature (SST) was good in all of them until they quit transmitting or ran aground. The other five clusters were all SVP Barometer (SVPB) type drifters from 5 different manufacturers, (same manufacturers as in SVP clusters and **Marlin Yug**). Nine of twenty five drifters are still transmitting (1 **Clearwater**, 1 **Metocean**, 4 **Pacific Gyre** and 3 **Marlin Yug**), 4 failed on deployment, (2 **Clearwater** and 2 **Marlin Yug**). Sea Level Pressure (SLP) and SST were good in most of them except one **Clearwater**, where SST nor SLP worked and one **Marlin-Yug** whose SST sensor failed after 296 days. The DAC has maintained a table, regularly updated and posted on the web showing these results as a response to an action item from DBCP-26, Oban, 2010 (www.aoml.noaa.gov/phod/dac/dacdata.php) , under "other presentations, posters and links". These tables are included in appendix C. The Drifter Operation Center plans to deploy 5 more SVPB clusters during August/September 2011.

9. Last year, there were several problems reported affecting drifters from different manufacturers. The DAC provided raw data to Scripps (SIO) to investigate the possible causes of the problems. So far, a SST bias was found in some **Pacific Gyre** drifters due to their choice of thermistors, with a large thermal inertia inside the buoy. The problem was addressed by changing thermistors, but a data comparison and verification is still pending. **Pacific Gyre** also revised their barometer port, and they now claim air pressure measurements are excellent. A number of drifters were retrofitted with drogues to use the correct anti-rip fabric. **Clearwater** issues with excessive current drain when in sleep mode were rectified by implementing a "limiting" circuit. SIO has offered their advice on battery pack best practices and can provide indications on battery brands. **Clearwater** claims Rayovac provided them with a batch of defective batteries. **Clearwater's** early drogue loss problem was tackled by encouraging them to adopt a drogue attachment comparable to the one used by **Pacific Gyre**. Also the tether is now wrapped coil by coil with paper tape, this should mitigate drogue losses. Drifters with the new design have not been delivered yet. **Technocean** was asked also to wrap the tether coil by coil with paper tape. A formal report will be presented by Scripps at DBCP-27 with more statistics about these findings.

MetService NZ Evaluation

10. From 1 Aug 2010 to 31 July 2011, MetService NZ deployed forty two buoys:

- 6 **Marlin-Yug** ARGOS3 buoys under ARGOS3-PP
- 5 SVPB **Technocean** buoys in Tasman Sea for MetService programme
- 29 SVPB **Technocean** buoys under SOBP (19 GDC +10 Upgrades)
- 2 Iridium Metocean Buoys

11. The performance of the ARGOS3 buoys and the Iridium buoys will be reported on under the respective Pilot Projects. Regarding the Argos3 buoys, MetService provided feedback to **Marlin-Yug** on how to improve the buoy packaging for deployment, and provided comments on their deployment manual and instructions. MetService provided comment on **Marlin-Yug's** report "Air Pressure measurements from different Marlin SVP-B drifters under different weather conditions" May 2011, and agreed that the **Marlin-Yug** buoy most suited to Southern Ocean conditions is the 41cm buoy, and that a trial using 41cm hulls with the new improved drogue

design would be beneficial. A précis of the **Marlin-Yug** report is contained in **Marlin-Yug's** report to TT-IBP.

12. The performance of **Technocean** GDC and Upgrade buoys in the last year has been very poor. Pierre Blouch, Meteo-France noticed that a lot of buoys were failing prematurely and detailed this in an email on 16 December 2010, entitled "It seems manufacturers no longer know how to build reliable drifters." This email signaled that a large number of failures were occurring, but disappointingly many buoys with latent problems were being deployed around this time and many early failures eventuated. In pre-deployment testing done by MetService, one **Technocean** buoy was rejected because it failed to activate. The remaining 29 buoys were deployed, twenty buoys failed within 0.5 to 3 months, and only 9 remain operational at 28/7/11, aged between 5 and 9 months. This high failure rate has greatly reduced the network of buoys in the Southern Pacific Ocean. Many buoys in the Southern Ocean exhibit intermittent spikey Air Pressure. The Meteo-France monitoring tools flag up buoys where the pressure is continuously bad and this data is removed from GTS distribution.

