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INTERGOVERNMENTAL OCEANOGRAPHIC
COMMISSION (of UNESCO)

WORLD METEOROLOGICAL
ORGANIZATION

Seventh Session of the Drifting-Buoy Co-operation Panel
Toulouse, France, 15-18 October 1991

SUMMARY REPORT

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ANNEXES

1. ORGANIZATION OF THE SESSION

1.1 OPENING OF THE SESSION

1 The Seventh Session of the Drifting-Buoy Co-operation Panel was opened by the Chairman of the Panel, Mr. Derek Painting, at 10 a.m. on Tuesday 15 October 1991 at the Toulouse Centre of Météo France. After welcoming the participants to the session, Mr. Painting called on the Deputy Director of the Centre, Mr. Jean-Pierre Bourdette, to address the Panel.

2 On behalf of the Director of Météo France and Permanent Representative of France with WMO, Mr. André Lebeau, Mr. Bourdette extended a warm welcome to the participants in the session. In so doing, he expressed the particular pleasure of Météo France in being able to host the Seventh Session of the Panel in Toulouse and underlined that this was one of the very first meetings to be held there since the conference building was only completed a few days earlier. Météo France considers the Panel achievements as highly commendable, in particular because they demonstrate an excellent spirit of co-operation between meteorologists and oceanographers, as well as between research and operational undertakings. The Panel itself provides for opportunities for meteorologists and oceanographers to work together and to take into account each other's points of view. Mr. Bourdette concluded in wishing all participants in the session a very fruitful meeting and a pleasant stay in Toulouse.

3 On behalf of the Secretary IOC, Dr. Gunnar Kullenberg, and of the Secretary-General of WMO, Professor G.O.P. Obasi, the IOC Secretariat Representative also welcomed the participants in the Seventh Session of the Panel. He expressed the considerable appreciation of IOC and WMO to the French Government, to Météo France and to the local organizers for hosting the session in Toulouse and for the excellent facilities provided. He expressed everyone's pleasure in being almost the first to make use of these new facilities. He wished the Panel a very successful session and assured it of the full and continued support of the Secretariats in its work.

1.2 ADOPTION OF THE AGENDA

4 The Agenda, as adopted by the Panel, is given in Annex I. The List of Participants is given in Annex XVI.

1.3 WORKING ARRANGEMENTS

5 Under this agenda item, the Panel decided on its hours of work and other working arrangements for the session. The List of Documents for the session, including items to which they referred, was also introduced by the Secretariats.

2. REPORTS

2.1 REPORT BY THE CHAIRMAN OF THE DRIFTING-BUOY CO-OPERATION PANEL

6 The Chairman informed the Panel that the work of the Panel had continued at a high level throughout the intersessional period. The Chairman expressed his gratitude for the excellent efforts of the Technical Co-ordinator and the assistance of the Secretariats of IOC and WMO and many Panel members. As well as dealing with some routine, mainly administrative, matters, the Chairman had participated in, and represented the Panel at, a number of meetings including:

(i) The First and Second Preparatory Meetings for an International Arctic Buoy Programme (IABP) held in Edmonton and Seattle respectively. At the second meeting, the IABP was inaugurated and was proposed as an action group of the panel (see Agenda Item 6.5).

(ii) Two special meetings to discuss the Argos GTS processing chain held in Landover, MD, USA. The meetings agreed on the documents to be placed before the DBCP and the Argos JTA at the next sessions.

(iii) The Second Meeting of the Co-ordination Group on the Composite Observing System - North Atlantic (CGC). The CGC is in the process of reviewing the network requirements for the COSNA which include the requirements for observations from drifting buoys.

(iv) An informal meeting at the Global Drifter Centre at Scripps Institution of Oceanography to discuss development and testing of the low cost WOCE/SVP "pressure" drifter (see Agenda Item 4.1).

7 The Chairman drew attention to the proposal for a further drifting-buoy programme in the Indian Ocean to be discussed further under Item 6.5, noting that this programme, in addition to the IABP, might be proposed as an action group of the Panel. The Chairman welcomed these developments since an important objective of the Panel is to encourage the formation of "action groups" to establish drifting-buoy programmes in data sparse areas.

2.2 REPORT BY THE TECHNICAL CO-ORDINATOR

8 The Technical Co-ordinator presented his activities during the intersessional period. His position in the United States, Landover, being employed by UCAR, had facilitated contacts with North American users, although good contacts were maintained with other users. Following DBCP-VI and JTA-X in Melbourne, October 1990, the Technical Co-ordinator visited the New Zealand Meteorological Service, the Japan Meteorological Agency and various agencies in Japan. He attended the First and Second Preparatory Meetings for the Implementation of an International Arctic Buoy Programme, the Fourth Session of the Surface Velocity Programme, San Diego, USA, and visited CLS/Service Argos, Toulouse, France, to discuss specifications for a new Argos GTS processing chain.

9 In Landover, he has undertaken monitoring activities in order to improve the quality of drifting-buoy data being distributed on the GTS. He also dealt with specific questions from principal investigators, Local User Terminals and meteorological centres related to the Argos system or data being processed at Argos centres. Through stressing continuously to principal investigators the value of buoy reports being distributed on the GTS, he has succeeded in gaining around 50 additional buoys for GTS data distribution. Among problems he had to face for that purpose, confidentiality is the most important one (20% of the buoys processed by Argos). Arguments such as explaining that GTS is not a good tool for computing sea-surface velocities convinced a number of researchers to give authorization for their data to be circulated onto the GTS. New GTS bulletin headers, as proposed by principal investigators, were presented and submitted for consideration by the Panel.

10 The Technical Co-ordinator then presented graphs (of quality of air-pressure data, buoy lifetimes), statistics and a status report on GTS drifting-buoy data, and detailed why almost 60% of drifting buoys currently processed by Argos do not report onto the GTS.

11 He also briefly mentioned other tasks he undertook during the period, which are discussed in detail under various agenda items, such as working on the project for a new Argos GTS processing chain, proposing new operating procedures for drifting-buoy data quality control and liaising with the Global Drifter Centre and various Meteorological Services on combined meteorological/oceanographic drifting buoys. The full report of the Technical Co-ordinator is given in Annex II.

12 The Panel noted the report with much interest and expressed its considerable appreciation to the Technical Co-ordinator for the excellent work which he had performed on its behalf. This work has undoubtedly been instrumental in establishing the Panel as an important factor in the efficient operation of drifting buoys in support of WMO and IOC programmes. Most of the matters raised by the Technical Co-ordinator are considered in detail under

later agenda items. With regard to the specific question of abbreviated GTS bulletin headers, the Panel:

(i) Approved the proposed new headers. The full list of headers for drifting-buoy data is given in Annex III.

(ii) Requested WMO/CBS to amend the GTS regulations regarding such bulletin headers to fully reflect the reality of the present situation, and to authorize the DBCP to be the competent body to maintain this list.

2.3 REPORT BY THE SECRETARIATS

13 The WMO Secretariat Representative reported to the session that the major activities of the WMO Secretariat during the past year in support of the Panel had continued to be concerned with the administration of the Panel's funds. Full details of these are discussed under Agenda Item 3. In addition to these matters, the WMO Secretariat had also been involved in various other activities in support of the work of the Panel, or of drifting-buoy programmes generally, such as involvement in the development of the new Argos GTS chain; support for the formation of the International Arctic Buoy Programme (with the Joint Planning Staff for the WCRP); the revision of the DRIFTER code, liaison with EGOS, ITPO and the WOCE IPO; organization of the design and manufacture of the DBCP tie; and maintenance of the list of national focal points for drifting buoys and of the system of WMO buoy identifier numbers. Finally, the WMO Representative noted the strong support for the Panel and its work expressed by the Eleventh World Meteorological Congress (May, 1991).

