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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of UNESCO)

WORLD METEOROLOGICAL ORGANIZATION

Eighteenth Session of the Data Buoy Co-operation panel
(Trois Ilets, La Martinique, France, 14-18 October 2002)

SUMMARY REPORT

A. ORGANIZATIONAL COMPONENT

1. ORGANIZATION OF THE SESSION

1.1 OPENING OF THE SCIENTIFIC AND TECHNICAL WORKSHOP

1.1.1 The Scientific and Technical Workshop with DBCP-XVIII was opened by the Chairman of the panel, Mr G. Brough, at 09.00 hours on Monday 14 October 2002, in the conference room of the Novotel Carayou, Trois-Ilets, La Martinique, France. In doing so, he welcomed all participants to the meeting, to the isle of Martinique and to France, and expressed his thanks to all those within Météo-France who were helping in the organization of the meetings under the leadership of Jean Rolland. He then invited Mr Maurice Merlet, Director of Météo-France Antilles-Guyane, to address the meeting.

1.1.2 Mr Merlet also welcomed participants to the meeting and to Martinique. He noted that, as with every meteorological service in the world, Météo-France was looking for more and more meteorological data, especially from the oceans. In the Caribbean region, meteorological hazards such as hurricanes, with accompanying violent winds, heavy rain, strong swell and storm surges, come from the sea. Good forecasts were needed to prepare adequate warnings for inhabitants, and the surrounding oceanic area was data sparse. The aim of the panel to increase the amount of available data was therefore most welcome.

1.1.3 Mr Merlet concluded by recalling the number of responsibilities falling on Météo-France, including that of Regional Meteorological Specialized Centre for cyclone forecasts in the South-Western part of the Indian Ocean. Some 10% of Météo-France staff were working overseas, which explained why Mr François Gérard, Deputy Director of Météo-France for overseas, was attending the meeting.

1.1.4 Mr Gérard expressed his pleasure to open the session of the DBCP on behalf of Mr J.-P. Beysson, Director-General of Météo-France and first vice-president of WMO. He recalled that Météo-France had already hosted sessions of the panel, in Toulouse and in La Réunion. Three reasons, nevertheless, made the present eighteenth session different from the others.

1.1.5 The first reason was geographical. The West Indies is a region of the world where risk awareness and vigilance towards atmosphere and ocean are well developed. Names such as Hugo, Mitch, George and, more recently, Lili, are all alive in memories. Authorities and the general public know the benefit they can derive from operational monitoring and forecasting of the environment. Groups such as the DBCP are highly appreciated, since cooperation is a necessity for small state islands in their attempts to develop and use the tools for maintaining risk awareness and producing forecasts.

1.1.6 The second reason was the timing. This session is taking place ten years after Rio, in a world where operational oceanography has become mature and has been recently recognized by the World Summit on Sustainable Development as an important activity towards meeting its aims. The work of the DBCP over almost twenty years is a example of what has to be done at the national and international levels to promote and develop operational oceanography. With the establishment of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology, the panel has found a convenient institutional system in which it appears as a key player.

1.1.7 The third reason was more “domestic”, at least at first glance. Operational oceanography pertains to the Météo-France long-term strategy, not only internally but within the context of various cooperative programmes. The MERCATOR project, developed to build an ocean forecasting system within the Global Ocean Data Assimilation Experiment, is one of those programmes, as well as the CORIOLIS initiative, which focuses on a data collection and assembly center for Argo and JCOMM and encompasses various cooperative sub-projects. Other cooperative projects are being developed within other European fora, all denoting improvements on the present status of cooperation.

1.1.8 In concluding, Mr Gérard highlighted that cooperation was the key to the successful development of operational oceanography – a key that had been since the beginning the rationale behind the success of the panel. He therefore expressed his confidence in the full success of the session.

1.1.9 On behalf of the Secretary-General of WMO, Professor G.O.P. Obasi, and the Executive Secretary IOC, Dr P. Bernal, the Secretariat representative expressed his sincere appreciation to Météo France, and to the Prefect, Administration and people of Martinique, for hosting the meeting and for providing such excellent facilities and environment. In doing so, he paid particular tribute to Jean Roland and Michel Trémant for their excellent work in organizing and supporting the meeting. The Secretariat representative then noted that the DBCP had achieved an enormous success in the eighteen years of its existence, and was now serving as an example for the development of other components of the operational ocean observing system coordinated through JCOMM. In particular, the JCOMMOPS facility was assuming considerable significance as an operational support tool for JCOMM, and he hoped that the panel would assist JCOMM in the further development and expansion of this facility. The Secretariat representative concluded by wishing participants a successful meeting, and assuring them of the full and ongoing support of the joint Secretariat.

1.1.10 Speaking on behalf of the French Government and in the name of the citizens of Martinique, Mr Michel Cadot, Prefect of Martinique Region, thanked the panel for having selected the "Island of Flowers" for the present session, thus demonstrating the panel's interest for the region. He highlighted that, after volcanic and seismic hazards, the cyclonic hazard was the most important danger in the region. The operational forecasting centre of Météo-France in Martinique is assisted by a similar centre in the sister island, La Guadeloupe, and ensures, in close connection with the National Hurricane Centre in Miami, the monitoring of cyclonic activity in the Atlantic and the Caribbean Sea.

1.1.11 Cyclonic hazards may now be forecast with a reasonable precision, even if there is still room for progress. In this field, buoy data are of the utmost importance to improve the quality of the forecast. France has deployed two offshore moored buoys, located in the Atlantic at 300 and 500 km from the islands, respectively. Other platforms, such as small coastal boats, gather oceanic variables, mainly to monitor the swell and calibrate numerical models.

1.1.12 In the environmental domain, international cooperation is essential. In the region, Météo-France is currently engaged in two important projects: the "Caribbean Radar Network", funded by the European Community, aims at implementing a significant number of new radars in several countries, from Guyana to Central America, to provide a composite image; the other one, called CARIB-HYCOS, developed under WMO sponsorship, aims at creating in the region a centre for hydrological resources, in order to develop skills in the hydrological field, especially with regard to flash floods caused by severe rains.

1.1.13 Mr Cadot noted that, in addition to its operational activities, the panel is also supporting research, more especially in the field of climate studies and long-range weather forecasting, a crucial topic for the planet as a whole. It is a challenging series of activities, which cannot be over-estimated. Mr Cadot concluded in wishing the session a full success and the participants a cheerful and pleasant stay in this beautiful and sunny island.

1.2 OPENING OF THE SESSION

1.2.1 The Eighteenth Session of the DBCP itself was opened by the Chairman at 13.30 hours on Tuesday 15 October, at the same location as the workshop. The list of participants in the session is given in *Annex I*.

1.3 ADOPTION OF THE AGENDA

1.3.1 The panel adopted its agenda for the session as given in *Annex II*.

1.4 WORKING ARRANGEMENTS

1.4.1 Under this agenda item, the panel decided on its working hours and other arrangements for the conduct of the session. The joint Secretariat introduced the documentation.

B. IMPLEMENTATION COMPONENT

2. IMPLEMENTATION REPORTS

2.1 TECHNICAL COORDINATOR.

2.1.1 The technical coordinator, Mr. Etienne Charpentier reported on his activities on behalf of the panel during the period 1 September 2001 to 31 August 2002. As for the previous years, he was employed by IOC and based at CLS, Toulouse, France. About 11% of time was spent on JCOMM related issues, mainly to attend JCOMM meetings (OCG-1, ET-ODRRGOS), and operate and develop JCOMMOPS. About 30% of time was spent on SOOP and 2% on Argo (Argo TC training, supervision & support, team work). The rest of the time was devoted to the DBCP.

2.1.2 During the period, he attended the following meetings:

- 5th IBPIO annual meeting, 17th DBCP session, and 21st JTA meeting, Perth, October 2001;
- GTSPP meeting, Brest, November 2001 ;
- Expert Team on Observational Data Requirements and Redesign of the GOS, Geneva, January 2002;
- 1st meeting of the JCOMM Ship Observations Team (SOT), Goa, February 2002;
- 1st meeting of the JCOMM Observations Coordination Group (OCG), La Jolla, April 2002. While in La Jolla, he also discussed specific DBCP issues with Peter Niiler, and Andy Sybrandy.
- 1st meeting of the DBCP-PICES North Pacific Data Buoy Advisory panel (NPDBAP), Victoria, June 2002;
- 12th IABP meeting, Ottawa, June 2002;
- 9th ISABP and 6th IBPIO meetings, Cape Town, July 2002.

2.1.3 The technical coordinator presented the status of buoy programmes. He reported that in July 2002, in addition to the 120 meteorological moored buoys reporting in SHIP format (e.g. USA, Canada, UK), 707 buoys reported SST on the GTS in BUOY code, and 304 reported air pressure. Thanks to the inclusion of a Southern Ocean Buoy Programme in the DBCP implementation strategy, the number of drifting buoys reporting air pressure south of 40S increased substantially in 2002. About 90 drifting buoys are committed by Australia, France, New Zealand, South Africa, UK, and USA for the SOBP during the period September 2002 to August 2003.

2.1.4 He stressed that recent impact studies showed that surface air pressure data are valuable for NWP (12th session of COSNA-SEG, Reading, May 2002). In particular, it was shown that data available at high temporal frequency should be distributed at least hourly as 4D-Var data assimilation systems or analysis systems with frequent update cycles can make excellent use of hourly data. This was particularly demonstrated for SYNOP and BUOY data using the ECMWF 4D-Var data assimilation system. Also, an Observing System Evaluation (OSE) conducted at the German Weather Service for the period 10-31 July 2001 showed that (i) withholding all surface observations (synop, ship, buoys) results in a large deterioration of the forecast quality, (ii) benefit is higher in the Southern Hemisphere and Tropics than in the Northern Hemisphere, (iii) impact of ships or buoys alone is less but noticeable, (iv) as opposed to winter cases, benefit of buoys are slightly higher than ships in the Northern Hemisphere, (v) benefit of buoys is slightly greater than that of ships in the Southern Hemisphere, (vi) neither ship or buoy pressure observations had any impact in the Tropics, (vii) in individual cases, ships or buoys have a significant impact on the forecast quality for Europe and the whole Northern Hemisphere, and (viii) overall, the impact for the summer period is less than for the winter period.

2.1.5 The panel agreed that it should take this into account when revising its implementation strategy (see agenda item 4).

2.1.6 A study was conducted for the Argos Operations Committee (OpsCom) regarding buoys which are not reporting on the GTS. A peak of about 800 buoys reporting on GTS was observed in mid-2000 thanks to extra 1998 "YOTO" drifter deployments still operational at that time. However, after these additional drifters ceased operating the number of drifting buoys reporting on the GTS dropped to 576 in March 2002. About 50% of the buoys reporting via Argos do report on the GTS. The remaining 50% account for not relevant buoy programmes (i.e. no geo-physical sensor, biological experiments, oil following, short programmes), poor quality, pre- or post-operational buoys, technical obstacles (e.g. complicated Argos message format), not authorized data distribution (small number of buoys actually fall in the latter category).

2.1.7 A substantial amount of time was spent to assist users in setting up buoy programmes and/or facilitating insertion of the data onto the GTS, resolving technical problems (e.g. data missing from GTS), providing them with technical information (e.g. Argos, GTS, Lagrangian drifters), or information on the status of buoy programmes. DBCP publications had been sent to users when required.

2.1.8 The technical coordinator also provided assistance to CLS/Service Argos with regard to the development and implementation of the new version of the BUOY code and development of the BUFR code which is due for implementation in early to mid-2003 (see agenda item 8.2 for details).

2.1.9 Other tasks performed during the inter-sessional period included: (i) operating the DBCP quality control guidelines, (ii) continuing development of JCOMMOPS (see 8.5), including database, associated tools, and specific web pages, (iii) participating in the CBS Expert Team on Observational Data Requirements and redesign of the GOS, (iv) conducting a study on GTS delays together with David Meldrum (see agenda item 8.6.2), (v) assistance with regard to the establishment of the new DBCP-PICES NPDBAP action group, (vi) working with the DBCP Evaluation Group (e.g. definition of DBCP ocean areas), (vii) advertisement of DBCP safety recommendations, (viii) working on the definition of a metadata specifications sheet with EGOS Technical Secretary, Ms. Anne Hageberg, (ix) producing specific reports and statistics, etc.

2.1.10 The full report of the technical coordinator is given in *Annex III*. The panel expressed its considerable appreciation to Mr Charpentier for the substantial amount of work he had accomplished in support of the DBCP in the past year, especially taking into account his additional tasks as leader of JCOMMOPS.

2.2 ACTION GROUPS AND RELATED PROGRAMMES

2.2.1 Under this agenda item, the panel was presented with reports by its action groups, viz:

- the European Group on Ocean Stations (EGOS) (verbal presentation by Ms Elizabeth M. Horton on behalf of the EGOS officers);
- the International Arctic Buoy Programme (IABP) (verbal presentation by Ms Estelle Couture, on behalf of the IABP officers);
- the International Programme for Antarctic Buoys (IPAB) (verbal presentation by Dr Enrico Zambianchi, IPAB chairperson);
- the International South Atlantic Buoy Programme (ISABP) (verbal presentation by Mr Louis Vermaak technical coordinator, ISABP);
- the International Buoy Programme for the Indian Ocean (IBPIO) (verbal presentation by Dr K. Premkumar, vice-chairman of IBPIO);
- the Global Drifter Programme (GDP) (verbal presentation by Mr Craig Engler, Manager of Global Drifter Center); and

- the Tropical Moored Buoys Implementation panel (TIP) (verbal presentation by Mr Paul Freitag, TAO Project Manager).

A summary of the presentations is reproduced as *Annex IV*. As usual, the full reports of the action groups will be reproduced in the panel's annual report.

2.2.2 A few questions and/or comments were raised concerning these presentations:

(i) It was recommended to do an analysis on a possible relationship between drogue lifetime and manufacturer; the analysis should also cover the physical location of drogue failure;

(ii) There were ongoing and increasing problems for buoy deployments in the South Atlantic, South Pacific and Indian Oceans, in particular related to changes in shipping patterns. It was hoped that the recruitment of new participants, in particular to the IBPIO, might help in identifying new deployment opportunities from merchant ships;

(iii) Subsurface observations by buoys were also important. Ocean sensors for subsurface observations (temperature, salinity, current) would be added to all buoys and coastal stations operated by NDBC.

2.3 NATIONAL REPORTS

2.3.1 The panel had received written reports on current and planned buoy programmes from Australia, Brazil, Canada, India, Ireland, Italy, Japan, Korea (Republic of), Netherlands, New Zealand, South Africa and USA. As usual, these reports, as well as others submitted to the Secretariat before 30 November 2002, will be published in the panel's annual report.

2.3.2 The panel noted with particular interest the report by Dr Paul Moersdorf, Director of the National Data Buoy Center, NOAA, USA, on plans for a major restructuring of operational ocean activities within NOAA. The coastal moored array will total 85 by 2004. Between 2004 and 2008, NDBC will add ocean temperature, wave, current and salinity measurement capability to their buoys and coastal stations. Additionally, NDBC is collecting data from U.S. regional observatories in the Gulf of Maine and off the Southern U.S. coasts, including the Gulf of Mexico. NDBC is hosting buoy data from the U.K., Canada and France, as well as preparing to host the North Pacific Data Buoy Advisory panel on its web site. Finally, NOAA is studying combining many of its observing systems under one operational agency, and that has been recommended to be NDBC. Presently, NOAA's Pacific Marine Environmental Laboratory (PMEL) is beginning to transition the Pacific tsunami buoy array to NDBC. At the same time, PMEL and NDBC are developing a transition plan for consideration and approval by the NOAA Executive Council, with the ultimate aim of transferring the operation of the TAO and PIRATA arrays from PMEL to NDBC. If the plan is accepted, and once the tsunami buoy array transition is complete, PMEL will begin the transition of operational responsibility for TAO and PIRATA to NDBC.

2.3.3 The panel recognized that, in particular, the proposed transfer of operations of the TAO and PIRATA arrays from PMEL to NDBC would be of the utmost importance to its activities, since tropical moored buoy arrays were key elements of the present ocean observing system and provided essential data for climate research and the advancement of climate prediction. It therefore urged NOAA to ensure that the transfer of operating responsibility from PMEL to NDBC did not compromise the quality or quantity of moored time series data, and that the transition did not disrupt the operational and research applications of the data. The panel reiterated the importance of continued funding support at the required level, for both the operation of the arrays, and also the associated research and other applications, during and following the transfer. It agreed that strengthened research and operational data applications were highly desirable outcomes of the transition.

2.4 ARGO

The Argo Science Team (AST)

2.4.1 The panel noted the report by the Argo Science Team, which is reproduced in *Annex V*. It further noted that implementation of the global Argo array was proceeding quite well. As of 9 September 2002, 549 profiling floats were active in the Argo programme. Floats funded in 2002 would be available for deployment between the time of the session and the end of 2003 and would nearly double the number of active floats by the end of 2003. While the ocean basins of the northern hemisphere continue to progress fairly rapidly towards the global array 3^ox3^o grid, the southern oceanic regions remain a concern for the Argo Science Team. The next two years, however, would likely see a rapid increase in float deployments in all ocean basins south of 40 ºS. Deployments in the central and northern Indian Ocean were also increasing. Maintenance of the global array would require approximately 825 floats per year (assuming a 10% failure rate in the first two years). Anticipated funding for float acquisition from 2003 to 2005 (likely available for deployment in 2004 through 2006) exceeded this level and while the funding in 2003 and beyond had some uncertainty for many programmes, this level of commitment was indicative that there was a great deal of international support to implement Argo and strong intentions to attain the global array within the period of the Global Ocean Data Assimilation Experiment.

The Argo Information Centre (AIC)

2.4.2 The panel noted the report by the AIC. Discussion on this topic was deferred to agenda item 8.5 – JCOMMOPS.

2.5 EVALUATION GROUP

2.5.1 The panel noted with interest that the members of the Evaluation Group worked on several key items during the intersessional period. These included a major study on the WOTAN technique for wind speed measurements, new drifter hardware and software upgrades, some progress on the drogue dropping issue, some problem with GTS distribution identified, and progress on DBCP definitions.

2.5.2 The results of the WOTAN study indicated that wind speed calculated from the 8 kHz values were correct, but the algorithm for the 2 kHz was wrong. Best results were obtained in the 2-6 kHz range. If wind data falling 2.5 std outside the range were removed, rms errors were reduced to 2.2 m/sec. The study also found that there was a slope change at 17.5 m/sec, perhaps due to the formation of breaking waves. Software changes were being implemented, and additional test deployments were planned, for the next intersessional period. (The Chairperson thanked Météo-France for their excellent work.)

2.5.3 Drifters were built with 28 bit ID's and using the DBCP M-2 standard format with good results. Some tests were done using metallic versus plastic pressure port membranes, and a new drogue attachment scheme had been developed and would be tested.

2.5.4 In general, it was recommended that manufacturers use standard DBCP M-1 and M-2 formats to reduce the risk of errors and to ensure that the data went out over the GTS.

2.5.5 The panel noted with appreciation that, as a result of the work of its Evaluation Group in particular, the quality of drifter data continued to improve. It therefore commended the Group for its achievements, as well as for its plans to work on additional improvements, which were well underway.

3. NEW ACTION GROUPS

3.1 Under this agenda item, the panel recalled that, at its sixteenth session (Victoria, October 2000), it had recognized the potential to expand the deployment and maintenance of a network of drifting buoys in the North Pacific through a cooperative programme involving countries on both sides of this important ocean region. It therefore had supported the proposal by Canada to survey all potentially interested countries in the region, in order to assess interest in the establishment of a North Pacific Buoy Programme (and possible eventual action group).

3.2 Over 2001, meetings were held with PICES (the North Pacific Marine Science Organization) towards the establishment of a subgroup (called an Advisory panel) to their Physical Oceanography and Climate Committee (POC). PICES accepted the concept of this new group and, at its seventeenth session (Perth, October 2001), the panel endorsed the proposal to establish a North Pacific action group, with participation from the PICES Advisory panel. It had requested Canada to work with the Secretariats to organize a preparatory meeting for such a group in the first half of 2002.

3.3 The panel was presented with the outcomes of the first meeting of the North Pacific Data Buoy Advisory panel (NPDBAP) (Victoria, June 2002), where the terms of reference and operating principles of the new body had been adopted (see *Annex VI*). The panel formally approved the proposal for the establishment of NPDBAP as an action group of the panel.

4. REVIEW OF THE DBCP IMPLEMENTATION STRATEGY

4.1 The panel recalled that it had reviewed its Implementation Strategy at its previous session and agreed that this review process should continue at each annual meeting, in view of ongoing developments in requirements for buoy data, as well as advances in buoy technology. In this context, it undertook a further review of the latest version of the strategy. Noting the increased adoption by NWS's of 4D assimilation schemes that allowed full use to be made of all hourly data, and the demonstrable advantage that accrued from the use of such observations, the panel recognized that hourly data from AWS's such as data buoys would assume increasing importance in coming years. It therefore agreed that the Implementation Strategy should be modified to include specific reference to such data, and that buoy manufacturers and CLS should be actively encouraged to take the necessary steps to allow all hourly data to be collected and disseminated on the GTS. Provided there was agreement from buoy operators, CLS/Service Argos and Service Argos Inc. were requested to change the technical files as implemented within the GTS Sub-system for those buoys which were presently transmitting hourly data through the system, so that these hourly data were inserted onto the GTS. The chairman was also requested to write to manufacturers in this regard. Other aspects of the strategy were updated to reflect changes in the status of various satellite communications systems, web site addresses, etc.

4.2 No other major modifications were noted during the meeting; however, participants were requested continue the review after the meeting, and to pass any additional suggestions for modifications to the vice-chairman, David Meldrum, by 30 November 2002 at the latest. The panel agreed that, in view of its highly dynamic nature, the Implementation Strategy should continue to be published and made available only through the DBCP web site, as was the case at present.

4.3 The panel discussed the Southern Ocean Buoy Programme (SOBP), which was part of its implementation strategy. It recalled that at its last session, it asked the technical coordinator to compile the list of proposed Member States' commitments for 2003 in the Southern Ocean (i.e. south of 40S to the sea ice zone). The technical coordinator reported figures provided by Member States so far. These could be summarized as follows: (*see next page*)

4.4 The panel was pleased to hear that the total number of buoys committed for 2003 surpassed the proposed level of deployments for that region according to the DBCP Implementation Strategy, i.e. about 80 units. It thanked Member States for their continuing support to make air pressure measurements using data buoys in this data sparse area and asked the technical coordinator to coordinate this exercise again for the next panel session.

Country	Buoys purchased SO	Additional upgrades SO	Total
Australia	7	10	17
France	3	5	8
New Zealand	5	6	11
South Africa	20	0	20
UK	3		3
USA	31	0	31
Total	69	21	90

5. JCOMM ACTIVITIES RELEVANT TO THE DBCP

5.1 The panel was informed that a substantial number of activities had taken place under or in support of JCOMM since DBCP-XVII. These included:

(i) The International Conference "Oceans and Coasts at Rio+10", Paris, December 2001;
(ii) The first session of the JCOMM Management Committee, Geneva, February 2002;
(iii) Sessions of all four Programme Area Coordination Groups (Geneva, April and June 2002, Paris, May 2002, La Jolla, April 2002);
(iv) The first session of the Ship Observations Team, Goa, February-March 2002;
(v) The fifth session of the GOOS Steering Committee, Paris, May 2002.

The chairman of the panel had participated in the session of the Observations Coordination Group, and the technical coordinator participated in both the OCG meeting and the session of the SOT. The presentations on JCOMM made to both the Paris Conference and the GSC session included specific references to the work of the panel within the overall integrated ocean observing system coordinated by JCOMM.

5.2 The panel noted that there were a number of specific actions undertaken within, or arising from these meetings which were of direct relevance to the DBCP, viz.:

(i) A technical workshop was included as an integral part of the SOT session, modelled on the very successful DBCP workshops. Proceedings from this have been published as a CD-ROM only;
(ii) The SOT also agreed that, in future, it would continue as a fully self-funding body, again following the DBCP model. The second session of the SOT is scheduled for IMO in London, in either July or September 2003;
(iii) The SOT established, inter alia, Task Teams on JCOMMOPS and on Instrument Testing and Intercalibration. The former was to develop a plan for the possible expansion of JCOMMOPS activities to support SOT coordination. The technical coordinator was a member of this team, and the panel agreed that its chairman should also be a member of the team. The panel also agreed that it should be represented on the instrument team, in view of the relevance of its work to that of the DBCP in this field. It nominated Ms Beth Horton, chairperson of the DBCP Evaluation Group, to undertake this representation.
(iv) The OCG was to develop a set of metrics to evaluate overall observing system performance in terms of requirements, taking into account existing metrics such as those prepared by Météo France for the DBCP. The technical coordinator was directly involved in this work;
(v) As part of its review of the overall observing system, the OCG identified as priorities a 50% increase in SST buoys, equipping all buoys with barometers, and enhancing ice buoy deployments;
(vi) The OCG requested the technical coordinator to do a feasibility study for expanding the existing buoy QC guidelines to also cover VOS observations;
(vii) The OCG reviewed the problem of vandalism, in particular of deep-ocean moorings, without being able to offer any concrete solutions;

(viii) The Data Management Coordination Group was in the process of identifying one or more centres to maintain the ODAS metadata archive, as requested by JCOMM-I;

(ix) The Capacity Building Coordination Group was undertaking regional surveys of national capacity building requirements in support of JCOMM. Priorities arising from these surveys relevant to the panel would be brought to its attention in due course.

5.3 The panel underlined the importance of the work now being undertaken by the OCG to develop integrated observing system performance metrics for JCOMM. It recognized that such metrics were essential to the proper management of the integrated observing system in support of the operational data requirements of the WWW, GOOS and GCOS. It also recognized that the observational data provided essential support to a range of research applications, and therefore urged that the system evaluation metrics should also cover the value of JCOMM observational data to research.

6. SCIENTIFIC AND TECHNICAL WORKSHOP

6.1 The Scientific and Technical Workshop of the eighteenth session of the DBCP was introduced by the workshop chair, Mr Eric Meindl (USA) at approximately 10.00 hours on Monday, 14 October 2002. The workshop was divided into three sessions. Ms Estelle Couture (Canada) chaired Session 1, "*Research Studies and results Using Buoy Data*"; Ms Elizabeth Horton (USA) chaired Session 2, "*Applications of Buoy Data in Operational Meteorology and Oceanography, particularly in the Tropics*"; and Mr Craig Engler (USA) chaired Session 3, "*Developments in Coastal and Ocean Observing Platforms and Communication Systems*". Sixteen papers were submitted in advance and it was possible to add two more of particular interest to panel members during the workshop. The panel agreed that the workshop proceedings would be published on CD-ROM only, with copies sent to all who attended. Authors were requested to submit their papers via e-mail or CD-ROM to the workshop chair no later than 30 November 2002 to be included in the proceedings. The preferred format is MS Word. At the conclusion of the workshop, Mr Meindl expressed special thanks to Mr Jean Rolland and Mr Michel Trémant (Météo France) for their assistance in the organization and smooth running of the workshop. The panel expressed its sincere appreciation to Mr Meindl for his efforts in the organization of the workshop.

6.2 The panel agreed to conduct another workshop with its session in 2003, which should focus again on applications of buoy data, and should include three main sections, with if possible a particular focus on the meteorology and oceanography of southern ocean regions:

- research applications
- operational applications
- buoy technology and communications

The panel accepted the kind offer of Mr Meindl to again undertake the organization of this workshop. The workshop concluded at 10.00 hours on Tuesday 15 October 2002.

7. DATA AND INFORMATION EXCHANGE

7.1 REPORTS BY BUOY DATA MANAGEMENT CENTRES

7.1.1 Under this agenda item, the panel reviewed the reports of the IOC International Oceanographic Data and Information Exchange (IODE) Responsible National Oceanographic Data Centre (RNODC) for drifting buoys, operated by the Marine Environmental Data Service (MEDS) of Canada; and of the JCOMM Specialized Oceanographic Centre (SOC) for drifting buoys, operated by Météo-France. A summary of the reports is reproduced as *Annex VII*. As usual, the full reports of the data management centres will be published in the panel's annual report.

7.1.2 The panel expressed its appreciation both to MEDS and Météo-France. The panel noted that the status of all the JCOMM SOCs was being reviewed by an *ad hoc* task team established by the JCOMM Management Committee, specifically in the context of the major infrastructure issues facing both the data management and services programme areas. The panel reiterated that the activities by Météo-France had been and would continue to be very important to the DBCP, no matter what the eventual status of JCOMM SOCs might be.

7.1.3 The panel invited the technical coordinator and MEDS to coordinate their work for the development of dynamic maps made available via the web so that the tools offered by MEDS on one hand, and JCOMMOPS on the other hand were complementary. It was noted that these products served slightly different purposes, i.e. (i) data inventory and data access for the MEDS products, and (ii) programme status and implementation for the JCOMMOPS products. The technical coordinator and Estelle Couture agreed to coordinate such developments during the next inter-sessional period.

7.2 INFORMATION EXCHANGE

7.2.1 The panel reviewed the different media it was using for exchanging technical information and advertising its activities.

Web site

7.2.2 Web site moved during the inter-sessional period and URL changed. The new URL was http://www.dbcp.noaa.gov/dbcp/. However, it was still hosted by NOAA/OAR/AOML in Silver Spring, Maryland.

7.2.3 The technical coordinator provided an overview of the information available from the web site. New pages were added, and many pages updated in the last 12 months. Some of the new web pages were actually hosted by JCOMMOPS. New features realized during the last inter-sessional period included

(i) DBCP monthly dynamic status map (i.e. zoom, click on a buoy to get information, http://w3.jcommops.org/WebSite/DBCP),
(ii) links to products developed and made available elsewhere such as the Information Service Bulletin on non-Drifting Ocean Data Acquisition Systems (ODAS) which is operated by MEDS,
(iii) recent DBCP recommendations on safety,
(iv) allocation of WMO numbers to specific transmitting platforms (http://w3.jcommops.org/cgi-bin/WebObjects/WMO_Telecom),
(v) query and list of contact points,
(vi) information on mailing lists (how to register, etc.),
(vii) query and list of meetings of interest to the buoy community,
(viii) JCOMMOPS generic database search Engine,
(ix) a glossary and list of acronyms, and
(x) query and access to documents referenced in the JCOMMOPS database (http://w3.jcommops.org/cgi-bin/WebObjects/Doc).

7.2.4 Other pages were updated such as the list of DBCP recommended Argos message formats, information on deployment opportunities according to new information provided to the technical coordinator by National contacts, survey on data collection and location systems by David Meldrum, the web page on current DBCP activities and highlight, the list of DBCP publications (some in electronic form), and status graphics.

7.2.5 The technical coordinator reminded the panel of existing web pages which also contained interesting features. These included information on SVPB upgrade opportunity, the web page on DBCP efficiency and achievements, the list of GTS bulletin headers, the list of impact studies regarding data buoys, information on vandalism on data buoys including advice to fishermen and mariners, the document describing benefits of authorizing GTS distribution of buoy data, the document explaining how to practically insert buoy data on GTS, information on buoy monitoring statistics as well as links to archived statistics, data flow monitoring tools, link to MEDS which provides access to archived QC messages produced by PMOCs in the context of the DBCP QC Guidelines, and a specific page on buoy deployment and recovery.

7.2.6 The panel agreed that the web site was an excellent tool for delivering useful information to panel members, buoy operators, and data users. However, the panel reiterated that in order to keep the web site up to date, panel members were invited to regularly provide the technical coordinator with the latest information on deployment opportunities and deployment plans. The panel also invited the panel members and the action groups to provide national and action group annual reports respectively in electronic form to the Secretariats and the technical coordinator for inclusion in relevant DBCP web site pages.

Internet technical forum

7.2.7 The panel agreed that although it was not extensively used by panel members, the DBCP internet technical forum (http://forum.jcommops.org/) was a useful tool to exchange information. It invited its members to use it more often. It noted that the conclusions from the discussion of the DBCP Evaluation Group on definitions, including DBCP ocean area definitions were placed on the forum.

Electronic mailing lists

7.2.8 The following mailing lists are presently available for the buoy community:

- dbcp@jcommops.org, dedicated to panel members and attendees to panel sessions for exchange of general information on the panel's activities.
- buoys@jcommops.org, dedicated to buoy operators and technical discussions on buoy matters (e.g. buoy technology, data telecommunication).
- Buoy-qc@vedur.is, dedicated to deferred time quality control (QC guidelines).
- dbcpeval@jcommops.org, dedicated to the DBCP Evaluation Group.

7.2.9 The panel agreed that the mailing lists which are routinely being used in the community were excellent tools for information exchange. Persons interested to appear in the mailing list(s) are invited to contact the person in charge (details at:
http://www.jcommops.org/mailing_lists.html#DBCP).

Publications

7.2.10 During the inter-sessional period, the DBCP published its Annual Report for 2001 as Technical Document No. 20 (also available via the web), and the proceedings of the October 2001 workshop in Perth as Technical Document No. 21.(available on CD-Rom and via the web only).

7.2.11 Publications No. 2, Argos GTS sub-system reference guide, No. 4, SVPB drifter design reference, and No. 15, DBCP implementation strategy, were edited as revised versions. All 3 publications are available in electronic form via the DBCP web site. No. 2 and 4 are also available in paper form and can be obtained from the technical coordinator.

7.2.12 Publication No. 3, Guide to data collection and localization services using Service Argos, still needs to be updated.

7.2.13 The panel agreed that publishing DBCP publications on CD-Rom was cost effective and as useful as in paper form and therefore agreed that this should be considered as the preferred approach.

Brochure

7.2.14 The Secretariat reported that the new version of the brochure kindly published by the BOM was now available in English, Spanish, and French. Copies can be obtained from the technical coordinator if required. The panel thanked the BOM for it's kind contribution in this regard.

8. TECHNICAL ISSUES

8.1 QUALITY CONTROL

8.1.1 The technical coordinator reported on how DBCP quality control guidelines had been operated during the period 1 August 2001 to 31 July 2002. For 1248 buoys which reported onto the GTS during the period, 119 status change proposals were made by PMOCs. Compared to previous years, overall activity was slowly decreasing probably because the meteorological centres had now more confidence in the data and because buoys tended to report less systematic errors. QC guidelines themselves aimed at eliminating these systematic errors. However, PMOCs continued to rely on the scheme to eliminate the errors, and activity was still substantial with 5 to 10 reports issued a month in average.

8.1.2 The technical coordinator then presented the various tools, including web based, which were now available to monitor the quality of the data (UKMO, NCEP/NCO, Météo France, MEDS, etc., see http://www.dbcp.noaa.gov/dbcp/0qc.html). He reported that quality of air pressure buoy data was excellent (i.e. 1 hPa RMS (Obs.-FG) in average), including air pressure from SVP barometer drifters (also 1 hPa RMS).

8.1.3 The technical coordinator also reported that as requested at the last DBCP session, after consultation with key PMOCs (France, Japan, UK, USA) he had drafted a proposal for integrating the DBCP QC guidelines within JCOMM. The proposal which originally included provision for the relay of quality information of buoy, XBT and float data was presented at the first meeting of the JCOMM Observations Coordination Group (OCG), La Jolla, April 2002. Further discussion with the SOOP, Argo and VOS programmes led to the following conclusions: (i) SOOP and Argo were developing their own data quality control schemes and associated relay mechanism so there was in fact no need to integrate XBT and float data in the new proposed JCOMM scheme, (ii) XBT and float profiling data were specific observing systems for which the proposed scheme might not be applicable, and (iii) VOS programme, however would benefit from such an integrated scheme. OCG-I therefore requested that a feasibility study should be made of the VOS aspect, despite the fact that the VOS were not yet a part of JCOMMOPS. If the study, to be assessed by the chairman of the OCG and the Secretariat, proved it to be realistic, the coordinator was requested to proceed with implementation. On the other hand, the group did not consider it appropriate to implement the proposal for SOOP, Argo and ASAP for the time being.

8.2 CODES

BUOY

8.2.1 The new version of the BUOY code (FM-18-XII) was implemented by CBS on 7 November 2001. However, specific developments had to be conducted at Service Argos, and this version could only be implemented at Service Argos on the 27 March 2002. Since the previous version of the code was compatible with the new version, late implementation at Service Argos had no operational impact for those meteorological centres who implemented new decoders as early as 7 November 2001. New version permitted in particular to encode variables such as buoy type, drogue type, anemometer height and hydrostatic pressure information for thermistor strings.

8.2.2 The panel recommended to buoy operators to routinely provide Service Argos with buoy type, drogue type and anemometer height information so that the information was properly encoded in BUOY reports and made available to the users.

BUFR

8.2.3 The technical coordinator reported on the developments of the BUFR code within the Argos GTS sub-system as recommended by the panel at its XVIIth session, and finally adopted by the XXIst JTA meeting for inclusion in the Argos development programme. Development project started in January 2002. Operational implementation was planned for early 2003.

8.2.4 He recalled that at its last meeting, Prague, 22-26 April 2002, the Expert Team on Data Representation and Codes reviewed in particular the template to be used for GTS distribution of buoy data in BUFR. The proposed template is given in *Annex VIII*. The panel noted that small changes could still be proposed to this template if required (through the TC who is participating in the CBS ET).

8.2.5 The technical coordinator stressed that new software would have to be extensively tested before actual operational implementation. Test BUFR reports would be distributed to willing operational centres for decoding, notification of possible encoding problems, and correction of the problems. This would also leave some time for operational centres to tune their decoding software. The panel invited centres interested in participating in such tests to contact the technical coordinator. Operational implementation of the new software within the Argos GTS sub-system as well as operational distribution of BUFR report would start when the produced BUFR reports would be properly encoded and accepted by those centres involved in the tests. Test period was expected to last for two or three months in early 2003. Operational distribution should therefore probably start in mid-2003.