13. MetService is very concerned by the sudden and dramatic decrease in the performance of **Technocean** buoys and has been working with **Technocean** to try to identify and fix the current problems.

UK Met Office Drifter Evaluation

14. The UK Met Office continues to deploy drifting buoys (with barometers) in the South Atlantic and the Southern Ocean. All drifters purchased have been ***MetOcean*** units and from 2007 have all been Iridium drifters and a contribution to the Iridium Drifter Pilot Project. Many of the drifters were ordered with lithium batteries in order to evaluate the potential increase in lifetime of the units.

15. The longest lived Argos drifter (from 5 units deployed) with alkaline batteries operated for 915 days, whereas the 2 longest surviving Argos drifters with lithium batteries (from 4 units deployed) operated for over 1,400 days.

16. The longest lived Iridium drifter (from 10 units deployed) with alkaline batteries operated for 463 days, whereas the longest surviving Iridium drifter with lithium batteries has operated for 1,000 days (as at 27th July 2011). A further 6 (from 10 units deployed in 2009) are still operating after over 600 days. 6 of 7 units deployed in 2010 and 2011 are also currently operating (the failed drifter most likely having been damaged by pack ice). These 7 units had higher precision SST sensors and are also contributing to the DBCP/GHRSST HRSST Pilot Project.

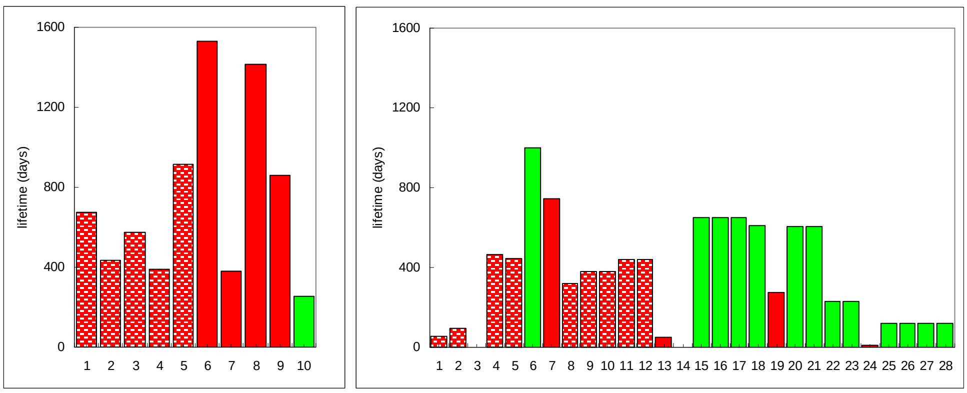

Figure 1. Lifetimes of Argos (left) and Iridium (right) drifters. Active drifters are shown in green, expired drifters in red, units with alkaline batteries are shown by hatched bars and with lithium batteries by solid bars.

17. Overall, there is now clear evidence that fitting lithium batteries to drifting buoys does give extended operating lifetime. At present 5 new HRSST drifters are on order and it is expected this will be increased to 7 units given HRSST Pilot project upgrade funding. These will be deployed in the South Atlantic or Southern Ocean in late 2010 or early 2011 depending on delivery time.

Centre of Marine Meteorology of Météo-France Evaluation

Iridium drifters
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18. Since the last DBCP meeting, the Centre of Marine Meteorology of Meteo-France has been continuing to use and to evaluate the Iridium Short Burst Data (SBD) transmission on operational drifting buoys. Since the 1st of September 2010, about one hundred Iridium SVP-B drifters built by **Metocean** for E-SURFMAR and about twenty ones for IBPIO (collaboration NOAA, DBCP, Meteo-France) have been deployed in addition to the 150 deployed earlier. All the buoys have been fitted with a GPS by now. The excellent data availability and timeliness for these buoys were confirmed.

19. Out of these, a lot of them in ESURFMAR area failed at deployment or quickly after. However, it appears the problems were rather due to manufacture modifications than to the system itself. During 2010, and the first part of 2011 **Metocean** worked to bring the quality of SVP-B drifters back at the level it was previously. The problems seem to be fixed by now and Meteo-France will only use drifters with 41 cm hull in the future.