14 The Representative of the IOC Secretariat reported that the IOC Assembly, at its sixteenth session (Paris, March 1991), had expressed its pleasure at the major successes of the Panel so far. It had recognized that this success was largely achieved through the work of the Technical Co-ordinator and urged once more Member States that have not yet done so to consider contributing to the Panel's fund. With regard to the legal status of Ocean Data Acquisition Systems, Aids and Devices (ODAS), the Assembly had underlined its view that the International Maritime Organization should collaborate with IOC in reviewing the preliminary draft convention prepared by the Soviet Maritime Law Association (SMLA). It had further agreed on a detailed set of actions regarding the preliminary draft, that includes: (i) comments to be provided by Member States; (ii) preparation by SMLA of a new draft; (iii) submission of the amended draft to a forthcoming session of the Inter-secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) and establishment of a group of experts among concerned international organizations to prepare a further draft. The Panel will continue to be considered as a technical adviser in this undertaking, within its terms of reference.

15 The Panel acknowledged with appreciation the report by the Secretariats. Discussion on any of the topics dealt with was deferred to further agenda items, as necessary.

2.4 REPORTS BY THE ACTION GROUPS OF THE PANEL

16 The Icelandic Delegate, Mr. Flosi Sigurdsson, Vice-Chairman of the European Group on Ocean Stations (EGOS), gave an oral report on EGOS, the first and, until now, only action group of the Panel. He referred to, and highlighted, several items of the report by the Technical Secretary of EGOS, Mr. Thor Kvinge. He described the drifting-buoy programmes EGOS North (SOBA) and EGOS South (SCOS) and commented on the present status of meteorological buoys in the North Atlantic. In particular, he emphasized the benefit of using three local user terminals in EGOS North, as it has increased the data reception by around 50%. The full EGOS report will be published in the Panel Annual Report for 1991.

3. FINANCIAL AND ADMINISTRATIVE MATTERS

3.1 FINANCIAL SITUATION

17 The Panel first considered the statement of account provided by the WMO Secretariat for the management of the Panel's regular budget for the period from 1 January 1990 to 30 September 1991. It noted that a statement covering this period was necessary since the WMO financial accounting period is now a calendar biennium (the current biennium being 1990/91) and this had resulted in some overlap between the statements presented at DBCP-VI and DBCP-VII. Nevertheless, through a careful intercomparison of the two statements, the Panel was able to identify both contributions and expenditures relating to its own 1991/92 financial year. In this regard, it noted with appreciation that all 1991/92 contributions had been received in good time, which had greatly facilitated the finalization of both the UCAR and Service Argos Inc. contracts. The Panel expressed its appreciation to all contributing Members for their financial support, and also for the timeliness of their payments. The Panel accepted the WMO statement of account for its regular budget, which is given in Annex IV.

18 The Panel next considered the statement of account for the fund for the GTS Argos processing chain. It noted with appreciation the additional contributions to this fund received since DBCP-VI of US$2,000 from Australia, US$20,000 from the USA and US$12,000 from the Joint Climate Research Fund of the WCRP. The Director of the ITPO explained that the WCRP is a joint programme of WMO and ICSU, both of which contribute to the JCRF, the main purpose of which is the international co-ordination of the WCRP. In September 1991, the Director of the WCRP agreed that the benefit to the WCRP of the new Argos GTS processing chain justified an allocation of US$12,000 from the JCRF to bridge the gap between the US$78,000 which had been committed by Panel Members and the target of US$90,000. The Panel expressed its particular appreciation to the Director of the WCRP for this very positive gesture of support, which was evidence of the importance of its own work in support of global climate research.

19 The Panel accepted the statement of account provided by WMO for the GTS processing chain fund, which is given in Annex V. In doing so, it noted that sufficient funds were now available to cover its commitment to support the implementation of the new Argos GTS processing chain, once the additional contribution from the USA was received and the late Canadian DBCP contribution for 1990/91 was refunded to this account.

20 Finally on this topic, the Panel noted and approved the financial statement provided by UCAR relating to the employment of the Technical Co-ordinator during 1990/91. It also accepted the interim statement from UCAR for the year 1991/92. Both these statements are given in Annex VI. In doing so, the Panel expressed its continuing appreciation to UCAR for the excellent services which it was providing in employing the Technical Co-ordinator on its behalf.

3.2 REVIEW OF CONTRACTS

21 Under this item, the Panel reviewed the two contracts which had been established by WMO on its behalf, respectively with UCAR for the employment of the Technical Co-ordinator, and with Service Argos Inc. for the logistic support of the Technical Co-ordinator. Copies of these contracts are given in Annexes VII and VIII, respectively.

22 The Panel agreed that the texts of both these contracts, as well as the final contract sums, were in conformity with what it had agreed at DBCP-VI, and that these contracts satisfied its requirements regarding the employment and logistic support for the Technical Co-ordinator.

23 Finally the Panel agreed that, since funds were now available to cover its contribution to the GTS processing chain development as noted under Agenda Item 3.1, the WMO Secretariat should proceed to draft and finalize a contract with CLS/Service Argos to formalize this contribution. It was further

agreed that this contract should contain the following features:

(i) specifications for the new processing chain, and an implementation timetable, as an annex;

(ii) explicit reference to the fact that the Panel is funding an initial portion of the total project cost, the remaining cost being funded as an Argos system development;

(iii) reference to the contribution to the development being made by the Technical Co-ordinator.

3.3 FUTURE EMPLOYMENT STATUS OF THE TECHNICAL CO-ORDINATOR AND COMMITMENTS FOR FUTURE FUNDING

24 In opening its consideration of this topic, the Panel first agreed that the employment and logistic support arrangements, through UCAR and Service Argos Inc. respectively, which had now been in place since 1989, had proved to be entirely satisfactory in providing both the type of employment and the necessary logistic support which is required for the Technical Co-ordinator, within the available funds. It further agreed that the services provided by the existing Technical Co-ordinator were entirely to its satisfaction. On being informed that UCAR, Service Argos Inc. and Mr. Charpentier were all agreeable to a continuation of the existing arrangements during 1992/93, and that there were no other impediments to such a continuation, the Panel therefore agreed to establish a draft budget and to seek the necessary financial contributions to this effect.

25 The Panel next considered the draft budget proposed by UCAR for the employment of the Technical Co-ordinator in 1992/93. It noted that the budget total of US$94,000 represented an increase of US$4,000 over that for the previous year, or approximatively 5% and that the detailed budget included the following features:

(i) a salary increase for the Technical Co-ordinator representing a third performance-related increment of US$1,000 plus an inflation-related increment;

(ii) no new allocation for relocation expenses, as the sum already held by UCAR appeared sufficient to cover these costs;

(iii) some small changes in UCAR costs;

(iv) a small increase in travel funds.

26 The Panel agreed that the proposed increase in the total UCAR budget was justified, and therefore approved the detailed draft budget, which is given in Annex IX. The Panel also agreed that the UCAR-WMO contract should remain unchanged for 1992/93, apart from necessary updating of contract sum and dates.

27 In noting that inflation in the USA is currently around 4% per year, the Panel agreed that it was appropriate to include an increase of this amount in the value of the contract with Service Argos Inc. for the logistic support for the Technical Co-ordinator. It therefore approved a total of US$14,500 for 1992/93, noting at the same time that any costs incurred by Service Argos Inc. in providing such support, over and above this contract sum, should be regarded as a contribution by Service Argos Inc. towards the work of the Panel. The Panel further agreed that the Service Argos Inc. contract for 1992/93 should be the same as that for 1991/92, apart from necessary changes in dates and contract sum.

28 In recalling that, during the past two years, the Panel Chairman had been called upon to travel quite extensively on Panel business, and that such travel had been supported at least partially from Panel funds, the Panel noted that such travel requirements were likely to increase in the future. Since it would be unreasonable to expect the Chairman's national service to

always cover such travel, and since there were also likely to be other unbudgeted expenses arising during the coming year (e.g. external contracts, etc.), the Panel agreed that the 1992/93 budged should include formal provision for such additional expenditure. Therefore, on the basis of:

- a UCAR contract for US$94,000,
- a Service Argos Inc. contract for US$14,500,
- WMO direct costs of US$300,
- sundry expenditures of $6,675,

the Panel agreed draft total expenditures for 1992/93 of US$115,475.00.