8.2.6 The panel stressed that a number of countries would not necessarily be able to decode and assimilate BUFR reports automatically and that (i) BUOY reports should continue to be distributed in parallel to BUFR reports during a relatively long period (i.e. several years), and (ii) easily portable BUFR decoding software should eventually be made available. Panel members who developed such software were invited to make it available to the community.

8.3 ARGOS SYSTEM

Operations

8.3.1 The panel noted with interest a presentation by CLS and Service Argos Inc on the present status and future enhancements of the Argos system. Argos systems operated aboard 6 NOAA satellites in 2002. Three of these were second generation systems (Argos 2) on board NOAA 15(K), NOAA 16(L) and NOAA 17 (M). The two satellites currently designated as operational by NOAA remained NOAA 15 and NOAA 16. Thus, expanded receiver bandwidth was available operationally and all Argos users were urged to take advantage of the improved performance possible by transmitting outside the Argos 1 band. Some delays were occurring in the receipt of the Argos global data due to the termination of Stored Tiros Information Processing (STIP) data receipt by the antenna at Lannion. The real-time (bent pipe) data receipt performance continued to improve with the addition of 8 new regional stations during the last 12 months: Buenos Aires, Oslo, Las Palmas, Nouméa, Réunion #2, Singapore, Hatoyama, Oslo.

8.3.2 The global processing centers at Largo and Toulouse continued to operate without a problem with an operational reliability of 99.9%. The Internet was the primary communication link to receive and distribute data and the dedicated 64K transatlantic line between Largo and Toulouse was replaced in 2001 by an Internet link and a 128K ISDN backup. The Internet access of each global center had been upgraded from 512 kbps to 1 Mbits. Data availability continued to improve with 86% of the real-time data being available within 30 minutes and 2/3 of the Argos data being retrieved in real-time.

Enhancements

8.3.3 Regarding computers and software, most of the work had been dedicated to the Argos 2001 project and the preparation of the Argos Downlink. As per Argos 2001, the Argos new user interface on the web had been completed and the data access module would be open shortly to some beta testing users. It would be available to all users at the beginning of year 2003.

8.3.4 The ADEOS-II launch was scheduled for December 2002 and all preparatory tasks for the Argos Downlink, such as the Downlink Message Monitoring Center (DMMC), User Interface, Master Platform network implementation would be completed at CLS/SAI by the end of 2002. 200 downlink receivers will be available in November 2002. Platform Messaging Transceivers (PMTs) , the new Argos terminals including transmitting and receiving capability, would be available for integration into platforms in early 2003. All manufacturers could also benefit from receiver and simulator tool kit to integrate the receivers in their platforms.

8.3.5 In order to enhance the timeliness of Argos data, especially in tropical areas, cooperation with the Brazilian space agency, INPE, was ongoing. INPE had 3 satellites in orbit and planned to launch 5 more within the next 4 years, all compatible with Argos-2. Preliminary tests showed that these satellites provided 40% of additional data in tropical regions around Brazil. CLS was doing a cost and performance evaluation to explore the development and implementation of a dedicated stand-alone Brazilian DCS station with an enhanced S-Band receiving antenna and processor. This evaluation would be completed by December 2002. Based on a recommendation by the Operations Committee, CNES/CLS and INPE would seek a framework for their cooperation through a formal agreement. .

8.3.6 CLS/SAI were continuing their transmission performance tests in the Argos-2 extended frequency bandwidth. These showed that the number of messages and their quality significantly increased when other channels outside the Argos-1 bandwidth were used. Users were hence strongly advised to take benefit of to these channels to enhance the performance of their platforms.

8.3.7 Further to the interruption of the STIP data downloading at the Lannion Global Receiving station, Mr David Meldrum and the technical coordinator conducted a study to document the related impact on data timeliness. It was shown that this led to a loss of up to three orbit (blind orbits) on the operational satellites, 15% of the data being received with a 5 hour delay. By re-establishing this link, most STIP data would be available in less than 100 min (see also agenda item 8.6.2 for further discussion and actions).

Argo QC in US Argos Center

8.3.8 Service Argos, Inc. (SAI) and NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) of Miami, Florida, had teamed up to strengthen the real-time operational processing of the U.S. Argo float data. A piece of software had been implemented by AOML at Service Argos and augmented the existing 24/7 Argos GTS data processing and dissemination chain. By taking advantage of the on-line operational systems at Argos, this AOML-SAI partnership maximized the real-time processing and dissemination capabilities for the U.S. Argo Programme. As a consequence, all US Argo profiles inserted on the GTS benefited from the AOML quality controls which met the Argo requirements.

Argo QC in the French Argos Center

8.3.9 Based on the Argo QC specifications, a specification document was written for the implementation of the new QC in the Argos GTS subsystem. These QC would be implemented by the end of Y2002.

8.3.10 Rob Bassett from NOAA/NESDIS outlined the requirements process for the Argos Data Collection System (DCS). He explained that system requirements could be addressed at three basic levels i.e. spacecraft, instrument and ground system, and provided examples of changes at each level and their associated timelines. He provided examples of possible methods to address data latency and data throughput requirements.

8.3.11 Two specific issues were discussed in regards to the Argos DCS planned for the NPOESS (National Polar-orbiting Operational Environmental Satellite System) era (2008-2018). The first issue concerned the planned transmission of stored and real-time Argos data via the High Rate Data (HRD) X-band frequency at a rate of 20 Mbps vice the Low Rate Data (LRD) L-band frequency at a rate of 3.5 Mbps. Rob Bassett highlighted that real-time data transmission via HRD would entail significant equipment changes for the Local User Terminal (LUT) network currently provided by numerous agencies around the world. The changes to HRD were predicted to negatively impact the scope of the LUT network and subsequently increase the latency of the Argos data. He reported that the best option to ensure maximum LUT coverage as well as reduce data latency was to request the real-time transmission of the Argos data-stream via both the HRD and LRD channels. Several members, including the Chairman, concluded that such a request from the DBCP Chairman should be generated and charged the technical coordinator to draft the request letter, with assistance from NOAA/NESDIS, and the support of a technical study of the LUT network by CLS/SAI. Rob Bassett stated that receipt of the letter by January 2003 would be beneficial for discussions with CNES on this matter. In addition, he encouraged ocean science organizations within the U.S. civilian and military communities to submit letters if their programs are adversely effected by this issue.

8.3.12 The second issue outlined the challenge of identifying further enhancements to the Argos system in the NPOESS era. Rob Bassett stated that with a new satellite series, users had a unique and singular opportunity to influence the capabilities of the system. He encouraged users to review their future programme plans to identify any data telemetry constraints, i.e. data latency, throughput, etc., in the current Argos architecture and submit them for evaluation by CNES and NOAA. Upon discussion by the panel on the best way to gather such input, the panel assigned the technical coordinator as the lead of a working group charged with evaluating the telemetry requirements of the DBCP as a whole. The group was tasked with reviewing these requirements in regards to the Argos DCS as well as other viable telemetry systems. Interested members of the DBCP were encouraged to participate in the working group. Rob Bassett stated that CNES and NOAA will review all submissions in June 2003.

8.4 NEW COMMUNICATION TECHNIQUES AND FACILITIES

8.4.1 Under this agenda item, the panel reviewed an updated report on developments in satellite communications systems prepared by its vice-chairman, Mr David Meldrum (see *Annex IX*). During the intersessional period there had been consolidation amongst the range of systems being planned or launched, largely in response to financial pressures. As a result, development work on roughly half of the systems described in the report had been suspended or cancelled. However, the systems that remained offered a range of facilities that could well encompass all envisaged buoy and float applications in terms of data throughput capability, geographical coverage and the like.

8.4.2 In particular, the panel recalled workshop presentations on the Iridium system that had outlined the potential of this system for real time interactive communications at high data rates, and a new approach to data acquisition, management and distribution. In this context, the panel also noted an ongoing US Navy ONR programme that had funded the distribution and support of 100 Iridium modems for evaluation by the ocean observations community.

8.4.3 The panel remained concerned, however, that the financial status of some of the operational systems remained precarious and that no system currently offered the range of data dissemination and quality control services that were available to users of Argos. Nonetheless, the panel recognized the potential benefits of the new systems, and explored the data dissemination and QC issues further under agenda item 8.6.1.

8.4.4 The panel thanked Mr Meldrum for his excellent review. It considered that a regular review of communications options was central to its objectives, and requested Mr Meldrum to again present an updated report to its next session

8.5 JCOMMOPS

8.5.1 The technical coordinator reported on the development of the JCOMM *in situ* Observing Platform Support Centre (JCOMMOPS). He recalled that JCOMMOPS had been formally established by JCOMM basically for facilitating [in an integrated way] programme implementation (i.e. DBCP, SOOP, and Argo), operations and monitoring (see http://www.jcommops.org/doc/jcommops/jcommops.htm for details). JCOMMOPS was operated by the DBCP&SOOP, and Argo Coordinators. DBCP, SOOP, and Argo provided the resources needed to run JCOMMOPS.

8.5.2 With the hiring of the Argo Coordinator in early 2001, JCOMMOPS development could actually start. Focus was initially put on the development of the Argo Information Centre (AIC). Then the development of a common database and web products between the AIC, the DBCP, and SOOP could start. Work which was shared between the Argo and the DBCP&SOOP technical coordinators plus some assistance from CLS, Service Argos could be spitted into (i) normal TC DBCP, TC SOOP, and TC Argo tasks (coordination and day to day operation of JCOMMOPS, e.g. user assistance, acting as a focal point, etc.), and (ii) specific JCOMMOPS developments (web site, database design and implementation, Geographical Information System, dynamic web pages).

8.5.3 The technical coordinator made a live web demonstration of typical JCOMMOPS tools now available. They included information on deployment opportunities, DBCP monthly dynamic map (GTS data, user can zoom on map and click on buoys to get information, etc.), database search engine (e.g. documents, meetings, contacts), list of allocated WMO numbers, mailing lists, etc.

8.6 OTHER TECHNICAL ISSUES

8.6.1 GTS distribution of buoy data collected through commercial satellite systems

8.6.1.1 At its sixteenth session, the panel discussed the issue of GTS distribution of buoy data collected via commercial satellite systems. It agreed that there were existing and likely future requirements for the GTS distribution of data collected through such commercial satellite systems, as well as on the potential value to all concerned of using the existing data processing facilities of the Argos GTS Sub-system to effect such distribution. The panel therefore requested CLS/Service Argos to undertake a feasibility study of the main issues involved. CLS/Service Argos undertook that study in conjunction with the technical coordinator.

8.6.1.2 At its seventeenth session, the study was presented to the panel. It was reported that the work involved is fairly dependent on a certain number of options such as how the data are accessed, their nature – i.e. raw data bit stream, observations- and the associated formats. Complexity clearly increases with the number of operators likely to supply the data. The easiest solutions are related to ftp file transfer from the operator to CLS/SAI of raw data bit streams, but other options could be implemented. To proceed with the matter, the DBCP agreed to undertake a feasibility study relating to Argos acting as a gateway for insertion of already formatted buoy data onto the GTS.

8.6.1.3 Results of that last study were presented to the panel (see *Annex XII*). Buoy operators interested in using that option would have to do the data processing, quality control and encoding. Properly formatted BUOY reports, grouped into GTS bulletins, would be routinely placed onto a dedicated ftp site at CLS/Service Argos for insertion onto the GTS from Météo France in Toulouse or from the NOAA/NWS gateway in Washington. Study showed that required developments at CLS/Service Argos could be realized at relatively low cost (i.e. about 2000 €). These would be conducted by CLS, Service Argos using internal resources. Running costs would depend on the amount of observation platforms concerned. Associated tariff, which could be either a yearly lump sum (one man*month as a start) or a platform daily charge, would be discussed later when demand appears.

8.6.1.4 At the same time, the panel noted an offer by NDBC to provide similar services, including software made available to buoy operators to encode the data in GTS format (FM-13 SHIP at this point). Advantage of the NDBC solution was that it included routine quality control of the data by NDBC prior to actual GTS insertion. The panel thanked NDBC for its offer, and recognized the merit of having several options available (i.e. Argos and NDBC at this point), leaving the choice eventually to the concerned buoy operators. While noting the small amount of resources that would be required to develop the CLS/Service Argos option, it recommended that it should still be included in the Argos development programme and invited its chairman to make such a recommendation to the following JTA meeting.

8.6.1.5 The panel stressed that buoy operators who were using satellite systems with no GTS data processing capabilities and were willing to distribute the data on GTS would get technical assistance from the technical coordinator regarding the possible options and the procedures to apply. Also, the technical coordinator explained that a BUOY encoder which was originally written for the Poseidon project of moored buoys (Greece) was available. Software ran under Windows (98/NT/2000/XP), was flexible, could be configured according to instrumentation, used simple ASCII delimited files for the input data and produced complete and properly encoded BUOY bulletins. It could be used in an automated data processing system and was well documented. Software, included source code if required, was available free of charge from the technical coordinator. NDBC informed the panel that it might develop similar portable (e.g. for Unix, Windows) BUOY encoding software in the future. The panel invited the technical coordinator and NDBC to discuss technical details for such developments.

8.6.2 GTS delays

8.6.2.1 At the XVIIth DBCP session, the panel was informed that STIP data downloaded from the satellites at the Lannion Global Receiving station were not available anymore and that this could potentially have adverse effects on the timeliness of the data eventually distributed to the users (e.g. via GTS). Considering that the impact of possibly restoring the collection and processing of STIP data was not well estimated at the moment, it agreed that there was a need to investigate the issue further. The panel requested Mr David Meldrum and the technical coordinator to conduct a study to document the impact of data timeliness on programme performance and to provide the relevant material to OpsCom.

8.6.2.2 The technical coordinator presented the results of the study concerning impact of delays on medium-range NWP models as well as short term mesoscale models. He showed that considering data assimilation schemes of modern global model (e.g. 4D-Var), delays were particularly important for observations made just prior to the main synoptic hours. On the other hand, for national shorter term NWP models and mesoscale models, only observations made close to main synoptic hours were assimilated and delays were extremely important (acceptable delays for short cut-off run vary from 30 minutes to 1 hour and 30 minutes).

8.6.2.3 The technical coordinator also detailed the various causes for such delays. They included (i) data storage on-board the buoy before actual satellite transmission, (ii) orbital delay (if direct LUT reception was not possible), (iii) Argos system data processing and location, (iv) GTS sub-system data processing and quality control, (v) distribution over the GTS network, and finally (vi) decoding, and data assimilation at meteorological centres. He stressed that not much could be done to reduce delays for categories (iii), (iv), (v), and (vi) as they were relatively short already. On-board delays on the other hand depended solely upon the number of satellites being operated and on the characteristics of their orbits. The only elements therefore where delays could be substantially reduced were (i) implementing more LUTs, and (ii) reducing orbital delays.

8.6.2.4 In summary, the key issues were:

(i) Data timeliness remained of paramount importance, even with the adoption of 4D-Var assimilation schemes by NWS;
(ii) Data delivery within 2 hours of observation time continued to be a prime requirement of forecast agencies;
(iii) Performance for stored data sets had worsened by a factor of two since the mid-1990s;

(iv) Stored data sets remained the main source of observations from key ocean areas such as the South Atlantic, the Southern Ocean and the South Pacific, despite the continued expansion of the LUT network.

8.6.2.5 In a detailed analysis of the orbital characteristics of the NOAA polar orbiting satellites, and the relationship of these orbits to ground station location, ocean areas served and data delivery delays as a function of time of day, it became clear to the panel that the closure of Lannion had demonstrably worsened the availability of critical buoy data. This chiefly resulted from the simple fact that, prior to its closure, Lannion was able to download data from orbits that could not be seen by either of the two US stations, the so-called “blind orbits”. The principal conclusions of the analysis were as follows:

- Delays for stored data had been getting steadily worse since about 1996.
- With the current global ground station network (Wallops Island and Fairbanks), approximately 15% of stored data was delayed by up to 5 hours because of blind orbits.
- The situation was worst with NOAA-17, where the blind orbits occurred around the major synoptic hour of 1200 UTC. For NOAA-16, the blind orbits were centred on 0300 UTC.
- The geographical areas affected were already data-sparse and poorly served by LUTs.
- The blind orbits could all be taken by Lannion, resulting in a maximum delay for stored data of less than 100 minutes.

The panel also noted that other critical data sets, notably sounder observations, would be similarly affected. This was corroborated by the representative of NOAA/NESDIS.

8.6.2.6 On the basis of the evidence presented in these reports, the panel had no hesitation in recommending that immediate action be taken as follows:

(i) The panel chairman should write immediately to NOAA/NESDIS to detail its concerns and the supporting evidence, and to ask for an early reinstallation of Lannion, such correspondence to be copied to the OpsCom, CNES and the JTA chairman;
(ii) The panel requested the representative of NOAA/NESDIS to seek whatever support he deemed necessary from panel members and the JTA to add weight to the above case;
(iii) CLS/Service Argos should, without delay, work with Météo France to arrive at a cost and timetable for the necessary upgrade to Lannion;
(iv) Executive action should be taken, if necessary, by the panel and JTA chairmen to progress matters in the intersessional period.

In addition, in recognition of the urgency of the situation, the panel asked that it be kept informed of progress during the intersessional period.

8.6.3 Metadata manufacturer's specification sheet

8.6.3.1 At its XVIth session, Victoria, October 2000, the panel noted that a good way to collect most of the buoy metadata was to ask manufacturers to fill out a standardized specification sheet each time a new drifting buoy was being delivered, bearing in mind that the JCOMM Expert Team on Marine Climatology would be the overall repository of metadata for all ocean observing systems.

8.6.3.2 During the last inter-sessional period, the matter was discussed between the EGOS Technical Secretary, Anne Hageberg, the Global Drifter Centre, and the technical coordinator. From those discussions, information which could be filled out by the manufacturers and would be required for the JCOMM metadata database was identified, i.e. (i) what metadata were needed, (ii) which metadata were mandatory and which optional, (iii) what were the metadata that needed to be provided by the manufacturer. Remaining information required for the JCOMM database would be provided by the buoy operators directly (e.g. WMO number, some calibration information, if recalibrated after delivery, etc.).

8.6.3.3 Specific products had been developed both a AOML (for GDP) and at CMR (for EGOS). EGOS web page (http://www.cmr.no/egos/) permitted to enter information broken down into the following categories (i.e. pages): (i) information specific for a type of buoy (or type and model of sensor) (e.g. drogue depth for a SVPB), (ii) information specific for a batch of buoys (or batch of sensors) (e.g. name of manufacturer, date of purchase), (iii) information specific for a particular buoy (or particular sensor) (e.g. hull number, serial number).

8.6.3.4 Peter Niiler stressed that drogue characteristics, and drogue attachment in particular was very important information to record especially for evaluation purposes. The panel agreed that such information should be included in the manufacturer's specification sheet and asked the technical coordinator to make sure that this was eventually the case.

8.6.3.5 The Global Drifter Center informed the panel that it was developing an application which will deliver GDP drifter metadata data via the web. The panel thanked both GDC and EGOS Technical Secretary for their efforts to properly collect and make available buoy metadata.

8.6.4 Others

Vandalism

8.6.4.1 Mr K. Premkumar (India) reiterated the concern of all operators of moored ocean data buoys regarding vandalism of these platforms by fishermen/mariners, either deliberately or accidentally, which was a major ongoing problem for continuous ocean observations in critical ocean areas. He suggested that this problem might be alleviated through an approach to national and private TV operators to broadcast at regular intervals, as part of their weather bulletins, the following message, with animated photographs of the drifters, moored buoys, Argo floats, etc.:

> "MANY OCEAN PLATFORMS SUCH AS DRIFTERS, MOORED BUOYS, FLOATS, ETC. ARE CONTINUOUSLY COLLECTING OCEAN DATA WHICH ARE OF GREAT IMPORTANCE TO THE PREPARATION OF THIS WEATHER BULLETIN. FISHERMEN AND ALL OTHER MARINE USERS ARE REQUESTED NOT TO DAMAGE OR INTERFERE IN ANY WAY WITH THESE PLATFORMS, WHOSE DATA ARE VITAL TO THE PROVISION OF WEATHER INFORMATION AND WARNINGS FOR THE SAFETY AND WELL-BEING OF THE WHOLE MARINE USER COMMUNITY."

Similar messages could be transmitted through navigational warning messages by NAVAREA coordinators on a weekly basis.

8.6.4.2 The panel agreed that such an action might indeed have value in publicizing the existence and value of ocean data buoys among fishermen and other marine users. It therefore requested the Secretariat to write to relevant National Meteorological Services, requesting them to take such action through their national/private media outlets. It also requested the Secretariat to discuss with IHO about the possibility for similar actions through the weekly Notices to Mariners and similar outlets.

Centralized data distribution system

8.6.4. 3 The panel noted that operational requirements for observations were increasingly defining much higher volumes of data transfer; on-demand, real-time, interactive command and control; on-demand access to remote observational platforms; remotely triggered warnings; and other applications. These requirements would result in a number of systems ranging from VHF and cellular systems to geostationary satellites being employed for telemetry. All of the data for the Integrated Ocean Observing System (IOOS) would need to be disseminated to user communities. Data dissemination would take a variety of forms including, at a minimum, GTS and web distribution. It was probable that a number of systems would be established to provide connections from platforms to both their operators and users of observations. These services were available from a wide variety of sources. The observing system community needed to be able to accommodate and facilitate this increasing variety of data dissemination tools.

C. ADMINISTRATIVE COMPONENT

9. REPORTS

9.1 CHAIRMAN AND VICE-CHAIRMEN

Chairman

9.1.1 The chairman reported that his seventh year of chairmanship of the DBCP has continued to be most interesting and challenging. The main activities during the year are summarized in the following paragraphs.

9.1.2 The chairman noted that progress has been made on most items in the intersessional work plan and action is in hand on all the remaining matters. The chairman wished to record his appreciation for the work of panel members and especially the efforts of the two vice chairmen, the technical coordinator, and the joint Secretariat in advancing the workplan.

9.1.3 During the intersessional period the chairman noted that his activities had been varied this year, but nonetheless there were a number of important issues that required attention throughout this period. The chairman reported that main event he participated in, was the inaugural meeting of the JCOMM Observations Co-ordination Group (OCG) at the Scripps Institute of Oceanography in La Jolla (May 2002). He noted that he had presented a report summarizing the activities of the panel. In particular, he had explained that the DBCP provided a forum for all matters related to management of the various international buoy networks and deployments (drifting buoys and moored buoys in the high seas). He had also highlighted that the DBCP undertook many tasks orientated towards ensuring integrated data processing operations, appropriate data quality, the robustness of the international exchange of buoy data, and the maximization of meteorological data on the GTS. And finally he had noted that the DBCP was an integral part of the Observations Programme Area under JCOMM, and supported the implementation of many other international programmes such as WWW, WCRP, CLIVAR, GOOS and GCOS.

9.1.4 The chairman reported that the OCG recognized the important work that the panel has been doing over the years and recalled that the DBCP Implementation Strategy was based on, and attempted to satisfy to the extent possible, requirements for ocean data to support operational meteorology (the WWW) and global climate studies (GOOS/GCOS/WCRP through the OOPC). He recounted that the Group had noted that a significant component of the overall buoy network consisted of buoys funded by and deployed in support of specific research projects. Furthermore, the Group acknowledged that one of the major challenges facing the panel and buoy operators was to continue to provide an effective forum to maintain the buoy networks established for research programmes, and assist in their conversion into long-term operational programmes. In this regard, the Group also noted that overall funding, including long term funding for the technical coordinator's position, remained an issue of concern.

9.1.5 The chairman then drew the attention of the meeting to the "*Rationale for the Overall System*" as resolved by the OCG, viz:

(i) Supporting and improving understanding of and the ability to forecast:
- Decadal and long-term climate change;
- Sea level variability;
- Seasonal to interannual climate variability.

(ii) Support for and continuation to improvements in:

- Numerical weather prediction;
- Numerical ocean prediction;
- Provision of marine services.

9.1.6 Finally in summarizing the deliberations of the OCG, the chairman listed the improvements recommended in the overall system which are of direct relevance to the panel's activities, in particular:

- 50% increase in SST buoys, equip all buoys with barometers;
- Enhance ice buoy deployments in accordance with implementation plan;
- Extend the tropical buoy array into the Indian Ocean.

9.1.7 The chairman also reported that he had attended the fourth session of the International Argo Science Team held in Hobart in March. While he noted that there were a number of issues that were unique to that platform type, he was interested to observe that a number of issues being addressed by the Team appeared superficially to be very similar to those of the DBCP. He recommended that the panel members keep in close contact with all Argo developments and look for mutual opportunities, such as deployment from the same vessels. He also suggested that members try and support the Argo initiatives wherever possible.

9.1.8 The chairman reported that there have been a range of very important issues involving the DBCP's action groups over the year. These groups have enjoyed another successful and productive year, and have continued to contribute to the on-going success of the panel in their respective advancement of buoy matters. While there has been an amount of movement in Group membership during this year, the overall progress has been unaffected. In addition, the chairman noted with interest the success of the SVPB Evaluation Group, convened by Ms E Horton from Navoceano, that operated during the year.

9.1.9 The chairman highlighted the continuing production of technical documents in the DBCP series - covering the Annual Report for 2001, and the Technical Presentations made at the Seventeenth Session (on CD).

9.1.10 The chairman expressed his appreciation of the assistance of the two vice-chairmen during the intersessional period, particularly with respect to representing the panel at various international meetings. He also expressed his thanks to the technical co-ordinator and the joint Secretariat.

Vice-chairmen

9.1.11 During the period, Mr. E. Meindl, Vice-Chair for North America, coordinated preparations for the Scientific and Technical Workshop of the eighteenth session of the DBCP.

9.1.12 He also worked with the DBCP technical coordinator (TC) to establish an electronic report that produces a monthly tally of observations from US moored buoys transmitted via geostationary satellites in order to more accurately report the amount of data provided by buoys. The TC requested that the US also provide a count of Canadian moored buoy data. However, while NDBC could assist in such an effort, it was recommended that the TC work directly with Canada because factors outside the control of the US might affect the count accuracy.

9.1.13 The name of Dr. Paul F. Moersdorf, Director of the National Data Buoy Center, was offered to organizers of the North Pacific Data Buoy Advisory panel, the newest action group of DBCP, for membership as US representative

9.1.14 Mr. Meindl did not attend this year's International South Atlantic Buoy Programme (ISABP) meeting, held jointly with the International Buoy Programme for the Indian Ocean (IBPIO), since the DBCP TC attended and represented the panel. However, while the ISABP/IBPIO meeting was in progress, Mr. Meindl met with Dr. Mario Caceres, Head Technical Division, Servico Hidrografico y Oceanografico de la Armada de Chile, who was on official travel in the US, and who expressed interest in ISABP membership. A DART (tsunami monitoring) buoy is scheduled for deployment off Chile in the near future, and Servico Hidrografico has proposed establishment of a 16-buoy meteorological/oceanographic array in the Pacific Ocean. Dr. Caceres was put in contact with the ISABP Chair and technical coordinator for possible follow-up.

9.1.15 Mr Meindl also communicated with several panel members by telephone and e-mail regarding miscellaneous buoy matters.

9.1.16 Mr David Meldrum reported that, during the intersessional period, the main DBCP-related activities in which he was involved were as follows:

(i) **Mobile satellite systems.** A close watch was kept on developments in this area, and an updated information paper produced for DBCP XVIII (see *Annex IX*). As noted on previous occasions, many of the new systems were unlikely to offer satisfactory oceanic coverage. Several also continued to experience severe financial difficulties, forcing a number of regroupings and closures. On the positive side, most systems had now recognised the importance of offering a data service, with some having released modem products on to the market.

(ii) **Impact study on the closure of the Lannion global ground station.** Following the disclosure at DBCP XVII that this station was unable to download stored datasets from the new generation Argos satellites (NOAA-15 *et seq*), a paper describing the consequent impact on data timeliness was prepared for presentation at the current session. This showed that action was needed to restore the timeliness of stored data to the standard that was enjoyed in the mid 1990s.

(iii) **DBCP Implementation Plan.** This was updated to reflect developments occurring during the intersessional period.

9.1.17 The panel expressed its considerable appreciation to the chairman and vice-chairmen for the very valuable work which they had undertaken on behalf of the DBCP during the past inter-sessional period.

9.2 SECRETARIAT

9.2.1 The panel noted with appreciation that the Secretariat had continued to undertake a number of activities on behalf or in support of the DBCP during the past intersessional period. These included publication and distribution of the Annual Report for 2001 and the proceedings of the 2001 Technical Workshop (in electronic form only, as far as the latter is concerned, through the DBCP web site and on CD-ROM); continued management of the panel's funds, as well as the employment and missions of the technical coordinator; close liaison with JCOMM, in particular in the development of coordination and integration procedures; liaison with CBS on codes and other matters; with other IOC and WMO technical commissions and regional associations (or equivalent bodies) on relevant issues; and with CLIVAR, GCOS, GOOS, SCOR and WOCE; presentations on the DBCP and other *in situ* marine observing activities to various forums; maintenance of the WMO buoy ID number register; support for the DBCP action groups as required, including for the establishment of the new North Pacific panel.

9.2.2 The panel carefully reviewed the list of National Focal Points for the DBCP and the register of WMO buoy ID numbers, which were presented by the Secretariat. As agreed at DBCP-XVI, a new list of national focal points for logistic support for JCOMM observing systems in general had also been compiled and was maintained on the JCOMM web site.

9.2.3 The panel noted that the second Session of the Intergovernmental Working Group on IOC Oceanographic Data Exchange Policy was held at UNESCO Headquarters from 17-18 June 2002. The

Group, after substantial discussion, agreed on a draft policy to be submitted to the Assembly at its forthcoming twenty-second session. The panel felt in agreement with the proposed draft.

10. FINANCIAL AND ADMINISTRATIVE MATTERS

10.1 FINANCIAL SITUATION

10.1.1 The panel considered the financial statements provided by IOC and WMO as follows:

(i) Finalized IOC account 1 June 2001 - 31 May 2002;
(ii) Finalized WMO account 1 January 2000 – 31 December 2001;
(iii) Interim WMO account 1 January 2001- 31 August 2002;
(iv) Provisional WMO statement of estimated income and expenditure to 31 May 2003.

These statements are reproduced in *Annex X*. The panel approved and accepted these various statements as appropriate.

10.1.2 In doing so, the panel noted that the operating budget deficit for 2001 identified at DBCP-XII had been essentially removed, and the funds temporarily transferred to the DBCP trust fund from the WMO regular budget had been repaid, thanks to additional one-off contributions for this purpose from a number of panel members. It expressed its particular appreciation to Australia, Canada, U.K. and the USA for these contributions, and noted with pleasure that the budget was once again in a healthy situation, and likely to remain so in the immediate future.

10.2 CONTRACTS

10.2.1 The contracts established by IOC/UNESCO for the employment and logistic support for the position of the technical coordinator were considered and approved by the panel.

10.3 FUTURE COMMITMENTS

10.3.1 The panel recalled that, at its seventeenth session (Perth, October 2001), it had agreed on the following arrangement with its technical coordinator:

(i) Mr Charpentier would be requested to inform the chairman, every year "Y" by the 1st of October, of his wish, or otherwise, to continue to work as technical coordinator of the panel for the period 1 June "Y+1" to 31 May "Y+2". Should that information be a wish to continue, the panel in turn would agree to retain him as technical coordinator, subject to the availability of funds;

(ii) At any time, should Mr Charpentier decide to give up the position, he would be required to inform the panel as soon as possible, and in any case preferably six months in advance, of his decision, as well as to assist in the recruitment and training of his successor, in order to ensure as full continuity as possible in the work of the panel's technical coordinator.

10.3.2 According to that arrangement, Mr Charpentier addressed the chairman on 27 September, to inform him of his intent to in principle continue working as technical coordinator of the panel for the period 1 June 2003 - 31 May 2004.

10.3.3 The panel recalled that the actions recommended at DBCP-XVII to remove the short-term operating budget deficit in 2001 had been successful, and that the budget in 2002 was again in the black (see also agenda item 10.1). In addition:

(i) The problem in 2001 of excessive publications costs had been overcome, partly through an increased use of CD-ROM and web publications only, and partly through the relay funding of publications costs through the WMO regular budget;

(ii) The JTA had, at its session in 2002, agreed to the DBCP proposal to fund the costs associated with maintaining an independent JTA chairman directly through the JTA;

Both these actions had been successful, from the point of view of the panel, in stabilising its expenditures at a level appropriate to the income. It therefore agreed that the same publications policy should apply in 2003 and future years. With regard to support for the position of an independent JTA chairman , the panel asked its chairman to inform JTA-XXII that the DBCP support would be maintained, on the assumption that funds continued to be provided by the JTA.

10.3.4 On this basis, the panel adopted a budget for 2003/04, which is given in *Annex XI*. The scale of provisional contributions required to balance expenditures under this budget is also given in *Annex XI*, on the assumption that contributions will again be received from SOOP participants similar to those in the current year.

10.3.5 The panel recalled that JCOMM-I had requested that consideration be given to implementing a mechanism for ensuring some long-term continuity and stability in funding for JCOMMOPS, given the present and future importance of this facility. In this context, and bearing in mind the discussions on the issue at DBCP-XVII, as well as the potential value of the JCOMMOPS facility to other in situ observing systems such as the VOS and ASAP, the JCOMM Ship Observations Team, at its first session (Goa, February 2002) had established a task team to prepare a comprehensive development plan for JCOMMOPS. This proposal was supported by the first session of the Observations Coordination Group (La Jolla, April 2002), and the DBCP chairman is a member of this task team. The task team is expected to present at least a draft plan to the OCG for consideration in the first half of 2003, and it is hoped that a full plan will be available for review by the panel at its 19th session in October 2003. The panel supported these actions, stressing that if new services and activities to support other observing system components were included in the plan, then they should be accompanied by a clear identification of the potential source of the additional resources which would be required to provide them. It agreed to review this issue again at DBCP-XIX.

10.4 REVIEW OF THE DUTIES OF THE TECHNICAL COORDINATOR

10.4.1 Under this agenda item, the panel reviewed the existing arrangements for the employment of the technical coordinator, as well as the sharing of his activities between the panel and the Ship-of-Opportunity Programme and his additional responsibilities as head of JCOMMOPS. The panel decided that these arrangements were suitable for the foreseeable future, subject to review at each panel session.

D. CONCLUDING COMPONENT

11. RECOMMENDATIONS TO THE ARGOS JTA

11.1 In the discussion under Agenda item 8.6.1, the meeting had agreed to propose a recommendation to enhance the Argos processing system to accept suitably formatted data from other satellite systems for insertion into the GTS. Details of the proposal, contained within a study made by the technical coordinator, are included in *Annex XII*. The meeting therefore requested the chairman to bring this recommendation to the attention of the Argos JTA with a view to the inclusion of implementation of the proposed service in the Argos development programme.

11.2 Under Agenda item 8.6.2 the panel had studied the impact of closure of the Lannion global ground station on the receipt of stored data sets and had concluded that this closure had a serious effect on the timeless of data reception for many applications. The panel requested the chairman to bring this matter to the attention of the Argos JTA, with a strong recommendation that the

Lannion ground station be reactivated to download stored data sets, thus restoring the service enjoyed to the mid 1990s.

12. WORKPLAN

12.1 As in previous years, the panel reviewed and updated its operating procedures, as well as the overall work plan for itself and the technical coordinator for the coming intersessional period. These work plans are given in *Annex XIII*.

13. ELECTION OF THE CHAIRMAN AND THE VICE-CHAIRMEN OF THE PANEL

13.1 The panel re-elected Mr Graeme Brough as its chairman, to serve until the end of the next panel session. It also re-elected Mr Eric Meindl and Mr David Meldrum as its vice-chairmen for the same period.

14. DATE AND PLACE OF THE NEXT SESSION

14.1 The panel recalled its agreement at DBCP-XVII that, in principle, the session in 2003 would be hosted by Brazil. It was therefore pleased to accept the confirmation from the Instituto Nacional de Meteorologia (INMET) to host DBCP-XIX either in Rio de Janeiro or in Salvador, subject to a similar agreement by JTA-XXII. Tentative dates for the session were agreed as 20-24 October 2003.

14.2 Bearing in mind its general policy to, as much as possible, alternate the annual sessions between hemispheres, the panel also accepted with appreciation the tentative offer from India to host the 2004 session in Chennai, as usual towards the end of October.

15. CLOSURE OF THE SESSION

15.1 Speaking on behalf of all participants, Bill Woodward expressed his sincere thanks to Météo France for hosting the session, for the excellent facilities and arrangements, and generous hospitality, which had contributed largely to its undoubted success. These comments were reiterated by the chairman, who also thanked all participants for their valuable input.