20. Over the past 12 months, Meteo-France was also involved in various aspects of the Iridium-PP work through:

- the operation of one SVP-B prototype built by **Technocean**;
- the evaluation of 8 SVP-BS (salinity drifters) to **Metocean**;
- the evaluation of one SVP-BTC (thermistor string) to **Marlin Yug**;
- the making of suitable dataformats for all these different buoys;
- the GTS data transmission for a majority of these buoys.

Improvements in SST measurements
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21. Data users require a better accuracy for SST. This was raised at DBCP-25 and DBCP-26. Drifting buoys are the best reference to validate (and possibly to calibrate) infrared and microwave satellite measurements. Iridium-PP data formats were adapted in order to allow a resolution of 0.01 K. Although FM-18 BUOY format does not allow to report SST with this resolution, FM-94 BUFR format does.

22. **Metocean** replaced former probe YSI 44032 they previously used (accuracy 0.1 K) with probe YSI 46000 (accuracy 0.05 K) on their buoys delivered to Meteo-France. The first deployments of HRSST-1 (High Resolution SST) buoys occurred by fall 2010. Since October 2010 about eighty drifters have been deployed in the Atlantic and in the Indian Ocean. However the probes are not calibrated.

23. So, the next step consists in building drifters, called HRSST-2, which could have their SST probe pre-and post calibrated. The purpose of post-calibrations is to improve the quality of delayed mode data but also to assess the possible trends in the measurements. The first HRSST-2 prototypes should be available before the end 2011.

SVP-BS (salinity) and SVP-BTC (temperatures in depth)
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24. In cooperation with LOCEAN, Meteo-France continues to use SVP-BS drifters from **Metocean** and **Pacific Gyre**. In addition to the eight Iridium SVP-BS drifters mentioned here above, 15 Argos SVP-BS from **Pacific Gyre** were deployed over the past 12 months. All are fitted with SEABIRD sensors. Results are globally satisfactory. Since the SMOS satellite was launched, *in situ* salinity data has been used to validate and calibrate its remote salinity measurements.

25. One Iridium SVP-BTC built by **Marlin** (WMO 6200510), purchased by Meteo-France and deployed in the Bay of Biscay (off France) by spring 2010, was recovered by beginning of May 2011. This buoy was fitted with a 80-metre long string with 16 sea temperature probes and a hydrostatic pressure sensor at its end. In addition to the temperature values, the buoy reports the depth of each probe according to the pressure value and an algorithm simulating the string shape. The buoy has been operational during one year at sea, the only problem appeared on the hydrostatic pressure sensor after eight months. About ten of those drifters will be deployed at sea in 2012 in Mediterranean Sea for Hymex experiment.

Argos-3 PP
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26. Two Argos-3 drifters (ID 82545, WMO 62839 and ID 82546, WMO 62840) built by Clearwater were deployed in the Bay of Biscay in beginning of March 2011. The two buoys failed before the end of March 2011.

India – National Institute of Ocean Technology

27. **Indigenized data buoy CPU** developed for industry standard was deployed at BD06 location is functional and providing data from July 2010 to till date and collected data during JAL cyclone and one more is deployed in Arabian sea at AD05. These CPUs are upgraded for wave data measurements.

28. **Coral Reef Buoy:** On the request of Department of Environment and Forest (DOEF), Andaman & Nicobar**,** successfully deployed Coral Reef Buoy in Mahatma Gandhi Marine National Park, Wandoor, Andaman & Nicobar Island during February 2011. The buoy is fitted with meteorological sensors, water quality sensor to monitor the coral reef environment. The environmental sensors stopped after 4 or 6 weeks due to marine fouling. The mooring is experiencing severe current. The mooring designed to have double anchor and a shore anchor to withstand high current, wave and wind loading in Andaman island and is being closely monitored.

29. **Data buoy as a reference platform** was deployed Off Agatti, Lakshadweep and is functional from March 2011 with dual mast and redundant wind & humidity sensors for the first time. This is a challenging task to integrate and to deploy such a buoy system. This mooring has a shore anchor and is experiencing sever wave and wind loads.