29 The Panel next considered how best to achieve this required sum. It noted first that a total of around US$3,000 was expected to be available for transfer from the 1991/92 budget, which left US$112,475 to be raised through contributions from Member countries, an increase of US$5,125 (or 4.5%) over that required in 1991/92. The Panel agreed that, ideally, such an additional sum should be raised through new contributions from additional Member countries, which would enable the contributions required from existing contributors to remain unchanged.

30 The Panel therefore:

(i) requested the Secretariats to seek such new contributions from those Member countries with an interest in drifting-buoy data who do not already contribute financially to the Panel;

(ii) in the event that new contributions to cover this additional amount could not be identified, to invoice existing contributors on the basis of the provisional table of contributions for 1992/93 which is given in Annex X.

31 While agreeing its draft expenditure budget and provisional table of contributions for 1992/93, both of which showed an inflation-related increase (of around 4-5%), the Panel noted that many contributing Member countries are themselves facing often substantial cuts in their own budgets, making it increasingly difficult to achieve the required contributions. The Panel therefore requested the Secretariats to make every effort to minimize any increase (in absolute terms) in the expenditure proposals for 1993/94, to be presented at DBCP-VIII.

32 Finally on this agenda item, the Panel recalled its decision at its sixth session to review annually alternative possibilities of employment of the Technical Co-ordinator, and mainly of moving the position from Service Argos Inc./Landover to CLS/Service Argos/Toulouse. The main problem lies in finding arrangements equivalent to those found with UCAR for the Technical Co-ordinator's employment. This could be done through the non-profit French private company SOFREAVIA SERVICE, which is specialized in supplying various types of technical assistance and specialist services, in and outside France, in the field of civil aviation and meteorology. It was made clear, however, that, should the Technical Co-ordinator's salary be maintained approximately at its present level, the cost to the Panel would be substantially increased, mainly because of the French benefits system. In fact, the cost to the Panel would be roughly equivalent to that incurred if the Technical Co-ordinator would be given the status of international civil servant within IOC/UNESCO or WMO.

33 The Panel expressed concern at this information. It recognized that there was a high probability that it would have to face this situation (viz the moving of the Technical Co-ordinator from Landover to Toulouse) for a possible fifth year of employment of Mr. Etienne Charpentier as Technical Co-ordinator, for various reasons. It considered that this matter deserved careful study during the coming intersessional period, since a final decision would have to be made at its forthcoming eighth session. It therefore requested all its members to take the measures they deem necessary to be ready to make a decision on this topic at DBCP-VIII, both at the national level and through consultations among themselves.

4. RELATIONSHIP WITH INTERNATIONAL PROGRAMMES/ORGANIZATIONS

4.1 WORLD CLIMATE RESEARCH PROGRAMME (WCRP)

New Developments in the WOCE/TOGA Surface Velocity Programme (SVP)

34 On behalf of the WOCE/TOGA SVP, Dr. Jeffrey Paduan presented to the Panel the status of the SVP, including highlights of projects completed since the last Panel session and predictions of tasks to be completed during the next year. The activities during the past year centered around three major tasks: (i) implementing the deployment of SVP drifters in the extratropical regions of the Pacific Ocean (deployments of drifters in the tropical Pacific has continued as part of the on-going TOGA portion of SVP), (ii) planning for deployment of drifters in the North Atlantic Ocean in 1992, and (iii) addressing a series of technical improvements to the SVP drifter. Details of these tasks are given in Annex XI. Of particular interest to the Panel was the evidence presented that shows a marked increase in drifter lifetimes as a result of the implementation of design improvements suggested by the Global Drifter Center (GDC) at Scripps Institution of Oceanography. A halflife (i.e. median lifetime) of at least 18 months for the performance of the entire system, including velocity measuring capabilities, is supported by the latest data available. Furthermore, the data show a continuous increase in drifter halflife for instruments deployed that incorporated none of, some of, or all of the suggested design improvements, respectively. It is also reasonable to expect that the halflife for position and SST information returned from SVP drifters (either with or without velocity measuring capabilities) will be greater than that which was demonstrated for the entire system.

35 The status of efforts to adapt atmospheric pressure measuring capability to the SVP drifter was given particular emphasis in Dr. Paduan's update to the Panel. He was able to report that field tests in the ocean off San Diego were conducted last February on a prototype SVP pressure drifter. The results showed that it is possible to make accurate pressure measurements from these small platforms at sea and, therefore, actions were taken by the GDC, with the help of the Technical Co-ordinator, to solicit support to construct and deploy SVP pressure drifters for long-time at-sea tests to evaluate the performance of the pressure sensors over periods of several months. Funds were raised from the GDC and four national Meteorological Services to purchase and deploy 25 SVP pressure drifters of which 2 will be moored at the Scripps pier for the duration of the test, 7 will be deployed off the west coast of the United States, 7 will be deployed off the coast of the United Kingdom, and 3 each will be deployed off the coasts of Canada, Australia and France. The timetable for the deployment of these test instruments is January 1992. The data telemetered from the instruments will be monitored for precision, accuracy and stability and it is hoped that as many of the test drifters as possible will be recovered after approximately 6 months at sea for post-calibration of the pressure sensors. Each drifter will include a moderately-priced barometer of proven accuracy in the laboratory and an inexpensive barometer for comparison with the, presumably, more accurate sensor.

36 In support of the efforts to develop, test and promote these low-cost pressure drifters, the Panel was asked, on behalf of the GDC, to distribute the information document describing the drifter and its potential use by meteorological agencies, that has been drafted by the Technical Co-ordinator in conjunction with the GDC. It was also requested that the Panel support the convening of a workshop to discuss the important problems associated with making air pressure measurements from small platforms at sea. The workshop could be held in conjunction with the Fifth Meeting of the SVP Implementation Panel the week of 6 April 1992 on the Island of Bermuda. The workshop would include discussion of the first 3 months of data from the test instruments. These requests to the Panel are discussed further under Agenda Item 6.4.

ATLAS Moorings in the Tropical Pacific

37 The Director of the ITPO described the dramatic expansion of the array of ATLAS moored buoys in the tropical Pacific that is being planned by NOAA's Pacific Marine Environmental Laboratory (PMEL). From 20 moorings in August 1991, the number of moorings will increase to 65 by the end of 1993. Data reports from these moorings are received through Argos and intended for GTS insertion. The Technical Co-ordinator has been assisting the PI for this project in developing and maintaining the Argos/GTS communication link.

4.2 WORLD WEATHER WATCH (WWW)

38 The Panel recalled that the requirements of the WWW for drifting-buoy data are clearly expressed in the WWW Programme volume of the Third WMO Long-Term Plan, which had recently been approved by the Eleventh World Meterological Congress. At the same time, the Panel noted with interest the report of its Chairman on the work of the Co-ordinating Group for COSNA (the Composite Observing System for the North Atlantic), which is essentially directed towards determining the optimum mix of meteorological observing system components over the North Atlantic, and ensuring the implementation of this system. The Panel agreed that it should continue to maintain a close interest in this work, through its Chairman, with a view to assisting in the implementation of the drifting-buoy component of the system when this had been fully defined. The Panel also noted that the results of the work of the CGC would also likely have implications for meteorological observing systems over other ocean areas.