15.2 The eighteenth session of the Data Buoy Cooperation panel closed at 11.15 hours on Friday 18 October 2002.

ANNEX I

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ANNEX II

AGENDA

A. ORGANIZATIONAL COMPONENT

1. ORGANIZATION OF THE SESSION

1.1 OPENING OF THE SCIENTIFIC AND TECHNICAL WORKSHOP
1.2 OPENING OF THE SESSION
1.3 ADOPTION OF THE AGENDA
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2.3 NATIONAL REPORTS
2.4 ARGO SCIENCE TEAM AND ARGO INFORMATION CENTRE
2.5 DBCP EVALUATION GROUP

3. NEW ACTION GROUPS

4. REVIEW OF THE DBCP IMPLEMENTATION STRATEGY

5. JCOMM ACTIVITIES RELEVANT TO THE DBCP

6. SCIENTIFIC AND TECHNICAL WORKSHOP

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9.1 CHAIRMAN AND VICE-CHAIRMEN
9.2 SECRETARIAT

10. FINANCIAL AND ADMINISTRATIVE MATTERS

10.1 FINANCIAL SITUATION
10.2 CONTRACTS
10.3 FUTURE COMMITMENTS
10.4 REVIEW OF THE DUTIES OF THE TECHNICAL COORDINATOR

D. CONCLUDING COMPONENT

11. RECOMMENDATIONS TO THE ARGOS JTA

12. WORKPLAN

13. ELECTION OF THE CHAIRMAN AND THE VICE-CHAIRMEN OF THE PANEL

14. DATE AND PLACE OF THE NEXT SESSION

15. CLOSURE OF THE SESSION

ANNEX III

REPORT BY THE TECHNICAL COORDINATOR

1) Introduction

This report covers the period 1 September 2001 to 31 August 2002. During this period the Technical Coordinator (TC) of the Data Buoy Cooperation Panel (DBCP) was based in Toulouse at CLS, Service Argos, and was employed by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). The time spent on TC DBCP tasks could be estimated as following:

Topic	days	%tot. TC
JCOMM		
Mission (JCOMM), effective meeting time (ET-ODRRGOS, OCG-1)	9.0	3.5
Missions (JCOMM), travel time on working days	0.0	0.0
JCOMMOPS database development & data loading	9.0	3.5
JCOMMOPS web products (dynamic pages, e.g. maps, WMO numbers)	4.0	1.5
Expert Team on Obs. Data Requ. & Redesign of the GOS	3.0	1.2
JCOMMOPS web (static pages)	2.0	0.8
Integrating QC guidelines within JCOMM (prepare/discuss proposal)	2.0	0.8
Deployment opportunities	1.0	0.4
SOOP (excluding travel time)	72.0	27.7
Missions (SOOP), effective meeting time (GTSPP, SOT-1, La Jolla)	9.0	3.5
Missions (SOOP), travel time on working days	1.0	0.4
Argo (coord. training, supervision, team work, misc. support)	5.0	1.9
Missions (Argo), effective meeting time	0.0	0.0
Missions (Argo), travel time on working days	0.0	0.0
Missions (DBCP), effective meeting time	22.0	8.5
Missions (DBCP), travel time on working days	6.0	2.3
Missions, preparation (DBCP only)	20.0	7.7
User assistance (e.g. assist GTS, NAYLAMP/Peru)	30.0	11.5
TC Vacation, holidays	26.0	10.0
GTS (BUFR (mainly), BUOY, bulletin headers)	10.0	3.8
Miscellaneous DBCP	4.0	1.5
Requests for GTS	3.0	1.2
Action Groups	3.0	1.2
GTS Sub-System	3.0	1.2
Misc. Techn. (e.g. formats, dropping drogues)	2.0	0.8
Monitoring, Quality Control Guideleines	2.0	0.8
Misc. Administrative	2.0	0.8
Publications (e.g. SVPB design manual)	2.0	0.8
TC monthly report, stats., regular reports	1.5	0.6
Metadata (manuf. spec. Sheet)	1.5	0.6
DBCP evaluation group (e.g. definitions)	1.0	0.4
DBCP web server & technical forum	1.0	0.4
TC Tools	1.0	0.4
Southern Hemisphere SVPBs	0.5	0.2
GTS sub-system monitoring	0.5	0.2
DB Quarterly report	0.5	0.2
Delays (i.e. impact of loss of Lannion STIP)	0.5	0.2
Vandalism	0.0	0.0
Total (52 weeks)	**260.0**	**100.0**

During the period, I also worked for SOOPIP part time (about 30%) and spent some time on Argo (about 2%) and JCOMM&JCOMMOPS (about 12%). Work spent on JCOMM was directly related to DBCP and SOOP activities. Work spent on Argo basically included training of the Argo Coordinator, supervision, team work to develop JCOMMOPS, and miscellaneous support. During the period CLS provided some staff support for routine tasks on DBCP related issues (user assistance, insertion of data on GTS, monthly reports, system monitoring).

The following paragraphs describe in detail the various activities of the TC DBCP during the period. Paragraph 2 highlights recent DBCP activities. Paragraph 3 describes specific non regular tasks undertaken by the TC DBCP during the considered period while paragraph 4 describes regular tasks normally undertaken during any intersessional period.

2) DBCP highlights (As of August 2002)

2.1) Present status of buoy programmes

See graphics in Appendix B:

- Graph-1: Buoys reporting via Argos and those on GTS by country also available at http://www.dbcp.noaa.gov/dbcp/statact.gif. Dynamic monthly map is available from JCOMMOPS at http://w3.jcommops.org/WebSite/DBCP/.
- Graph-2: Number of drifting buoy data on GTS in BUOY code by country and sensor also available at http://www.dbcp.noaa.gov/dbcp/status.gif

Among the drifting and moored buoys which are reporting on GTS in BUOY and SHIP format, the following variables are being measured (valid for drifting and moored buoy data received from GTS at Météo France during the period 1 June to 30 June 2002):

Table 1: Buoys reporting on GTS in BUOY format, June 2002

Variable	Buoys	Reports/day	Average delay (min)	Remark
AT	136	1075	213.9	
P	304	6473	210.5	
U	75	336	247.3	
SST	707	8224	159.3	
Tend	230	4680	200.8	
Waves	12	50	262.3	Small number of buoys
Wind	118	879	250.4	Mainly TIP moored buoys; small number of coastal buoys reporting in BUOY format
Sub/T	2	6	192.5	Mainly TIP moored buoys; small number of drifting buoys with thermistor strings
Sub/Sal	84	306	243.4	Small number of buoys

Table 2: Buoys reporting on GTS in SHIP format, June 2002

Variable	Buoys	Average delay (min)
AT	120	28.6
P	121	28.4

U	40	23.7
SST	120	28.4
Tend	121	28.4
Waves	119	28.6
Wind	118	28.5

2.2) 17th DBCP session, Perth, 22-26 October 2001.

More than 50 people attended the DBCP workshop. 48 people attended the main DBCP session, including representatives from 14 countries plus representatives from buoy manufacturers, data telecommunication providers, WMO, and IOC Secretariats, and DBCP Action Groups. 25 presentations were made at the Scientific and Technical workshop.

The Panel decided to extend the terms of references of the SVPB/SVPBW evaluation group to include other types of buoys as well as other technical issues (e.g. Argos message formats) and therefore renamed the group to “DBCP Evaluation Group”.

DBCP implementation strategy was reviewed and commitments in the Southern Ocean discussed (about 80 barometer buoys committed in the region for 2002).

The Panel discussed information exchange and technical issues (QC, GTS codes, Argos system, new communication techniques, GTS distribution of buoy data collected through commercial satellite systems, SVPB upgrade), and particularly, the Panel:

- Acknowledged agreement by MEDS to act as PMOC for location data
- Acknowledged agreement by MEDS to change its flagging practice for location data and agreed to re-process its archives and web site maps accordingly.
- Asked the TC to make a proposal for integrating data buoy, profiling float, and XBT observing systems in a quality control relay mechanism similar to the DBCP QC guidelines. Proposal was then submitted to the JCOMM OPA (see below).
- Asked David Meldrum and TC to investigate impact of data timeliness on programme performances (loss of Lannion STIP data).
- Recommended to include quality control of Argo profiling float data in the Argos development programme (recommendation to the JTA).
- Asked the TC and CLS to prepare a document on the feasibility of using Service Argos as a relay for inserting buoy data on GTS for data collected through other satellite systems and adequately formatted according to WMO regulations.
- Discussed safety issue (i.e. risk of buoy explosion) and issued a set of recommendations to buoy operators and manufacturers (see below).
- Decided to increase the delay before re-allocation of WMO numbers from 3 months to at least 6 months.
- Endorsed the proposal by Canada to establish a North Pacific Action Group

2.3) Global Implementation

2.3.1) JCOMM

Time spent on JCOMM during the intersessional period is related to (i) running JCOMMOPS and particularly dealing with integration issues between the DBCP, SOOP, and Argo, (ii) development of the JCOMMOPS database, web site and associated products, (iii) representing JCOMM at the CBS Expert Team on Observational Data Requirements and Redesign of the Global Observing System, (iv) Attending JCOMM

2.3.1.1) JCOMMOPS.

JCOMMOPS was strongly endorsed at the first JCOMM meeting, Akureyri, Iceland, 19-29 June 2001. JCOMMOPS activities, goals, and Terms Of References were presented and discussed at the last DBCP session. During the intersessional period, the Technical Coordinator worked with the Argo Technical Coordinator to further develop JCOMMOPS. A relational database (Oracle) was built and loaded with data. A few dynamic web products have been made available online. These include for example as far as data buoys are concerned:

- Deployment opportunities (http://www.jcommops.org/depl_opport/depl_opport.html)
- DBCP monthly dynamic status map (http://w3.jcommops.org/WebSite/DBCP)
- Allocation of WMO numbers to specific transmitting platforms (http://w3.jcommops.org/cgi-bin/WebObjects/WMO_Telecom)
- List of contact points (http://w3.jcommops.org/cgi-bin/WebObjects/Search.woa/wa/contact)
- Mailing lists (http://www.jcommops.org/mailing_lists.html)
- List of Meetings (http://w3.jcommops.org/cgi-bin/WebObjects/Search.woa/wa/meeting)
- JCOMMOP generic database search Engine (http://w3.jcommops.org/cgi-bin/WebObjects/Search)
- Glossary and list of acronyms (http://w3.jcommops.org/cgi-bin/WebObjects/Search.woa/wa/glossary)

See DBCP session preparatory document dealing with JCOMMOPS for details.

2.3.1.2) Expert Team on Observational Data Requirement and Redesign of the Global Observing System (ET-ODRRGOS).

I participated in the ET representing JCOMM for *in situ* components of the marine observing systems and attend the 3rd meeting of the ET, Geneva, 28 January-1 February 2002. I reported on the current status of marine observing systems (DBCP, SOOP, Argo, VOS, ASAPP), and provided input on (i) current requirements expressed by WWW and GOOS/GCOS, (ii) estimates of instrument performances.

With Dr Hiroshi Kawamura who also represented JCOMM as Satellite Rapporteur, we drafted statement of guidance for Ocean Weather forecast and Marine Services bearing in mind that these will need to be reviewed by other JCOMM experts. On the other hand, this draft is based on the CBS Rolling Requirement Review Process and the critical review chart based on 1) expressed requirements, and 2) estimates of instrument performances. It was noted that some of the JCOMM requirements are not reflected accurately in the WMO/CEOS database (e.g., GODAE) and that this guidance should be reviewed again once the database is updated to take the latest expressed requirements into account.

I also summarized specific network deficiencies based upon analysis of some of the critical review charts (e.g. for buoy data), on future developments of these programmes, and on new technology or methods for network management which might be used by them in the future GOS. These included for example as far as buoys are concerned:

(i) use of Wind Observation Through Ambient Noise (WOTAN) technique with Lagrangian drifters, as well as similar technology for measuring precipitations at seas surface,
(ii) maintaining a network of about 80 SVP Barometer drifters (SVPB) in the region 40S to the Antarctic Circle,
(iii) possible extension of the Tropical Moored Buoy array in the Indian Ocean to provide surface meteorological data, including wind, and sub-surface water temperature profiles,
(iv) data buoy network management capability to extend the operational life-time of the buoys and save costs (e.g. temporarily shut a buoy down when the data are not needed) when satellite downlink capability will be available, and

The ET-ODRRGOS had also explored observing system technologies that will be available in the next decade with the goal to develop a strategy for a composite upper-air observing system that best utilizes the strengths of *in situ* and satellite observing systems. WWW Technical Report No.20 (WMO/TD No.1040) was the first outcome of these efforts. I offered to update the part related to DBCP, SOOP, and Argo activities in the report.

The ET made the following recommendations related to data buoy applications:

(i) Enhance international exchange of wave data from buoys (high priority)
(ii) Use of ground based and in situ observations for calibration of satellite measurements and validation of NWP models. Studies are needed to define the in situ networks for these purposes. (high priority)
(iii) Increase satellite data telecommunication bandwidth. (high priority)
(iv) For both NWP (wind) and climate variability/climate change (sub-surface temperature profiles), it is recommended to extend the tropical mooring array into the tropical Indian Ocean at resolution consistent with what is presently achieved in the tropical Pacific and Atlantic Oceans. (high priority)
(v) Distribute all available high frequency observations globally for use in NWP. Recent studies have shown that 4D-Var data assimilation systems or analysis systems with frequent update cycles can make excellent use of hourly data, e.g. from SYNOPs, buoys, profilers, aircraft (AMDAR) (high priority)
(vi) Ensure adequate coverage of wind and surface pressure observations from drifting buoys in the Southern Ocean in areas between 40S and the Antarctic circle based upon adequate mix of SVPB (surface pressure) and WOTAN technology (surface wind). The pressure observations are a valuable complement to the high density surface winds provided by satellite. (high priority)
(vii) Increase coverage of ice buoys (500 km horizontal resolution recommended) to provide surface air pressure and surface wind data (lower priority).

2.3.1.3) Attend JCOMM meetings:

As SOOP Coordinator, I attended the First meeting of the JCOMM Ship Observations Team, Goa, India, 25 February - 2 March 2002.

I also attended the 1st meeting of the JCOMM Observations Coordination Group, La Jolla, 24-27 April 2002. I represented the DBCP and SOOP, and reported on JCOMMOPS. I also presented the proposal by the DBCP to integrate the DBCP QC guidelines (data quality relay mechanism) into JCOMM (see preparatory document on QC for details). Integrated performance metrics, and mapping were discussed. The group particularly agreed that it was necessary to monitor (i) the number of funded/deployed units as a function of agreed goals, (ii) data return, and (iii) data availability as a function of requirements for specific variables. It further agreed that a standard base map was required to show (i) for each requirement what's required against what's in place, (ii) gaps in coverage, and (iii) subsets by country. The group also agreed that (i) JCOMMOPS would provide a single point of access to existing individual system component monitoring results, and (ii) a first draft of an integrated system performance monitoring scheme should be developed by the OCG Chairman with JCOMMOPS and Bob Keeley.

2.3.2) Deployment opportunities

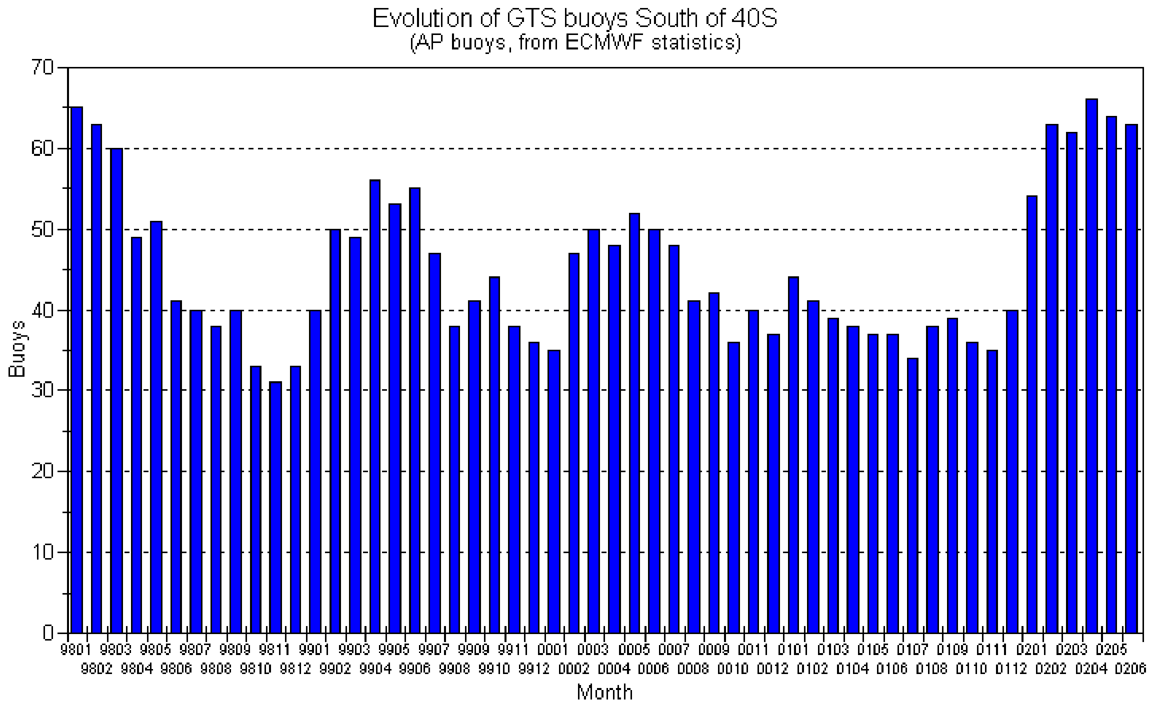
As part of JCOMMOPS activities, DBCP, SOOP, and Argo Technical Coordinators are routinely collecting information on deployment opportunities. Such information is made available via the JCOMMOPS web site at http://www.jcommops.org/depl_opport/depl_opport.html. Information is useful for buoy operators, and especially new ones, to make contacts in specific countries in order to seek new deployment opportunities. It can also be interesting for buoy operators willing to deploy buoys in ocean area where there are not used to do so to quickly identify available opportunities and make appropriate contacts.

2.3.2) Southern Hemisphere barometers

A Southern Ocean Buoy Programme (SOBP) is now part of the DBCP Implementation Strategy.

Evolution of the number of buoys reporting pressure on GTS south of 40S since 1998 is given in the graph below.

Graph 1: Evolution of the number of buoys reporting pressure on GTS since 1998:



We now reach a level of about 65 buoys reporting from the region as compared with the target of 80 buoys. Main players are:

- The Bureau of Meteorology, Australia
- The Antarctic Division, Australia
- The South African Weather Service
- The Meteorological Service, New Zealand
- Météo France
- INPE, Brazil
- The Alfred Wegener Institute, Germany,
- JAMSTEC, Japan
- The Meteorological Office, UK
- Navoceano, USA
- NOAA/AOML, USA

Proposed commitments for the period September 2002 to August 2003 are:

Country	Buoys purchased SO	Additional upgrades SO	Total
Australia	7	10	17
France	3	5	8
New Zealand	5	6	11
South Africa	20	0	20
UK	3	0	3
USA*	31	0	31
Total	69	21	90

*: USA plans to deploy 31 SVPBs in the region 40S-55S, i.e. 10 in the SA, 15 in the PO, and 6 in the IO.

AOML also offers to upgrade standard drifters (SST only) with barometers for $US 1000 per unit (see http://dbcp.nos.noaa.gov/dbcp/svpb_upgrade.html)

2.3.5) DBCP Action Groups

2.3.5.1) EGOS

European Group on Ocean Stations (EGOS)

Area of interest: North Atlantic Ocean: EGOS area of interest covers the sea area from the European coastline out to 50 °W, between 30°and 65°N, including adjacent seas, such as the Baltic and Mediterranean Seas.
Chairman: Volker Wagner, DWD, Germany
Vice-Chairman: Wil Van Dijk, the Netherlands
Technical Secretary: Ann Hageberg, Christian Michelsen Institute, Norway
Technical Coordinator: Pierre Blouch (deployment coordination and GTS matters), Meteo France
Web site: http://www.meteo.shom.fr/egos/
Status: 45 drifting buoys were operational in June 2002, including 39 SVPBs, 5 SVPBWs. In addition, 15 moorings are part of the EGOS programme.
Next meeting: Geneva, 3-4 December 2002.

2.3.5.2) IABP

International Arctic Buoy Programme (IABP)

Chairman: Tim Goos, Meteorological Services Canada
Coordinator: Ignatius Rigor, University of Washington
Web site: http://iabp.apl.washington.edu/
Area of Interest: Central Arctic Ocean and its marginal seas, excepting Exclusive Economic Zones where agreements of the Coastal States have not been obtained.
Status: 12th IABP meeting was held in Ottawa, June 2002. 49 IABP buoys were operational in the Arctic basin in June 2002. The key re-seeding of the buoy array across the Arctic Basin occurred annually, courtesy of the Naval Oceanographic Office (NAVOCEANO) under the WHITE TRIDENT exercise.
Next IABP meeting: To be decided: mid 2003, probably in Europe.

2.3.5.3) ISABP

International South Atlantic Buoy Programme (ISABP)

Chairman: Alaor Moacyr Dall'Antonia Jr., MHS, Brazil
Vice-Chairman: Ariel Troisi, Argentina
Coordinator: Louis Vermaak, SAWB, South Africa
Web site: http://www.dbcp.noaa.gov/dbcp/isabp/
Area of Interest: South Atlantic Ocean north of 55S plus Tropical Atlantic Ocean.
Status: Last meeting was held in Cape Town, 29-31 July 2002. 142 drifters had been deployed in the South Atlantic during the intersessional period, including 41 SVPBs, 12 SVPBWs, and 89 standard drifters. Most of these buoys were deployed South of 20S or North of the Equator in the tropics by USA, South Africa, and Brazil. Data sparse area remains along the West coast of Africa, and off the East coast of Argentina.

Next ISABP meeting: 2004, exact date and place to be decided.

2.3.5.4) IBPIO

International Buoy Programme for the Indian Ocean (IBPIO)

Chairman: Graeme Ball, BOM, Australia
Vice-Chairman: K. Premkumar, India
Coordinator: Pierre Blouch, Météo France
Web site: http://www.shom.fr/meteo/ibpio
Status: Last meeting was held in Cape Town, 29-31 July 2002. About 550 drifters had been deployed since 1996, including 224 SVPBs. There has been 99 buoys deployed in the period August 2001 to July 2002, compared to 83 during the previous 12 months. In June 2002, 33 drifters reported SST, 69 air pressure, and 4 wind data. The 12 NIOT moorings also provide valuable data as well as the two JAMSTEC TRITON buoys. Lack of data is observed in the South Tropical region where drifters tend to escape rapidly.
Next IBPIO meeting: Probably La Réunion, September 2003.

2.3.5.5) IPAB

WCRP International Programme for Antarctic Buoys (IPAB)

Chairman: Enrico Zambianchi, Istituto Universitario Navale, Italy
Coordinator: Peter Wadhams, SPRI, UK
Web site: http://www.antcrc.utas.edu.au/antcrc/buoys/buoys.html
Status: Last meeting (IPAB-III) was held in Fairbanks, Alaska, 26-28 June 2000.
The IPAB was launched in 1995 for a period of 5 years, to coordinate drifter deployments in the Antarctic sea ice zone, to optimize buoy distribution and create a central data archive. The programme was reviewed at the third biennial meeting in Fairbanks, Alaska, in June this year. It was resolved to continue the programme indefinitely, and as of September 2000, 14 participants had reconfirmed their commitment to the IPAB action group.

Deployments during 2000 were less than during earlier years, and in October there were only 10 active buoys contributing to IPAB. Although the exact situation was as yet uncertain, it would appear that deployments next year would be much improved. At least 10 to 12 high latitude deployments were expected, with the possibility that more than 20 buoys might be ultimately deployed.

In July 2001, 14 buoys were reporting on GTS in BUOY code from the Antarctic region (i.e. South of 55S). 9 of these buoys were reporting air pressure.

2.3.5.6) GDP

Global Drifter Programme (GDP)

Chairman: Pierre Poulain, OGS, Italy
Manager, GDC: Craig Engler, AOML, USA
Web site: http://www.aoml.noaa.gov/phod/dac/gdp.html
Status: The Global Drifter Center (GDC, http://www.aoml.noaa.gov/phod/dac/gdc.html) has now been fully integrated into NOAA's Global Ocean Observing System (GOOS) Center in Miami, Florida. GDP deploys about 420 drifters per year in the world oceans, including 200 into the tropical Pacific, 90 into the tropical Atlantic, 50 into the tropical Indian and more than 12 into the southern ocean.

The GDC supports the upgrading of SVPs to SVPBs by any country which desires to do so and it is working closely with those countries in coordinating the shipping and deployment of those upgraded drifters.

The GDC and its related Data Assembly Center (DAC) provides products through the following web site: http://www.aoml.noaa.gov/phod/dac

The GDC encourages other drifter programs to contribute their data to the DAC if those data are collected by the SVP WOCE type drifter with drogues set between 10 and 15 meters.

Distributing submergence data on GTS:

The DBCP agreed that submergence data of Lagrangian drifters should be distributed on GTS so that sea surface velocity can be derived in quasi real-time by GTS users based upon drogue status (drogue status is derived from submergence). Since there is no provision for coding submergence in BUOY reports and since modification of the BUOY code is not possible anymore (at last CBS, DBCP agreed via its ET/DR&C that it would not require any additional BUOY code modification and tentatively eventually switch to table driven codes), the DBCP agreed to adopt the following practice: Submergence data from Lagrangian drifters should be coded in % (percentage of time the drifter is being submerged) as housekeeping parameter number 2 of BUOY reports. Most of the Lagrangian drifters which report on GTS now comply with this recommended practice.

New Lagrangian drifter design.

The Global Drifter Programme is in the process of redesigning the SVP drifter, including the SVPB by reducing its size in order to lower the cost and therefore increase the number of buoys deployed worldwide at constant budget. While keeping a drag area ratio of about 40, new design will be cheaper, smaller in size (2/3 of original size), drogue diameter will be 60cm, drogue will be 6m long and include 4 sections. 7.5V and 0.5W Toyocom Argos transmitters will be used. Cost is expected to be in the order of $1700 per unit (i.e. standard SST drifter) instead of $2200 at the moment. 50% of the drifters purchased in 2002 should have new design. Navoceano certification for air deployment might however be long to obtain.

2.3.5.7) TIP

Tropical Moored Buoy Implementation Panel (TIP)

Chairman: Mike McPhaden, PMEL, USA
Coordinator: Paul Freitag, PMEL, USA
Status: In January 2000 the TAO Array was renamed TAO/TRITON reflecting the transition of sites west of 165°E longitude from ATLAS moorings, designed and built by PMEL, to TRITON moorings, designed and built by JAMSTEC. The transition to TAO/TRITON required the assembly of data processed by both PMEL and JAMSTEC into a unified data set available on the World Wide Web from both PMEL and JAMSTEC. Data from all sites continued to be disseminated on the GTS. A new data distribution page provided a wider range of data types, more varied temporal sampling and options on formats. Data return remained good. The overall value for real-time data

availability from ATLAS moorings was 89% for the past year (Oct 1999 to Oct 2000). Damage to moorings and sensors due to fishing activity continued to be of concern. This damage accounted for a significant amount of data loss, especially in the far eastern and far western portions of the Pacific basin. The array was expanded for NOAA's EPIC (Eastern Pacific Investigation of Climate Processes) Program (http://www.pmel.noaa.gov/tao/epic/) with 3 additional moorings along 95°W in the eastern Pacific. Moreover, all moorings along this line were enhanced with additional sensors to provide real-time telemetry of long- and short-wave radiation, rainfall, barometric pressure, salinity, and ocean currents. A two-month long, land-based intercomparison of TAO, TRITON and WHOI-IMET surface instrumentation was conducted this summer. Initial examination indicated that data from the three systems compared well. A detailed description of the intercomparison and analysis of the data would be published as a technical report.

PIRATA (Pilot Research Moored Array in the Tropical Atlantic) was completing its pilot phase and was about to enter a 5-year (2001-2006) consolidation phase during which data from the array would be evaluated for its utility in support of research and operational forecasting. The number of moorings in the array would be reduced from 12 to 10, due to larger than expected losses due to vandalism.

TIP changed its terms of reference and name to include mooring in tropical area of the Pacific, Atlantic, and Indian Oceans. It's now called the Tropical Moored Buoy Implementation Panel (TIP). This was in part in response to the fact that TAO was now fully implemented and in an operational phase. TIP now functions as a technical advisory committee for existing or future mooring programs in any of the tropical oceans. The scientific design and scope of future moored arrays will be addressed by the sponsors of TIP, the COOP (CLIVAR Ocean Observation Panel) and OOPC (Ocean Observations Panel for Climate).

2.3.5.8) DBCP-PICES NPDBAP

DBCP-PICES North Pacific Data Buoy Advisory Panel (NPDBAP)

Co-Chairmen: NE Pacific: Brian O'Donnell, MSC, Canada
NW Pacific: To be proposed by PICES
Coordinator: Ron McLaren, MSC, Canada
Area of Interest: North Pacific Ocean and marginal seas generally north of 30°N.
Status: This is a new Action Group of the DBCP. First meeting was held in Victoria, Canada, 5-7 June 2002. The NPDBAP aims an operational network of about 120 buoys North of 30N in the Pacific Ocean.
Next meeting: Might be held prior to, or in conjunction with PICES-11, Qingdao, China, 18-26 October 2002, or prior to, or in conjunction with PICES-12, Seoul, Korea, 10-18 October 2003.

2.4) Information exchange

2.4.1) DBCP Web server

DBCP web site moved. New URL is now http://www.dbcp.noaa.gov/

Among latest or modified pages we have for example:

- List of DBCP recommended Argos message formats (DBCP-M2 format introduced, http://www.dbcp.noaa.gov/dbcp/1ramf.html)
- BOM deployment methods (http://www.dbcp.noaa.gov/dbcp/fgge_depl_bom.html)
- Deployment opportunities (via JCOMMOPS web site at http://www.jcommops.org/depl_opport.html)
- Data collection and location systems (by David Meldrum, http://www.dbcp.noaa.gov/dbcp/1smms.html)

- DBCP efficiency and achievement (http://www.dbcp.noaa.gov/dbcp/achieved.html)

Some other pages are also available via the JCOMMOPS web site. See preparatory document on information exchange for details.

The panel is reminding interested members and Action Groups (AG) to provide the technical coordinator with their annual reports (i.e. national reports and AG reports respectively) and deployment opportunity information in electronic form for inclusion in the DBCP web site.

2.4.2) DBCP Internet technical forum

The DBCP Internet technical forum which was established in May 1999 was renamed and move to the JCOMMOPS forum in early 2001. JCOMMOPS forum includes DBCP, SOOP, and Argo technical sub-forums. Having one single forum for the three programmes permits to facilitate utilization by users (e.g. one single username/password). Address of JCOMMOPS forum is http://forum.jcommops.org/ .The DBCP forum is a mean of debating on technical issues, answering technical questions, and exchanging information among buoy operators or actors. The forum is a good complement to the DBCP web site and is directly linked to it. Documents, questions and answers can be exchanged over the forum while being accessible to anybody in the buoy community.
If desired, new teams dedicated to DBCP Action Groups can be created on the forum with privileged access for AG Participants and administration privileges for the AG Coordinator (please contact the Technical Coordinator of the DBCP in that case). An EGOS team has been created which is managed by Pierre Blouch.

2.4.3) DBCP mailing lists

The following DBCP mailing list was created:

- dbcpeval@jcommops.org

DBCP maintains the other following mailing lists:

- dbcp@jcommops.org is a mailing list for exchange of general information on DBCP activities.
- buoys@jcommops.org is a mailing list for exchange of technical information among buoy operators.
- Buoy-qc@vedur.is is a mailing list to report specific problems regarding GTS distribution of buoy data.

Details at: http://www.jcommops.org/mailing_lists.html#DBCP.

2.4.4) New DBCP publications:

The DBCP recently published the following documents within its Technical Document series:

- No. 2 (revision 1): GTS sub-system reference guide (also published via web in March 2002, http://www.dbcp.noaa.gov/dbcp/Argos-GTS-sub-system-ref-guide.pdf)
- No. 4 (revision 1): GDP Barometer Drifter design reference (also published via web in March 2002, http://www.dbcp.noaa.gov/dbcp/SVPB-design-manual.pdf)
- No. 19: October 2000 DBCP Workshop's report (Victoria)
- No. 20: DBCP Annual report for 2001 (also available via web at http://www.dbcp.noaa.gov/dbcp/doc/dbcp20-annual-report-2001.zip)
- No. 21: Developments in buoy technology, communications, science and data applications, presentations at the DBCP technical workshop, Perth, Australia, October 2001 (also available via CD-Rom and via the web at http://www.dbcp.noaa.gov/dbcp/doc/DBCP-21/TOC.htm)

The following documents still have to be published:

- Update of the Argos system guide (No. 3)
- Update of DBCP implementation strategy (No. 15)

2.4.5) CD-Rom:

The DBCP publication No. 21 (see above) was also issued on CD-Rom.

2.5) Buoy data and applications

This was discussed at the last DBCP Workshop in Perth, October 2001. Workshop proceedings were published on CD-Rom which is available from the Technical Coordinator. See also paragraph 2.5.3.

2.5.1) GTS

2.5.1.1) GTS codes

BUOY: Latest version of BUOY format (FM-18-XII) was implemented at Service Argos in March 2002.

BUFR: Developments are underway at Service Argos for encoding buoy data in BUFR. Operational implementation is planned in early 2003. CBS Expert Team on data representation & codes proposed a specific template (i.e. list of BUFR descriptors) for encoding buoy data in BUFR. See DBCP session preparatory document dealing with code matters for details. TC DBCP spent time on the issue to work on the development project and discuss technical details with CLS and the contracted company in charge of the developments.

2.5.1.2) GTS bulletin headers

Complete list of GTS bulletin headers used for GTS distribution of buoy data from Service Argos is given in Appendix A.

2.5.1.3) GTS distribution of buoy data

Identify buoy data which are not distributed on GTS and encourage buoy operators to authorize GTS distribution of the data when this is feasible. Provide technical assistance to buoy operators in this regard (e.g. assistance provided to DHN, Peru, and Oceanor, Norway for the NAYLAMP moored buoy programme). Provide a report to the Argos Operations Committee explaining why about 50% percent of the buoys are not reporting their data on GTS (see Appendix B).

2.5.1.4) GTS Delays

Loss of Argos STIP data from Lannion, France.

2.5.1.5) Argos & Argos GTS sub-system

a) New geo-magnetic variation model implemented (IGRF 2000) in September 2001.

b) Olso LUT is now connected to the Argos System. Data collected in real-time in Olso are therefore processed through the standard Argos system, including for location, and GTS distribution purposes. These data distributed on GTS are therefore consistent with the Argos data collected for the same buoys through other Argos receiving stations (local or global).

c) The new version of the BUOY code (FM-18-XII) was finally implemented at Service Argos on 27 March 2002 (new version was implemented by CBS on 7 November 2001). I assisted CLS, Service Argos for required software developments, tests, validation, and initialization of the GTS sub-system database with required values for the new fields of relevant platforms. Main GTS users and buoy operators were contacted and encouraged to provide Service Argos with new information which can now be coded in the new format (e.g. buoy type, drogue type, anemometer height). The list of wind reporting buoys is therefore no longer issued on a regular basis as required information is now included in BUOY reports.

d) GTS buoy data are now delivered to Météo France for global GTS distribution via tcp/ip (instead of X25 dedicated link).

e) The Argos GTS sub-system reference guide was updated to reflect latest improvements with the system. The new guide was published by the DBCP (Revision 1) and can be obtained from the Technical Coordinator of the DBCP.

f) New algorithm was implemented in February 2002 for the computation of wind direction data for TAO moorings.

g) Developments are underway at Service Argos for implementation of the BUFR code within the Argos GTS sub-system. BUFR should be available in the beginning of 2003.

h) Following discussions by the DBCP evaluation group, updated list of DBCP recommended Argos message formats is available from the DBCP web site at: http://www.dbcp.noaa.gov/dbcp/1ramf.html

2.5.1.6) GTS distribution of buoy data from satellite systems with no GTS data processing capability.

Specific study was conducted by TC-DBCP and CLS, Service Argos for using Service Argos as a relay for GTS insertion of already formatted buoy data. Study showed that required developments could be made at relatively low cost. Refer to specific preparatory document for details.

2.5.2) Quality Control

2.5.2.1) QC guidelines.

At its 17th session, the DBCP asked the Technical Coordinator to make a specific proposal for integrating the existing DBCP QC guidelines (quality information relay mechanism) into a new more general JCOMM scheme. This was an opportunity to modernize the DBCP QC guidelines by using for example dedicated web pages to report on detected problems. The Technical Coordinator wrote a proposal, discussed it with key operational centres (i.e. UKMO, Météo France, NCEP, JMA), and finally presented it at the first JCOMM Observations Coordination Group meeting in La Jolla, 24-27 April 2002 for discussion. The meeting reviewed the proposal and suggested that it would be integrated within JCOMM and may eventually include other types of in situ marine observing systems such as the VOS. Argo profiling float data as well as XBT data were not considered as relevant as specific schemes were being defined by Argo and GTSPP respectively. See specific agenda item and related preparatory document for details.

In August 2002, upon request from Julie Fletcher, I acted as PGC for MSNZ buoy data.

2.5.2.2) Buoy monitoring statistics

A comprehensive report describing algorithms and remaining discrepancies among statistics produced by UKMO, NCEP, Météo France, and ECMWF is available via the DBCP web site at http://www.dbcp.noaa.gov/dbcp/monstats.html .

2.5.3) Impact studies regarding data buoys:

At the second CGC/WMO workshop on the impact of various observing systems on numerical weather prediction, Toulouse, France, 6-8 March 2000 (see Jean Pailleux and Horst Böttger, WMO/TD No. 1034, WWW Technical report no. 19), the following was particularly demonstrated:

- Noticeable impact, in particular in short range, with improvements in Southern Hemisphere scores equal to half a day in forecast skill have been found from SH drifters (p) (study undertaken in response to OPAG-IOS ET-ODRRGOS request).
- PAOBS and drifters combined provide positive impact in SH, over and above the effect
- coming from the drifters alone (one study by BMRC).