30. **Best of Practice Method Manual for moored buoys** was prepared and is being followed using the inputs from PMEL NOAA and vetted by NOAA NDBC to obtain quality data from moored buoys.

Environmental Canada Evaluation

31. Environment Canada (EC) continues to deploy SVP-B and SVP-B/W buoys in three target areas; the Northeast Pacific Ocean, the Northwest Atlantic, as well as the Arctic Basin (primarily north and west of the Canadian Arctic archipelago). Arctic deployments include air deployable ICEX buoys manufactured by **CMR**, CALIB (Compact Air Launched Ice Beacons) from **MetOcean**, as well as the evaluation of the new AXIB (Airborne Expendable Ice Buoy) built by **LBI Inc**.

32. EC has continued to contribute to the Iridium Pilot project, with 6 Iridium SVP-B drifters in

deployed this year. Given the results to date, along with information shared by DBCP Iridium Pilot Project, all future SVP-B deployments will use Iridium telemetry. We will also be working with buoy manufacturers to determine the feasibility of integrating Iridium SBD modems (9602) into existing buoy platforms. As part of this effort, EC funded an Engineering project at **CMR** in Norway to integrate an Iridium modem into their ICEX Air buoy platform. The system was tested, and 2 units were produced. We expect to deploy the ICEX Air – Iridium, in the spring of 2012. In addition, we will be utilizing Lithium batteries for all drifting buoy deployments in the Arctic, and will be examining the impact (and cost/benefit) of Lithium batteries in the North Pacific and Northwest Atlantic.

33. EC is continuing discussions with **MetOcean** and **Pacific Gyre** regarding a new type of SVP-B buoy that will utilize a Sonic Anemometer (Gill or similar) to attempt to estimate wind speed a direction more accurately than the existing acoustic SVP-B/W buoys. It is understood that there are significant challenges associated with the development of algorithms to provide useful estimates wind speed/direction given the impact of continuous wave action and submergence of the buoys. The power requirements of the sensor will also need to be carefully assessed. The design is also of significant interest for on-ice, and on-land deployments in the Canadian Arctic (with deployment via ice breaker or even aircraft landing on-ice). We will continue to engage buoy manufactures, and National Meteorological Services to determine the feasibility of direct wind measurements from drifting buoys. While this may prove difficult for Ocean deployments (sonic sensor submerged for sig. proportion of time), ice or even terrestrial deployments in remote locations may be a better application and need to be further evaluated.

34. Finally EC has completed the implementation of a new system that will be used to better manage our surface observing networks, including the EC Marine Networks. The new ALM (Asset Life Cycle Management) system now allows for more comprehensive and accurate tracking of assets including detailed calibration reports for every sensor at each station. The resulting system will allow for improved traceability of calibration results, information on mean-time of failure of specific make/model of sensors and other components (i.e. transmitters, power modules, solar panels etc.). It will over time also provide the ability to track the costs associated with the maintenance/calibration of each station and also form the basis for core metadata, allowing for production of reports to suit users of EC observational data in the operational and research communities.

Marine Hydrophysical Institute and Marlin-Yug Ltd Comments

Tracking of Argos-2 drifters
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35. Two SVP-B buoys with 64 alkaline D-cells and in continuous mode operation, were deployed by BOM Australia and kept their tracking capabilities for a very long period of time after deployment in South Ocean. The drifter was tracked up to July 25, 2011 (the date of this analysis) and visible via JCOMMPC web

http://wo.jcommops.org/cgi-bin/WebObjects/JCOMMOPS.woa/1/wo/aLRIIProQYwON6XRyNVDsg/0.0.96.3.

36. ID67381/WMO56531 was deployed on May 11, 2006 and emitted for 1900 days. GTS distribution was stopped on 1183 day. ID67379/WMO56532 was deployed on December 12, 2006 and emitted for 1692 days. GTS distribution was stopped on 710 day. This information demonstrates the adequate power budget of Argos-2 drifters and should force efforts of manufacturers to develop sensors with longer lifetime.