4.3 INTEGRATED GLOBAL OCEAN SERVICES SYSTEM (IGOSS)

39 Under this agenda item, the Panel was presented with the reports by the IGOSS Specialized Oceanographic Centre (SOC) for Drifting Buoys, operated by the Service Central d'Exploitation de la Météorologie of Météo France, and the IODE Responsible National Oceanographic Data Centre (RNODC) for Drifting Buoys, operated by the Marine Environmental Data Service (MEDS) of Canada. Both centres receive drifting-buoy reports from the GTS and prepare various kinds of products: global monthly maps of buoy tracks and numbers per Marsden square, annual reports summarizing the data received and processed, user-oriented displays, etc. A file containing information about programmes, operators and, when available, characteristics of the buoys, has been recently installed by the RNODC on the basis of information provided every month by the Technical Co-ordinator. Other developments, either completed or in progress, were reported, such as the processing by MEDS of all historical data available over the GTS from 1980 to 1985, or the preparation of on-line products, as well as specific actions such as identifying where and why some drifting-buoy data got lost over the GTS.

40 The Panel expressed appreciation for the activities of the centres and encouraged them to pursue their efforts to the benefit of the overall meteorological-oceanographic community. It did not consider necessary to provide them with further advice.

4.4 GLOBAL OCEAN-OBSERVING SYSTEM (GOOS) AND GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)

41 The Panel noted with appreciation the recent developments regarding GOOS and GCOS and their relationships. Both systems are, for the time being, in the conceptual phase and have, as a common feature, to essentially build on what already exists, such as WWW, IGOSS, GLOSS, DBCP, etc. Practical arrangements for the co-ordination of the systems are being worked out, such as the establishment of a Scientific and Technical Committee and an inter-disciplinary Planning Office for GCOS. Some of them are already established, such as the GOOS Support Office in the IOC Secretariat, with the support of WMO.

42 The Panel expressed readiness to contribute to the development of both systems and underlined that, through its Chairman, it had already responded to some requests (such as comments on the draft GOOS Implementation

Plan). It expressed the hope that some kind of a technical forum will soon be established, within which it could express its views through e.g. its Chairman and looked forward to new developments in these difficult but fascinating undertakings.

5. REPORTS ON CURRENT AND PLANNED DRIFTING BUOY PROGRAMMES

43 The Panel was presented with reports by Canada, France, Greece, Iceland, Netherlands, United Kingdom, United States and SCAR. In addition, it noted that written reports had been received by the Secretariats from Australia, Korea and New Zealand. In so doing, the Panel recalled that a standard format had been suggested for reports, according to its request at its previous session. It expressed the hope that the reports would follow the suggested format, while making clear that this format was to be considered as guidelines rather than as a mandatory presentation. As in previous years, the Panel agreed that the reports should be included as annexes to the DBCP Annual Report.

6. CO-ORDINATION ACTIVITIES

6.1 QUALITY CONTROL OF DRIFTING-BUOY DATA

44 The Technical Co-ordinator reported on quality control issues raised during the Sixth Session of the Panel and also presented new proposed operating working guidelines for drifting buoy data quality control. On the basis of this report and following discussions on the subject, the Panel agreed the actions described in the following paragraphs.

45 Considering the important delays involved between the time the statistics are produced and the time a needed change is actually implemented through contact with the owner of the buoy (4 to 10 days), the Chairman of the DBCP, in conjunction with the Technical Co-ordinator, decided during the intersessional period not to ask ECMWF to provide the Technical Co-ordinator with ECMWF statistics on a weekly basis. The Panel however asked the ECMWF Representative at the session whether the European Centre could: (i) take the originating LUT into consideration when producing such statistics, and (ii) provide the Technical Co-ordinator with the list at the beginning of each month as well as on the 15th of each month, using one month of data each time. The ECMWF Representative agreed to implement this proposal.

46 As far as using flags in GTS messages is concerned, for indicating data quality, it was pointed out that the new Argos GTS processing chain will provide for the BUFR code after 1993 and that flag information could be included in such messages. The Panel therefore agreed not to consider this issue further during the present session.

47 Early in 1991, following DBCP-VI recommendations and discussions with the Technical Co-ordinator, and after having advertised it widely, the Ocean Product Center of NOAA resumed distribution of quality-controlled BATHY messages generated from original DRIBU messages of ATLAS moored buoys. The Panel expressed its appreciation to the OPC for its efforts in this regard.

48 Considering the importance of consistency between data being distributed from Argos Global Processing Centres and Regional Processing Centres, the Chairman of the DBCP asked CLS/Service Argos to allow global distribution on GTS of drifting buoy data from the Australian regional centre, received through the Melbourne Local User Terminal. Especially concerned are buoys belonging to the Australian Bureau of Meteorology, the New Zealand Meteorological Service and the US National Data Buoy Center (for TOGA). CLS/Service Argos informed the Panel that it was willing to do this, provided that the buoy description would be updated once a week only for buoys entering and leaving the LUT visibility. The Panel felt this was acceptable and thanked CLS/Service Argos for its kind offer.

49 New proposed operating working guidelines for drifting-buoy data quality control were presented by the Technical Co-ordinator and discussed in

detail by the Panel. An outline of these guidelines is given in Annex XII. The main purpose of the guidelines is to speed up and rationalize the status change process for drifting buoys reporting data on GTS when action is felt necessary by meteorological centres (delayed-mode quality control). The scheme is based on a centralized electronic bulletin board shared by the various centres involved in the process. The Panel decided, in principle, to implement these guidelines as from 1 January 1992. In the meantime, Service Argos Inc., in conjunction with the Technical Co-ordinator would study relevant issues in detail so that the Chairman of the DBCP can make a decision on what bulletin board service to use (e.g. Omnet, Argos, other) and who should pay for it. Before 1 January 1992, a Sub-group of Experts including the Technical Co-ordinator, Mr. Archie Shaw (Service Argos Inc.), Mr. Ray Mc Grath (ECMWF), Dr. Paul Julian (NOAA), Mr. Pierre Blouch (Météo France) and Mr. Flosi Sigurdsson (Icelandic Meteorological Office), was designated by the Panel to agree on a standardized format for exchanging information via the bulletin board. The NDBC, Météo France, ECMWF, UKMO and Ocean Product Center Representatives agreed in principle to participate in the procedures given in the guidelines, thus acting as Principal Meteorological or Oceanographic Centres responsible for drifting-buoy data quality control (PMOC). The Panel thanked these agencies for undertaking such very useful roles, which are likely to improve the overall quality of drifing-buoy data circulating on GTS.

50 It was decided that the working guidelines, as presented in Annex XII, could be changed by the Chairman of the DBCP, if felt necessary, and that the period between 1 January 1992 and the next DBCP session shall be considered as a trial period. Formal decision to continue with, or cease, these procedures shall be taken at the next Panel session, based on the trial results.

51 The question of introducing automatic real-time data quality control checks in the system and, particularly, to include these in the specifications of stage 3 for the new Argos GTS processing chain, was raised. These tests would generate alarms to the Technical Co-ordinator and/or flags in GTS messages but would definitely not remove data from GTS distribution. It was noted, however, that a decision as to whether or not to implement such checks was premature at this stage, in view of the introduction, from 1 January 1992, of the delayed-mode procedures agreed above. The Panel therefore decided to defer a decision on this issue until its next session, when it would have had a chance to assess the efficiency and relevance of these procedures.

6.2 CODE MATTERS

52 The Panel considered recommendations from its Sub-group of Experts on Codes for modifications to the DRIFTER code (adopted by the WMO/CBS in September 1990 and due for implementation on 1 November 1991) to address, in particular, identified requirements for quality control indicators and for a capability to report additional variables which can now, or may in the future, be measured from drifting buoys.

53 Following discussion, the Panel asked its Sub-group of Experts on Codes to finalize the modifications by including, in particular, specific suggestions agreed upon during the session. Members were asked to formalize their suggestions in writing and send them to the Secretariat at an early date. The Panel agreed it would then recommend to CBS that the modifications to the DRIFTER code put forward by the Panel be adopted for implementation.