At the 12th session of the COSNA Scientific Evaluation Group, Reading, UK, 21-22 May 2002, it was reported that:

- The impact of hourly surface pressure and also wind observations (SYNOP, SHIP and DRIBU) had been evaluated in the context of ECMWF's operational 4D-Var data assimilation system. The study period was 1-31 May 2001. The globally available observations from the main synoptic hours at 00, 06, 12 and 18 UTC were used in the experiments. Only the data from the intermediate hours were excluded. The hourly surface observations are found to have a positive impact in the short-range forecast in those areas where such data are available (i.e. the North Atlantic and the southern oceans where other data are relatively sparse). The global exchange of all hourly surface observations for use in a 4D-Var system appears to be beneficial for NWP.
- An Observing System Evaluation (OSE) was run for the period of 10 July to 31 July 2001, using the DWD's 4th generation Global-Modell (GME). The following results were obtained:
  - Withholding all surface observations (synop, ship, buoys) results in a large deterioration of the forecast quality.
  - Benefit is higher in the Southern Hemisphere and Tropics than in the Northern Hemisphere.
  - Impact of ships or buoys alone is less but noticeable
  - As opposed to winter cases, benefit of buoys are slightly higher than ships in the Northern Hemisphere.
  - Benefit of buoys is slightly greater than that of ships in the Southern Hemisphere.
  - Neither ship or buoy observations had any impact in the Tropics.
  - In individual cases, ships or buoys have a significant impact on the forecast quality for Europe and the whole Northern Hemisphere.
  - Overall, the impact for the summer period is less than for the winter period.

The Expert Team on Observational Data Requirements and Redesign of the GOS also made a few recommendations which are relevant to buoy programmes (see Appendix D for details):

- Ensure distribution of wave buoy data on GTS
- Ensure distribution of high resolution temporal data (e.g. hourly data)
- Improve satellite data telecommunication bandwidth
- Extend TAO array into the Indian Ocean
- Ensure adequate data coverage for pressure and wind in the Southern Ocean
- Increase coverage of ice buoys in polar regions (500km horizontal resolution)

List of impact studies regarding data buoys is available through the DBCP web site (http://www.dbcp.noaa.gov/dbcp/impact.html). Anybody with information on past, present or future studies which are not listed in the web page is invited to submit details to the Technical Coordinator.

2.5.4) Metadata/Manufacturer's spec. sheet.

Discussion is still underway on specifications sheet for manufacturers to fill in upon buoy purchase. This would facilitate collection and access to metadata. The matter was particularly discussed between the EGOS Technical Secretary, Anne Hageberg, and the Technical Coordinator of the DBCP, Etienne Charpentier. Things have been clarified to some extend although work is still required to eventually agree on (i) what metadata are needed, (ii) which metadata are mandatory and which are optional, (iii) what are the metadata that need to be provided by the manufacturer and what are those which need to be provided by the buoy operator, (iv) how the metadata should be provided (structure of spec. sheet), (v) who should eventually make necessary developments, and (vi) who should fund such developments. A draft application is available at CMR via http://www.cmr.no/egos/.

2.6) Safety.

Following explosion of a moored buoy in 2001, DBCP safety recommendations (DBCP-17) were issued via the DBCP mailing lists and are available via the DBCP web site at http://www.dbcp.noaa.gov/dbcp/safety.html:

- Batteries are to be placed in a vented compartment, eliminating voids as far as possible, with a double venting arrangement;
- Incorporation of an overcharge controller and temperature controlled switch, to disconnect the batteries from the solar panels when required;
- Incorporation of an explosive gas sensor and temperature sensor inside the battery compartment and instrument cylinder, with the data to be transmitted once a day, to allow corrective action, or suitable explosive gas testing procedures, to be undertaken on buoy retrieval or servicing;
- Incorporation of continuous monitoring of battery charge current and voltage, to be transmitted with the buoy data;
- Incorporation of a suitable purging system and procedures.

2.7) DBCP evaluation group.

The terms of references of the SVPB/SVPBW evaluation group had been extended to include other types of buoy and to work on other issues such as Argos message format etc. Sub-group works mainly through mail exchange and use the DBCP technical forum (http://forum.jcommops.org/) for basic open discussion, record of those discussions and publication of intermediary or final results. Sub-group presently includes the following people: Elizabeth Horton, Navoceano (Chairperson), Pierre Blouch, Météo France, Sarah North, UKMO, Graeme Brough, BOM, Peter Niiler, SIO, Etienne Charpentier, DBCP, Tony Chedrawy, Metocean, Jeff Wingenroth, Technocean, Gary Williams, Clearwater Instrumentation, Sergey Mothyzev, MARLIN, Louis Vermaak, SAWB, Ron McLaren, Environment Canada, Julie Fletcher, MSNZ, New Zealand, and Satheesh Shenoi, NIO, India. Any other person interested in participating in the evaluation group should contact Elizabeth Horton.

As recommended by the Panel at its 17th session, a dedicated mailing list was established: dbcpeval@jcommops.org.

DBCP definitions.

Following recommendations by the DBCP at its 17th session in Perth, the DBCP evaluation group proposed a set of "DBCP Definitions". These included definitions of specific DBCP ocean areas. For example DBA area is defined as the Atlantic Ocean between Arctic Circle and 55S and for southern latitudes between 65W (Drake passage) and 20E (Cape of Good Hope). It includes Norwegian Sea, Labrador Sea, North Sea, and excludes Gulf of Mexico, Caribbean Sea, Hudson Bay, Baffin Bay, Mediterranean Sea, Baltic Sea. NDNA area is defined as DBA North of Tropic of Cancer. Other definitions which are for DBCP use only, include for example resolution (time, horizontal, vertical), useful observation, useful day of observation, early failure/infant failure, required variables, operational and useful life-time, delay, data availability. Details on DBCP definitions can be found on the JCOMMOPS forum under DBCP at http://forum.jcommops.org/

Argos message formats (see details at http://www.dbcp.noaa.gov/dbcp/1ramf.html)

The following formats are now recommended by the DBCP:

- DBCP-M2 format (Meteo - including for 28 bit Argos IDs)
- DBCP-O3 format (Standard SVP drifter format - including for 28 bit Argos IDs)
- DBCP-O4 format (Oceanographic purposes & evaluation - including for 28 bit Argos IDs)

The following formats were deprecated:

- DBCP-M1 format (Meteo)
- DBCP-O1 format (Standard SVP drifter format)
- DBCP-O2 format (SVPB drifter 2-page format)

Dropping drogues:

In June 2002, it was noted that drogue information (submergence and/or drogue status) was not properly reported on GTS for a large number of Lagrangian Drifters. With assistance from Pierre, Blouch, CMM, and Mayra Pazos, GDC, things could be corrected for most of the buoys.

3) Specific TC DBCP non regular tasks undertaken during the intersessional period

- **<u>September 2001</u>**

1. Development of JCOMMOPS database (design SOOP model, uploading data from my Paradox database)
2. New version of geo-magnetic variation model (IGRF2000) installed in Argos GTS sub-system
3. Preparation of DBCP session (prepare presentations & slides, upload preparatory documents on web)
4. Draft SVPB design manual for discussion at DBCP session
1. Update SOOP Semestrial survey - 2000 (new BOM data by CSIRO then BOM)
5. SOOP semestrial survey, Jan-June 2001
6. Correct/update survey based upon feedback from operators
7. Still some problems with XBT 12H duplicates. Check software and correct bug with CLS.
8. Test Canadian SVPB using 28-bit Argos Ids with old format DBCP-M1
9. Assist Pierre-Marie Poulain to put drifter data on GTS
10. Finalize new version of Argos GTS sub-system reference guide and send to WMO for publication
11. Craig Engler, AOML, looking for deployment opportunities in Gulf of Guinea
12. Update deployment opportunities web page at JCOMMOPS web site

- **<u>October 2001</u>**

1. 18-31 October, IPBIO-5, DBPC-17, JTA-21 meetings, Perth.
2. Development of JCOMMOPS database (continue uploading data, including GTS data from Météo France)
3. Create dbcpeval@jcommops.org mailing list for DBCP evaluation sub-group
4. Ask DBCP evaluation sub-group to vote for deprecating DBCP recommended Argos message formats
5. New JCOMMOPS dynamic status map available for GTS buoy data (by country and/or sensor, possibility to query). http://www.jcommops.org/status_maps.html
6. Make a presentation on BUFR code to the company who is going to develop BUFR for the Argos GTS sub-system
7. Fill out on behalf of the DBCP a CBS questionnaire on Innovative Collaboration in the Implementation of the WWW.
8. Seek OCEANOR attending the DBCP to provide information on safety issue.

- **<u>November 2001</u>**

1. 19-20 November 2001, Brest, GTSPP meeting.
2. Inform buoy community about DBCP safety recommendations via the buoys@jcommops.org mailing list

and via DBCP web site (http://www.dbcp.noaa.gov/dbcp/safety.html)
3. Work with CLS Service Argos on implementing the new version of the BUOY code (formally implemented by CBS on 7 Nov. 2001).
4. Finalize SVPB construction manual. I have now all necessary input from Andy Sybrandy.
5. Make a list of SOOP publications and scientific articles for SOOP web site.
6. Coordinate SOOP operations guide, ask input from A. Sy, R. Bailey, S. Cook; prepare a list of acronyms for the SOOP Operations guide
7. Re-design SOOP web site according to discussion with Rick Bailey in Perth. New draft site available at http://www.jcommops.org/soop/new_root/
8. Discussions regarding DBCP evaluation sub-group membership. Ron McLaren, Julie Fletcher, Satheesh Shenoi added. Propose definitions for DBCP evaluation group. Proposed definitions on DBCP forum http://forum.jcommops.org/
9. New DBCP recommended formats published on the web (DBCP-M2, DBCP-O3, DBCP-O4).
10. Black-sea data on GTS.
11. Update DBCP web site (news, meetings)

- **December 2001**

1. Prepare documents for JCOMM-SOT meeting in Goa
   a. Report by the Coordinator
   b. JCOMMOPS
   c. Argo (report by Mathieu Belbeoch)
2. DBCP Definitions in the context of the DBCP evaluation group (DBCP ocean areas, etc)
3. Make specific computations for availability of buoy data in defined DBCP ocean areas.
4. Prepare document on status of marine observing systems for the meeting of the expert team on observational data requirements and redesign of the GOS, Geneva, 28 Jan. 2002 - 1 February 2002.
5. Work on new version of BUOY Code with CLS, Service Argos.
6. New version of SOOPIP web site.
7. Start working on integrating DBCP guidelines within JCOMM with other types of marine observing systems (floats, XBTs).
8. SOOP Operations Guide
9. 24-31 December 2001: Vacation

- **January 2002**

1. 1-4 January: Vacation
2. CLS, Service Argos contracted developments with private company for implementing BUFR in the Argos GTS sub-system. Developments started. I am assisting CLS in following development of the project.
3. Prepare documents for JCOMM-SOT meeting in Goa
   a. Ship recruitment and servicing (support provided by JCOMMOPS)
   b. Telecommunication facilities and procedures (Argos & SOOP)
   c. Monitoring reports
4. JCOMMOPS database loading (contacts, SOOP data)
5. Refine new version of SOOP web site
6. 21, 22 January: Visit of Bert Thompson to discuss JCOMMOPS and contributions from Member States to GOOS.
7. 28 January - 1 February, Geneva: Meeting of the Expert Team on Observational Data Requirements and redesign of the Global Observing system.

- **February 2002**

1. Prepare presentations for SOOPIP-IV meeting
2. JCOMMOPS database loading (SOOP data, ships, resources)
3. Start editing WMO/TD 1040 document for ET/ODRRGOS (describing present and future in situ marine observing systems)
4. List of wind buoys
5. Test new version of Argos GTS sub-system (new version of BUOY code)
6. Discuss modification of Argos GTS sub-system to implement modification proposed by TIP for new algorithm to compute wind direction. Liaise with CLS, make modification, and test.
7. Prepare AIC budget and statement for AIC funding.
8. Advertize new version of SOOP web site, ask for comments. Make changes according to comments. Ask

IRD to implement new version at official site.

9. Ask SOOP participants to provide me with SOOP resources data (Jan.-Dec. 2001) prior to Goa meeting (only data from SEAS, Brest, CSIRO, and JMA received).
10. Manual on Data Transmission Techniques for SOOP received from Steve Cook and added in the SOOP Operations Guide.
11. Météo France is willing to establish GTS link between CLS and Météo France using TCP/IP instead of X25.
12. 25 February-1 March, Goa, India: JCOMM SOT-1 and SOOPIP-IV meetings

- **March 2002**

1. Edit DBCP documents No. 2 (Argos GTS sub-system reference guide) and 4 (SVPB design manual) in PDF format and make them available via the DBPC web site. Make announcement through mailing lists.
2. Write proposal to integrate DBCP QC guidelines into an integrated JCOMM quality information relay scheme to include data buoys, XBTs, and Argos floats. Consult key people and seek comments (DBCP, SOOP, Argo, PMOCs).
3. Make proposal on SOOP indicators and seek feedback from SOOP operators. Write dedicated software to compute indicators.
4. New version of BUOY code implemented at Service Argos on 27 March. Main GTS users and buoy operators contacted and encouraged to provide Service Argos with new information (e.g. buoy type, drogue type, anemometer height).
5. Discuss with CLS and contracted company GTS distribution of Argos data to Météo France via TCP/IP
6. Renew discussion on metadata specifications sheet from manufacturers for buoys
7. Seek clarification regarding final recommendations by Upper Ocean Thermal Review (discrepancies between web site paper and Neville's book paper)

- **April 2002**

1. Continue coordination of SOOP indicators issue.
2. Proposed JCOMM QC feedback mechanism. Agreement by UKMO, Météo France, NCEP, JMA. Argo and XBT data might not be relevant.
3. Seek information on *in situ* marine observing systems from experts in the JCOMM community for WMO Technical Document number 1040 (Observing systems Technologies and their use in the next decade)
4. Establish Ship Observation's Team (SOT) mailing list (sot@jcommops.org).
5. Automatic data processing of NDBC list of moorings (monthly file from NDBC automatically loaded in JCOMMOPS database)
6. 12 April. Meeting with Johannes Guddal at Météo France to discuss JCOMMOPS. Define development of JCOMMOPS and funding which could be obtained from the European Union. Tentatively establish priorities.
7. Discussion on spec. sheet for manufacturers to fill in upon buoy purchase to facilitate access to metadata.
8. 19 April. Visit from Steve Piotrowicz and John Gould to discuss Argo.
9. 22-23 April, La Jolla, USA. Discuss GDP and new developments with regard to Lagrangian drifters with Peter Niiler. Discuss SOOP and SOOP indicators issue with Steve Cook and Gary Soneira.
10. 24-27 April, La Jolla, First meeting of JCOMM Observations Coordination Group (OCG). Present JCOMMOPS, proposed JCOMM QC feedback mechanism.

- **May 2002**

1. 10 May: Vacation
2. 15 May: meeting at Meteo France with CLS and company contracted to develop BUFR to discuss formatting of BUFR bulletins.
3. 18 May: visit of Hiroshi Kawamura to discuss JCOMMOPS and Argo
4. 1st May, DBCP server was moved to http://www.dbcp.noaa.gov (used to be http://dbcp.nos.noaa.gov/dbcp/).
5. Finalize input for WMO TD 1040 and submit it to Paul Menzel, Chairman, CBS EX/ODRRGOS.
6. Continue discussion on metadata spec. sheet for buoy manufacturers. Discussion with Ann Hageberg, CMR, Norway.
7. Continue discussion on SOOP indicators
8. JCOMM metrics discussion with Bob Keeley, MEDS and Stan Wilson, NOAA.
9. Report to Argos OPSCOM regarding buoys reporting via Argos which data are not distributed on GTS.

10. Prepare NPDBAP and IABP meetings.
11. Impact of loss of Lannion STIP data on data delivery delays
12. Establish a JCOMM Ship Observation's Team (SOT) web page (http://sot.jcommops.org/)
13. Discuss and suggest solutions with DHN, Peru, and Oceanor manufacturer, Norway, for GTS distribution of NAYLAMP buoy data on GTS
14. Fix a few discrepancies in the DBCP monthly summary by country for specific countries.

- **June 2002**

1. 5-7 June, Victoria, first meeting of the DBCP-PICES North Pacific Data Buoy Advisory Panel
2. 10-12 June, Ottawa, 12th meeting of the International Arctic Buoy Programme (IABP)
3. Prepare web pages on DBCP web site for DBCP & JTA meetings
4. Discuss JCOMM Metrics issue with Bob Keeley
5. Prepare ISABP and IBPIO meetings
6. Follow development of BUFR code at Service Argos
7. Continue working on NAYLAMP data on GTS issue
8. Dropping drogues: drogue status and submergence information from BUOY reports doesn't seem to be consistent. Invite GDP to check information.
9. New WMO-Platform cross reference list on the JCOMMOPS web site (http://w3.jcommops.org/cgi-bin/WebObjects/WMO_Telecom). This list replaces the WMO/Argos list which was issued monthly.
10. Cuban refugees tied to unidentified moored buoy. Buoy position needed for rescue.

- **July 2002**

1. 1-19 July: Vacation
2. Prepare new SOOP Indicators proposal according to discussions with Rick Bailey, and Steve Cook at the La Jolla OCG meeting, April 2002.
3. 29 July-2 August: ISABP & IBPIO-6 meetings, Cape Town

- **August 2002**

1. Prepare documents for DBCP session (TC report, Information Exchange, QC, Codes, JCOMMOPS, GTS distribution of buoy data from satellite systems with no GTS data processing capability, GTS delays, Metadata manufacturer's spec. sheet, Implementation strategy (with David Meldrum), Argos system & GTS sub-system (with input from CLS))
2. Act as PGC on behalf of MSNZ.
3. GTS delays issues
4. SOOP Indicators' issue
5. Discuss with CLS required Argo QC developments
6. Study on GTS distribution for buoys reporting through another satellite telecommunication system than Argos.
7. Re-install Windows 2000 operation system and all required software&applications on my PC.

4) Regular or normal tasks

4.1) Monitoring

Below are detailed the different monitoring activities that the TC DBCP undertook during this intersessional period:

4.1.1) Quality Control Guidelines

4.1.1.1) Reading QC messages

To read the QC messages from the BUOY-QC Internet mailing list as posted by the Principal Meteorological or Oceanographic Centres responsible for GTS buoy data quality control (PMOC). For rationalization purposes, all the proposals are stored and archived in a data base.

4.1.1.2) Contacting PGCs

To contact_the PGCs: The QC guidelines have been automated, so most of the time status change proposals are automatically forwarded to the Principal GTS Coordinator (PGC) provided that he has an email address. In case the PGC has no email address, the TC DBCP contacts the PGC directly, and suggests him to implement the proposed change. The PGC should normally contact Service Argos and/or Local User Terminal (LUT) operators and request implementation of the proposed change. In case the PGC disagrees, the TC DBCP immediately sends a denial message on the mailing list.

4.1.1.3) Checking Argos files

To check Argos files and/or GTS data in order to ascertain whether suggested modifications have actually been implemented or not.

4.1.1.4) Feed back.

For sensors actually recalibrated, and on behalf of Service Argos, possibly provide feed back information onto the mailing list.

4.1.2) Specific problems.

To resolve specific problems related to GTS for given buoys, such as looking carefully at the data and the transfer functions. For example, I could be investigating why no or only a few messages are received at Meteorological Centres...

4.1.3) TC DBCP files.

To update TC files: list of the operational platforms and programs (on GTS or not), new programs, WMO numbers, monitoring statistics...

4.2) User assistance

As usual, I answered specific questions and resolved specific problems as needed or requested by users.

4.2.1) Principal Investigators (PI) or buoy programme managers:

PIs regularly request the TC DBCP to look at specific problems regarding their buoy data or request assistance for GTS distribution of the data. For example, I could be studying in detail Argos message formats and sensor transfer functions or I could obtain WMO numbers on their behalf. I could also simulate satellite orbits in order to estimate orbital delays.

4.2.2) Local User Terminals (LUT):

From time to time, LUT operators ask me to provide them with the transfer functions used with specific platforms so that they can also report to the GTS via their LUT.

4.2.3) Meteorological Centres

Meteorological Centres may contact me when they need information on given platforms drifting in an area of interest.

4.2.4) Secretariats:

Upon request, I provided WMO or IOC secretariats with graphs and documentation.

4.2.5) Buoy manufacturers.

Buoy manufacturers regularly contact me to be included in the DBCP list of drifting buoy manufacturers (http://www.dbcp.noaa.gov/dbcp/1lobm.html). I may also discuss technical issues with them.

4.2.6) Individual users

Individual users contact me to obtain buoy information and/or seek information on how to obtain buoy data. I usually redirect them to adequate institution(s) (e.g. RNODC/DB).

4.2.7) Acting as a Principal GTS Coordinator

e.g. When the regular PGC is in vacation, I can replace hem/her and act as a PGC.

4.2.8) Focal point.

Directly or through the BUOY-QC Internet mailing list, I am acting as a focal point between the Meteorological Centres and the Principal Investigators when a specific action is required for a buoy reporting onto the GTS (e.g. remove the data from the GTS, recalibrate a sensor...).

4.2.9) Investigate various data loss problems.

4.3) Drifting Buoy Quarterly Report

The Drifting Buoy Quarterly Report was issued , and distributed widely by CLS, Service Argos.

4.4) Global Telecommunication System (GTS)

4.4.1) Status for drifting buoys reporting onto the GTS:

Year	Operational drifting buoys	On GTS	% on GTS
July 1991	718	264	36.8%
July 1992	1162	474	40.8%
August 1993	1269	548	43.2%
September 1994	1246	587	47.1%
September 1995	1429	631	44.2 %
September 1996	1180	638	54.1%
September 1997	1159	581	50.1%
August 1998	1230	543	44.1%
July 1999	1270	728	57.3%
July 2000	1385	807	58.3%
July 2001	1338	763	57%
July 2002	919	459	49.9%

See also graphs, tables, and maps in Appendix B
Météo-France provided me with Data Availability Index Maps on a monthly basis. The maps are useful to identify the data sparse ocean area for each kind of geo-physical variable and therefore to assist the various data buoy programmes in adjusting deployment strategies. The maps show clearly the impact of the TAO array ATLAS moored buoys (wind), of DBCP regional action groups such as the ISABP (air pressure), or of specific national programmes such as MSNZ (air pressure).

4.4.2) GTS bulletin headers:

All Local User Terminal sources comply with WMO regulations regarding GTS bulletin headers.

See Appendix A for a complete list of GTS bulletin headers used to date.

4.4.3) Quality Control.

The work of the TC DBCP concerning Buoy data Quality Control was related to the following topics:

Actually monitor the Internet Mailing List, and contact PGCs accordingly when those cannot be reached automatically.
Act as a PGC upon request.

Refer to related DBCP session agenda item (Quality Control of buoy data) for details.

4.4.4) New buoys on GTS

I am regularly contacting buoy programme managers of new programmes in order (i) to convince them to authorise GTS distribution of their buoy data, and (ii) to offer assistance for that purpose. Programme managers who spontaneously authorise GTS distribution of their buoy data, may regularly contact me for assistance.

The new GTS sub-system permits to process the data provided that adequate information is precisely implemented in the system. I am therefore studying in details technical files of buoys with complicated Argos message formats. In some instances I obtain WMO numbers from National Focal Points or WMO secretariat on behalf of the programme managers.

4.5) Argos GTS Sub-System

The regular work of the Technical Coordinator concerning the Argos GTS Sub-System is mostly related to the following topics:

- Monitor the system and look for possible problems.
- Make sure the problems are corrected.
- Training of the Argos Users' Guidance Office and work in conjunction with it regarding complex problems.
- Refer to related DBCP session agenda item (Argos) for details.

4.6) DBCP World Wide Web Internet server

The regular work of the Technical Coordinator concerning the DBCP web site is mostly related to the following topics:

- Keep regular files on the Web. Server up to date (transfer files).
- Tentatively keep links to other servers up to date.
- Refer to related DBCP session agenda item (Information exchange) for details.

4.7) TC statistics and graphs.

4.7.1) Active drifting buoys.

Using Argos files and data provided by LUT operators, I computed on a monthly basis, by country and by organisation, graphs showing the distribution of active GTS and non-GTS drifting buoys. It is particularly useful to see the evolution of the total number of drifting buoys deployed by the various countries involved, and the percentage of these reporting to the GTS. See graph-1 in Appendix C (distribution of active buoys by country), graph-2 (distribution of GTS buoy data by country and variable), and graph-3 (Evolution of number of air pressure observations distributed on GTS per month since 1991 (from ECMWF monitoring statistics)).

4.7.2) Quality of air pressure.

I Computed on a monthly basis, the graph showing the distribution of the RMS (of Observation minus First Guess Field) of Air Pressure data according to ECMWF monthly monitoring statistics. This graph, which uses 6 months of data, gives a good estimate of the quality of the drifting buoy Air Pressure data. See graph-4 in Appendix C (evolution of mean RMS (Obs.-First guess) per month since 1991 for global GTS air pressure data (from ECMWF monitoring statistics)), and graph-5 (histogram of distribution of RMS (Obs. - First Guess) for the period 02/2001 to 07/2001).

4.7.3) Air pressure from drifting buoy life time.

I Computed the graphs showing the distribution of life times of Air Pressure measurements, using the ECMWF monitoring statistics.

4.8) Action Groups, Regional actions.

4.8.1) Action Groups.

I liaise with DBCP Action Group coordinators and reply questions from them, prepare DBCP reports for AG meetings (to be presented by the DBCP representative at the meeting), and possibly attend those meetings on behalf of the DBCP.

4.9) Miscellaneous

4.9.1) Drifting Buoy Quarterly Report.

I checked the Quarterly Report on Drifting Buoy and gave approval before CLS could send it to WMO and IOC.

4.9.2) Argos monthly status report.

I checked the Argos monthly status report to WMO which was prepared by CLS, Service Argos.

4.9.3) TC DBCP files.

Updating files and databases (PC, Paradox database, JCOMMOPS database). Data come from various sources, including Argos files and database, files regularly submitted by buoy operators or Action Group Coordinators.

4.9.4) WMO/Argos number cross reference list and PGC list.

Until June 2002 the WMO/Argos cross reference list was issued monthly through BUOY-QC@VEDUR.IS mailing list. After that date, the monthly list is not issued anymore but is available via JCOMMOPS through (i) a dynamic web page which permits to query the JCOMMOPS database (http://w3.jcommops.org/cgi-bin/WebObjects/WMO_Telecom), and (ii) a file updated daily which can be downloaded from the JCOMMOPS ftp site.(ftp://ftp.jcommops.org/JCOMMOPS/GTS/wmo/wmo_list.txt).

The database includes WMO numbers for buoys transmitting on GTS via Argos, and Local User Terminals (LUT). For each WMO number, one can obtain the Argos or platform number, the drifting buoy owner, and the dates the WMO numbers have been introduced and removed from the system (Argos or LUT).

4.9.5) TC DBCP bimonthly report.

I provided the Chairman of the DBCP as well as the WMO and IOC Secretariats with my bimonthly report.

4.9.6) List of buoy user requirements.

I am keeping this list up to date according to comments or information from buoy users.

4.9.7) Documentation, assistance.

I provided users with documentation or status reports concerning specific programs or experiments; I answered specific questions regarding the Argos System.

4.9.8) TC DBCP missions.

I prepared the various missions or meetings I had to attend.

4.9.9) Preparation of the DBCP session.

I prepared specific documents and the TC report for the DBCP annual session:

APPENDIX A

GTS bulletin headers being used for GTS distrib. of buoy data in BUOY code

- Table 1: Data distributed from the US Argos Global Processing Centre, Largo, USA

Bulletin header	Deployment area	Remark
SSVX02 KARS	GDP	New
SSVX04 KARS	North Atlantic and EGOS	Same
SSVX06 KARS	Northern Hemisphere	Same
SSVX08 KARS	TAO, PIRATA	Was SSVX40 for TAO
SSVX10 KARS	Southern Hemisphere and ISABP	Same
SSVX12 KARS	Arctic, Antarctic, sea ice	Arctic, Antarctic merged
SSVX14 KARS	Indian Ocean and IBPIO	New
SSVX16 KARS	Navoceano	Same
SSVX18 KARS	Pacific Ocean	New
SSVX20 KARS	Navoceano	Same
SSVX22 KARS	Mediterranean sea	New
SSVX42 KARS	NOAA/NDBC, Southern Hemisphere	Was SSVX02
SSVX44 KARS	NE Pacific Ocean (USA, and Canada)	Was SSVX18
SSVX48 KARS	NOAA/NDBC, Northern Hemisphere	Was SSVX08
SSVX96 KARS	NDBC	Same

- Table 2: Data distributed from the French Argos Global Processing Centre, Toulouse, France

Bulletin header	Deployment area	Remark
SSVX01 LFPW	North Atlantic and EGOS	Same
SSVX03 LFPW	Southern Hemisphere and ISABP	Same
SSVX05 LFPW	Northern Hemisphere	Same
SSVX07 LFPW	Arctic, Antarctic, and sea ice	Arctic, Antarctic merged
SSVX09 LFPW	Indian Ocean and IBPIO	New
SSVX11 LFPW	TRITON	New
SSVX13 LFPW	GDP	New
SSVX15 LFPW	Pacific	New
SSVX21 LFPW	Mediterranean Sea	New
SSVX39 LFPW	French West Indies	Was SSVX19

Backup procedure:

Backup procedure in case one of the two Argos global processing centres fails does not change. If one centre fails, the other centre processes all the data, i.e. the data it normally processed plus the data the other centre normally processes. Hence, when an Argos centre is in backup mode, it will generate bulletins with even and odd numbers (in normal mode, only even numbers are used by Largo, and odd numbers by Toulouse). In other words:

- In case the French Argos Global Processing Center in Toulouse fails, the US Argos Processing Center in Largo is switched to backup mode. In that case, GTS bulletins normally distributed from Toulouse under TTAAii LFPW bulletin headers are distributed from Largo under TTAAii KARS bulletin headers (e.g. SSVX01 LFPW becomes SSVX01 KARS and is sent out from Largo).

- In case the US Argos Global Processing Center in Largo fails, the French Argos Processing Center in Toulouse is switched to backup mode. In that case, GTS bulletins normally distributed from Largo under TTAAii KARS bulletin headers are distributed from Toulouse under TTAAii LFPW bulletin headers (e.g. SSVX04 KARS becomes SSVX04

LFPW and is sent out from Toulouse).

Remark concerning GDP:

since GDP drifters deployed world-wide may also participate in a DBCP regional action groups (e.g. ISABP if deployed in the South Atlantic), we have to agree on a policy on what GTS bulletin header to choose. Considering that GDP header was created basically for tracking Lagrangian drifters, it sounds reasonable to recommend to have all Lagrangian drifters participating in GDP report under GDP bulletin header and not under the other DBCP Action Group it is participating in. For example, a Lagrangian drifter participating in both GDP and ISABP (South Atlantic) and which data are distributed from the French Argos Global Processing Center would report under SSVX13 LFPW (i.e. GDP) bulletin header, and not under SSVX03 LFPW (i.e. Southern Hemisphere).

- Table 3: Data routed from the National Data Buoy Center (NDBC),Mississippi, USA, based on data received from Service Argos Inc. (SAI), Landover MD, USA

Bulletin header	Deployment area	Remark
SSVX42 KWBC	NOAA/NDBC, Southern Hemisphere	Was SSVX02 KWBC
SSVX48 KWBC	NOAA/NDBC, Northern Hemisphere	Was SSVX08 KWBC

- Table 4: Data routed from the National Ice Center (NIC), Washington DC, USA, based on data received from Service Argos Inc. (SAI), Landover MD, USA

Bulletin header	Deployment area	Remark
SSVX18 KWBC	Arctic Ocean, data Quality Controlled at NCEP	

- Table 5: Data routed from Edmonton Local User Terminal (LUT)

Bulletin header	Deployment area	Remark
SSVX02 CWEG	Arctic Ocean	
SSVX03 CWEG	Hudson Bay	
SSVX04 CWEG	NorthEast Pacific Ocean	

- Table 6: Data routed from Halifax Local User Terminal (LUT)

Bulletin header	Deployment area	Remark
SSVX01 CWHX	NorthWest Atlantic Ocean	

- Table 7: Data routed from Oslo Local User Terminal (LUT)

Bulletin header	Deployment area	Remark
SSVX01 ENMI	North Atlantic Ocean (EGOS)	

- Table 8: Data routed from the Centre de Meteorologie Marine, Brest

Bulletin header	Deployment area	Remark
SSVX51 LFPW	North Atlantic Ocean (Bodega-TOGA)	
SSVX55 LFPW	Equatorial Pacific Ocean (Bodega-TOGA)	

- Table 9: Data routed from the Sondre Stromfjord Local User Terminal (LUT)

Bulletin header	Deployment area	Remark
SSVX01 BGSF	North Atlantic Ocean (EGOS)	

APPENDIX B

Buoys reporting on GTS

(Information provided by the Technical Coordinator of the DBCP to the Argos Operations Committee, Hawaii, June 2002)

There was 1149 buoys reporting via Argos in March 2002. 576 of these were reporting on GTS. Table below summarizes the evolution of these numbers in the last 10 years.

Year	Operational drifting buoys	On GTS	% on GTS
July 1991	718	264	36.8%
July 1992	1162	474	40.8%
August 1993	1269	548	43.2%
September 1994	1246	587	47.1%
September 1995	1429	631	44.2 %
September 1996	1180	638	54.1%
September 1997	1159	581	50.1%
August 1998	1230	543	44.1%
July 1999	1270	728	57.3%
July 2000	1385	807	58.3%
July 2001	1338	763	57%
March 2002	1149	576	50.1%

The following comments can be made:

1) The number of buoys reporting via Argos increased substantially during the period 1991 to 1995. Figures then decreased until 1997, and increased again until 2001. A drop was noticed in 2002.

2) The number of buoys reporting on GTS as well as the percentage of buoys reporting on GTS increased dramatically during the period thanks to the following:
   a. Increased deployments of Lagrangian drifters worldwide by the Surface Velocity Programme and then by the Global Drifter Programme.
   b. Increased cooperation between meteorologists and oceanographers in particular with regard to the development of the SVP barometer drifter (SVPB). Such cooperation included design, testing of prototypes, and operational deployments. GTS distribution is also regarded as an efficient way to obtain quality information on the performances of the instruments (i.e. comparisons of the observations with the NWP models).
   c. Decrease in the number of PIs reluctant to allow for GTS distribution of their data. Scientific community involved in drifter programmes is now very aware of the need for GTS distribution of the data for operational purposes while at the same time recognizing that scientific studies based upon GTS data solely have (e.g. quality of location was only introduced recently in BUOY reports) little or less value that similar studies based upon the Argos data they directly get from Argos or based upon scientifically quality controlled data from DACs. There is now also a trend towards operational oceanography which greatly facilitates obtaining authorization for GTS distribution of the data. In addition, submergence information which permits to deduce drogue status and therefore water following characteristics of the drifters was recently added to BUOY reports with no objection from the scientific community.
   d. Implementation of the Argos GTS sub-system which permitted to process formats for GTS distribution purposes which could not be processed before. Since the GTS sub-system is separate from the standard Argos system, PIs requiring the raw data from Service Argos can still authorize GTS distribution of the data (data have to be processed in geo-physical units, QC'ed, and properly formatted for GTS purposes).
   e. Efforts were made to standardize Argos data formats. There are now series of DBCP recommended data formats.

3) Still it can be noted that there remain a number of buoys which are not reporting on GTS. This is

explained by the following reasons:

a. Some of the buoys are not relevant for GTS distribution (e.g. oil following drifters, biological buoys, short life-time experiments)
b. Some of the buoys were removed from GTS distribution because of poor quality data although they are still reporting via Argos
c. Some of the buoys are deployed but not yet considered operational. Pre-operational tests have to be conducted to make sure that the data are good for GTS distribution.
d. For a small number of buoys now, the PI might be reluctant to authorize for GTS distribution of the data because he/she wants to publish scientific study first. This used to be the case but thanks to better cooperation between meteorologists and oceanographers as well as with the advent of operational oceanography, PIs are now much more open to GTS distribution than in the past.
e. Technical obstacles such as complicated Argos data formats might prevent from realizing GTS distribution of the data. However, the Argos GTS sub-system now permits to deal with a wide variety of data formats.
f. Other types of platforms (e.g. floats) might be counted here as buoys (errors in Argos database). Efforts are being made to track such errors.

Most of the improvements stated in (2) above could be realized thanks to the action by the Data Buoy Cooperation Panel.