Iridium PP

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37. Three Iridium SVP-B drifters with 41-cm hulls and 92-cm drogues, equipped with 64 alkaline D-cells, were deployed by SAWS in South Atlantic in late 2009 and early 2010. All performed adequately during their operational status on July 25, 2011, including one buoy with a drogue attached for 545 days. Two SVP-B drifters had GPS receivers with hourly samples. The tandem Iridium/GPS provided reliable GPS fixes in this area with rough weather conditions. Only 1% of the hourly GPS fixes were lost during 1.5 years. Current level of battery voltage provides for a 2-year theoretical lifetime. The third SVP-B drifter without GPS keeps also continues operating and the current level of battery voltage allows for a 2.5-year theoretical lifetime.

Argos-3 PP
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38. Five Argos-3 SVP-B mini drifters with 35-cm hulls and 61-cm drogues, were successfully deployed by NZ MetService in the Tasman Sea in August-October 2010, and continue to operate. One buoy came ashore in July 2011. We have noticed that the battery voltage provides smaller power consumption in contrast with Argos-2 similar drifters and theoretical lifetime for Argos-3 buoys with 40 alkaline D-cells which could be at the level of 24 months .

Iridium SVP-BTC80/RTC/GPS temperature-profiling drifters
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39. The last prototype of this drifter was deployed by Meteo-France in the Bay of Biscay on May 9, 2010. The buoy was recovered on May 1, 2011. During the one-year lifetime the buoy had all sensors perfectly operational providing hourly temperature profiles, AP measurement and GPS locations. The single failure took place within eight months for hydrostatic pressure sensor at the end of temperature chain. Meteo-France extracted this sensor and returned to Marlin for study and repair. After this procedure the sensor was sent back to Meteo-France to be installed in buoy with following its re-deployment. The design of hydrostatic pressure was updated to be used in further prototypes of this drifter. This experiment showed that this kind of drifter can support reliable measurements of temperature profiles with high space-time resolution with 1-year duration at least.

Lifetime of drogues to be attached
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40. Experiments with Iridium SVP-BTC80 drifter in the Bay of Biscay, after recovery of the buoy, demonstrated that the main parts of drifter, which are responsible to keep the drogue attached, have the level of reliability for 1-year operation under very rough weather conditions, when the amplitude of waves are 10 m and more. A study of this buoy, as well other Marlin buoys recovered, allows us to make the following conclusions:

- Carefully sewed from strong synthetic fabric the Holey Sock drogue with “wire” design can provide an approximate one-year lifetime. The static and dynamic loads for this drogue with temperature chain connected to bottom “wire” ring is much larger in contrast with a standard SVP-B drifter. Nevertheless the temperature-profiling drifter’s drogue did not have essential damage after a one-year period of time. This fact allows for a supposition that drogued drifters without chains can keep the drogue attached longer than one year.
- Similar inferences can be made to the “wire” design of the drogue connection with tether.

41. The weaker “link” is the tether but this cannot be referred to from the durability of wire rope. The rope, even if it has small diameter, has a good reserve of durability, but only when the rope is under permanent tension. In real seas, the rope can get slack very often. Because of presence of angular momentum, loops can be appeared on rope which can be drawn tight when a float jumps over a wave. The result of this is occurrence will be a weak link at the tether and a fast rupture of

rope. More often this case takes place during deployment of drifter, when the drogue submerges with small velocity and tether has a large slack.

42. Good results are seen when buoys are equipped with the tether laid in clips connected to the upper ring wire radials. This method allows the drifter to keep the tether under tension during submergence of the drogue. The method is good enough for deployment in calm sea. The drifters equipped with this system and deployed in 2009-2010 had a much longer drogue attached in contrast with Marlin buoys deployed in previous years.