54 Concerning the name DRIFTER, the Panel noted that this suggested a **Lagrangian drifter** to the user community. As such, the name itself, to some extent, discouraged investigators concerned about the confidentiality of precise buoy position data from providing reports from their buoys to the GTS in real time. Furthermore, it was recognized that the DRIFTER code (like the DRIBU code) would be used to relay reports from some other ocean data platforms such as moored buoys (e.g. ATLAS buoys) and sailing vessels. In view of these facts, the Panel decided to recommend to CBS that it change the name DRIFTER to BUOY, noting that such a change would encourage more researchers to provide their data for GTS relay in real time and would recognize the

utility of the code for platforms other than drifting buoys. At the same time, the Panel noted further that the SHIP code, which can be used to transmit reports from fixed ocean platforms, is not always suitable for platforms reporting through Argos.

6.3 NEW ARGOS GTS PROCESSING CHAIN

55 The Panel noted with much interest the state-of-the-art regarding the development of a new Argos GTS processing chain since its fifth session (see Annex XIII). It recognized that, in fact, stages 1 and 2 of development were in progress and that agreement had been reached for their funding , viz US$90,000 coming from the Panel and the remaining costs to be included as CLS development expenses and amortized accordingly. As far as stage 3 was concerned, the Panel unanimously agreed that the inclusion of "raw-data simulation" and data conversion through special customer-defined software modules were worthwhile features in the new processing system. In addition, it recalled its decision regarding automatic real-time quality control checks (see para.51 above). It further recognized that the costs implied by the development of stage 3 were in fact already taken into account under the development of the other two stages and that, for the time being, it was unnecessary to modify the existing specifications. It therefore decided to re-consider the question of the new chain as a whole at its forthcoming eighth session with a view to adjusting its requirements, as necessary.

6.4 COMBINED METEOROLOGICAL/OCEANOGRAPHIC DRIFTING BUOYS

56 The Panel recalled the requests made by Dr. Paduan, on behalf of the WOCE/TOGA SVP, concerning the development of the low-cost Lagrangian drifter with atmospheric pressure sensor, which are recorded under Agenda Item 4.1. It also recalled that a number of Meteorological Services have already agreed to participate in operational trials of these buoys, and noted that the results of the trials will be of great interest to all Meteorological Services concerned with the acquisition and/or use of data from drifting buoys. In addition, the Panel noted with interest a presentation by the Technical Co-ordinator on the draft booklet he had prepared on the drifter, with the assistance of the GDC.

57 The Panel strongly endorsed the potential value of these low-cost drifting buoys in support of operational meteorology and oceanography, as well as the actions already undertaken towards their development. The Panel therefore agreed:

(i) that the draft booklet describing the drifter, with some slight amendments, should be distributed immediately to all interested services and organizations, as a way of alerting potential users of the drifter to developments and possible applications;

(ii) that a further booklet or paper, detailing the results of the sea-trials of the pressure sensor, should be distributed after the completion of the trials;

(iii) that a DBCP-SVP workshop should take place in the first half of 1992 (nominally in early April as proposed by the SVP) to assess progress with the trials as well as preliminary results;

(iv) that the WMO Secretariat should ensure that the workshop report, as well as the full results of the trials, should be distributed to potentially interested national Meteorological Services, as soon as they are available.

58 In addition to these actions, the Panel also:

(i) recommended that the GDC operated by Scripps Institution of Oceanography should act as the focal point between operational agencies and SVP drifter deployers in the exploitation of these pressure drifters;

(ii) acknowledged the potential value of involving space agencies in

the drifter deployment programme, since this would both provide additional data for ground-truthing of satellite sensors, and also help to increase data for operational purposes.

6.5 FORMATION OF OTHER ACTION GROUPS

International Arctic Buoy Programme

59 The Panel was presented with a request that the International Arctic Buoy Programme (IABP) become an Action Group of the Drifting-Buoy Co-operation Panel. During the presentation made by the Chairman of the Executive Committee of the IABP, Mr. Bryan O'Donnel, the Panel was given a description of the Programme. The Chairman of the IABP expressed his gratitude to the Panel and, in particular, to its Chairman, for their assistance over the past year during the two preparatory meetings which led to the successful formation of the IABP. The Chairman of the IABP also noted the strong support to the Programme given by the WCRP.

60 The Panel accepted the request to establish the IABP as an Action Group of the DBCP and offered to provide the Programme with its technical and administrative support as required. The Panel expressed its congratulations to the Chairman and the members of the IABP for the successful formation of the Programme.

South-west Indian Ocean Buoy Project

61 The Panel recalled that, at its sixth session, it had received information on the possible establishment of a drifting-buoy project in the south-west Indian Ocean, under the auspices of the WMO Tropical Cyclone Committee for the South-west Indian Ocean, and had offered its own techncial and organizational expertise in support of this programme, as required. In this context, the Panel welcomed the information provided by the Permanent Representative of Mauritius with WMO, Mr. Y. Valadon, that funding had now been approved by the European Development Fund to implement this project. The Panel further noted the request from Mr. Valadon for assistance and advice by the Panel towards the planning and implementation of the project.

62 The Panel reiterated its earlier offer to provide whatever assistance was required for the project, through its Chairman, Technical Co-ordinator and individual Panel Member countries, as appropriate. Specifically, it noted that France was ready to provide assistance with technical aspects of drifting buoys, the USA could provide assistance with any moored buoy component to the project, while the Technical Co-ordinator would be most appropriate to assist with telecommunication aspects, in particular through Argos. The Panel therefore requested its Chairman to write directly to Mr. Valadon to reiterate this offer and to seek further clarification on requirements for assistance, and eventually to co-ordinate, with the help of the Secretariats, whatever arrangements may be necessary to effect this assistance. Finally, the Panel expressed the hope that ways would be found to continue this project on a long-term basis, and that it may eventually also become an action group of the Panel.

6.6 OTHER CO-ORDINATION ACTIVITIES

63 The Panel noted that very few programmes existed or were planned in the data sparse areas of the central and southern Atlantic and South-eastern Pacific Oceans. The Panel therefore agreed that an approach should be made through the appropriate international bodies to consider the establishment of operational drifting-buoy programmes in these areas with funding provided through mechanisms such as the Voluntary Co-operation Programme (VCP) of WMO. In addition, the Panel understood that some countries bordering these particular data sparse regions have indicated a willingness to co-operate with any future programmes, to the extent of providing deployment and related logistic services.

7. PUBLICATIONS

64 Under this agenda item, the Panel considered ways and means of preparing its annual report for 1991. It agreed to retain the basic table of contents as contained in its 1990 report, while allowing for some flexibility in the appendices. It was made clear that all relevant material should reach the IOC Secretariat by 15 November 1991 at the latest, in order that the report be published in due time.

8. REVIEW OF THE PANEL'S OPERATING PROCEDURES AND OF THE TECHNICAL CO-ORDINATOR'S TASKS

65 Following established procedures, the Panel reviewed its operating procedures as confirmed at its sixth session. It saw no need to change these procedures which are reproduced in Annex XIV.

66 The Panel further reviewed its workplan as adopted at its sixth session. In the light of discussions under previous agenda items, of achievements during the past intersessional period and of developments expected in the future, it undertook the revision of some items listed in the workplan. The revised workplan is given in Annex XV.

9. ELECTION OF THE CHAIRMAN AND THE VICE-CHAIRMAN OF THE PANEL

67 The Panel unanimously re-elected Mr. D. Painting as its Chairman and Dr. A.D.J. O'Neill as its Vice-Chairman for the coming intersessional period.

10. DATE AND PLACE OF THE NEXT SESSION

68 The Panel welcomed the offer of IOC to host the eighth Panel session at UNESCO headquarters in Paris. It agreed that the session should be held in conjunction with the Twelth Meeting on Argos Joint Tariff Agreement and that, subject to agreement by the Eleventh Meeting on Argos Joint Tariff Agreement, the dates for the eighth Panel session should be 13 to 16 October 1992.

69 The Panel welcomed the kind offer by Mr. A. Shaw, President of Service Argos Inc., to host a future Panel session in Landover, USA.