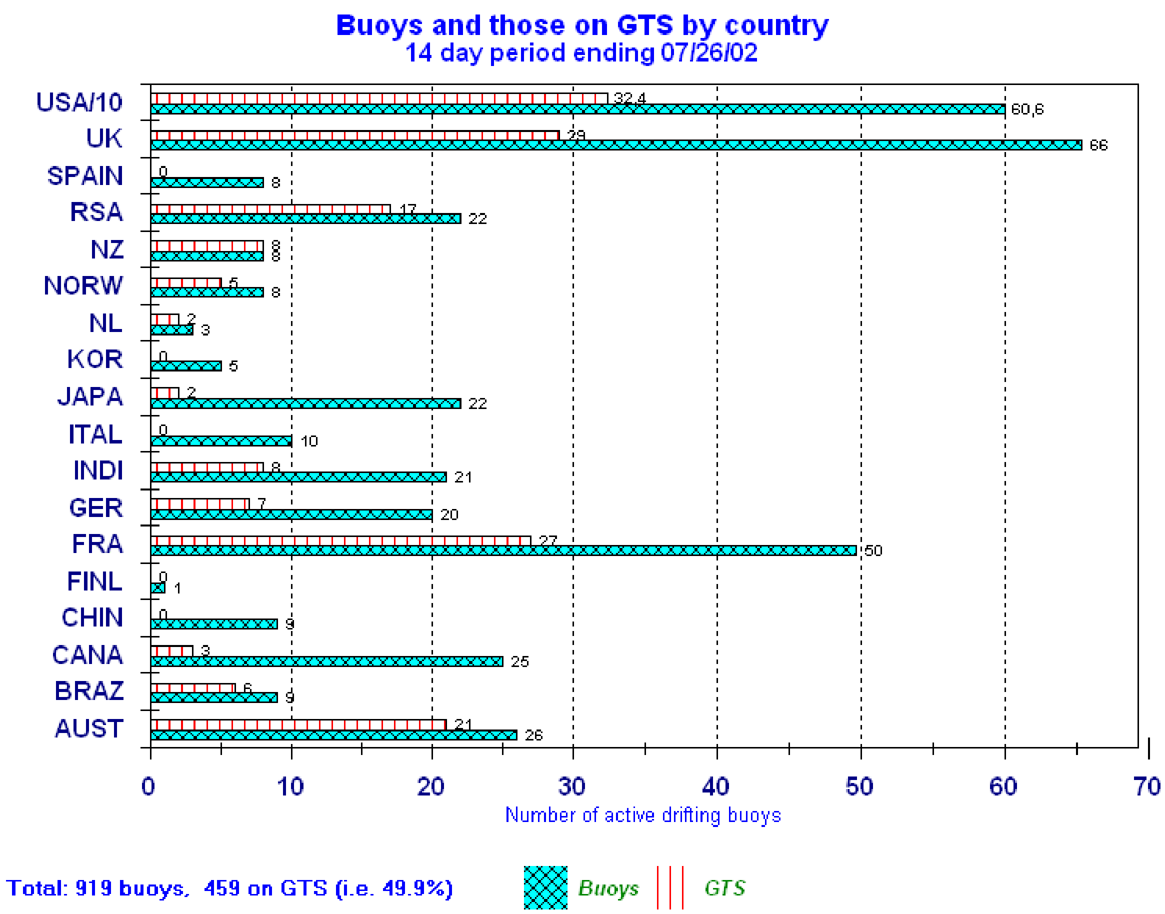
With regard to the decrease in buoys and buoys on GTS in the last two years:

1) Additional deployments of about 50 more drifters per year were made by the GDP after mid-1998 thanks to International Year of The Ocean (YOTO) commitments. These extra deployments ceased in 2000. Average life-time for a drifter is 18 months. So YOTO drifters counted for about 225 extra drifter*year during the period mid-1998 to mid-2001. We reached a peak of 807 buoys on GTS in July 2000 (most of them were GDP drifters).
2) In 2001, 120 drifters were deployed by GDP in a cluster in the Eastern Tropical Pacific Ocean for the EPIC Programme. Because of the area of deployment, currents and wind conditions, they beached relatively quickly hence making the number of operational drifters fall dramatically.
3) Now the GDP maintains a deployment level of about 440 drifters per year. Changes in drifter design will permit to reduce cost of units ($1700 from $2200 per unit expected). This should permit at constant budget to eventually increase the number of drifters deployed in the GDP each year (i.e. about 50 more).
4) GDP authorizes GTS distribution for all of its drifters, provided that the quality is acceptable. There might be a small number of drifters deployed which are not reporting on GTS for the following reasons (i) pre-operational tests to make sure that the quality is good before actually authorizing GTS distribution, and (ii) post-operational drifters, i.e. quality was poor and their data were removed from GTS distribution. Consequently, a drop in the number of deployments in the GDP automatically leads to (i) a drop in the number of buoys reporting on GTS, (ii) a drop in the number of those reporting on GTS, and (iii) a drop in the percentage of those on GTS.

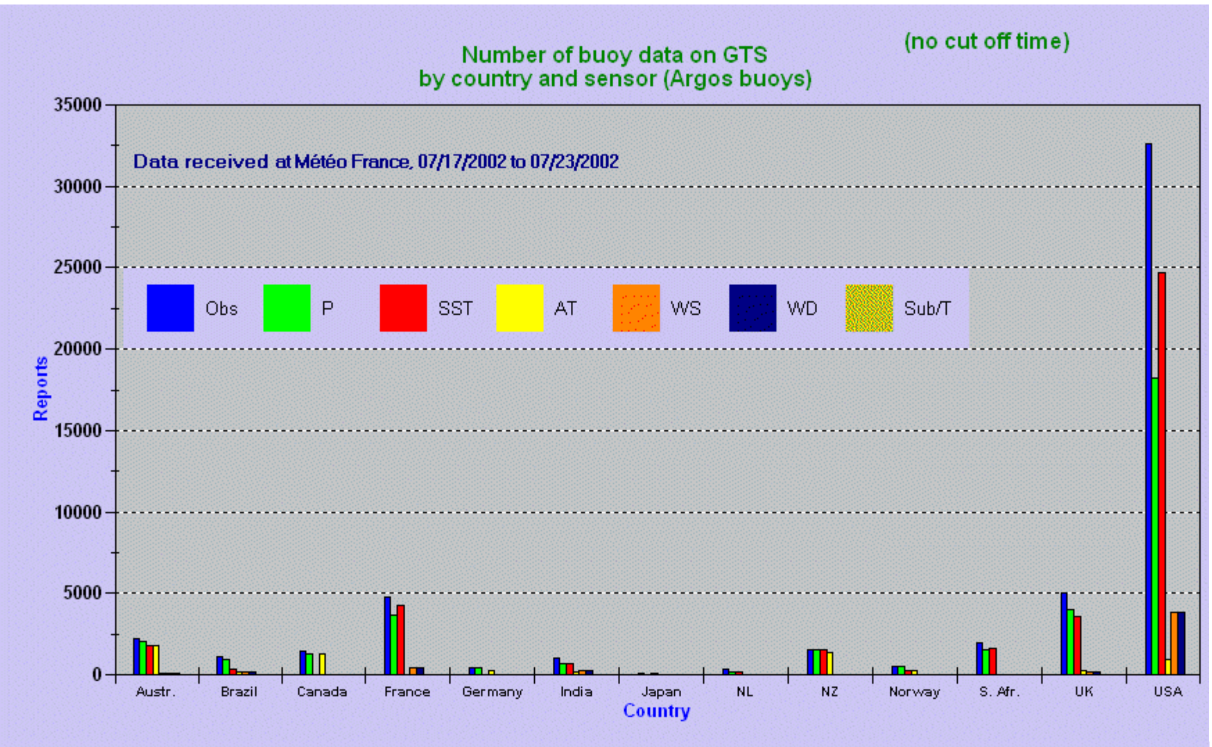
APPENDIX C

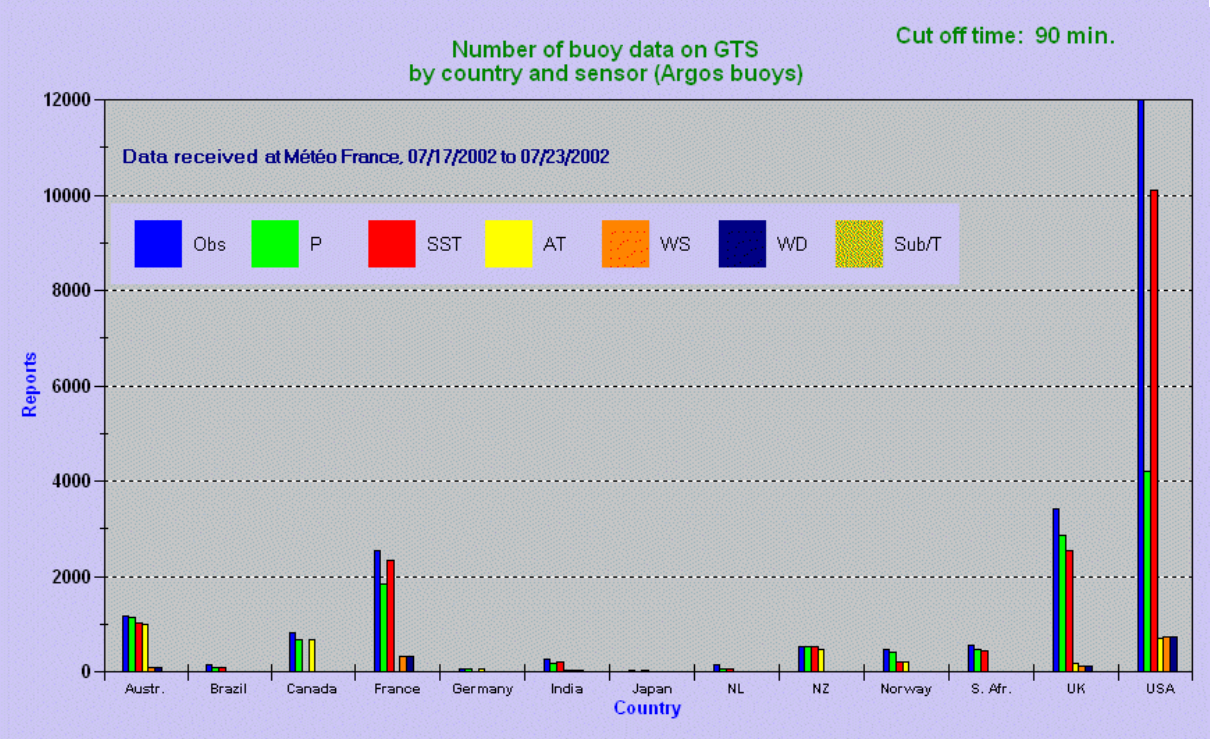
Graphs

Graph-1: Buoys and those on GTS by country:

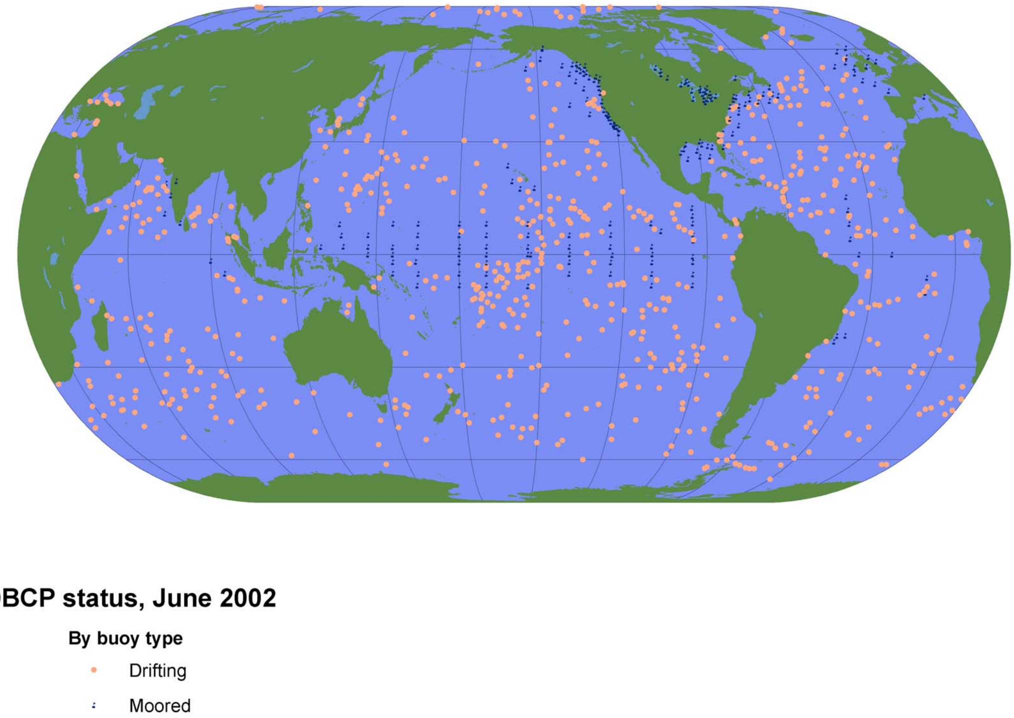


Graph-2: Number of drifting buoy data on GTS by country and sensor:

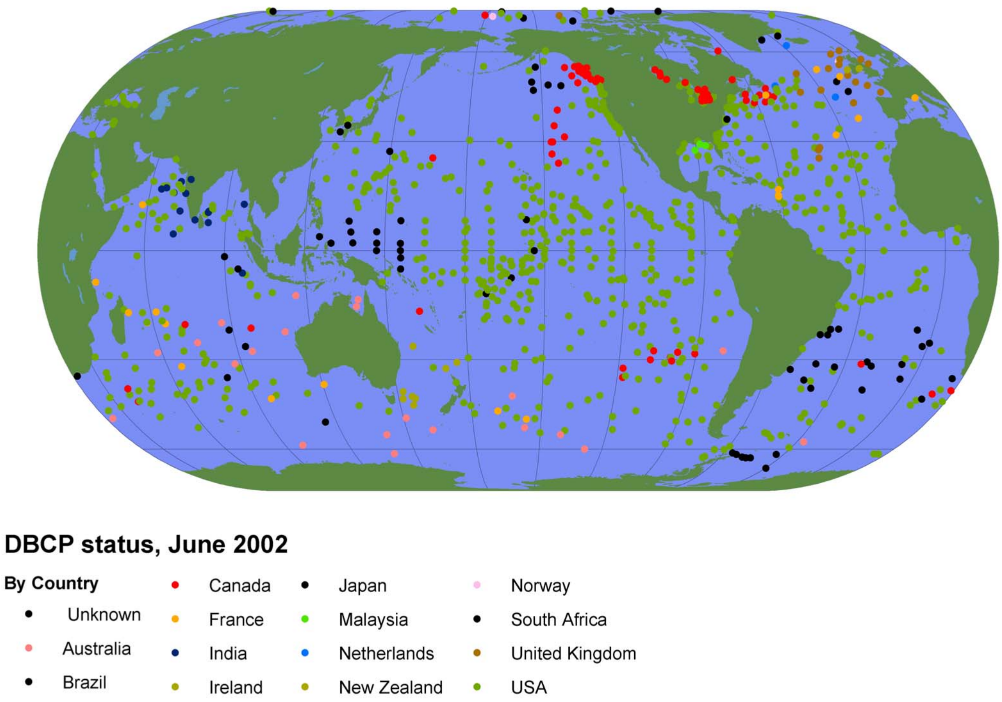




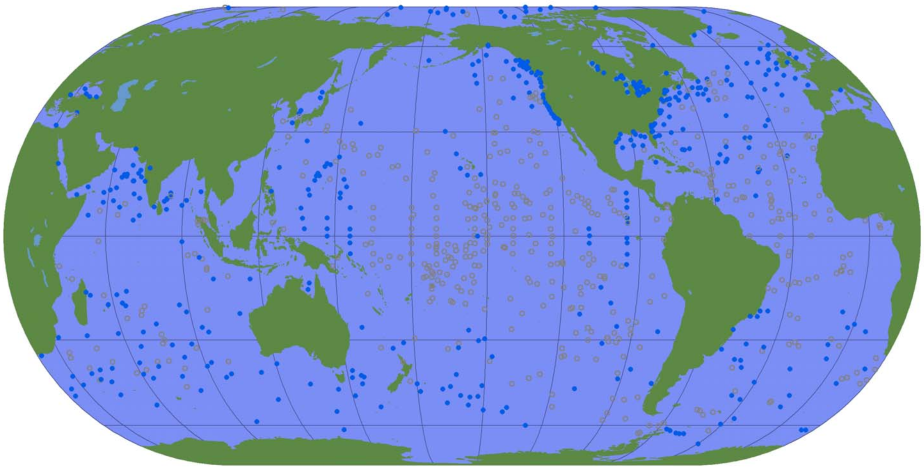
Map 1: **Drifting and Moored** buoys reporting on GTS in June 2002:



Map 2: Buoys reporting on GTS in June 2002 **by country**:



Map 3: Drifting and Moored buoys reporting **Air Pressure** on GTS in June 2002:



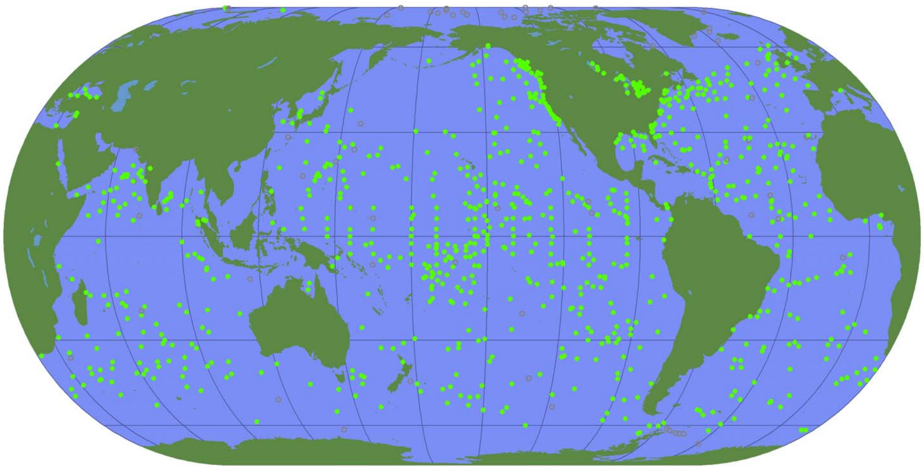
DBCP status, June 2002

Measured

Air pressure

Not measured

Map 4: Drifting and Moored buoys reporting **SST** on GTS in June 2002:



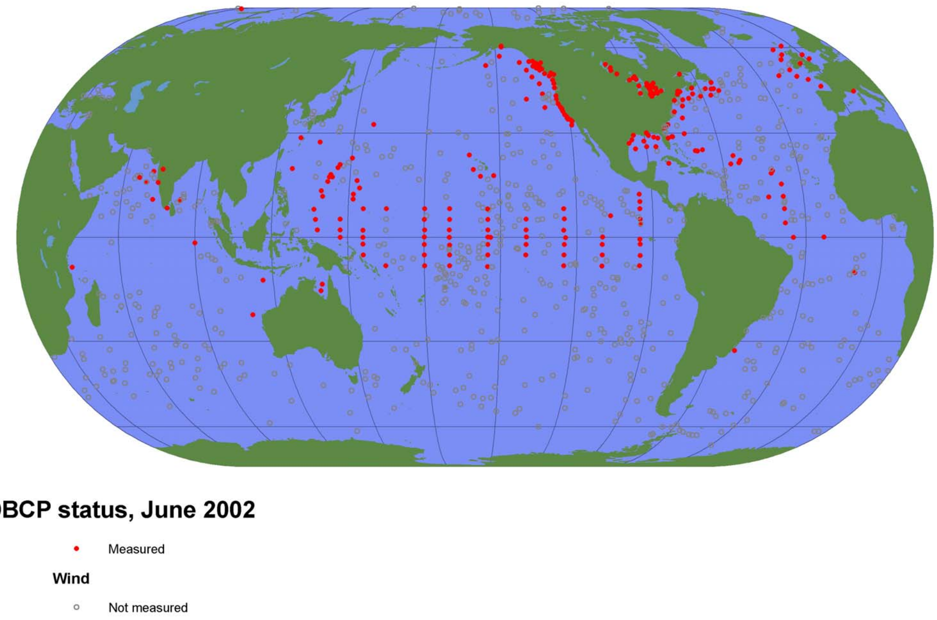
DBCP status, June 2002

Measured

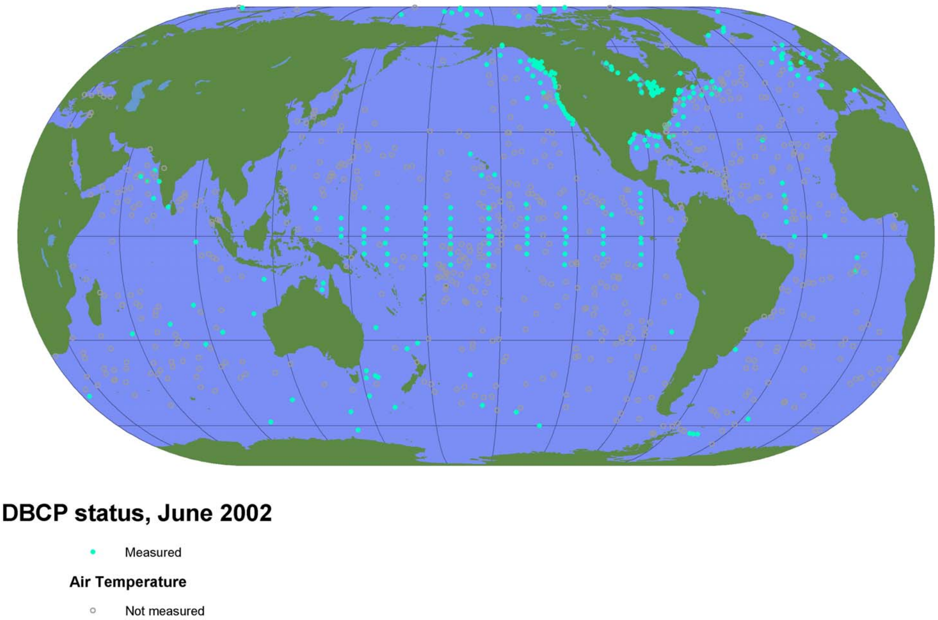
SST

Not measured

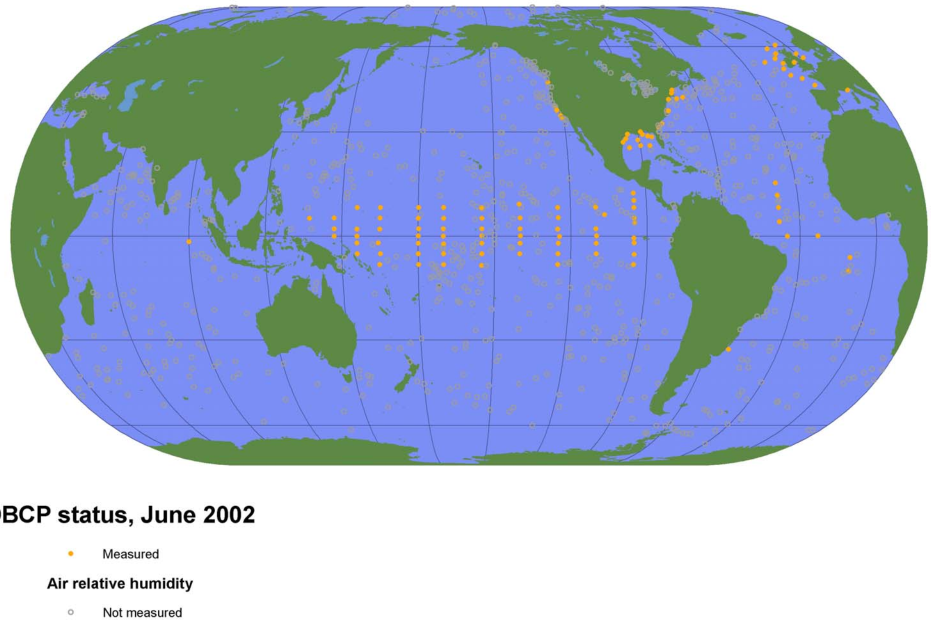
Map 5: Drifting and Moored buoys reporting **Wind** on GTS in June 2002:



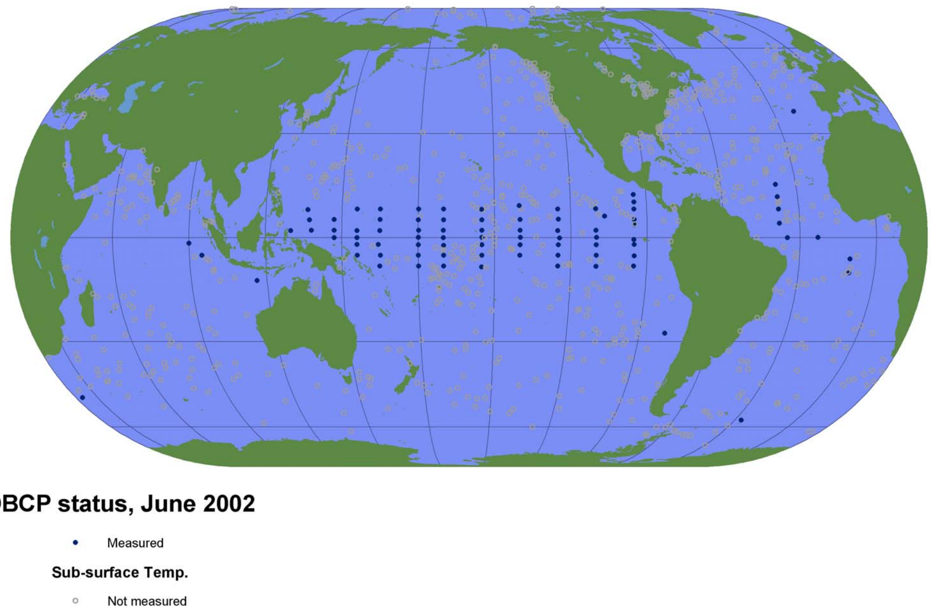
Map 6: Drifting and Moored buoys reporting **Air Temperature** on GTS in June 2002:



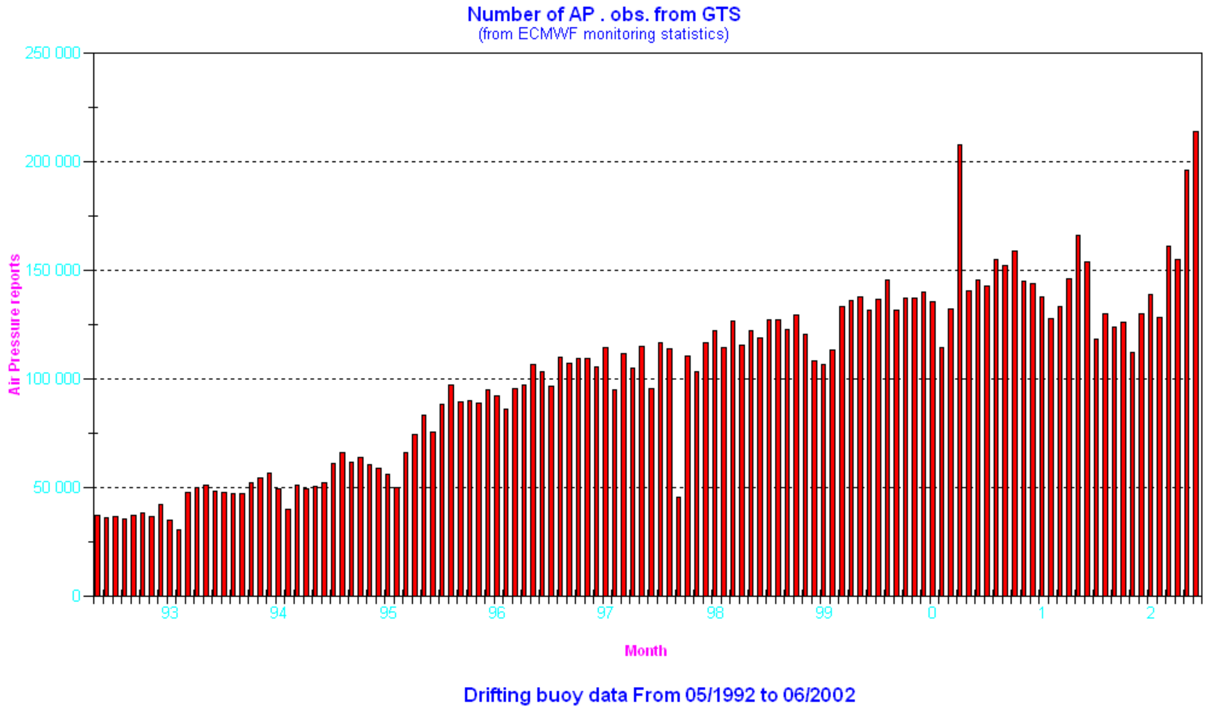
Map 7: Drifting and Moored buoys reporting **Air Relative Humidity** on GTS in June 2002:



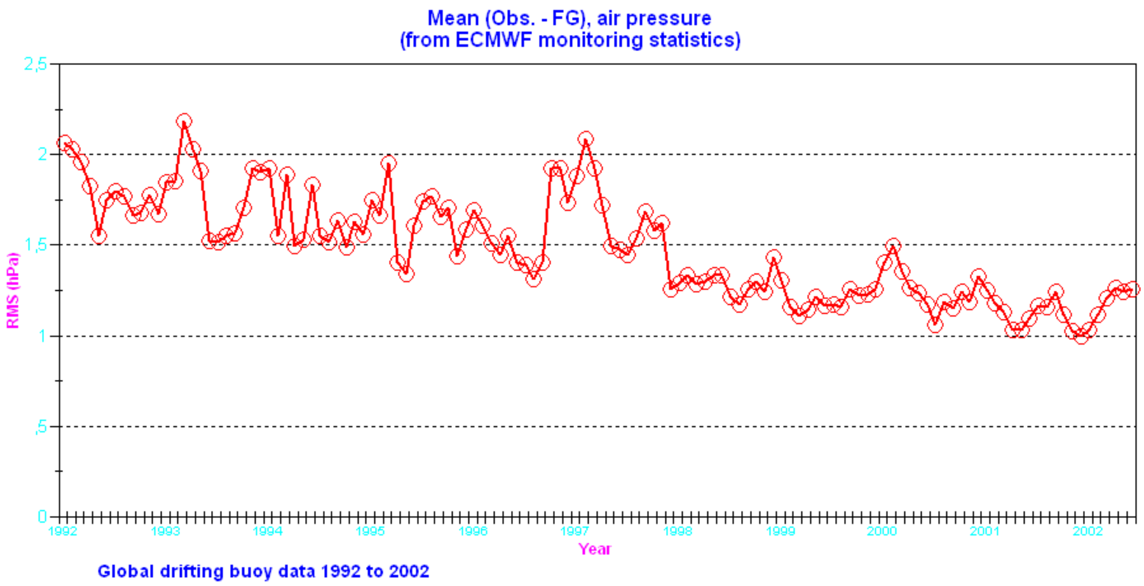
Map 8: Drifting and Moored buoys reporting **Sub-surface Temperature** on GTS in June 2002:



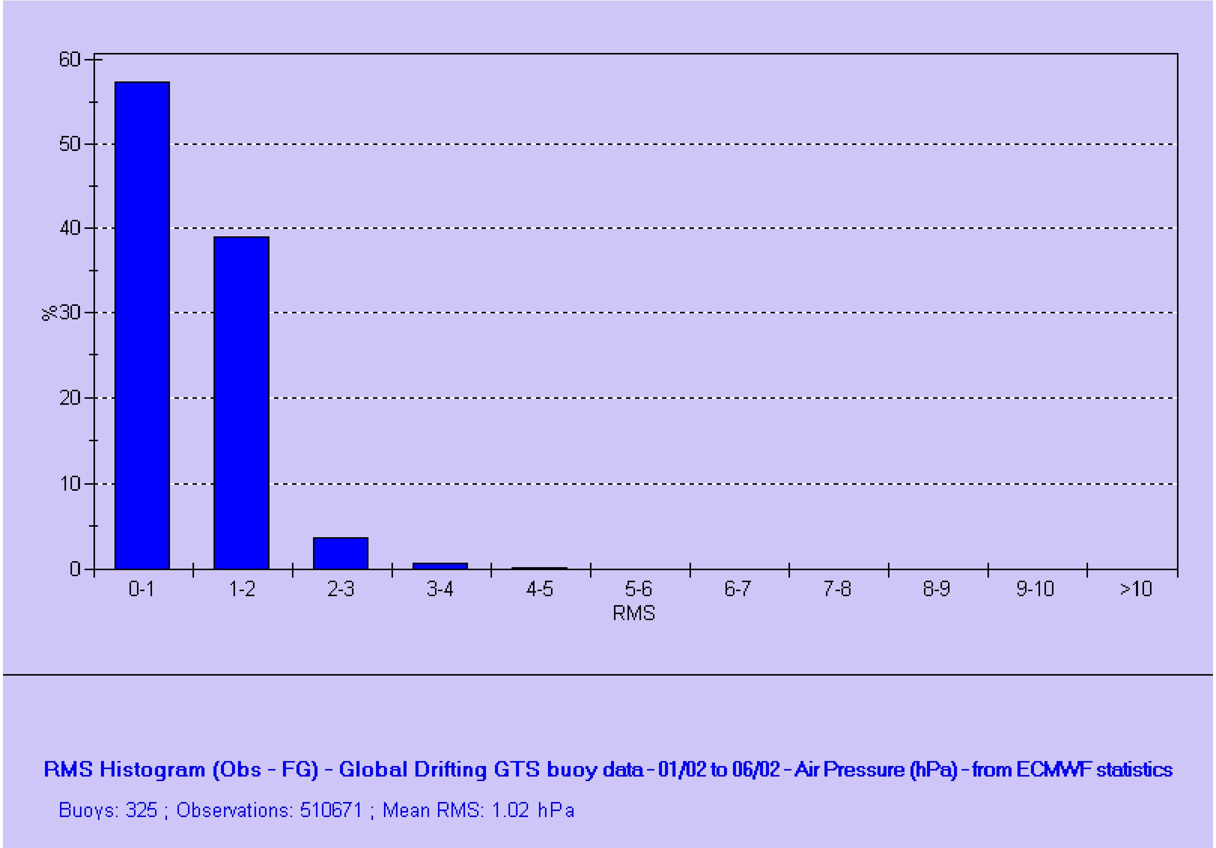
Graph 3: Evolution of number of air pressure observations distributed on GTS per month since 1992 (from ECMWF monitoring statistics)



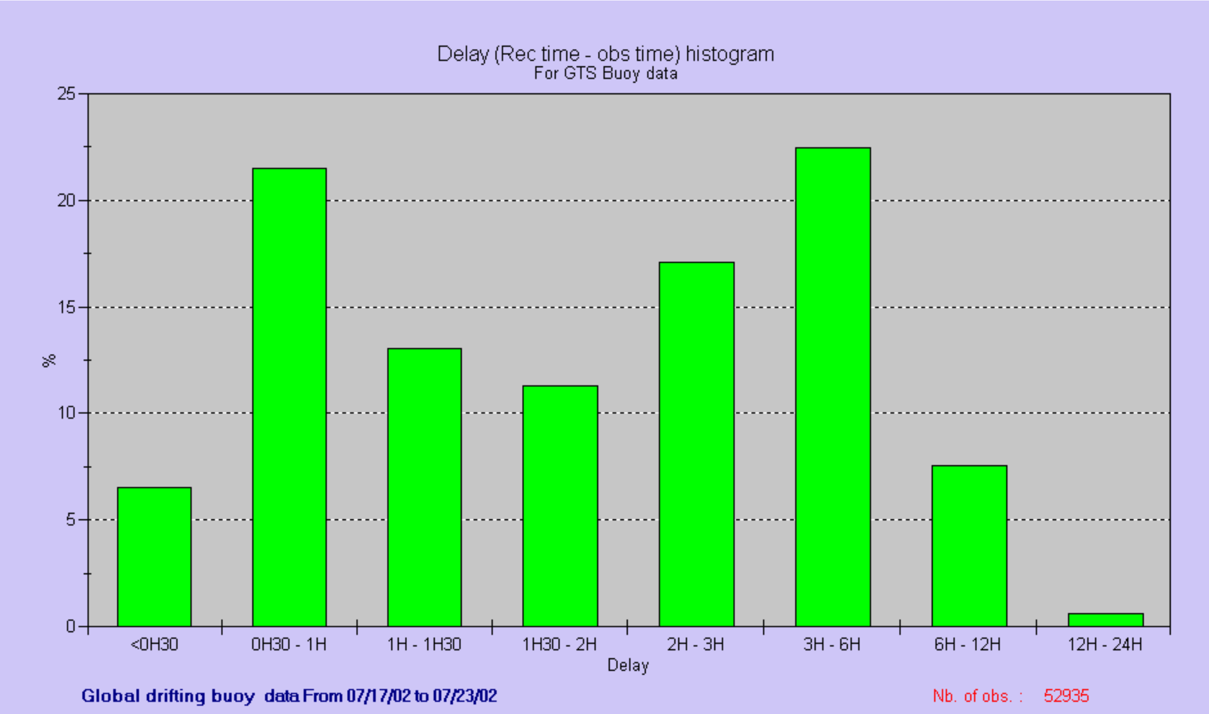
Graph 4: Evolution of mean RMS (Obs.-First guess) per month since 1992 for global GTS air pressure data (from ECMWF monitoring statistics)



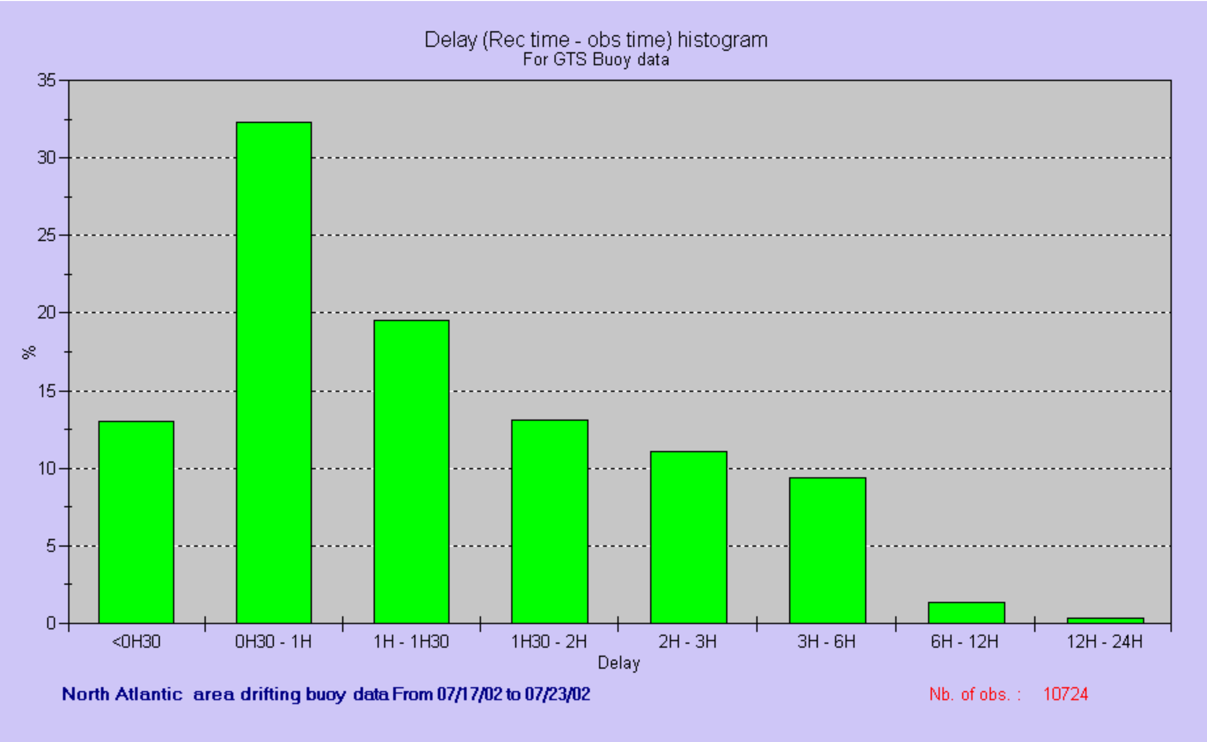
Graph5: Histogram of distribution of RMS (Obs. - First Guess) for the period 01/2002 to 06/2002.