43. But calm seas are a very rare thing. From one-year of operating a temperature-profiling drifter, it was obvious that this buoy kept its drogue in spite of the influence of permanent waves. On the one hand this fact can be explained that this buoy had manually-made deployments, but on the other hand it was under the effect of high waves without causing problems for the tether. The capability to keep the drogue appeared for this kind of drifter when the buoy got its tether hidden inside the rubber hose with a 14 mm outside diameter. This hose prevents appearance of loops at tether and theoretically the buoy can have its drogue attached during its full lifetime. If this method could be used for standard WOCE drifters it could produce very positive results. A similar approach to this was the first prototype of WOCE drifters with intermediate floats at tether. The problem is that the buoy with the tether inserted in the hose loses its Lagrangian quality because DAR drops to 20-25. Nevertheless, there is some common sense here to be discussed. At least experimental cluster of such drifters could be built and tested.

Quality of AP measurements.
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44. Our own study together with analysis made by Pierre Blouch in ftp://esurfmar.meteo.fr/pub/pb/misc/dbcp/AP_waves.pdf allows making the following conclusions: Standard SVP-B drifters as well as its SVP-BTC modification with 41-cm hull provide reliable AP samples independently of its drogue presence or absence under any weather conditions. The following buoys showed a high quality of AP samples for a long time. For example, on July 25, 2011 the following buoys had high quality AP data:

ID49678/WMO62505 was deployed by Meteo-France in Bay of Biscay on June 15, 2008 and kept AP GTS distribution for 1135 days.
ID84146/WMO56939 was deployed by BOM Australia in South Ocean on December 25,2008 and kept AP GTS distribution for 972 days.
ID84147/WMO56943 was deployed by BOM Australia in South Ocean on January 4, 2009 and kept AP GTS distribution for 932 days.
ID84152/WMO56941 was deployed by BOM Australia in South Ocean on January 13, 2009 and kept AP GTS distribution for 923 days.

45. Thus, standard SVP-B drifters with 41-cm hull and 92-cm OD drogue is the perfect tool for long measurements of AP (near 3 years) anywhere and especially in difficult areas to reach in the Southern Ocean, where the weather conditions are too harsh, but on the other hand there is very small probability of sea vandalism or loss of drifter because of beaching. The long-living buoy with reliable AP data could decrease logistics fees to support necessary density of drifter observations in South Ocean.

46. SVP-B mini drifters with 35-cm hull have a smaller number of batteries and correspondently shorter lifetime. This buoy provides good quality AP samples while it has its drogue attached. When the drogue is lost, further AP samples can be made for some buoys or have too many positive spikes for other buoys. The following provides a probable explanations for these events.

47. A 35-cm float with a barometric port has vertical stability in contrast to a 41-cm float with the same port design. The float without the drogue is similar yacht under wind pressure. The yacht

has always inclination from vertical under wind influence. The barometric port provides similar sail for the float, but the 41-cm hull has a much better restoring moment and correspondently its vertical orientation is more stable, even if the wind is too strong. Additionally, the 34-cm float has the same barometric port. The restoring moment for this float is much smaller in contrast to the 41-cm hull, while the wind pressure on the port is same. As a result, the 34-cm float gets more inclination from the vertical and the inlet of its port becomes open for influence of wind pressure. This pressure has a significant influence in this matter and the AP sensor provides increased values of AP data in spite of the employment of a de-spiking algorithm. The difference in quality of AP data for 35-cm buoys without drogues depends on the point on tether, where the rupture took place. If the rupture occurred too closely to the drogue, the remainder of tether will impact the stabilizing role which does not allow for too large an inclination of the port from the vertical. If the rupture was too close to the float, the spherical hull with smaller diameter can get larger inclinations and larger influence of wind on quality of AP samples.

48. The analysis of 35-cm drifters used in different areas showed that SVP-B mini drifters do not have practically the problems with AP quality in low latitudes. For example, this is visible for the DBCP intercomparison study of Marlin drifters. However, this kind of drifters has scattered AP data in high latitudes, in particularly in Tasman Sea, where wave and wind activities are much higher.

49. The following conclusion can be suggested for this paragraph taking into account the information in other paragraphs above. The long-living drifters with 41-cm hulls and reliable AP measurements under any weather conditions should be used in South Ocean and may be in North high latitudes, while the mini drifters with smaller diameter of float and shorter lifetime could be used in low latitudes, where there is large probability to get a buoy lost because of beaching or vandalism, but there is good probability to support density of drifter net by means of ships of opportunity.

Prototypes of drifters with 20-cm hull.