11. CLOSURE OF THE SESSION

70 In closing the session, the Chairman expressed his thanks to all participants for their valuable contributions to the work of the session. He offered his particular appreciation to Météo France for hosting the session and for the excellent support and hospitality they have provided to the Panel.

71 The Seventh Session of the Drifting-Buoy Co-operation Panel closed at 12.30 p.m. on Friday 18 October 1991.

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ANNEX I

AGENDA

1. **ORGANIZATION OF THE SESSION**

1.1 OPENING OF THE SESSION

1.2 ADOPTION OF THE AGENDA

1.3 WORKING ARRANGEMENTS

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2.2 REPORT BY THE TECHNICAL CO-ORDINATOR

2.3 REPORT BY THE SECRETARIATS

2.4 REPORTS BY THE ACTION GROUPS OF THE PANEL

3. **FINANCIAL AND ADMINISTRATIVE MATTERS**

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3.2 REVIEW OF CONTRACTS

3.3 FUTURE EMPLOYMENT STATUS OF THE TECHNICAL CO-ORDINATOR AND COMMITMENTS FOR FUTURE FUNDING

4. **RELATIONSHIP WITH INTERNATIONAL PROGRAMMES/ORGANIZATIONS**

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4.2 WORLD WEATHER WATCH (WWW)

4.3 INTEGRATED GLOBAL OCEAN SERVICES SYSTEM (IGOSS)

4.4 GLOBAL OCEAN-OBSERVING SYSTEM (GOOS) AND GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)

5. **REPORTS ON CURRENT AND PLANNED DRIFTING BUOY PROGRAMMES**

6. **CO-ORDINATION ACTIVITIES**

6.1 QUALITY CONTROL OF DRIFTING-BUOY DATA

6.2 CODE MATTERS

6.3 NEW ARGOS GTS PROCESSING CHAIN

6.4 COMBINED METEOROLOGICAL/OCEANOGRAPHIC DRIFTING BUOYS

6.5 FORMATION OF OTHER ACTION GROUPS

6.6 OTHER CO-ORDINATION ACTIVITIES

7. **PUBLICATIONS**

8. **REVIEW OF THE PANEL'S OPERATING PROCEDURES AND OF THE TECHNICAL CO-ORDINATOR'S TASKS**

9. **ELECTION OF THE CHAIRMAN AND THE VICE-CHAIRMAN OF THE PANEL**

10. **DATE AND PLACE OF THE NEXT SESSION**

11. **CLOSURE OF THE SESSION**

ANNEX II

REPORT BY THE TECHNICAL CO-ORDINATOR

1) Introduction

This report covers the period 1 October 1990 to 30 September 1991 during which the Technical Coordinator of the DBCP was based in Landover at Service Argos Inc., and was employed by the University Corporation for Atmospheric Research (UCAR).
This position in the United States lead to facilitated contacts with the American and Canadian Drifting Buoy Users. As for the previous year, many Organizations based in the Washington DC area have been visited. Contacts have been maintained and improved with non-North American Users using the various telecommunication tools provided by SAI to the TC DBCP such as Telephone, Argos Electronic Mail, Omnet Electronic Mail, Fax, Telex, Regular and Express mail.
The following paragraphs describe in detail the various activities of the TC DBCP during the period.

2) Missions, Visits, Meetings

2.1) 16-19 October 1990, Melbourne, Sixth session of the Drifting Buoy Cooperation Panel.

2.2) 22-23 October 1990, Melbourne, Argos Users' Conference.

2.3) 24-26 October 1990, Melbourne, Tenth session of the Joint Tariff Agreement.

2.4) 29 October 1990, Wellington, Visit of the New Zealand Meteorological Service. The very accurate calibration procedures operated by the NZMS on drifting buoy barometers prior to any deployment allow them to show ones of the best quality Air Pressure data from drifting buoys The TC DBCP did also a presentation on how the service could collaborate with the WOCE Surface Velocity Programme by upgrading drifters with an air pressure port.

2.5) 31 October 1990 - 2 November 1990, Tokyo, Visit of various agencies based in the Tokyo area:

2.5.1) The Japan Meteorological Agency,
2.5.2) The Maritime Safety Agency, Hydrographic Department (MSA/HD) Meeting with Dr. Iwao Nogushi and Dr. Ishii. Although oral approval was given for GTS distribution of MSA/HD drifting buoy data, provided a contract was signed with MEDS for the data being kept in confidence for at least 2 years, the draft copy of the contract, signed by MEDS, that the TC DBCP sent to MSA/HD, was never returned, nor amended.
2.5.3) The Fisheries Agency, National Research Institute of Far Seas Fisheries (FA/NRIFSF), Shimizu. Meeting with Dr. Satsuki Matsumura and Dr Masahisa Kubota (of Tokai University). Facing confidentiality problems, the same kind of argumentation was developed in order to obtain approval for GTS distribution of their drifting buoy data: (i) GTS is not a good tool for Surface Velocity

purposes and (ii) a contract could be signed with MEDS; see also paragraph 6.2 for details. A contract was signed in December 1990, the buoys now report on GTS.
2.5.4) The Argos office in Tokyo, i.e. Cubic I. Ldt.
2.5.5) The University of Tokyo (one moored buoy not compatible with Argos/GTS).

2.6) 11 December 1991, NMC, Camp Spring, Maryland. the Technical Coordinator met with Paul Julian and Glenn Hamilton to prepare the following meeting on the New Argos GTS Processing Chain (20 December). Technical issues were discussed.

2.7) 17 December 1990, Polar Research Laboratory (PRL), McLean, Virginia. Meeting with Ray Mahr at PRL (drifting buoy manufacturer) to discuss the PTT format used by the Alfred Wegener Institute (AWI, Germany). AWI deploys buoys in the antarctic area using complicate PTT format. The TC DBCP studied the format in detail and suggested solutions so that the platforms can report on GTS from the FRGPC. He also suggested PRL to change the PTT format of next platforms so that it will be easier to sent the data on GTS.

2.8) 20 December 1990, Service Argos Inc. (SAI), Landover: Informal consultation on the New Argos GTS Processing Chain. Refer to the New GTS Chain report for details.

2.9) 29 January 1991, Office of the Federal Coordinator for Meteorological Services and Supporting Research in Rockville, Maryland. As he did for the previous year, the TC DBCP attended the meeting of the US Working Group for Marine Environmental Services (WG/MES). Organisms represented were: The NOAA, National Weather Service, the Naval Oceanographic Office, the Mineral Management Service, the NDBC, the NMC, the Corps of Engineers (CERC), the COAP (Monterey). Topics such as Synoptic data needs, improvement in space/time resolution and forecast horizon, improved forecast dissemination, internal ocean forecasting, research on "Bomb" storms and rogue waves, hurricane forecasting, Atlantic Tropical Cyclone Observation Network (ATCON) and Drifting Data Buoy Plan (NDBC) were discussed. The need for more ship, drifting and moored buoy data was particularly expressed as well as the implementation of an operational oceanographic satellite. The TC DBCP did a short presentation concerning (i) the results of the survey he did for buoys not reporting on GTS, (ii) the possible collaboration between oceanographers and meteorologists on the WOCE Surface Velocity Programme and (iii) the New Argos GTS Processing chain.

2.10) 7 February 1991, National Weather Service, Suitland, Maryland. Meeting with Lloyd Irvin to discuss GTS bulletin headers issues. The NWS was actually not able to handle the Toulouse headers in case the FRGPC fails. The purpose of the meeting was therefore to study how NWS could implement the FRGPC lists in its directory. Lloyd Irvin explained that NWS needed a formal request from the DBCP. It also appeared that the ATLAS moored buoys were not disseminated worldwide and particularly not to South America. A request letter was sent to NWS the 8 February, and both Toulouse and ATLAS' headers were implemented the 27 March.