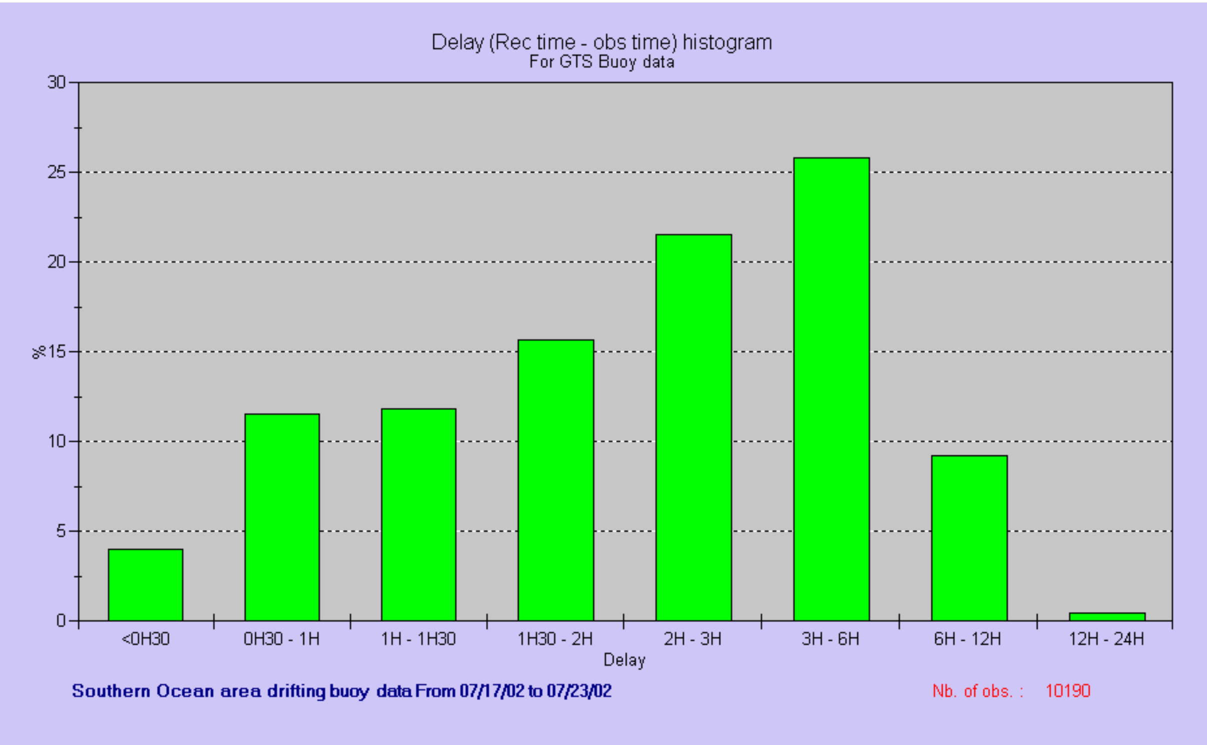
Graph 6: Histogram of distribution of delays for drifting buoy reports received by Météo France in BUOY format 17/07/2002 to 23/07/2002



Graph 7: Histogram of distribution of delays for North Atlantic drifting buoy reports received by Météo France in BUOY format 17/07/2002 to 23/07/2002



Graph 8: Histogram of distribution of delays for Southern Ocean drifting buoy reports received by Météo France in BUOY format 17/07/2002 to 23/07/2002



APPENDIX D

Excerpt from recommendations by the Expert Team on Observational Data Requirements and Redesign of the Global Observing System, reduced session, Oxford, UK, 1-5 July 2002

Remark: Topics relevant for the DBCP are here highlighted in **red/bold**.

High-Priority General Recommendations

Data distribution and coding

1. Exchange internationally observational data not yet centrally collected but potentially useful in NWP, e.g., radar measurements to provide information on precipitation and wind, surface observations, including those from local or regional mesonets, **wave buoys**. Encourage WMO Members in regions where these data are collected to make them available via WMO real time information systems.

2. **Data available at high temporal frequency should be distributed at least hourly. Recent studies have shown that 4D-Var data assimilation systems or analysis systems with frequent update cycles can make excellent use of hourly data, eg from SYNOPs, buoys, profilers, aircraft (AMDAR). [OSE-1]**

3. **Assure that all sources are accompanied by good documentation, careful QC, and monitoring.**

4. Use coding standards that assure that the content (e.g vertical resolution) of the original measurements, sufficient to meet the user requirements, is retained during transmission. Some current coding/formatting standards in the character codes degrade potentially useful information in meteorological reports. (Example: lost information at various levels in a rawinsonde sounding in the TEMP code could be retained in the BUFR code.) [CBS decision to migrate to table driven and binary codes]

Broader use of ground based and in situ observations

5. Calibration of measurements from satellites depends on using ground-based and *in situ* observations, such as ozone profiles from sondes. Near real-time distribution of ozone sonde data is required for calibration and validation of newly launched instruments and for potential use in NWP. [Joint ECMWF / WMO expert team meeting on real time exchange of ground based ozone measurements, ECMWF, 17-18 October 1996]

Moving towards operational use of targeted observations

6. Transfer into operations the proven methodology of observation targeting to improve the observation coverage in data sensitive areas. This concept is in operational use at the US Weather Service in the north-eastern Pacific during the winter storm period. **EUCOS is planning on field experiments in the Atlantic**, possibly in the context of a THORPEX study. Designated major operational centres should share the responsibility for determining the target areas. [FASTEX results and Toulouse report]

High Priority System Specific Recommendations

Optimisation of rawinsonde launches

7. Optimise the distribution and the launch times of the rawinsonde sub-system (allowing flexible operation while preserving the GUAN network and taking into consideration regional climate requirements). Example: Avoid duplication of Automated Ship-borne Aerological Program (ASAP) soundings whenever ships are near a fixed rawinsonde site in order to free resources for observations at critical times. Example: Optimise rawinsonde launch to local time of day to meet the local

forecasting requirements. [EUCOS Studies, OPAG IOS Chairman]

Development of the AMDAR programme

8. AMDAR technology should provide more ascent/descent profiles, with improved vertical resolution. A good way to accomplish this is to extend the AMDAR programme to short-haul commuter flights, business aviation, and air freight. Emphasis should be to expand into areas where vertical profile data from radiosondes and pilot balloons are sparse a well as into times that are currently not well observed such as 11 pm to 5 am local times. [Toulouse report, ECMWF northern hemisphere AMDAR impact study, OSEs 4, 5, 8]

9. AMDAR coverage is both possible and sorely needed in several currently data-sparse regions, especially Africa and South America, Canadian arctic, northern Asia and most of the world's oceans. Moreover, the timing and location of reports, whose number is potentially very large, can be optimised while controlling communications costs. The recommendation is to optimise the transmission of AMDAR reports taking into account, en route coverage in data-sparse regions, vertical resolution of ascent/descent reports, and targeting related to the weather situation. [Toulouse report, ECMWF northern hemisphere AMDAR impact study]

10. Lower-tropospheric water vapour measurements are vital in many forecast applications. To supplement the temperature and wind reports from AMDAR, the further development and testing of water vapour sensing systems is strongly encouraged. Example: WVSS-2 employs a laser diode to measure the absorption by water vapour of energy in the laser beam over a short path length. This is an absolute measurement of water vapour content that is expected to be accurate from the ground to flight altitudes. [Toulouse report]

Tropospheric Aircraft Meteorological Data Reporting (TAMDAR)

11. TAMDAR could potentially supplement AMDAR and radiosonde data by providing lower level en route observations and profiles over additional, regional airports not served by larger AMDAR compatible aircraft. Instrumentation would not necessarily be designed to function in the high troposphere and would therefore be less expensive. The development of the TAMDAR system should be monitored with a view towards operational use. [EUCOS Programme Plans]

Ground based GPS

12. Develop further the capability of ground-based GPS systems for the inference of vertically integrated moisture with an eye toward operational implementation. Distribute globally the measurements of total column water vapour from available nd emerging ground based GPS systems for use in NWP. Such observations are currently made in Europe, North America and Japan. It is expected that the global coverage will expand over the coming years. [COSNA/SEG, NAOS, JMA reports]

Improved observations in ocean areas

13. Increase the availability of high vertical resolution temperature, humidity, and wind profiles over the oceans. Consider as options ASAP and dropsondes by designated aircraft. [EUCOS programme plan]

14. Considering the envisaged increase in spatial and temporal resolution of *in situ* marine observing platforms and the need for network management, either increase the bandwidth of existing telecommunication systems (in both directions) or establish new relevant satellite telecommunications facilities for timely collection and distribution. Examples include drifting buoys, profiling floats, XBTs. [JCOMM Operations Plan]

15. For both NWP (wind) and climate variability/climate change (sub-surface temperature profiles), it is recommended to extend the tropical mooring array into the tropical Indian Ocean at resolution consistent with what is presently achieved in the tropical Pacific and Atlantic Oceans. . [JCOMM Operations Plan]

16. Ensure adequate coverage of wind and surface pressure observations from drifting buoys in the Southern Ocean in areas between 40S and the Antarctic circle based upon adequate mix of SVPB (surface pressure) and WOTAN technology (surface wind). The pressure observations are a valuable complement to the high density surface winds provided by satellite. [Toulouse report, ODRRGOS OSE study]

17. For Ocean Weather Forecasting purposes, improve timely delivery and distribute high vertical resolution data for sub-surface temperature/salinity profile data from XBTs and Argo floats. . [JCOMM Operations Plan]

18. For NWP purposes, increase coverage of ice buoys (500 km horizontal resolution recommended) to provide surface air pressure and surface wind data. . [JCOMM Operations Plan]

Improved observations over tropical land areas

19. Enhance the temperature, wind and if possible the humidity profile measurements (from radiosondes, pilots and aircraft) in the tropical belt, in particular over Africa and tropical America. There is evidence from recent impact studies with the radiosonde/pilot balloon network over the Indonesian/Australian region that such data give a better depiction of winds in the tropics and occasionally strongly influence the adjacent mid-latitude regions. [OSE-5]

New Observing Technologies

20. Demonstrate the feasibility of ground based interferometers and radiometers (e.g. microwave) to be an operational sub-system providing continuous vertical profiles of temperature and humidity in selected areas.

21. Demonstrate the feasibility of Unmanned Aeronautical Vehicles (UAVs) to be an operational sub-system.

22. Demonstrate the feasibility of high altitude balloons to be an operational sub-system

Table linking observed parameters with a given system of the surface based component of the GOS *(If the agencies pursue the recommended actions and encourage the indicated developments, the surface based component of the GOS would have the following characteristics)*

System	Parameter	Action/Development
AMDAR	Vertical profiles of temperature and wind at airports Flight level data Vertical profiles of humidity	Increase coverage, increase vertical resolution Extend programme to short-haul, commuter and freight flights Study feasibility of adaptive use, demonstrate the need for high frequency data, in particular over Africa, South America Develop capability
TAMDAR	Vertical profiles of temperature and wind at regional airports	Develop the programme (currently undertaken by NASA), suitable for expansion to other regions, such as the arctic, Siberia, etc.
Radiosondes	Vertical profiles of temperature wind and humidity	Optimise horizontal resolution and operation of sub-system (launch times, adaptive operation). Ensure that codes accommodate full vertical resolution of measurements. Increase the availability over the oceans (ASAP, dropsondes, etc.)
Ozone soundings	Vertical profile of ozone	Integrate into GOS

UAVs	Spatial coverage and vertical profile of wind, temperature and humidity	Demonstrate feasibility of an operational sub-system; target areas for operation are the ocean storm tracks (planned in THORPEX)
High-altitude balloons deploying sondes	Vertical profile of temp, wind and humidity	Demonstrate feasibility of an operational sub-system
Drifting buoys	**Surface measurements of temperature, wind and pressure, SST**	**Extend coverage especially in SH based on SVPB and WOTAN technology**
Moored buoys	**Surface wind, pressure, sub-surface temperature profiles** **Wave height**	**Improve timely availability for NWP.** **Exploit for monthly & seasonal forecasting.** **Extend coverage into Indian Ocean**
Ice buoys	**Ice temp; air pressure, temp and wind**	**Increase coverage**
VOS	Surface pressure, SST, wind	Maintain their availability to provide complementary mix of observations
Ships of opportunity (SOOP)	Sub-surface temperature profiles (XBT)	Improve timely delivery and distribute data with full vertical resolution
Subsurface profiling floats Argo programme	Sub-surface temperature and salinity	Improve timely delivery and distribute data with full vertical resolution
Tide gauges (GLOSS)	Sea level observations	Establish timely delivery
SYNOP and METAR data	Surface observations of pressure, wind, temperature, clouds and 'weather' Visibility Precipitation Snow cover and depth Soil moisture	Exchange globally for regional and global NWP at high temporal frequency (at least hourly), develop further automation Ditto Ditto Distribute daily Distribute daily
Wind profiling radar	Vertical profile of wind	Distribute data
Scanning weather radar	Precipitation amount and intensity Radial winds, Velocity Azimuth Display (VAD)	Provide data, demonstrate use in hydrological applications (regional and global NWP) Demonstrate use in regional NWP Ensure compatibility in calibration and data extraction methods
Ground Based GPS	Column Water Vapour	Demonstrate real-time capability
Ground Based Interferometers and other radiometers (e.g. MW)	Time continuous vertical profile of temp/humidity	Demonstrate capability

ANNEX IV

ACTION GROUP REPORT SUMMARIES

The European Group on Ocean Stations (EGOS)

The Management Committee met on 4-5 December 2001 and 28-29 May 2002. There have been no changes to the members of EGOS with nine participants. Anne Hageberg of Christian Michelsen Research, Norway continues as the Technical Secretariat, and Pierre Blouch of Météo-France is the Technical Co-ordinator, with Volker Wagner the Chairman and Wil van Dijk the Vice Chairman.

EGOS continued to develop the operational programme through the intersessional period, with the main focus on optimum usage of available resources through improved deployment strategies. New ship routes between Norway and the USA and the United Kingdom and the USA were used, as well as air deployments and existing ship tracks. In August 2002, there were 44 operational buoys, with 21 in EGOS North and 23 in EGOS South. Eight to nine non-EGOS buoy reported in the EGOS area during 2002. There were no early drifter failures this year, and average lifetime was 353 days. Drogues continue to be lost. Part of this may be explained by a rather harsh winter this year. In addition to drifters, EGOS continues to operate a moored buoy network. There were 16 operational mooring during the intersessional period.

The International Arctic Buoy Programme (IABP)

Participants in the IABP met from 10-12 June in Ottawa, Canada. The meeting was hosted by MEDS with some support from the Meteorological Services of Canada (MSC).

This year, 17 new buoys were deployed in April and August 2002. These new buoys were deployed by helicopter, by fixed wing aircraft landing on ice, from icebreakers and via air drops. At the end of August, when the buoy array is typically at its maximum, 41 buoys were present in the array, 28 of which reported their data on GTS.

Data, publications, reports and products are available on the IABP web site at: http://IABP.apl.washington.edu. The number of papers and other publications citing IABP data continues to grow and was approximately 300 in October 2002.

Work in progress:

1) The coordinator of IABP (Ignatius Rigor) is working with the Metadata Working Group to ensure that the metadata from ice buoys is collated.
2) The coordinator and the chairman (Tim Goos) are working to identify buoys in the Arctic Basin that are beyond the realm of IABP in order to facilitate GTS distribution and encourage the owners to join the IABP.
3) MSC is working on implementing processes to improve the quality of location data distributed on GTS from the Edmonton LUT.
4) MSC is investigating the feasibility of participating in the DBCP QC guidelines monitor the quality of Arctic data distributed on GTS.

The International Programme for Antarctic Buoys (IPAB)

The International Programme for Antarctic Buoys (IPAB) was launched in 1995 to establish, coordinate and maintain a network of drifting buoys in the Antarctic sea-ice zone in order to monitor and to support research on atmospheric and oceanic climate in the Antarctic sea-ice zone. The operational area of the Programme is south of 55 degrees South latitude, and includes that region of the Southern Ocean and Antarctic marginal seas within the maximum seasonal sea-ice extent.

Around 165 buoys providing data to the programme were deployed south of 55 °S in the eight-year period between 1995 and 2002. Most IPAB data buoys report through System Argos and the programme encourages buoy operators to equip platforms with basic pressure and temperature sensors and to contribute real-time operational meteorological data via the GTS. The last two years have seen an increase of IPAB related activities: the new deployments in 2001 and in this portion of 2002 amount to over 20 platforms reporting data via the GTS each year, with a sensible increment with respect to year 2000.

Chairman: Enrico Zambianchi, Università di Napoli "Parthenope", Italy

Coordinator: Peter Wadhams, Scott Polar Research Institute, UK

Last IPAB meeting: IPAB-III in Fairbanks, Alaska (USA), June 2000
Next planned IPAB meeting: IPAB-IV in Dunedin (New Zealand), November 2002

The International South Atlantic Buoy Programme (ISABP)

The intersessional period August 2001 to July 2002 has been very successful. In the Tropical and Southern Atlantic ocean the data coverage has been good, with some gaps still in the eastern part of the sub-Tropical ocean. In the period 142 drifters were deployed consisting of 89 SVP, 41 SVPB and 12 SVPW drifters. The contributers to the deployments were GDC, Navoceano, South African Weather Service, Brazil and Argentina. 127 drifters were deployed by ship and 15 by air. 37% of the drifters deployed measured air pressure compared to the 28% in 2001.

The ninth ISABP meeting was held at the Marine and Coastal Management conference facility in Sea Point, Cape Town from 29 July 2002 to 2 August 2002 in conjunction with the sixth IBPIO meeting. The very successful meeting was preceded by a Technical and Scientific workshop during which 17 papers were presented , attended by 27 participants. At the meeting hosted by the South African Weather Service Alaor Moacyr Dall' Antonia was re-elected as chairman and Ariel Triosi as vice-chairman. Louis Vermaak was re-appointed as Programme Co-ordinator.

Future plans include the maintenance of the array in the Tropical Atlantic to ensure data during the hurricane season and the improvement in the network off the West Coast of Africa and air pressure measurements in the Southern Oceans.

The Programme Committee expressed their concern that the loss of Lannion Argos Global Coverage about two years ago significantly increased delays of data collected through the Argos system. The committee therefore suggests that the DBCP considers a recommendation to include required developments in the Argos development programme.

ISABP information is available on the Web site: http://dbcp.noaa.gov/dbcp/isabp

The International Buoy Programme for the Indian Ocean (IBPIO)

The International Buoy Programme for the Indian Ocean was formally established in 1996. The primary objective of the IBPIO is to establish and maintain a network of platforms in the Indian Ocean to provide meteorological and oceanographic data.

The sixth Programme Committee meeting was held in Cape Town, South Africa, from 31 July to 2 August 2002. Mr.Graem Ball as Chairman, Mr.K;Premkumar as Vice Chair and Mr.Pierre Blouch as the Programme Coordinator have been elected for the current session. Mr.Premkumar presented the Annual report of IBPIO in the 18th Session of DBCP. Between September 2001 and August 2002, 105 drifting buoys were deployed (71% measuring air pressure). Participants in IBPIO contribute to the programme in various ways: provision of buoys, funding of barometer upgrades to SVP drifters, deployment arrangement, coordination and data transmission.

The Department of Ocean Development, Govt. of India through National Institute of Ocean Technology (NIOT), Chennai operates a network of 12 moored buoys in Indian waters. Plans exist to extend to 20 stations. IBPIO participants are regularly informed, too, about the two TRITON buoys deployed in the eastern tropical Indian Ocean by JAMSTEC.

IBPIO participants are constantly encouraged to increase their contributions.

IBPIO information is available on the World Wide Web at http://www.shom.fr/meteo/ibpio and a promotion leaflet can be obtained from the Chairman or the Programme Coordinator.

The Global Drifter Programme (GDP)

The Global Drifter Program (GDP) is a branch of the Global Ocean Observing System (GOOS) Center at NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML). The GDP objective is to maintain a global, 5 degree by 5 degree array of ARGOS tracked Lagrangian Drifters to meet the need for an accurate and globally dense set of in-situ observations of Sea-surface temperature (SST) and surface circulation. This data supports short-term (seasonal-to-interannual) climate predictions as well as climate research and monitoring.

Past Work

Tropical Oceans in 2002

In the Atlantic Ocean, 79 SVP drifters have been deployed as of current date. Recent deployments have been made in the data sparse areas of the Gulf of Guinea and Angola Basin. A total of 171 SVP drifter buoys were deployed in the pacific. Deployments made by United States Research vessels and Voluntary Observing Ships. In the Indian Ocean 40 drifter buoys have been deployed. Ten buoys were upgraded with barometers by Meteo-France.

Southern Oceans (60 S – 20 S) in 2002

In the year 2002, 78 drifting buoys were deployed in the Southern Oceans. A total of 48 buoys were upgraded with barometers by co-operative agencies. Deployments made by Research Vessel and Voluntary Observing Ships. There was an increase from the 31 barometer upgrades in 2001. Our appreciation to the many agencies and companies for their contributions to the Global Drifter Program.

Work and Goals in 2003

In the year 2003 the GDP will work toward the following goals:

- Deployment of 476 Drifters in the period between October 2002 and September 2003
- Concentration on Southern Oceans and Data Sparse regions. Deployment of 10 SVP-BW (Tropical Atlantic) drifters to aid in 2003 CBLAST " HURRICANE STUDY "
- Continue to work with Co-Operative Agencies to upgrade Buoys with Barometers.
- Continue conversion of Metafile Database to Informix Database.• Continue to monitor HURRICANE PERFORMANCE STATUS.

The Tropical Moored Buoys Implementation Panel (TIP)

The present composition of the TAO/TRITON Array is 55 ATLAS moorings maintained by the Pacific Marine Environmental Laboratory (PMEL), 12 TRITON moorings maintained by the Japan Marine Science and Technology Center (JAMSTEC), and 5 subsurface Acoustic Doppler Current Profiler (ADCP) moorings (4 maintained by PMEL and 1 by JAMSTEC). In addition to these core moorings, there are several moorings deployed as enhancements to TAO/TRITON. These include 3 ATLAS moorings deployed along 95°W for the Eastern Pacific Investigation of Climate (EPIC), 4 TRITON moorings along 130°E and 137°E, and 2 TRITON moorings in the eastern Indian Ocean.

The Pilot Research Moored Array in the Tropical Atlantic (PIRATA) is in the second year of a 5-year consolidation phase, during which the array will be maintained in a configuration of 10 ATLAS moorings while it is evaluated for its utility in support of research and operational forecasting.

Data return of primary TAO/TRITON measurements (wind speed and direction, air temperature, relative humidity, sea surface and subsurface temperatures has been 86% for the past year. Data return for the same measurements in PIRATA was lower, 72%. The lower value for PIRATA relative to TAO/TRITON is due to the smaller size of the array (loss of one mooring is a relative larger proportion of the array) and due to a less frequent maintenance schedule for PIRATA (annual vs. semi-annual for TAO/TRITON).

Demand for TAO/TRITON and PIRATA data remains high. The TAO Web page was favourably reviewed recently in EOS (Sept. 10, 2002). In the past year, there have been 9,862 requests for data via the Web and 109,351 data files have been delivered to users. Since January 2002, 42 peer-reviewed papers, which used TAO/TRITON data, have been published or are in process.

A WHOI Technical Memorandum, comparing meteorological measurements from IMET, TAO and TRITON instrumentation, is in press. The report concludes that the 3 systems produce interchangeable climate quality data. Newly developed surface flux measurements from TAO moorings, such as long-wave radiation, compare favorably to similar shipboard measurements made during EPIC. Newly added measurements of barometric pressure, also added for EPIC, have provided new insight into the relationship between oceanic tropical instability waves and pressure induced variability in the wind field.

A recently published review of the Tropical Moored Buoy Network during an international workshop expressed unanimous support for the network, describing it as a key element of the present ocean observing system.

The Administrator of NOAA has requested a plan for the transfer of the TAO portion of TAO/TRITON Array and the PIRATA Array from PMEL to NDBC. A plan is being drafted and will be completed by January 2003.

ANNEX V

Implementing Argo, the global profiling float array

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Abstract –The Argo Project (Argo Science Team, 2001) has entered its implementation phase, with over 400 active floats now in the water, and committed funding for 1500 floats. Emphasis is shifting from motivating and planning Argo to deploying floats, providing data to users, and demonstrating the value of the array while it grows. Challenges remain associated with the production and deployment of a global 3000 float array. Argo requires strong collaboration across its national programs, and the involvement of many additional nations in float deployment and utilization of Argo data. The long-term engagement of scientific expertise in Argo is also needed, along with a strong partnership between scientific and operational participants. The vast extent of the southern hemisphere oceans, where most of the floats will be distributed, is a further challenge. Argo was initiated under the joint auspices of CLIVAR and GODAE, to produce unprecedented broad-scale measurements of temperature, salinity , and ocean circulation for climate and other applications. The import of Argo's simple premise – that Global Ocean Data Assimilation requires global ocean data – is about to be demonstrated.

1 - The scientific and technical basis for Argo

1.1 The aim of Argo.

Argo will collect global subsurface measurements of time-varying temperature, salinity and ocean circulation, to observe the ocean's storage and interior transport of heat and freshwater. The fundamental elements of the climate system are the heat and hydrological cycles. Understanding climate requires tracking heat and water through the system – including exchanges, storage, and transport by the atmosphere and the ocean. Mean ocean circulation carries about 2 pW of heat northward out of the tropics, comparable to the atmosphere at that latitude, with variability that is poorly known. The ocean dominates heat storage in the ocean/atmosphere/ cryosphere. Over 90% of the increased heat content seen in the global warming signal of the past 40 years occurred in the oceans (Levitus et al, 2000). A role of salinity is to reveal variability in precipitation minus evaporation (P-E). Subsurface water mass anomalies reveal past P-E forcing in outcrop regions, and carry a record of recent climate variability along water parcels' pathways. Most of the globe's evaporation is from the oceans, and most of the precipitation is into it. More than 10^6 m^3/s of freshwater is carried by the atmosphere across the sea-land boundary, returning to the sea in rivers.

Climate observation is a major part of the rationale for Argo, including improved seasonal-to-interannual prediction, but there are many other uses for Argo data as well. By tracking the physical state of the upper ocean in near real-time, a host of applications is possible. These include marine products and forecasts for naval and commercial uses - shipping, safety at sea, transport of pollutants etc. Data assimilation broadens the utility of physical data through coupled physical/biological/geochemical models, for example in fisheries population studies, health of coral reefs, or the carbon cycle. Argo data are useful not only on a global basis, but for regional analyses and to provide the offshore conditions for coastal models. Other uses of Argo data include basic research in air-sea interaction and secondary and tertiary education.

Many of the applications of Argo are yet to be explored. A workshop to investigate "Potential

Applications of Ocean Data for Pacific Island Countries" is being held October 4 – 7, 2002 in Fiji, and other regional workshops will similarly lead to better utilization of Argo and related datasets elsewhere. Already, secondary education programs for Pacific Island nations are in development, relying on the internet access and display of Argo data. For Argo to succeed and continue, it must provide value in many nations - Argo and other sustained ocean observations are a resource belonging to all.

1.2 The global span of Argo.

Climatically important modes of regional ocean variability have been described in all the oceans. One could focus the ocean observing system entirely on the known regional patterns of variability. Such a system might well be effective in exploiting the potential predictability in these modes, just as the ENSO Observing System does with notable success for El Nino. But there are also compelling arguments for making measurements globally. First, the known modes are numerous and broad enough to require sampling much of the global ocean anyway (climate is a global problem). Hence the gained efficiency in sampling regional modes compared to global sampling would not be especially great. Second, the scope of satellite observations is global, and interpretation of satellite data sets would be lost by limiting the domain of subsurface data. Third, global assimilations would suffer as errors from the unmeasured oceans propagated into the regions of interest. Finally, with historical observations being so limited – very sparse in the vast southern hemisphere seas, and lacking entirely any systematic observing system for salinity – we do not yet know the ocean well enough to design a "smart" observing system. Lacking information, it is necessary to collect enough to describe the multi-year mean state and the statistics of variability for the global ocean. Having done this, a more efficient observing system will follow.

1.3 Completing the *in situ* ocean observing system.

Argo is only one element of the ocean observing system, providing observations on broad spatial scales in the upper 1-2 km of the sea. It will not measure air-sea exchanges, transport in boundary currents and narrow equatorial flows, high frequency time-series, or property distributions in the abyssal oceans. All of these are important, and must have appropriate balance in a comprehensive ocean observing system. The integrated system will provide far greater value than its individual elements. In the past we have argued that it is crucial to implement Argo early – to demonstrate the high value of global observations and to provide added justification for regional enhancements and process studies. Now, as Argo has begun implementation, it is equally important that other critical elements of the observing system elements are not left behind.

A systematic plan for measuring the world's boundary currents is needed and has not yet been designed (Imawaki et al, 2001). For now, moored arrays and high density and frequently repeated XBT transects are sampling some of these features. In the future, small autonomous underwater vehicles (gliders) may deliver a cost-effective solution to the problem. However, there are hurdles – technical, organizational, logistical, and political – before the boundary current systems can be well-measured. It is essential to press forward with technology development and scientific planning to lay the groundwork for this activity. The western boundary currents carry as much transport as the entire width of the ocean interiors, and they play key roles in the climate system. An observing system for the ocean interior (Argo) without a counterpart for the boundary currents would be incomplete.

1.4 Argo and Jason

Argo is linked as strongly to the satellite measuring systems as to the other *in situ* measurements. While satellite measurements provide the sea surface temperature over the globe, Argo will tell us the depth and salinity of the mixed layer, and the structure of the pycnocline beneath it. While scatterometry provides unprecedented information on the wind-forcing of the sea, Argo will reveal the large-scale response to that forcing.

Argo has a special synergy with satellite altimetry, such as the JASON-1 mission, and hence its name. The altimeter provides excellent along-track spatial resolution that cannot be duplicated in subsurface measurements. However, models are not yet capable of decomposing sea surface height anomalies into accurate T(z), S(z), and reference velocity components. Argo provides this complementary information.

The JASON/Argo combination offers the space-time coverage of the satellite and its interpretability by subsurface data – a dynamically complete picture of the upper and mid-depth ocean.

2 - The present status of Argo

2.1 Technical capabilities of profiling floats

Profiling floats have been in use for nearly a decade, proving the practicality and robustness of the technology and its high scientific value. The Argo Project is technically feasible, and its climate science objectives make a compelling case for immediate implementation. However, there are still instrumentation improvements ahead. These include better communications to enable shorter time of floats on the sea surface and improved vertical resolution in transmitted profiles, greater buoyancy control, improved ruggedness, and development of new sensors. A major technical advance has been the demonstration of stable salinity measurements over periods of years from some floats (Riser and Swift, 2001). The plan for the coming years will be to exploit technical improvements in floats and sensors while maintaining continuity of the array.

2.2 The present array and commitments of Argo floats

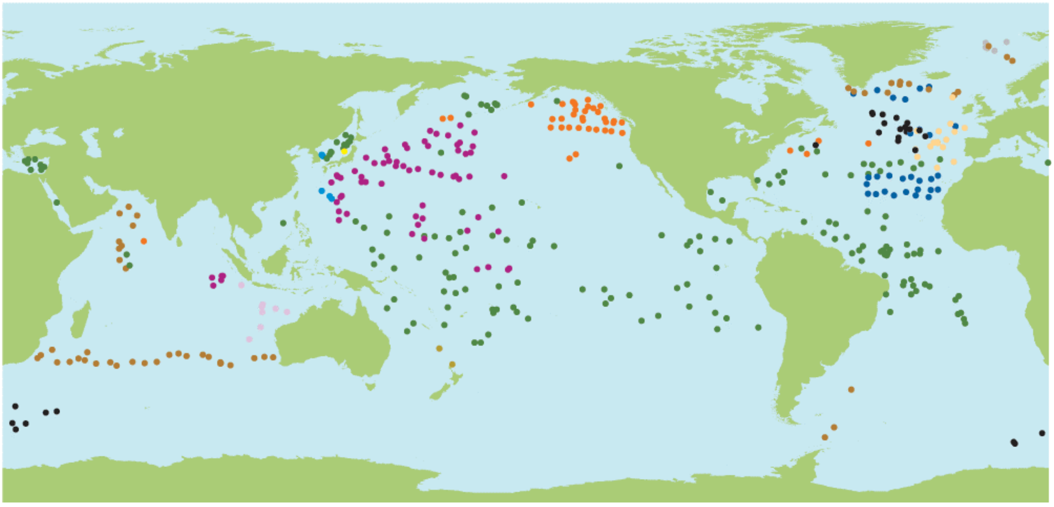

Fig 1. Locations of 423 active Argo floats as of 24 April 2002, with colors to indicate different national programs. For details and updates see http://argo.jcommops.org.

There are now more than 400 active Argo floats spread over all of the oceans (Fig 1), a substantial beginning toward the 3000 float array. Early float deployments were mostly in the North Atlantic, the North Pacific, and the tropics. But as commitments have increased and it has become clear there will be sufficient floats for the global array, deployments in remote ocean locations have begun. Over 1500 floats are funded, and will be deployed by the end of 2003. By then the array will be global but sparse. A relatively long lead-time between funding actions and deployment is due to several factors – time required for funds to pass through agencies to float providers, time needed for fabrication, and time waiting for appropriate deployment opportunities. In the case of nations without previous profiling float experience, spin-up time is necessary for familiarization with the technology. In some cases, there have been delays in production or deployment to diagnose and correct technical difficulties. Happily, there have not been widespread problems in producing the required numbers of floats or CTDs. Proposals for Argo floats average nearly 900 per year over the next 3 years (Table 1). At this rate, the Argo array will be completed around the end of 2005. All float positions are monitored and made available by the Argo Information Center (http://argo.jcommops.org)

Table 1. National commitments of Argo floats, funded through FY02 and proposed for the next three years. About 800 floats per year are required to build and maintain the 3000 float array. A float equivalent is funded through non-Argo sources but consistent with Argo

Number of Floats by Country	Argo Funded FY99	Float Equiv's FY99	Argo Funded FY00	Float Equiv's FY00	Argo Funded FY01	Float Equiv's FY01	Argo Funded FY02	Float Equiv's FY02	Proposed over next 3 years	Prop Float Equiv's over 3 yrs
Australia	10				13		7		93	
Canada	10		42		20		25		75	
China					10		8		105	
Denmark						5			30	
European Comm.			10		70					
France		8	3		50		95		160	
Germany				18		22		42	115	
India							31		119	
Japan			24	4	76	8	90		300	
New Zealand			2		2		2		6	
Republic of Korea					19		30		90	
Russia		1		2		2	2	1	6	
Spain									30	
United Kingdom			13		50	5	45	12	150	40
U.S.A.	55		132	51	174	43	275	7	1238	75
TOTALS	75	9	226	75	484	85	610	62	2517	115
TOTALS BY YEAR	FY99 = 84		FY00 = 301		FY01 = 569		FY02 = 672		Ave/Yr = 877	

2.3 The Argo data system

The Argo data system is now functioning, delivering near real-time data via GTS and internet pathways (Fig 2). Coarse automated quality control standards are applied to the real-time profiles prior to GTS transmission. A Global Argo Data Center (http://www.ifremer.ft/coriolis/cdc/argo.htm) collects data from all Argo floats, and from other profiling floats made available to Argo, to provide a complete dataset through a single interface. A NetCDF format for exchange of Argo data has been adopted, and is being implemented by all of the data centers.