50. 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.

The Chair of the Task Team on Buoy Best Practices and Drifter Technology Developments would like to thank members for their hard work during the intersessional period, and for providing the input for this report.

APPENDIX B

TERMS OF REFERENCE OF THETASK TEAM ON INSTRUMENT BEST PRACTICES & DRIFTER TECHNOLOGY DEVELOPMENTS

(as adopted at DBCP-XXIV)

Note: The DBCP Evaluation Group is being merged into this Task Team.

The DBCP Task Team on Instrument Best Practices & Drifter Technology Developments shall:

Instrument Best Practices and Quality Management

1. When required by the DBCP, evaluate quality of buoy data produced by specific types of buoys, as well as functioning, efficiency;

2. Review existing practices for automatic real-time buoy data quality control, and delayed-mode buoy data quality control, and possibly suggest design changes for improvement (sensors, hardware, software, data formats) in liaison with the Task Team on technological developments;

3. Address instrument evaluation issues; suggest specific tests and / or evaluation deployments in different sea conditions to DBCP members in order to evaluate buoy quality as described in (1) above;

4. Share experience and results of evaluation with the DBCP and other interested parties;

5. Review and recommend Best Practices; work on specific technical issues in order to facilitate standardization and liaise with the other DBCP Task Teams as appropriate (e.g., DBCP recommended Argos message formats); and

6. Define specific criteria for evaluation purposes (e.g. ocean areas, definition of acceptable quality data, e.g., early failures, lifetimes, delays, accuracies, resolutions, etc.);

Drifter technology developments

7. Investigate developments in the fields of sensor technology, on-board processing, buoy hardware, hull design, energy generation and storage in order to better meet user requirements in terms of the range, reliability and quality of observed parameters and their cost-effectiveness;

8. Regularly review and document operational and upcoming satellite telemetry systems in terms of their ability to address user requirements such as bandwidth, timeliness, availability, geographical coverage, reliability, service quality, technical support, energy consumption and cost;, and make specific recommendations to the communications service providers on required / desired enhancements;

9. Review operational platform location systems, and whether they meet the user requirements;

10. Propose to the DBCP and its Executive Board any evaluation activities and pilot projects that it deems beneficial to data buoy operators;

11. Propose recommendations, both upon request and unsolicited, to the Argos Joint Tariff Agreement. Such recommendations shall be passed via the DBCP Executive Board or the DBCP as appropriate; and

12. Evaluate, test, and promote buoy designs that are resistant to vandalism;

General

13. Review all relevant JCOMM Publications to make sure they are kept up to date, comply with Quality Management terminology, and adhere to the WMO Quality Management Framework (QMF);

14. Provide the DBCP Executive Board and the DBCP, both upon request and unsolicited, with technical advice needed for addressing the issues above; and

15. Submit reports to the DBCP Executive Board and to the DBCP at its annual session that describe intersessional activities and propose a Workplan for the next intersessional period.

Membership:

The membership is open to all Panel members. The Chairperson, appointed by the Panel , has selected the following team members:

- Dr Bill Burnett, NDBC (TT Chairperson);
- Mr Pierre Blouch, Météo-France;
- Ms Emily Daniel, MetOcean;
- Mr Shaun Dolk, NOAA / AOML;
- Ms Julie Fletcher, MSNZ;
- Mr Paul Freitag, NOAA / PMEL;
- Mr Frank Grooters, KNMI;
- Mr Michel Guigue, CLS;
- Mr Robert Jenson, USACE;
- Mr Chris Marshall, Environment Canada;
- Mr David Meldrum, SAMS;
- Mr Sergey Motyzhev, Marlin Yug;
- Mr Peter Niiler, SIO;
- Ms Mayra Pazos, NOAA / AOML;
- Mr Steve Piotrowicz, NOAA; and
- Dr M Ravichandran, INCOIS
- Dr. Tim Richardson, Liquid Robotics
- Mr Jean Rolland, Météo-France;
- Mr Andy Sybrandy, Pacific Gyre;
- Mr Jon Turton, UK Met Office;
- Mr Bill Woodward, CLS America;
- Technical Co-ordinator, DBCP.