2.11) 18-20 March 1991, preparatory meeting for an International Arctic Buoy Programme, Edmonton, Canada.

2.12) 8-9 April 1991, Fourth session of the Surface Velocity Programme Meeting, San Diego, 8-9 April 1991. Various sciences related subjects were debated as well as more bureaucratic aspects such as deployment plans. Each participant presented his own drifting buoy programme. The TC DBCP did presentations on the New Argos GTS Processing Chain and on combined oceanographic-meteorological drifting buoys (i.e. SVP drifter equipped with a barometer).

2.13) 15 April 1991, US Embassy in Paris to renew TC DBCP visa. Short visit to IOC.

2.14) 17-26 April 1991, CLS, Service Argos, Toulouse. Discussions with CLS and software companies chosen to make financial evaluations for the development of the NGC (Digital Equipment France (DEC), SEMA Group and CISI).

2.15) 31 May 1991, Service Argos Inc, Landover. Meeting with Bill Woodward (NOAA/NOS), Archie Shaw (SAI), Chris Estes (SAI) and Steve Harris (SAI) at Service Argos Inc to discuss GTS distribution of ATLAS moored buoy data.

2.16) 16-18 September 1991, University of Washington, Second preparatory meeting for an International Arctic Buoy Programme, Seattle, Washington.

2.17) 19-20 September 1991, Seattle, Washington. Visit of Drifting buoy users at the PMEL and the University of Washington.

3) Monitoring

The monitoring activities of the TC include the following points, mainly related to GTS and Quality Control. As far as possible, while the TC was physically present in Landover, and using the different tools and reports available to him (e.g. access to the Argos files, Status reports, ECMWF monitoring statistics...), he contacted the drifting buoy owners or the responsible agency, when action was needed concerning a specific buoy transmitting bad data onto the GTS. Either the data of a failed sensor or all the data concerning a few platforms had indeed to be removed from the GTS distribution. In a few cases, a recalibration of the sensor was only needed.
Note: Due to other priorities, such as Technical Coordinator's missions, and other tasks he undertook (for example, working on the New Argos GTS Processing Chain, combined meteorological and oceanographic drifting buoys or trying to get more data on GTS), such monitoring activity suffered a little bit when compared to the previous intercessional period.

3.1) Check for bad data using the TC tools: check the positions and look for beached platforms, compare the data with climatological limits, draw tracks and time series.

3.2) Check for bad data using the monitoring statistics produced by the European Center for Medium range Weather Forecasts (ECMWF), the Ocean Product Center of NOAA (OPC), the United Kingdom Meteorological Office and the Centre de Meteorologie Marine of METEO-FRANCE.

3.3) Check the various status reports produced on a regular basis by the National Data Buoy Center (bi-weekly), the United Kingdom Meteorological Office (bi-annual), the Australian Bureau Of Meteorology (monthly) and the European Group on Ocean Stations (EGOS, monthly).

3.4) Check on a bi-weekly basis for bad "User limits" introduced in the Argos system, which could lead to good quality data being removed form the GTS distribution.

3.5) Resolve specific problems related to GTS for one given buoy, such as looking carefully on the data and the transfer functions used. For example, he could be investigating why delays are too important, or find why only a few messages are received at Meteorological Centers...

3.6) Update the TC files: list of the operational platforms (on GTS or not), new programs, WMO numbers, ECMWF statistics...

4) User assistance

Many drifting buoy users requested the TC to look carefully at specific problems.

4.1) Principal Investigators:

4.1.1) Get WMO numbers for the PI for new buoys being disseminated to the GTS. Study in detail the PTT message format and the transfer functions used so that using the appropriate processing type, the Argos System can be able to convert the raw data into physical values.

4.1.2) The PI may request the TC to look at a specific problem appearing with one of his buoys. See paragraph 3.5.

4.2) Local User Terminals: From time to time, LUT operators asked the TC to provide them with the transfer functions used with specific platforms so that they can also report to the GTS via their LUT.

4.3) Meteorological Centers: Contact the TC when they need information on one given platform drifting in an area which they are interested in.

4.4) Act as a focal point between the Meteorological Centres and the Principal Investigators when a specific action is needed on a buoy reporting to the GTS (e.g. remove the data from the GTS, recalibrate a sensor...).

4.5) Other: Provide the user with documentation or status reports concerning a specific program or experiment; answer specific questions concerning the Argos System...

5) Drifting Buoy Quarterly Report

Most of the problems discussed during the previous session of the DBCP, Melbourne, October 1990, were solved and operating this file has reached an acceptable level of reliability, although a few errors could still appear in the report. The distribution list proposed by IOC to which the TC DBCP added a couple of names was accepted by CLS in April of 1991. CLS is now issuing the report on a quarterly basis according to this list. The last report was issued the 1 October 1991.

6) Global Telecommunication System

6.1) Buoys not reporting on the GTS.

Reminder: In February 1990, 594 buoys were operational, 221 (37.2%) of which reported on GTS.

The TC DBCP updated the file he maintains on drifting buoys not reporting onto the Global Telecommunication System (See figure 6.1 for details). During the week preceding the 17 July 1991, 718 drifting buoys were operational and transmitted data through Argos. 275 (i.e. 38.3%) of these buoys were about to be inserted on GTS (10) or actually reported onto the GTS from Argos centres or LUTs (265). Here are the causes for the remaining 443 buoys for not reporting on GTS:

6.1.1) Confidentiality (152 buoys, i.e. 21.2%)

The owner does not want his data on GTS. The figures are a bit higher when compared to ones of February 1990 (139). Note that Principal Investigators can be reluctant to allow their data being distributed onto the GTS because they know that the Argos System is not technically able to provide them with the raw data if physical units are distributed onto the GTS. The New Argos GTS Chain will solve this problem.

Action proposed : Continue stressing on PIs via different canals (e.g. TCDBCP, WMO, financiers...) and inform the scientific community that the New Argos GTS Chain will allow the distribution of raw data to Principal Investigators. On the other hand, one could make it possible to provide positions (thanks to a revised version of the DRIFTER code, see also paragraph 6.6.2) coded to the nearest 1/10 of degree (e.g. coding latitude and longitudes as $Q_cL_aL_aL_a$// and $L_oL_oL_oL_o$/), so that data could still be accurate enough for meteorological purposes (approximately +/- 11 kilometers) but would not be good enough for reliable surface velocity computation. Publishing formally and regularly the list of Principal Investigators allowing the distribution of their Drifting Buoy

data on GTS, as well as arguments for doing so, would definitely help to gain new platforms on GTS (as explained in paragraph 6.2).

6.1.2) No geo-physical sensor installed on the buoys (32, i.e. 4.5%)

The buoys are deployed only to measure surface currents and eddy fields and are therefore not equipped with any meteorological sensors. Compared to February 1990 figures (51), fewer buoys have now no geo-physical sensor.

6.1.3) Tests operated or poor quality data (158, i.e. 22.0%)

Much more buoys are being tested now or show poor quality data (55 in February 1990). Tested buoys are likely to report on GTS in the future once fully operational (approximately 60 of these are WOCE drifters). Poor quality data were most of the time from buoys which were consequently removed from the GTS.
Maybe these buoys should not be considered as "operational" and therefore not included in these statistics.
Action proposed : Improve Quality Control procedures.

6.1.4) Not compatible with Argos for GTS purposes (e.g. sensor order), or the user needs raw data (46, i.e. 6.4%)

These are buoys for which the Argos system is not technically able to process for GTS purposes according to Principal Investigators or GTS needs. The number of platforms concerned increased slightly when compared to February 1990 figures (39).
The New Argos GTS Processing Chain, of course, will solve these kind of problems.

6.1.5) Unknown reasons (55, i.e. 7.7%):

Despite repeated efforts (telephone calls, letters, fax, Omnet messages, etc...) from the TC DBCP to get technical information on the buoys and approval for GTS distribution, either the latter did not receive any answer from Principal Investigators or received confusing information making it very difficult to go further in the process to put the buoy data on GTS.
When compared to February 1990 figures (89), fewer platforms don't report on GTS for unknown reasons. This is due to new or better contacts that the TC DBCP has established with Argos Users since then.