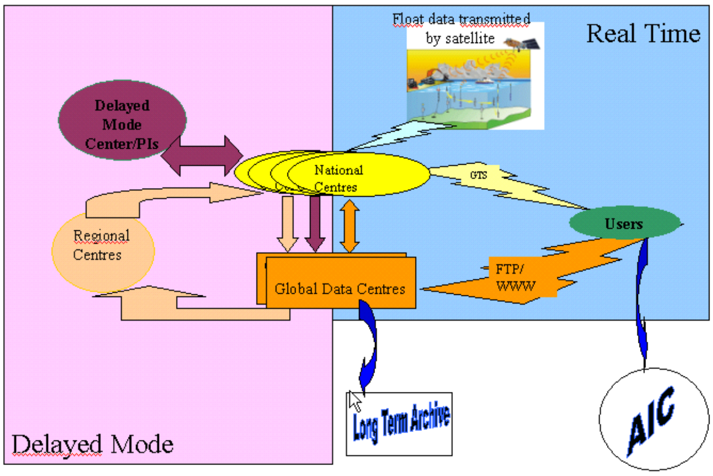

Fig 2 . Schematic of the Argo data system showing pathways for delivery of near real-time and scientific quality data.

Additional elements of the data system will come on line with the next few months. A second Global Data Center (the GODAE server) will provide mirrored access and redundancy in case one of the sites is temporarily inaccessible or one of the pathways is faster from a user's location. To guarantee access to the best copy of the data, users should obtain Argo data from one of the Global Centers rather than from other repositories. Improved user interfaces are under development and will be implemented soon. Following the real-time QC, Argo data pass through additional QC measures. Salinity drifts are identified and corrected through comparison of Argo profiles with high quality historical and contemporary CTD datasets, using an objective mapping technique (Wong *et al*, 2001, http://floats.pmel.noaa.gov/argo/index.jsp). This process requires a sequence of profiles prior to and after the profile being corrected, so it is optimally applied several months after data collection. Profiles are examined by the scientist responsible for a given float, to identify and correct problems in the recalibration. It is expected that the specific procedures for producing this delayed-mode version of the data will be finalized soon, and delivery of the scientific-quality data will begin later this year (2002). Additional improvement in data quality will occur as new shipboard CTD transects are collected and multi-year Argo datasets are assembled in each ocean basin.

2.3 Early Argo results

A wide variety of scientific analyses are now underway using early Argo data from the Indian, Pacific and Atlantic Oceans. These include studies of Subtropical Mode Waters in the northwest and southeast Pacific, interannual variability in upper ocean salinity in the Indonesian Throughflow, the role of salinity in sea surface height variability in the tropical Pacific, and local heat budget analyses and basin-scale data assimilation projects in the Atlantic. Although Argo presently includes only a small fraction of its eventual coverage, it is already making a unique contribution to the observing system through its broad-scale collection of salinity profiles together with temperature.

One example of Argo results is shown in Fig 3. We assembled Argo profiles from the tropical Pacific Ocean, supplemented by some XCTD data, and for each of about 4000 T/S profiles calculated the contribution to sea surface height due to anomalous salinity. For each profile, measured salinity was compared with historical (Levitus) salinity for the given location. The absolute value of the difference between dynamic height (0/500 db) using measured and historical salinity is displayed in Fig 3. Although RMS values of the dynamic height due to salinity are typically 2 dyn cm in the tropics, large dynamic height signals due to salinity occur in clusters, with some values greater than 10 dyn cm. Causes of the large signals are identified by examination of the profile clusters. For example, the large dynamic height anomalies (> 8 dyn cm) near 160^{o}W in the central equatorial Pacific are due to very fresh surface layers observed with XCTDs during the 1997 El Nino. The large anomalies in the southeastern Pacific are due to saline anomalies in recent Argo data extending from the sea surface to 300 m in the evaporative region where the subsurface salinity maximum is formed. Large anomalies in dynamic height due to salinity correspond to some of the most striking features in Pacific interannual variability. Systematic errors would occur if such features were interpreted in altimetric height as having come from heat storage.

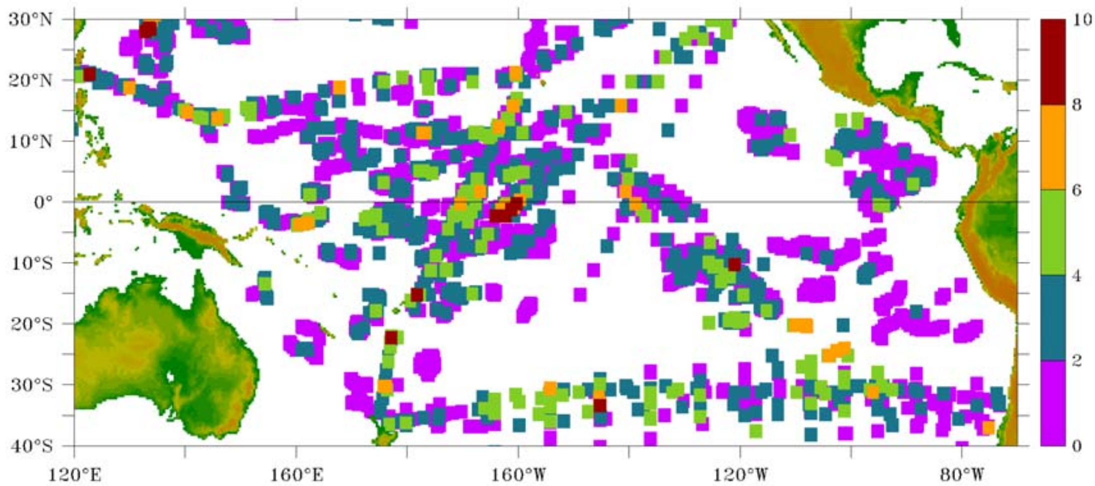

Fig 3. Dynamic height anomaly (absolute value, dynamic cm) due to salinity difference with respect to historical data. When boxes are overlaid, the higher value is plotted on top.

3 – Challenges for Argo implementation

3.1 Production and deployment of a global array

The Argo endeavor is in some ways unprecedented in oceanography, and the difficulty of the challenge should not be minimized. About 800 instruments per year must be produced on a sustained basis, while maintaining technical standards across many national programs having a variety of objectives. The profiling float operates to great depths for periods of years while producing data of scientific quality - it is a technically demanding instrument. Its production and design evolution require careful oversight. Another challenge is the global deployment of an evenly spaced array. Deployment requires a high level of international planning and collaboration, with the majority of floats targeted for remote regions such as the vast southern hemisphere oceans, rather than for seas contiguous to the float-providers' coastlines. Cost considerations require that float deployments often be carried out from vessels of opportunity (commercial ships and transiting research vessels), using dedicated research vessels only where essential.

A final challenge is to broaden the international understanding of Argo's value far beyond the group of float-providing nations, so that maximum use can be made of Argo data.

3.2 Engaging scientists on a long-term basis

The success of Argo as a scientific venture – capable of detecting and understanding climate signals in the global ocean - requires a long-term partnership between scientists and operational agencies. It has been possible to engage nearly all of the world's float experts in the initial phases of Argo because the project is novel, difficult, and worthwhile. However, participation carries no preferential access to Argo data. Open data access is mandated by the high value of the data and the pressing need to exploit it to the greatest possible degree. The lack of proprietary access, if coupled with low recognition of the value of scientific data collection, may make it difficult to sustain the present high level of scientific engagement. Another challenge will be the delicate balance needed in the science/operations partnership. Argo will fail if the partnership is not maintained, because of the technically demanding nature of the instrumentation, the requirements for high quality data, and the need for continuing evolution of instrumentation, array design, and deployment techniques and strategies.

3.3 Technology transfer

The list of nations committed to providing large numbers of floats for the Argo array (Table 1) includes some having no previous experience with profiling float technology but with strong interest in local fabrication of floats and with skilled technical teams. Some profiling float designs are proprietary, while others are open and available to all. But even in the case of open designs, a high level of technical support is required for successful transplantation of float production. At present, the expert technical groups are so heavily engaged in the demands of their own national Argo programs that it is proving difficult to provide the necessary engineering support for technology transfer. Argo will need to solve this problem or be needlessly narrowed.

4 GODAE and Argo interactions

4.1 Fulfilling GODAE's requirements for Argo data

Data assimilation will be the primary tool for exploiting Argo data in conjunction with other *in situ* and satellite observations. It is therefore essential for Argo to be implemented and evolve in a complementary fashion with GODAE. Some aspects of this relationship are straightforward. For example, basin-scale Atlantic assimilations will be GODAE pilot projects, so Argo is being rapidly deployed in the Atlantic to support these activities. Other aspects are subtler – because both the design of Argo and the use of Argo in data assimilation are themselves topics of scientific investigation. GODAE requirements to be filled by Argo include:

- Provide global mean fields valid for a given observational period.
- Determine the statistical relationship between point-wise profile data and smoothed fields in order to characterize noise and signal in assimilation.
- Provide global observations for assimilation.
- Provide independent data for testing of assimilation results and model processes.
- Discover new phenomena not anticipated in models, thereby stimulating model improvement.

The design of Argo recognizes these requirements by considering what is needed for data analysis independent of assimilation. Because the data must be sufficient for testing and improvement of models, the initial requirements for data are substantially greater than they would be if providing data for model assimilation were the sole purpose. Another clear requirement for the success of Argo and GODAE is for strong interaction between the observational and assimilation experts, working side by side to understand and improve the effectiveness of data and the quality of assimilations.

4.2 Demonstrating the value of Argo

In projecting Argo's cost, some float-providing nations have explicitly recognized that the requirements for broad-scale data collection will persist into the future, while other national contributions are calculated for a single deployment of the global array, with subsequent evaluation. In practical terms, both of these approaches require that the value of Argo be demonstrated at an early date. The issue is not whether continuing global subsurface data collection is needed, but whether the approach, design, and cost effectiveness of Argo are adequate. GODAE must need to take a leading role – by showing the incremental value of Argo data in ocean state estimation and in the improvement of forecasts. Such demonstrations are problematic since assimilation is itself a rapidly evolving field – in methods, models, and model resolution. An assessment of the incremental value of any dataset is dependent on all of these, and will evolve accordingly. In addition:

- Techniques for combining high resolution altimetry with broadscale Argo data require further attention.
- The measurement in Argo of salinity in addition to temperature is a substantial contribution beyond that of temperature-only datasets (e.g. Fig 3).
- Mid-depth trajectory measurements from Argo are also of substantial value, but are not yet used in most assimilation systems.

Finally, while it is important to demonstrate the usefulness of Argo data early, one must bear in mind that the full value of Argo will not be realized until years of data collection provide the necessary statistics for analysis and assimilation of Argo data. Argo is fundamentally a long-term effort.

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APPENDIX

Report of the Argo Science Team 4th Meeting (AST-4)

March 12-14, 2002, CSIRO Division of Marine Sciences
Hobart, Tasmania Australia

Summary

The fourth meeting of the Argo Science Team (AST-4) was held in Hobart, Tasmania, Australia from March 12-14, 2002. International commitments to the Argo project continue to increase. More than 10% of Argo has now been deployed, with about 340 floats presently active. The number of active floats will increase rapidly over the coming year - over 1500 floats have now been funded, with additional proposals over the next three years averaging nearly 900 floats per year. In consideration of the steep increase in float deployments, AST-4 considered areas needing attention for successful large-scale Argo implementation. These include completion of the data management system, technical aspects of float performance, a regional float deployment planning mechanism, and the need for rapid utilization of Argo data. Another objective of the meeting was to encourage float providing nations to increase deployments in the Southern Hemisphere - and to that end a Southern Ocean Science Symposium was held in joint session with the CLIVAR Southern Ocean Panel.

A second meeting of the Argo Data Management team was held in Brest in October 2001. Formats for exchange of Argo data have been agreed, and direct exchange of data between national and global data centers (GDACs) will occur soon. Argo profiles are presently published on the GTS and distributed via the Internet by the IFREMER/Coriolis GDAC. An improved user interface is being implemented at Coriolis and a second GDAC will soon be operating. Plans for scientific quality control of Argo data were discussed – including a semi-automated step as described by the PMEL center, and final examination by the principal investigator. It was agreed that by September 2002, the scientifically reviewed Argo data should start becoming available.

Technical issues relevant to the Argo array were reviewed. A major development is the availability later this year of the Iridium system for improved communication bandwidth, two-way capability, and decreased surface time for Argo floats. Continuing successes with stable salinity sensors were also reported. Several technical problems (and solutions in some cases) were described by individual groups - including surface pressure drifts, rapid battery drain due to a controller failure, and salinity offsets in some recently deployed floats. It was noted that the Argo technical forum has not been a useful mechanism for information exchange and a technical workshop should be staged at an appropriate time.

A formal mechanism has been established for iteration and web publication of regional plans for float deployment. For each ocean basin a deployment coordinator is identified as well as points of contact for all float-deploying groups. After communication with the float providers, the coordinator will publish plans extending approximately 12 months in advance, and these plans will be updated at least every 6 months. A number of other issues related to large-scale implementation of Argo were discussed. Possible activities and participants for the regional data centers were identified. A mini-symposium was held describing early scientific results from Argo data and it was agreed to emphasize Argo results in future meetings. The next meeting, AST-5, will be held in Hangzhou, China around March 2003.

ANNEX VI

NORTH PACIFIC DATA BUOY ADVISORY PANEL (NPDBAP)

I. TERMS OF REFERENCE FOR THE NPDBAP

The following terms of reference are intended to advise the deliberations of a group sponsored collaboratively between the WMO-IOC Data Buoy Co-operation Panel (hereinafter DBCP) and the Physical Oceanography and Climate Committee (hereinafter POC) of PICES.

The North Pacific Data Buoy Advisory Panel is an independent self-funded body that maintains, as a significant element of its responsibilities, an observational data buoy programme providing meteorological and oceanographic data for operational and/or research purposes in support of the World Weather Watch (WWW), the World Climate Research Programme (WCRP), the Global Climate Observing System (GCOS), and the Global Ocean Observing System (GOOS), and other relevant WMO and IOC programmes as well as those sponsored by PICES/POC.

The North Pacific Data Buoy Advisory Panel will support the aims and objectives of the DBCP as set out in the terms of reference of the DBCP in particular with respect to:

- Provision of good quality and timely buoy data to users;
- Insertion of real-time (or near real-time) buoy data into the Global Telecommunications System (GTS);
- Archiving
- Exchange of information on data buoy activities and development and transfer of appropriate technology;

and will support the aims and objectives of PICES as expressed through POC in particular with respect to:

- Encouraging the exchange of ocean data and information in the N. Pacific.
- Encouraging the development of new sensors that increase the utility of ocean data buoys and the exchange of information about those sensors.

In accordance with the regional interests of PICES, the North Pacific Data Buoy Advisory Panel adopts a regional interest defined as generally north of 30°N in the North Pacific Ocean, and its marginal seas.

More detailed information on the operation of the NPDBAP will be found in the Operating principles of the NPDBAP.

The North Pacific Data Buoy Advisory Panel will submit annual reports of its activities to the Chairman of the DBCP, and to the Chairman of PICES/POC, prior to the annual meetings of each organisation.

(*Updated 6 June 6 2002*)

II. OPERATING PRINCIPLES OF THE NPDBAP

1. Objective

The objective of the North Pacific Data Buoy Advisory Panel (NPDBAP) is to maintain an observational data buoy programme north of 30°N in the North Pacific Ocean and marginal seas providing meteorological and oceanographic data for operational and/or research purposes in support of the World Weather Watch (WWW), the World Climate Research Programme (WCRP), the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and other relevant WMO and IOC programmes as well as those sponsored by PICES. The Panel will build upon cooperation among those agencies and institutions with North Pacific interests.

2. Panel Responsibilities

The NPDBAP will establish a meteorological and oceanographic observational data buoy programme in the North Pacific Ocean to;

- Ensure the collection and distribution of basic meteorological and oceanographic data and buoy location from the network in real time over the Global Telecommunication System (GTS) and distribute relevant additional real-time data approved for public dissemination;

- Ensure data and metadata from the network are archived; and

- Cooperate with and provide results of the Programme to other related programmes.

3. Observation Programme

3.1. Operational Area
The operational area of the Panel will include the North Pacific Ocean and marginal seas generally north of 30°N.

3.2. Variables
The basic meteorological and oceanographic variables of atmospheric pressure, air temperature, sea surface temperature as well as additional variables such as atmospheric pressure tendency, wind speed and direction will be measured, as appropriate. Surface and subsurface oceanographic data collection is desirable and will be encouraged.

3.3. Basic Network Density
The Panel will strive to establish and maintain a basic network with an average observational data availability of 1 Sea Surface Temperature and 8 Mean Sea Level pressure (MSL) observations per day in every 500 x 500 km square area. As far as practical, buoys will be deployed to achieve and maintain this density over the operational area (As a minimum, approximately 120 data buoys would be required).

4. Data Transmission and Distribution

4.1. Transmitters
All data buoys in the basic network will be equipped with transmitters to enable transmission of basic meteorological data in real time (synoptic and asynoptic modes).

4.2. Coding
All basic meteorological and oceanographic data and buoy location will be coded in the approved format of the WWW, GOOS and GCOS as appropriate for real time data distribution.

4.3. Distribution
It is the responsibility of the participating Members to ensure that automatically quality controlled data are distributed via the Global Telecommunication System.

5. Data Archiving

5.1. Operational Archiving
All data transmitted on the GTS will be archived by the Marine Environmental Data Service (MEDS) as the Responsible National Oceanographic Data Centre (RNODC) for Data Buoys, on behalf of both the Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organization (WMO).

5.2. Research Data Base
Members/Participants will encourage data holders to submit their data/metadata sets to MEDS on an annual basis.

6. Organizational Structure

6.1. Members/Participants
Members will be appointed by the National Representatives of the PICES Governing Council. Participants are expected to indicate their participation in the Panel by means of a Letter of Intent. Members/participants in the NPDBAP will be: operational agencies, meteorological and oceanographic institutes, universities, research agencies, data centres and non-governmental organizations interested in the North Pacific Ocean and contributing actively to the Panel. Participants may withdraw from the Panel with a letter to a Co-chair of the NPDBAP. On an annual basis, the Members will review the membership to identify potential new Members.

6.2. Election of Panel Executives
On an annual basis, the Members will elect two Co-chairs and appoint a Coordinator. The Co-chairs will be selected to balance representation from Asia and North America and from PICES and the DBCP. Membership and chairmanship will be reviewed during the annual Panel meetings.

6.3. Coordinator
The Coordinator will act as the focal point for the Panel and will carry out the directives of the Co-chairs during inter-sessional periods. Specific responsibilities and duties of the Coordinator are contained in Appendix 1.

6.4. Funding Provisions
The Panel will be self funded, supported by contributions of equipment, services (such as communications, deployment, archiving, and scientific or technical advice), coordination, and monetary contributions. As necessary, the Members will establish a budget. Other funding arrangements made between the Participants will be recognized as contributions to the NPDBAP if they further the Objectives of the Panel.

6.5. Annual Review
The operating principles and procedures will be reviewed and updated as necessary at the annual Panel meeting.

7. Meetings

An annual Panel meeting will be held at a location to be determined by the Members.

○ ○ ○ ○ ○

Terms of Reference for the Coordinator of the NPDBAP

The Coordinator will facilitate the implementation of the NPDBAP. The Coordinator will be appointed at the annual meeting of the Members and will be directed by the Co-chairs. The Coordinator's specific responsibilities will be as follows:

1. To monitor data from the buoy network and to prepare a status report every 6 months;

2. To stay informed of other buoy programmes and other field operations and to make that information available, as possible;

3. To provide liaison with Members/Participants and managers of individual buoy programmes in the North Pacific Ocean;

4. To encourage buoy programme operators to submit their data to MEDS.

5. To recommend a deployment strategy to maintain an optimum buoy network in the North Pacific Ocean;

6. To coordinate opportunities for buoy deployment;

7. To provide liaison on technical aspects of buoy deployment;

8. To prepare and distribute an annual summary of Panel activities.

9. To work with the Technical Coordinator of the Data Buoy Cooperation Panel.

10. To maintain a distribution list for monthly status reports and annual data reports;

11. To maintain a web page that promotes the NPDBAP, provides links to NPDBAP datasets, and provides news and information.

12. To organize the annual Panel meeting in consultation with PICES, present a report of the preceding year's activities, and prepare a plan for the following year; and

13. To promote the NPDBAP.

(*6 June 2002*)

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ANNEX VII

SUMMARY OF REPORTS BY DATA MANAGEMENT CENTRES

Responsible National Oceanographic Data Centre (RNODC) for Drifting Buoys

During the last intersessional period, MEDS has archived an average of 273,000 BUOY reports per month from an average of 818 buoys per month.

This year's web developments focused mainly on the use of Scalable Vector Graphics (SVG) technology. MEDS created 2 applications to show IABP and NPDBAP buoys using this technology. These applications are updated daily and they allow users to view data and information about the buoys. The IABP map tool may be viewed at:
http://www.meds-sdmm.dfo-mpo.gc.ca/meds/Prog_int/RNODC/IABP/polar_svg_e.shtml
Deployment of the NPDBAP tool is planned for early 2003.

MEDS now participates in the DBCP QC guidelines to monitor the quality of location data distributed on GTS. At the beginning of each month, MEDS provides monthly statistics and a link to scalable maps on the BUOY-QC@vedur.is distribution list. To access the maps:
http://www.meds-sdmm.dfo-mpo.gc.ca/meds/Prog_int/RNODC/buoy-qc/buoy-qc.htm

Ongoing work includes:

1) Reprocessing the archives to implement the new quality flagging policy for location data
2) Reviewing MEDS' processing system
3) Completing the update of the GDC data to MEDS' archives
4) Building a NPDBAP web site with the collaboration of MSC and NDBC

Specialized Oceanograhic Centre (SOC) for drifting buoys

A summary of the activities of France regarding buoys is included in the national report, and can be described as made up of 3 parts:

- SOC for drifting buoys, focussing on GTS transmission, metrics and operational availability and use of data;
- Météo-France CNRM/CMM, involved in research and development actions, as well as operations (buoys operations, quality control, elaborated products...);
- The "Coriolis" project, a multi-institution effort towards operational ocean *in situ* observations: Technological developments, data management, and coordination of all kind of activities linked to observations for operational oceanography. Ifremer leads the Coriolis project. See www.coriolis.eu.org

The SOC for drifting buoys is operated by Météo-France DPrévi/Mar (in charge of marine meteorology and operational oceanography) and located in Toulouse. It is physically close to CLS Service Argos and JCOMMOPS. This allows interaction with and support to both services. Different actions have been carried on in 2002 (ease access to GTS, set up metrics...) and others are scheduled for the next year (evolve to new codes, increase frequency of metrics and reports...), as reported by the JCOMMOPS coordinator and Service Argos representative. The other main activities of the SOC have been driven by the Coriolis project (ease transfer of data to the Ifremer delivery centre, harmonise quality control and organise backup procedures...) and among them the reinforcement of operational links between the SOC and the CNRM/CMM team.

An example of the SOC activity is given each year in the report for the DBCP (refer to it). Products are delivered on demand, and statistics are produced monthly and send to roughly 50 users world wide. This activity is likely to be integrated under the Coriolis umbrella within the next few years, Météo-France contribution to the Coriolis project being particularly strong regarding drifting buoys (by the CNRM/CMM and DPrévi/Mar teams). This is a natural evolution since Météo-France and Ifremer have been collaborating on the ocean *in situ* observations for many years, each within its own framework (IOC/WMO IGOSS namely for the meteorological service and IODE for Ifremer). Coriolis is the French expression of the current "JCOMM process" towards integration of marine meteorology and operational oceanography.

ANNEX VIII

Proposed template for GTS distribution of buoy data in BUFR

(Excerpt from final report of ET/DRC meeting, Prague, 22-26 April 2002)
(Template updated in August 2002 following further discussion via email)

001003 - WMO region
001020 - WMO region sub-area
001005 - Buoy/platform identifier
002001 - Type of station
002036 - Buoy type
002149 - Type of data buoy
301011 - Date
301012 - Time
008021 - Time significance (value = “26" (time of last known position))
301011 - Date
301012 - Time
008021 - Time significance (value = "missing")
301021 - Latitude and longitude (high accuracy)
027004 - Alternate latitude (high accuracy)
028004 - Alternate longitude (high accuracy)
007030 - Height of platform above MSL
001051 - Platform Transmitter ID (CCITT IA5)
002148 - Data collection and/or Location system
001012 - Platform drift direction
001014 - Platform drift speed
002040 - Method of removing platform direction and speed from current
033022 - Quality of buoy satellite transmission
033023 - Quality of buoy location
033027 - Location quality class (range of radius of 66% confidence)
022063 - Total water depth
302021 - Waves
302022 - Wind waves
302023 - Swell waves
025025 - Battery voltage
002034 - Drogue type
007070 - Drogue depth
002190 - Lagrangian drifter submergence
025086 - Depth correction indicator
002035 - Cable length
002168 - Hydrostatic pressure of lower end of cable
020031 - Ice deposit (thickness)
306004 - Digitization, depth/salinity method, depths/salinities/temperatures
002030 - Method of current measurement
306005 - Time/duration of current measurement, depths/directions/speeds
007031 - Height of barometer above MSL
302001 - Pressure and pressure change
007032 - Height of sensor above marine deck platform (for temp.&hum. measurement)
007033 - Height of sensor above water surface (for temp.&hum. measurement)
012101 - Dry-bulb temperature (scale 2)
012103 - Dew-point temperature (scale 2)
013003 - Relative humidity
007032 - Height of sensor above marine deck platform (for wind measurement)
007033 - Height of sensor above water surface (for wind measurement)
002169 - Anemometer type
002002 - Type of instrumentation for wind measurement
008021 - Time significance (value = “2" (time averaged))
004025 - Time period in minutes
011001 - Wind direction
011002 - Wind speed
008021 - Time significance (value = "missing”)
004025 - Time period in minutes
011043 - Maximum wind gust direction
011041 - Maximum wind gust speed
007033 - Height of sensor above water surface (set to missing to cancel previous value)
007032 - Height of sensor above marine deck platform (for precipitation measurement)
004024 - Time period in hours
013011 - Total precipitation
007032 - Height of sensor above marine deck platform (set to missing to cancel the previous value)
008021 - Time significance (value = “3" (accumulated))
004024 - Time period in hours
014021 - Global radiation, integrated over period specified
008021 - Time significance (value = "missing”)

ANNEX IX

DEVELOPMENTS IN SATELLITE COMMUNICATION SYSTEMS

1. INTRODUCTION

Mobile satellite systems (MSS) may be classified according to orbit altitude as follows:

- GEO - geostationary earth orbit, approx altitude: 35 000 km
- MEO - mid-altitude earth orbit, approx altitude: 10 000 km
- LEO - low earth orbit, approx altitude: <1 000 km

LEOs can be further sub-divided into Big LEO and Little LEO categories. Big LEOs will offer voice, fax, telex, paging and data capability, whereas little LEOs will offer data capability only, either on a real-time direct readout ('bent pipe') basis, or as a store-and-forward service.

Since the satellite footprint decreases in size as the orbit gets lower, LEO and MEO systems require larger constellations than GEO satellites in order to achieve global coverage and avoid data delays. Less energy is, however, generally required for LEO and MEO satellite communication because of the shorter average distance between transmitter and satellite. Some systems implement several high-gain antennas to generate ‘spot beams’ and so reduce the requirement of the mobile to have a complex antenna and/or high output power. A key feature of several MSS currently under development will be their inter-operability with existing public switched telephone and cellular networks, using a dual-mode handset, for example.

Because of the commercial forces which are driving the implementation of the new systems, many will primarily focus on land masses and centres of population, and will not offer truly global or polar coverage. These systems will not in general be acceptable for global ocean monitoring. Furthermore, while the technical capabilities for the new MSS do currently exist, delays are inevitable due to problems with spectrum allocation, licensing (in each country where the service will be offered), company financing, and availability of launch vehicles and ground stations.

It is unlikely that all of the planned systems will overcome all of these hurdles. Indeed, major financial difficulties have hit a number of systems, with Starsys having been cancelled, Iridium having collapsed (and been relaunched), and both Orbcomm and New ICO having been in and out of Chapter 11 bankruptcy protection in the US. Mergers are becoming increasingly common, as market reality forces system planners to cut their losses and pool resources: CCI, Teledesic, Ellipso and New ICO have all recently signed buy-out or collaboration agreements with cellphone entrepreneur Craig McCaw.

From a technical point of view, some systems do offer significantly enhanced capabilities compared to existing methods. Potential advantages include two-way communication, more timely observations, and greater data rates and volumes. Some systems may also prove to be considerably less expensive than existing channels, although this is as yet unclear. However, dangers will exist for data buoy users of most MSS, in that they will generally be small minority users of the system, with consequent lack of influence in regard to pricing. The arrangements for data distribution are also unlikely to be tailored towards data buoy applications, in particular those that require data insertion on the GTS.

2. DESCRIPTION OF CANDIDATE SATELLITE SYSTEMS

The following paragraphs describe the salient features of those systems that might have a data buoy application. In many cases systems are at an early planning stage, and reliable technical information on which to base an evaluation is unavailable. This section is summarised in tabular form in the Annex of the document.

2.1 Little LEOs

2.1.1 Argos

Argos has been used by the oceanographic community for more than two decades, and is a dependable, true polar, operational data collection and platform location system. Communication is one-way only, at 400 baud, with practicable data rates of the order of 1 kbyte per day. Transmissions by the mobile are unacknowledged by the system and therefore have to incorporate some form of redundancy if data transfer is to be assured. The system enjoys a particularly clean part of the spectrum (401.65 MHz), with minimal interference from other users. Traditionally, Argos has flown as an attached payload on the NOAA 'TIROS' weather satellites, but future launches will also use the Japanese ADEOS and European METOPS platforms

Enhancements to the Argos on board equipment ('Argos-2') include increased receiver bandwidth and sensitivity, with two-way communication ('downlink messaging') to be piloted aboard ADEOS-II in late 2002. Next generation Argos equipment ('Argos 3') will fly from 2004 onwards, and will offer order of magnitude increases in data rates, as well as two-way communications. The system is one of the few that offers true global coverage, and currently has no commercial requirement to recover the cost of the launch or space segment equipment.

The first of the Argos-2 satellites, NOAA-K (NOAA-15) was launched in May 1998, and has been followed in September 2000 by NOAA-L (NOAA-16), and by NOAA-M (NOAA17) in June 2002. New direct readout stations continue to be commissioned bringing the current total to 32. Additions during the year have included Buenos Aires, Noumea, Las Palmas and Miami. This continues the programme of improving data timeliness by exploiting use of Argos in 'bent-pipe' mode. Further enhancements to the on board equipment (Argos-3), to the ground processing centres and software, including new on-line facilities for users, are at the planning stage.

2.1.2 Orbcomm

This company was awarded the first FCC Little-LEO licence in late 1994. Satellites consist of discs about one metre in diameter prior to deployment of solar panels and antenna. Two satellites were launched into polar orbit during 1995, using a Pegasus rocket piggy-backed on to a Lockheed L-1011 aircraft. After a prolonged period of launcher problems, 35 satellites are now in orbit, making up the complete constellation – although Orbcomm have been awarded a licence for an expansion to a 48 satellite constellation. Of these satellites, 30 are currently operational. The A, B, C and D planes are at 45° inclination and therefore have poor coverage at high latitudes: only two satellites, in the F and G planes (70°), offer a near-polar service. No further launches have been announced.

The system offers both bent-pipe and store-and-forward two-way messaging capabilities, operating in the VHF (138-148 MHz) band. User terminals are known as 'Subscriber Communicators' (SCs). Although there have been significant problems with interference close to urban areas, this is not expected to impact offshore operations, and trials of the system have been encouraging. Operational experience of the system is growing rapidly, although it remains difficult to obtain detailed technical information from Orbcomm.

The message structure currently consists of packets transmitted at 2400 bps (scheduled to rise to 4800 bps), and coverage is now global and near-continuous between the polar circles. Messages are acknowledged by the system when correctly received and delivered to a user-nominated mailbox. The platform position is determined, if required, using propagation delay data and doppler shift, or by an on-board GPS receiver. Position accuracy without GPS is similar to that offered by Argos, i.e. km-scale.

The limitations on the store-and-forward mode messages (known as globalgrams) have become apparent, with SC originated messages limited to 229 bytes and SC terminated messages limited to 182 bytes. Each SC can theoretically have a maximum of 16 globalgrams stored on each satellite. Currently, satellites will not accept or process globalgrams when in view of a ground ('gateway') station. As messages have to be designated as globalgrams or bent-pipe by the SC at the moment of origination, this presently limits the flexibility of the system to adapt to different coverage situations. Work-arounds do, however, exist, and it is expected that the next generation of SCs will be able to adapt more readily to changes in satellite communications mode.

Authorised transceiver manufacturers include Panasonic, Elisra (Stellar) and Quake. Elisra were the first to offer a transceiver with a fully integrated GPS engine, although Panasonic now also have one available. Quake sell a fully integrated unit which features a built-in antenna as well as GPS. Prices of most units are falling, with models now available for around $500.

The ground segment has continued to expand, and there are now active stations in Italy, Morocco, Argentina, Brazil, Curacao, Japan, Malaysia and Korea in addition to the four in the US. However the Japanese station is not available for international registrations. Further potential sites have been identified in Russia, Ukraine, Philippines, Botswana, Australia and Oman. 16 international service distribution partners have been licensed. Non-US customers have faced considerable difficulties because of the absence of ground stations, lack of spectrum licensing and the presence of other in-band users. However the situation is improving. Currently subscription costs within Europe are on a fixed cost per unit with two bands of usage (above and below 4kbytes per month with a typical monthly rate for the higher band being $70). A fully metered billing system based on users' actual data throughput was to be implemented in July 2000 but was postponed, officially due to technical problems. If this billing system is implemented with the planned charges ($6/kbyte) then it will result in a massive increase in airtime costs for any user with data rates over 0.5 kbytes/day. Metered billing is apparently implemented outside Europe.

Orbcomm have been suffering financial difficulties, and filed for 'Chapter 11' bankruptcy protection in September 2000. The parent company, Orbital Sciences Corporation, has now put together a new consortium to run Orbcomm. The outstanding debts are believed to stem largely from the system rollout phase, with net running costs being of much smaller concern. Industry opinion is that Orbcomm will prevail, largely because of the commitment of many third-party equipment and system manufacturers to the success of the system, and evidence of increasing service take-up by a diverse range of customers.

2.1.3 Starsys

This system was to have been broadly similar to Orbcomm, except that it offered bent pipe mode only, thus limiting its usefulness to coastal areas. Further work on the system, in which the operators of the Argos system were closely involved, was suspended some years ago. The FCC licence was returned in late 1997 and the system is now no more than one of the first memorials to the many failures in the business.

2.1.4 Iris/LLMS

This European-led system appears to be similar to Argos, using two polar-orbiting satellites with store-and-forward capability. However, terminals are alerted by the satellite downlink signal, and two-way communications and message acknowledgement are supported. Location is by doppler and ranging, and message lengths of up to a few kilobytes are permitted. Some provision is planned for terminal-terminal communication within the satellite footprint. A single satellite was in orbit for system tests, but nothing further has been heard, and the parent company's website (www.saitrh.com) no longer makes any mention of the system.

2.1.5 Vitasat/Gemnet

This was a 36 + 2 satellite constellation proposed by CTA Commercial systems. Their experimental satellite was the failed Vitasat launch in 1995. CTA is reported to have been taken over by Orbital Science Corporation, the parent organisation of Orbcomm, and the 36-satellite Gemnet component has been cancelled. However, the volunteer VITA organisation still exists and currently has one satellite in orbit, with plans to rent bandwidth on two other existing satellites, HealthSat-2 and UoSat-12. This proposal received FCC clearance in December 2000, and the company have now brought HealthSat-2 on line. The main mission is to offer low-cost messaging services to developing countries.

2.1.6 Faisat

The Final Analysis company have planned this 32 (+ 6 spare) satellite constellation to provide data messaging services, principally aimed at small messages (~ 100 bytes), but with support for larger messages as well. It will operate in both bent-pipe and store-and-forward modes. The first satellite launch, on the Russian Cosmos vehicle, was scheduled for early 2000, but nothing has been reported. Further launches were to have occurred roughly twice a year. The system received FCC authorisation in April 1998. A test satellite (also part of the Vitasat system) was launched in 1997.

2.1.7 Leo One

This US-designed system consists of a planned 48 satellite constellation offering store-and-forward two-way messaging at up to 9600 bps. An FCC license was granted in February 1998, and a spectrum sharing agreement signed with the operators of the Russian maritime satellite system, TSYKADA. Commercial operation was expected to start in 2003, although no details are known regarding the launch schedule. Orbit inclination was to have been 50°, giving useful coverage up to latitudes of about 65°. No further details have been reported and the website no longer exists.

2.1.8 Gonets

Two GONETS LEO messaging systems have been proposed by the former Soviet Union, using both UHF and L/S-band communications channels. Both will offer true global coverage from high inclination 1400 km orbits. One system, GONETS-D already has 8 satellites in orbit with a further 36 planned. No operational experience has been reported to date.

2.1.9 Other Systems

Six E-Sat satellites are planned. Launches were to have started in 2001, but nothing has so far been announced. The system is aimed principally at the US utility industry for remote metering. The Italian based Temisat is another planned system which is intended to offer global coverage. Little further has been heard of the European SAFIR store-and-forward messaging system, which has two satellites in orbit, but has yet to relaunch a service after major technical problems with its first satellite.

2.2 Big and Broadband LEOs

2.2.1 Iridium

Iridium filed for Chapter 11 bankruptcy protection in August 1999, and underwent financial restructuring. Financial difficulties continued and the system ceased operation in April 2000. At that time, Iridium had its complete constellation of 66 satellites plus spares in orbit, and offered a true global service through a network of ground stations backed up by inter-satellite links. The system has since been rescued from planned de-orbiting and resurrected by the US Department of Defense. A commercial service has also been relaunched. Of particular interest to data buoy operators in the early days of Iridium was the Motorola L-band transceiver module, which was designed to be easily integrated with sensor electronics via a standard serial interface, but this product is not now likely to appear. Most Iridium phones are, however, data capable and will interface with a standard modem. Throughput is about 2400bps. The component parts of some phones are now being repackaged as stand-alone modems. A short message service (1500 bytes max per message) is also to be introduced in late 2002, as well as a dropout-tolerant direct Internet connection at up to 10kbps.

Iridium continues to add to its constellation, with five new satellites launched in February 2002, and operational experience with the data service is starting to grow. However it is likely that its future survival will depend heavily on continuing support from defence interests

2.2.2 Teledesic

This 'Internet in the Sky' system planned a 288 (originally 840) LEO constellation to carry global broadband services such as video conferencing, the Internet, etc. It recently merged with Celestri, another proposed broadband LEO system. Since then there has been some doubt over the actual makeup of the combined constellation. Teledesic has suffered because of the financial difficulties of Iridium, as Motorola, one of Teledesic's primary investors and head of the industrial partnership developing the system, transferred engineering effort and funding to prop up Iridium. Teledesic has received FCC licensing for operations in the USA, and recently joined forces with Craig McCaw's New ICO. The constellation plan has been further trimmed to 30 MEOs, and the company has just announced (1 October 2002) that it is to suspend its satellite construction work.

2.2.3 Globalstar

Globalstar was Iridium's main competitor in the mobile satellite telephony market. After a bad start in September 1998 when 12 satellites were lost in a single launch failure, Globalstar now has its complete 48 satellite constellation in space, and commenced a limited commercial service in the US in October 1999. Service has since been expanding to other regions and was available in the UK in mid 2000. Globalstar differs significantly from Iridium in that for a call to be made the user must be in the same satellite footprint as a gateway station. There is no inter-satellite relay capability as in Iridium. This means that coverage will not be truly global, especially in the short term as far fewer gateways have been built than originally planned. Although Globalstar was currently in a much stronger financial position than any of its competitors, only 55,000 subscribers had been signed by late 2001 and the company laid off half of its work force in August 2001. Globalstar subsequently filed for Chapter 11 bankruptcy protection in February 2002.

Data services at 9600 bps are planned to be commercially available sometime in the future. As with Iridium this is likely to be very dependent on the initial success of the basic voice service. Globalstar also has a second generation system planned, said to involve 64 LEO satellites and 4 GEO satellites. Little else is known about the planned enhancements of this system.

2.2.4 Other Systems

Other planned big LEOs include Ecco (by the owners of Orbcomm), Ellipso (a hybrid elliptical LEO/MEO system, now merged with Teledesic and New ICO), LEO SAT Courier (a German led system which was originally a much smaller little LEO system), Signal and SkyBridge. Most of these systems seem to be on indefinite hold.

2.3 MEOs

2.3.1 New ICO

New ICO (formerly ICO Global Communications) is the third of the three main players in the global satellite telephony market. However it also has suffered severe financial difficulties and filed for Chapter 11 bankruptcy protection in August 1999, just two weeks after Iridium. The system, formerly known as Inmarsat-P but now fully autonomous, will use a constellation of 12 MEO satellites backed by a 12-station ground segment to provide a truly global voice, fax, data and messaging service. The aim is to complement and be inter-operable with existing digital cellular telephone networks. Prior to filing for bankruptcy protection, the first launch was planned for late 1999 with commercial service roll out scheduled for the third quarter of 2000. The company emerged from Chapter 11 protection in May 2000, and the first satellite was launched in June 2001, with service scheduled to start in 2003. However, ICO appear not to have launched any more satellites in 2002, and there is still no definite date for service rollout.

When the complete constellation is in service two satellites will always be visible from any point on the earth's surface. The space segment is being built by Boeing Satellite Systems. Data rate will be 9600 bps.

Many large manufacturers are engaged in developing dual mode ICO/cellphone handsets. An ICO 'engine', is to be defined for the benefit of third-party equipment manufacturers (OEMs).

New ICO have joined forces with Teledesic (both owned by ICO-Teledesic Global), with major revisions to the scope of both systems. In particular New ICO is now putting a far greater emphasis on data services, rather than voice services which are now widely recognised as holding smaller potential.

2.3.2 West and East

Little is known about these systems, designed by Matra Marconi Space, except that a combination of MEO and GEO satellites were planned, with multimedia-like services scheduled to begin in Europe via West in 2003. A follow-on vehicle supporting a fully fledged ATM switch is planned for 2004. The Matra Marconi website makes no mention of these systems and they are probably on indefinite hold.

2.4 GEOS

2.4.1 Inmarsat D+.

This is an extension of the Inmarsat D service using the new (spot-beam) Inmarsat Phase 3 satellites and small, low-power user terminals. The system was initially designed as a global pager or data broadcast service, with the return path from the mobile used only as an acknowledgement. D+ permits greater flexibility, but the uplink packets are still limited to 128 bits. The first ground station has been implemented in the Netherlands by the existing Inmarsat service provider (Station 12), but useful technical information has been difficult to obtain. The only remaining manufacturer of D+ transceiver seems to be Skywave. The Skywave unit includes an integral antenna and is specifically designed for low power applications.

The service may prove particularly attractive to national meteorological services as protocols already exist with Inmarsat service providers for the free transmission of observational data to meteorological centres for quality control and insertion on to the GTS. Inmarsat, given its assured multinational backing and established infrastructure, is also extremely unlikely to disappear.

2.4.2 ODL

Oceanographic DataLink (ODL) was a US Office of Naval Research sponsored demonstrator system that uses Intelsat C-band transponders to communicate with small oceanographic packages at rates of up to 10 kbps. New signal processing techniques allow such transponders to be used in low energy applications. Both antenna and transceiver size are small (the complete package is expected to be video cassette size), and data costs are expected to be low. Successful bench trials were completed, and the results of field evaluations awaited with interest, but no information has been forthcoming. The parent company (Viasat) website no longer mentions the project.

2.4.3 Inmarsat Mini-M, Thuraya, ACes, AMSC, etc

These advanced GEOs offer voice-band communications using compact handsets or laptops by implementing high gain steerable spot beams to achieve sufficient link margin. Data services may available using a modem connection on the handset. Coverage is generally regional and not advertised for oceanic areas.

3. ACKNOWLEDGEMENTS

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4. REFERENCES

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2. Hoang, N (1999). Data relay systems for drifting buoys utilizing low-earth orbit satellites. In: *Proceedings of the DBCP Technical Workshop, Hawk's Cay, October 1998*. DBCP Technical Document No 14, WMO, Geneva.

5. USEFUL WEB SITES

5.1 General information

Little LEO status, launch dates	*http://www.ee.surrey.ac.uk/SSC/SSHP/const_list.html*
Constellation overview	*http://www.ee.surrey.ac.uk/Personal/L.Wood/constellations/*
The Satellite Encyclopaedia	*http://www.tbs-satellite.com/tse/online/*
General satellite news/gossip	*http://www.hearsat.org/*
Satellite news	*http://www.spacedaily.com/*
General space news	*http://www.space.com/spacenews/*

5.2 Specific operators

Argos	*http://www.cls.fr/*
	http://www.argosinc.com/
Ellipso	*http://www.ellipso.com/*
E-SAT	*http://www.dbsindustries.com/*
Final Analysis	*http://www.finalanalysis.com/*
Globalstar	*http://www.globalstar.com/*
GOES	*http://www.goes.noaa.gov/*
Inmarsat	*http://www.inmarsat.org/*
Iridium	*http://www.iridium.com/*
LEO One	*http://www.leoone.com/*
LEO SAT Courier	*http://www.satcon-de.com/*
METEOSAT	*http://www.esoc.esa.de/external/mso/meteosat.html*
New ICO	*http://www.ico.com/*
Orbcomm	*http://www.orbcomm.com/*
Ocean DataLink (ODL)	*http://www.viasat.com/*
SAFIR	*http://www.fuchs-gruppe.com/ohb-system/*
Skybridge	*http://www.skybridgesatellite.com*
Teledesic	*http://www.teledesic.com/*
Thuraya	*http://www.thuraya.com/*
VITA	*http://www.vita.org/*
West	*http://www.matra-marconi-space.com/*

Overview of mobile satellite systems with possible data buoy applications - update 2002

System	Status*	Date (if known)	Orbit type	Buoy position	Message type	Terminal size	Power (watts)	Comments
ARGOS	Operational		Little LEO	Doppler Shift	data: 32 bytes	Handheld	1	Various enhancements, incl 2-way messaging, are scheduled
ECCO (CCI Global)	On hold		LEO	GPS Required	voice/data	Handheld	TBD	12 equatorial satellites planned by 2003. Status questionable – merged with ICO-Teledesic Global
ELLIPSO	Licensed On hold		Big LEO	GPS required	voice/data	Handheld	TBD	17 satellites in highly elliptical orbits, serving major land masses. Status questionable – merged with ICO-Teledesic Global
EYESAT	Experimental		Little LEO	GPS Required	data: 60 bytes	Handheld	5	1 satellite 1995, principally for radio amateurs
E-SAT	Licensed On hold		Little LEO	GPS Required	data: TBD	TBD		6 satellites for utility metering (aimed at Continental US only initially)
FAISAT	Licensed On hold	Service 2002+	Little LEO	GPS Required	data: 128 bytes	Handheld	10	38 satellites 2000+ Test satellite launched 1997
GEMNET	Cancelled (pre-op)		Little LEO	GPS Required	data: no maximum	Laptop	10	1st satellite 1995 - launch failure 36 satellites by ???
Globalstar	Operational	1999	Big LEO	GPS Required	voice/data: no maximum	Handheld	1	48 satellites + spares (constellation complete) Limited coverage due to lack of ground stations. Financial difficulties.
GOES, Meteosat, GMS	Operational		GEO	GPS required	data: various options	Laptop	10	4 satellites; directional antenna desirable NOAA / ESA / Japanese met satellites.
GONETS-D	Pre-operational		Little LEO	GPS/ Glonass	Data	Handheld	TBD	8 satellites in orbit, 36 more planned
GONETS-R	Planned On hold?		Little LEO	GPS/ Glonass	Data	Handheld	TBD	48 satellites planned

INMARSAT-C	Operational		GEO	GPS required	data: no maximum	5.5 kg	15	Steered antenna not required
INMARSAT-D+	Operational		GEO	GPS required	data: 128bytes uplink, 8 bytes downlink	Handheld	1	Global pager using existing Inmarsat-3 satellites Note very oriented to downlink
INMARSAT-Mini-M	Operational		GEO	GPS required	voice/data: no maximum	Laptop	1	Mobile phone using regional spot-beams
ICO (New ICO)	Licensed On hold?	Service 2003	MEO	GPS required	voice/data: no maximum	Handheld	1	Global voice and packet data services. Recently merged with Teledesic to form ICO Teledesic Global. 12 satellites planned, only one launched so far.
Iridium	Revived	Service resumed 2001	Big LEO	GPS preferred	voice/data: no maximum	Handheld	1	72 satellites in orbit
IRIS/LLMS	Experimental On hold		Little LEO	Doppler + Ranging	data: up to few kbytes	Handheld	1	1 satellite in orbit. Belgian messaging system part of an ESA research prog.
LEO One	Licensed On hold	Service mid 2003	Little LEO	GPS Required	data uplink 9600bps, downlink 24000bps	Handheld	Max 7	48 satellite constellation, store and forward + 8 spares. No polar sats
LEO SAT Courier	Planned On hold?	Service 2003+	Big LEO	GPS required	Data / voice	Handheld	1-5	72 satellites
OCEAN-NET	Experimental		GEO	Moored	no maximum	Large		uses moored buoys + Intelsat
Ocean DataLink (ODL)	Experimental On hold?		GEO	GPS	no maximum	Handheld	TBD	uses Intelsat
Odyssey	Cancelled (pre-op)		MEO	GPS required	voice/data: no maximum	Handheld	1	12 satellites were planned
Orbcomm	Operational	1998	Little LEO	Doppler or GPS	data: no maximum	Handheld	5	35 satellites in orbit, 30 operational, expansion to 48 sats licensed

SAFIR	Pre-operational On hold		Little LEO	Doppler or GPS	data: no maximum	Laptop	5	2 satellites in orbit
Signal	Planned On hold?		Big LEO		voice/data			48 satellites planned
SkyBridge	Licensed On hold	Service 2002+	Big LEO	GPS Required	Broadband	Larger than handheld		80 satellites planned, recycling GEO spectrum allocations
Starsys	Cancelled (pre-op)		Little LEO	Doppler + Ranging	data: 27 bytes multiple msgs	Handheld	2	12 satellites 1998+ 24 satellites 2000+
Teledesic	Licensed On hold	Service Late 2004	Big LEO	GPS required	Broadband			288 LEOs planned, now reduced to 30 MEOs FCC licence granted, merged with new ICO
Temisat	Experimental		Little LEO		Data			7 satellites planned for environmental data relay. 1 satellite launched 1993.
Thuraya	Operational		GEO	Integral GPS	Voice/data	Handheld		1 multiple spot beam satellite in orbit (over Middle East), 1 planned
Vitasat	Pre-operational		Little LEO	GPS Required	Data			2 satellites in orbit, 2 more planned
WEST	Planned On hold	Service 2003+	MEO	GPS Required	Broadband			9 satellites planned

* Status of systems is categorized according to seven groups:

Planned:	Little is known about the system except a name, notional type, and services to be offered. Mostly not licensed, although some may be.
Licensed:	System has been licensed by a national or international regulatory agency (in most cases the FCC), but no satellites have been launched.
Experimental:	System has one or more satellites in orbit for experimental purposes (not usually part of the final constellation). Includes new systems planning to use existing satellites.
Pre-operational:	System is in process of launching, or has launched, its constellation but is not yet offering full services. Some limited evaluation service may be available.
Operational:	System has full or nearly full constellation in place and is offering readily available service to external users (not necessarily commercial).
Cancelled:	System has been cancelled, either before satellites launched (pre-op) or after (post-op).
On hold:	No progress reported or scheduled.

ANNEX X

FINANCIAL STATEMENTS

Financial Statement by IOC
for the year 1 June 2001 to 31 May 2002

(all amounts in US $ unless otherwise specified)

BALANCE (from previous years)			**28,659**
FUNDS TRANSFERRED FROM WMO (relevant to the period)			
	(05.04.2001)	118,000	**118,000**
	(15.10.2001)	FF 59,000	**FF 59,000**
		in US $:	**8,259**
	TOTAL RECEIPTS		**154,918**
EXPENDITURES			
Technical Co-ordinator's employment:			**98,160**
Salary:		?	
Allowances:		?	
Relocation (yearly provision):		?	
Technical Co-ordinator's missions:			**14,030**
Yokohama/Tokyo (28 May - 6 June 2001)		736	
Akureyri (20-24 June 2001)		1,692	
Paris (27-30 June 2001)		897	
Hyderabad (24-28 July 2001)		2,118	
Perth (15 October - 2 November)		2,545	
Brest (18-20 November 2001)		542	
Geneva (27 January - 1 February 2002)		1,625	
Goa (23 February - 4 March 2002)		1,838	
La Jolla (20-28 April 2002)		2,255	
Adjustment on previous missions		-219	
Contract with CLS/Service Argos			**€ 12,200**
		in US $:	**11,199**
	TOTAL EXPENDITURES		**123,389**
BALANCE (at 1 June 2002)			**31,530**

World Meteorological Organization

Data Buoy Co-operation Panel
Revised Final Statement of Account as at 31 December 2001

	US$		US$
Balance from 1999			37,798
Contributions Paid for Current Biennium			291,909
Total Funds Available			329,707
Obligations Incurred			
Consultants	227,734		
Travel	55,607		
Bank charges	18		
Publication of reports	12,242		
Printing services	13,174		
ATLAS project	8,255		
Equipment	5,000		
Support cost	9,661		
			331,691
Balance of Fund		US $	(1,984)
Represented by.			
Cash at Bank			8,743
Less : Unliquidated obligations - prior years	(2,981)		
Unliquidated obligations - current year	(2,746)		(5,727)
Accounts Payable			(5,000)
		US $	(1,984)

CONTRIBUTIONS	Received 2000	Received 2001	TOTAL
Australia		13,500	13,500
Canada	10,000	10,000	20,000
FAO		10,000	10,000
France	9,863	9,435	19,298
Germany	5,000	5,000	10,000
Greece	2,200	2,200	4,400
Iceland	1,500	1,500	3,000
Ireland	1,243	1,168	2,411
Japan		10,000	10,000
Netherlands	1,575	1,575	3,150
New Zealand	0	500	500
Norway	2,075	1,575	3,650
South Africa		3,000	3,000
United Kingdom	16,000	15,000	31,000
USA	79,000	79,000	158,000
TOTAL	128,456	163,453	291,909

Prepared (on 19 September 2002

World Meteorological Organization

Data Buoy Co-operation Panel
Interim Statement of Account as at 31 August 2002

	US$		US$
Balance from 2001			(1,984)
Contributions Paid for Current Biennium			154,283
Total Funds Available			152,299
Obligations Incurred			
Consultants	100,000		
Travel	31,960		
Bank charges	21		
Postage	847		
ATLAS project	4,768		
Support cost	4,128		
			141,724
Balance of Fund		US $	10,575
Represented by.			
Cash at Bank			21,971
Less : Unliquidated obligations - prior years	(3,323)		
Unliquidated obligations - current year	(3,318)		
			(6,641)
Net exchange gain			(4,754)
		US $	10,575

CONTRIBUTIONS	TOTAL
Australia	13,500
Canada	12,015
CLS	10,000
FAO	10,000
France	
Germany	
Greece	
Iceland	1,500
Ireland	1,118
Japan	10,000
Netherlands	1,575
New Zealand	1,000
Norway	1,575
South Africa	3,000
United Kingdom	3,000
USA	86,000
TOTAL	154,283

Prepared on 19 September 2002

PROVISIONAL ESTIMATE OF INCOME AND EXPENDITURE
UNTIL 31 MAY 2003

Income	**USD**
Balance of fund from interim account	10,575
Additional contributions	17,200
Expenditure	
Unseen Obligations	17,500
Additional Atlas work	5,000
Travel of chairman/vice-chairmen/JTA chairman	1,000
Total	23,500
Anticipated balance to transfer to 2002/2003 account	4,275

ANNEX XI

EXPENDITURES AND INCOME FOR 2000-2004

	Actual 2000 and 2001 (2 years)	Estimated 2002 (1 year)	Estimated 2003 (1 year)
		USD	
Expenditures			
Technical Coordinator (Salary, Travel and Logistics)	252,000	126,000	126,000
Travel (chair, vice-chairs and JTA chair)	16,881	11,998	15,000
JTA chairman	14,460	7,485	8,000
Publications	25,416	0	6,000
CLS/equipment	5,000	0	10,000
WMO/charges	9,679	4,996	1,500
WMO marine programme refund		18,000	
Contingencies			2,325
TOTAL	323,436	168,479	168,825
Income achieved/required to balance expenditures			
Contributions	281,909	176,483	164,550
Carry forward from Previous biennium	37,798	-3,729	4,275
Carry over to next biennium	-3,729	4,275	
TOTAL	323,436	168,479	168,825

DRAFT TABLE OF PROVISIONAL CONTRIBUTIONS

DBCP

	2001-2002	**2002-2003**	**2003-2004**
AUSTRALIA (including JTA chair support 2001 and one-off payment 2002)	13,500	13,500	12,500
CANADA (including one-off payment 2002)	10,000	12,015	10,000
FRANCE	9,435 (FRF 70,000)	(10,000) (FRF 70,000)	10,000
GREECE	2,200	(2,200)	2,200
ICELAND	1,500	1,500	1,500
IRELAND	1,168 (IR£ 1,000)	1,118 (IR£ 1,000)	1,200
JAPAN	5,000	5,000	5,000
NETHERLANDS	1,575	1,575	1,575
NEW ZEALAND	500	1,000	1,000
NORWAY	1,575	1,575	1,575
SOUTH AFRICA	3,000	3,000	3,000
UNITED KINGDOM (including JTA chair support 2001 and one-off payment 2002)	16,000	18,000	16,000
USA (including JTA chair support 2001 and one-off payment 2002)	69,000	76,000	69,000
JTA (for JTA chair support)		10,000	10,000
TOTAL	**134,453**	**(156,483)**	**144,550**

SOOPIP

	2001-2002		2002-2003		2003-2004
Germany	5,000		(5,000)		5,000
Japan	5,000		5,000		5,000
USA	10,000		10,000		10,000
TOTAL	**20,000**		**20,000**		**20,000**

TOTAL INCOME FROM CONTRIBUTIONS

	2000-2001		2001-2001		2002-2003
TOTAL	**149,956**		**(176,483)**		**164,550**

ANNEX XII

Feasibility study for using CLS/Service Argos as a relay to insert already formatted buoy data onto the GTS, for buoys transmitting their data using a satellite system with no GTS data processing capability

It is assumed that the buoy operators using another satellite system than Argos and interested to use CLS, Service Argos facilities to insert their data on GTS would:

(i) Receive the buoy data themselves,
(ii) Decode the data in geo-physical units
(iii) Apply automatic quality control tests such as those applied within the Argos GTS sub-system (see DBCP publication No. 2, GTS sub-system reference guide for details)
(iv) Properly encode the data in BUOY or BUFR format
(v) Compile the BUOY or BUFR reports into GTS bulletins with appropriate GTS bulletin headers
(vi) Submit the data to Service Argos in real-time via a dedicated FTP site at Service Argos, Inc., Largo, for North American users, and at CLS, Toulouse, for other users.

Service Argos would in turn:

(i) Scan the FTP site regularly (e.g. every 5 minutes)
(ii) Assume that the bulletins containing the buoy data reports are properly encoded and formatted and contain good quality data.
(iii) Directly forward the GTS bulletins to Météo France (no check) for actual GTS insertion from there. It would use the same tcp/ip link and protocol as the one used by the Argos GTS subs-system.
(iv) Maintain an archive of distributed bulletins distributed in the last 7 days.
(v) It should be noted that as data formats of files submitted by Service Argos, Inc. to the NOAA/NWS Gateway on one hand, and by CLS to Météo France on the other hand differ slightly, no backup procedure is proposed at this point in case of failure of one of the Argos Global Data Processing Centre.

This involves on the Service Argos side:

(i) Establishing a dedicated FTP sites both in Largo and Toulouse
(ii) Developing a dedicated application to scan the FTP sites and submit the data to Météo France or the NOAA/NWS Gateway
(iii) Test the system before operational implementation
(iv) Maintain the system operational

Development and running costs:

Item	Work involved	New software needed	Development costs	Running costs
(i) FTP site	Relatively straight forward and can be implemented rapidly using existing software	No	Setting up FTP site. 1 man*day	Commitments already made by Service Argos to maintain its own FTP site. No substantial extra work
(ii) Scanning application	Some developments required to copy files from FTP site to the existing dedicated directory. The Argos GTS sub-system works in such a way that produced GTS bulletins are copied to a specific directory which is regularly scanned for delivery to Météo France via tcp/ip. Same tool could be used to forward the GTS bulletins received via FTP to Météo France.	Small developments	2 man*day	
(iv) Tests	Tests conducted by CLS, Service Argos with assistance from the Technical Coordinator of the DBCP	No	1 man*day	No
(v) Operations&Maintenance	No specific tool required	No	No	Some overall application monitoring required. Estimated at 0.5 man*day per month
Total	**Relatively small**	**Some developments needed**	**4 man*day**	**1 man*day per month**

Developments are therefore estimated at about 4 man*day **(i.e. 4 x 500 € = 2000 €)**. These would be conducted by CLS, Service Argos using internal resources. Running costs will depend on the amount of observation platforms concerned. Associated tariff, which could be either a yearly lumpsum (one man.month as a start) or a platform daily charge, will be discussed later when demand appears.

ANNEX XIII

DBCP IMPLEMENTATION & TECHNICAL WORKPLAN FOR THE 18th YEAR

PART A - Summary of tasks

1. Analyse programme information & other data as appropriate & in particular in accordance with DBCP global programme implementation strategy.

2. Assist in the planning & implementation, as appropriate, of the ocean data buoy component of GOOS, GCOS & CLIVAR.

3. Implement database of buoy programme information on JCOMMOPS web server.

4. Update & amend, as necessary, the DBCP World Wide Web server, including up to date information on existing & planned data telecommunication systems.

5. Continue investigation regarding developments in communication technologies & facilities, relevant to the collection of sensor &/or location data from buoys.

6. Update & publish new versions of DBCP publications No. 3 (Argos guide) & 15 (Implementation strategy, web only). Produce new publications: 2002 Annual Report, Workshop Proceedings (CD-Rom and web only).

7. Develop & implement cooperative buoy deployment strategies, in particular with the GDP, to provide buoy networks which serve both research & operational applications.

8. Organize scientific & technical workshop at DBCP-XIX

9. Monitor & evaluate quality of pressure & wind data from SVPB & SVPBW drifters.

10. Assist in implementing new buoy programmes as required.

11. Encourage other centres to act as PMOC

12. Begin tests and implementation of BUFR within Argos GTS sub-system. Interested Panel Members to participate in the tests.

13. Document calibration procedures

14. Provide the Technical Coordinator with deployment opportunities (maps & point of contact) for inclusion on the JCOMMOPS web server.

15. Produce table of national commitments in the Southern Ocean (by next Panel's session).

16. Buoy operators to develop their metadata catalogues & submit information to the JCOMM sub-group on Marine Climatology

17. Relevant panel members to routinely (e.g. monthly) provide the Technical Coordinator with the list of moored buoys they operate and which are reporting in SHIP format. This list must be provided in an electronic form in a format suitable for automatic data processing. Format to be defined with TC.

18. Enhance buoy safety through improved design (refer recommendations) and keep the Panel informed about related changes.

19. Make sure that newly manufactured buoys are capable of transmitting hourly data. For already deployed buoys, buoy operators to check with Service Argos that when such data are transmitted via Argos, they are also distributed on GTS (e.g. TRITON).

20. JCOMMOPS and MEDS to coordinate dynamic map products.

21. Recommend for inclusion in the Argos Development Programme a development for an application capable of reading already formatted BUOY bulletins from an FTP site and to insert them onto the GTS.

22. Develop an application at NDBC capable of reading already formatted BUOY bulletins from an FTP site and to insert them onto the GTS. Develop portable BUOY encoding software.

23. Take steps to resume operations of Lannion Global Readout station.

24. Study impact of using X-band only local receiving stations with future Argos system versus capability of using both X-band and L-band stations for the operations of the LUT network used for the collection of real-time Argos data. LUT network study by CLS. Letter to OpsCom to be drafted by the TC and signed by the chairman.

25. Analysis on a possible relationship between drogue lifetime and manufacturer; the study to include physical location of drogue failure.

26. Buoy operators to make sure that metadata that can be included in BUOY section 4 are routinely provided to Service Argos for actual GTS distribution.

27. Provide in situ testing of drifters equipped with PTTs with carry frequency outside the Argos-1 band, to investigate the advantages of Argos-2 extended bandwidth.

DBCP IMPLEMENTATION & TECHNICAL WORKPLAN FOR THE 18th YEAR

PART B

TASK	CARRIED OUT BY*	SUPPORTED/ ASSISTED BY	REPORTED TO/ ACTION BY
1	TC	Vice-chairmen	Chairman for presentation to the panel
2	DBCP	Panel members	Panel
3	TC		Panel
4	NOAA/AOML & TC	Vice Chairman (Meldrum)	Panel
5	Vice-chairman (Meldrum) & TC	Chairman & Panel members	Panel
6	TC, Secr.	Service Argos (No. 3), Panel Members (No.15)	Panel
7	Regional action groups, GDC	Panel members, TC	Panel, GDP
8	Mr. Eric Meindl	Secr.	Panel
9	DBCP evaluation group		Panel
10	Support team (USA, UK, Brazil, Canada)	TC, Secr.	Panel
11	Panel Members	TC	Panel
12	CLS, Service Argos	TC, Panel Members involved in tests	Panel, JTA
13	Panel Members		JCOMM sub-group on MC
14	Members		Panel
15	TC	Panel Members	Panel
16	Buoy operators		JCOMM –MC
17	Panel Members	TC	Panel
18	Manufacturers	Panel Members	Panel
19	Buoy operators & manuf.	Service Argos	Panel
20	JCOMMOPS & MEDS		Panel
21	Chairman, JTA	Service Argos	Panel
22	NDBC	TC	Panel
23	Chairman, JTA, CLS, Meteo France, NOAA/NESDIS	Rob Basset	Panel, OpsCom
24	CLS	Rob Basset	Panel, OpsCom
25	GDC		Panel
26	Buoy operators	Service Argos	
27	Evaluation group		Panel

DBCP ADMINISTRATIVE WORKPLAN FOR THE 18th YEAR

PART A - Summary of tasks

1. Maintain summary of requirements for buoy data to meet expressed needs of the international meteorological & oceanographic communities.

2. Maintain a catalogue of existing ongoing ocean data buoy programmes

3. Maintain a list of national contact points for the DBCP & within other relevant bodies with potential for involvement in DBCP activities.

4. Identify sources of buoy data not currently reported on the GTS & determine the reason for their non-availability.

5. If deemed necessary, make proposals for coordination activity as a result of the above actions to address items 2 to 6 in the terms of reference of the DBCP.

6. Arrange for the circulation of information on the Panel's activities, current & planned buoy programmes & related technical development/evaluations, including via distribution of existing DBCP publications to potential Argos GTS users.

7. Monitor the operation of the Argos GTS processing sub-system & arrange for modifications as necessary.

8. Continue the arrangements (including finance) to secure the services of a technical coordinator.

9. Review programme & establish working priorities of the technical coordinator.

10. Prepare annual report of the DBCP.

11. Support, as required, existing DBCP action groups (EGOS, IABP, IPAB, ISABP, IBPIO, GDP, TIP, NPDBAP), and provide assistance on request to other internationally coordinated buoy programme developments.

12. Investigate requirements for initiating new coordinated buoy deployments in other ocean areas such as the Black Sea.

13. Make every effort to recruit new contributors to the trust fund.

14. Keep up-to-date with the latest buoy technical developments.

15. Coordinate operation of DBCP QC guidelines.

16. Follow up & possibly assist in implementing requirements expressed by the buoy users within the Argos system.

17. Provide technical workshop papers to WMO Secretariat (end December) & publish proceedings (mid 2003).

18. Submit national reports & Action Group reports in electronic form to the technical coordinator for inclusion in the DBCP server.

19. Prepare & distribute revised budget estimates for 2003-2004

20. Secr. & members to identify necessary funding to allow for expansion of JCOMMOPS & AIC staffing & resources.

21. Interested Member states to make commitments to the DBCP newly established budget line of the DBCP trust fund dedicated to instrument evaluation. Chairman to write formally to WMO to establish the budget line.

22. Continue development of JCOMMOPS.

23. Make a study on the necessity, or otherwise, of having two different centres in JCOMM dealing with the same kind of data, as is the case for the RNDOC/DB and SOC/DB.

24. Review to assess the benefits and efficiency that might be achieved by extending the TOR of JCOMMOPS to include also support for VOS and ASAP.

25. IBPIO to take the lead in implementing support for an Indian Ocean Observing System as far as data buoys are concerned.

26. TC to investigate with buoy operators possible future needs (long term) with regard to satellite data telecommunications of buoy data. Target date end March 2003.

27. Chairman to write to NOAA/NESDIS to detail its concerns and the supporting evidence and to ask for an early reinstatement of Lannion.

28. Secretariat to write to relevant Member States requesting them to take action regarding publicising the existence and value of ocean data buoys among fishermen and other marine users. Secretariat to also discuss the issue with IHO, e.g. regarding weekly Notices to Mariners.

29. TC to inform chairman of his wish or otherwise to continue to work as TC/DBCP for the period 1 June 2003 to 31 May 2004.

30. Chairman to write to manufacturers regarding collection and transmission of hourly data.

DBCP ADMINISTRATIVE WORKPLAN FOR THE 18th YEAR

PART B

TASK	CARRIED OUT BY*	SUPPORTED/ ASSISTED BY	REPORTED TO/ ACTION BY
1	TC	Panel members & Secr.	Chairman for presentation to the panel
2	TC	Panel members & Secr.	Chairman & panel for information
3	Secr.	Panel members	Chairman & panel for information
4	TC, CLS	Panel members & Secr.	Chairman & panel for information
5	Chairman & TC	Secr. & others as appropriate	To Panel for consideration & appropriate action or for direct action by chairman
6	TC	Chairman, Secr. & CLS	Wide circulation by Secr. & CLS
7	TC	CLS	Panel & users
8	Chairman & sub-committee	Secr.	Secr.
9	Panel/chairman		Panel (at next session)
10	Chairman & Secr.	TC	Executive Councils of WMO & IOC
11	Chairman & Secr.	TC	Panel
12	Ukraine, Chairman & Secr.	EGOS, Panel members	Panel
13	Chairman	Panel members	Panel
14	Operational services, chairman, vice-chairmen & TC	Panel members	Panel
15	TC	Panel members & operational services	Panel
16	CLS	TC	Panel, meeting on JTA
17	Panel members, Secr.		Panel
18	Panel members, AG, TC		Panel
19	Secr.		Panel
20	Secr. & panel members		
21	Panel members, Chairman		WMO, Panel
22	DBCP TC & Argo TC	Panel Members, Secr., CLS	Panel
23	RNODC/DB, SOC/DB	JCOMM	Panel
24	JCOMM SOT	VOS, ASAPP, SOOP	SOT, DBCP, JCOMM
25	IBPIO	DBCP Chair, TC, Secr.	Panel
26	TC	Panel	Panel
27	Chairman		NOAA/NESDIS
28	Secretariat	IHO, NMS	Panel
29	TC		Chairman
30	Chairman	TC	Panel

ANNEX XIV

LIST OF ACRONYMS AND OTHER ABBREVIATIONS

ADEOS	Advanced Earth Observing Satellite (Japan)
AIC	Argo Information Centre
AOML	Atlantic Oceanographic and Meteorological Laboratory
ASAP	Automatic Shipboard Aerological Programme
AST	Argo Scientific Team
AWS	Automatic Weather Station
CLIVAR	Climate Variability and Predictability (WCRP)
CLS	Collecte Localisation Satellite
CMR	Christian Michelsen Research
CNES	Centre national d'études spatiales
DBCP	Data Buoy Cooperation Panel
DBCP-M	Argos message format - Meteo
DBCP-O	Argos message format - Oceanographic
DCS	Data Collection System
DMMC	Downlink Message Monitoring Centre
ECMWF	European Centre for Medium-Range Weather Forecasts
EGOS	European Group on Ocean Stations
GCOS	Global Climate Research Programme
GDP	Global Drifter Programme
GOOS	Global Ocean Observing Sytem
GTS	Global Telecommunication System (WWW)
GTSPP	Global Temperature & Salinity Profile Programme
HRD	High Rate Data
IABP	International Arctic Buoy Programme
IBPIO	International Buoy Programme in the Indian Ocean
IGOSS	Integrated Global Ocean Services System (IOC-WMO; subsumed into JCOMM)
INPE	Instituto National de Pesquisas Espaciais (Brazil)
IODE	International Oceanographic Data & Information Exchange (IOC)
IOOS	Integrated Ocean Observing System
IPAB	International Programme for Antarctic Buoys
ISABP	International South Atlantic Buoy Programme
JCOMM	Joint WMO-IOC Technical Commission for Oceanography & Marine Meteorology
JCOMMOPS	JCOMM *in situ* Observing Platform Support Centre
JTA	Argos Joint Tariff Agreement
LRD	Low Rate Data
LUT	Local User Terminal
MEDS	Marine Environmental Data Service (Canada)
NCEP	National Center for Environmental Prediction (NOAA)
NCO	NCEP Central Operations
NDBC	National Data Buoy Centre (USA)
NESDIS	National Environmental Satellite Data and Information Service (USA)
NOAA	National Oceanic and Atmospheric Administration (USA)
NPDBAP	North Pacific Data Buoy Advisory Panel
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NWP	Numerical Weather prediction
NWS	National Weather Service (NOAA)
OAR	Office of Atmospheric Research (NOAA)
OCG	Observations Coordination Group (JCOMM)
ODAS	Ocean Data Acquisition System
ONR	Office of Naval Research (USA)
OpsCom	Operations Committee (Argos)

OSE	Observing System Evaluation
PICES	North Pacific Marine Science Organization (Pacific ICES)
PIRATA	Pilot Research Moored Array in the Tropical Atlantic
PMEL	Pacific Marine Environmental Laboratory (USA)
PMOC	Principal Meteorological or Oceanographic Centre (DBCP)
PMT	Platform Messaging Transceivers
PTT	Platform Transmitter Terminal (Argos)
QC	Quality Control
RMS	Root Mean Square
RNODC	Responsible National Oceanographic Data Centre (IODE)
SCOR	Scientific Committee on Oceanic Research
SOBP	Southern Ocean Buoy Programme
SOC	Specialized Oceanographic Centre (ex-IGOSS)
SOOP	Ship-of-Opportunity Programme
SOT	Ship Observations Team (JCOMM)
STIP	Stored TIROS Information Processing
SVP	Surface Velocity Programme drifter
SVPB	SVP “barometer” drifter
TC	Technical Coordinator
TIP	Tropical Moored Buoys Implementation Panel
UKMO	United Kingdom Meteorological Office
VOS	Voluntary Observing Ships
WOCE	World Ocean Circulation Experiment (WCRP)
WOTAN	Wind Observation Through Ambient Noise
WWW	World Weather Watch (WMO)
XBT	Expendable Bathythermograph
YOTO	International Year of the Ocean