6.2) Request for new buoys reporting to the GTS

Following his trip to Japan, where he faced confidentiality problems, The Technical Coordinator developed a new argumentation for getting authorization to distribute drifter data onto the GTS:

A contract being signed with MEDS for holding the data in confidence for two years is a very strong argument, but not sufficient since researchers may have a direct access to the GTS, though most of the organisms benefitting from such an access are operational meteorological agencies.

The basic point is that GTS is not a good tool for computing Surface Velocities. Publishing ocean current results based on GTS drifter data could not be considered as serious. For example, there is presently no indication in GTS messages whether the drifter is equipped with a drogue, and if any, whether the drogue is still attached or not; the positions being coded in degrees and minutes makes it impossible to provide positions with an accuracy better than 1 nautical mile, i.e. 1852 m, whereas Argos can provide Principal Investigators with positions accurate to 150 m; In addition, the date of location can differ up to 12 hours from the time of observation which is indicated in the GTS message.

Formally publishing the list of agencies allowing their data to be distributed on GTS can also lead Principal Investigators to make a decision in favor of the GTS.

Among organisms having been convinced by the above argumentation are: the Scripps Institution of Oceanography, the Institute of Ocean Sciences of Canada, the Fisheries Agency, National Research Institute of Far Seas Fisheries of Japan and the Netherlands Institute for Oceanic Sciences.

The action of the TC DBCP to get more buoy data on GTS, i.e. facing confidentiality and technical problems, lead to an increase of about 50 drifting buoys reporting to the GTS, that otherwise would not have been disseminated.

6.3) GTS bulletin headers:

Discussions with the National Weather Service, Washington DC, lead the latter being able to handle GTS bulletins generated by Service Argos Inc, Landover, in case the Toulouse Centre fails. SAI also generates non-official headers, because Principal Investigators required this. The TC DBCP tried as far as possible to suggest rational choices. These headers are:

SSVX16 KARS: Buoys from various ocean area. The owner does not want to advertise his identity although he accepts the data being used by Meteorological Centres.

SSVX40 KARS: ATLAS moored buoys in the Equatorial Pacific Ocean.

SSVX96 KARS: Specific experiment conducted by the NDBC.

6.4) Quality Control

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

- Own TC monitoring activities, see paragraph 3 for details,
- Quality Controlled BATHY messages generated by the NOAA, Ocean Product Center (OPC) from Argos DRIBU messages. Inform OPC on DBCP VI recommendations. OPC resumed distribution of such duplicate messages early 1991 after having widely informed the GTS user community.
- Study the possible Global GTS distribution of TOGA buoy data from the Melbourne Argos Regional Processing Center.
- Use of flags in GTS drifting buoy reports ==> recommendations for the new DRIFTER code and consider using flags when finalizing specifications for a new Argos GTS Processing Chain.
- Study the option to get monitoring statistics from ECMWF on a weekly basis.
- Propose new operating procedures for Drifting Buoy data Quality Control. This issue is discussed in a separate document.

See the annex regarding Quality Control on Drifting Buoy Data for details.

6.5) A Status on Drifting Buoys reporting to the GTS, valid for July 1991 has been produced. The maps on figures 6.5.1 to 6.5.8 show the distribution of the 300 drifting and moored buoys that reported data on GTS during July 1991 (at least once) and the distribution of the main meteorological variables measured (Air Temperature, Air Pressure, Air Pressure Tendency, Sea Surface Temperature and Wind). To summarize, one could express the needs as follow:

Arctic Ocean	A few buoys with Air Pressure. Should improve in the future,
North Atlantic Ocean	Good SST coverage. Well covered compared to other area,
South Atlantic Ocean	Real lack of data of any kind,
Indian Ocean	Real lack of data. A few buoys reporting SST; 3 buoys reporting Air Pressure in the Arabian basin,
Equatorial Pacific Ocean	Good SST coverage. Winds available, thanks to ATLAS buoys,
North Western Pacific Ocean	Real lack of data of any kind,
North Eastern Pacific Ocean	Good SST coverage. Acceptable coverage off Canadian coasts (AES),
South Eastern Pacific Ocean	Good SST coverage. Lack of other data although a few TOGA buoys are present (NDBC),
South Western Pacific Ocean	Good SST coverage. Lack of Air Pressure and Wind data, Tasman sea well covered (NZMS),
Southern Ocean	Lack of data of any kind although a few TOGA (NDBC) and ABOM buoys are present.

6.6) DRIFTER code

6.6.1) Since DRIFTER will officially replace DRIBU the 1 November 1991, and in order to facilitate its implementation in the Argos system, the TC DBCP

wrote a FORTRAN programme able to convert DRIBU messages into DRIFTER messages. The programme was proposed to CLS and accepted. Minor modifications will be done by CLS for practical implementation.

6.6.2) Proposed modification for the new DRIFTER code:
In addition to the ones already stated by DBCP VI and according to remarks from Paul Julian of NOAA, NMC, the TC DBCP suggested new modifications for the DRIFTER code:

* Change the name to BUOY. In peoples' mind, DRIFTER suggests "Lagrangian" drifter, i.e. a device to measure surface currents. A lot of drifting buoys are not Lagrangian drifters, especially ones deployed by Meteorological Agencies. Oceanographers reluctant to put their drifter data on GTS for confidentiality reasons may toughen their position if we suggest that GTS drifting buoy data are from Lagrangian drifters because they fear other people making Surface Velocity studies and publishing reports based on GTS drifter data. On the contrary, naming a drifter report BUOY suggests more meteorological oriented applications. In addition moored buoy data processed by Argos would have to be coded using the SHIP code which does not make provisions for non-synoptic data. SHIP would therefore have to be modified as well.
* Allow positions to be coded to the nearest 1/10 of degree, e.g. $Q_cL_aL_aL_a$// and $L_oL_oL_oL_o$// in order to beat confidentiality problems. The data would still be useful for operational meteorological purposes (see paragraph 6.1.1).
* Add new fields (e.g. Humidity, Wind Gust, Visibility,...).
* HL in section 4 changed to give the actual date/time of the previous location fix.
* Introduce a single flag (0 or 1) to indicate wether data have been Quality Controlled or not.
* Introduce a single flag (0 or 1) to indicate wether data are from messages already disseminated onto the GTS (duplicate data) or not. For example BATHY messages are being disseminated on GTS by the Ocean Product Centre from data extracted from DRIBU messages generated by Argos and already circulating on GTS.
* Possible Quality Control flags, applied at the physical variable level (opposed to the whole section level), which values could for example be:

  0: Good
  1: Bad
  2: Inconclusive (the test was not able to estimate the quality of the data)
  3: Doubtful (the data might be good)
  /: No QC applied

  The new Argos GTS Processing Chain will include and use such QC procedures.

* At least for wind, air temperature, air pressure and SST, indicate the average period used as well as the level of the sensor above or below the station level (e.g. the ATLAS moored buoys measure winds at 2 meters above sea level and are averaged over 1 hour and 24 hours; these buoys are located in the data sparse Equatorial Pacific Ocean and must definitely report on GTS, but forecasting centres must be aware of the non-standard nature of the data).
* At least for wind, air temperature, air pressure and SST, introduce a recalibration indicator to show that a recalibration has been introduced: 0 for the first time, then 1 as soon as a recalibration was made, then 2 for the next one, then 3,4 ... 9 and then 0 again.
  Recalibrations are regularly done at the Argos centre level and the meteorological centres must be informed. A message is presently transmitted via Omnet by the TC DBCP to ECMWF, NMC, UKMO and METEO-FRANCE.

6.7) The TC DBCP wrote a draft manual on GTS code forms being used with the Argos system, describing in detail DRIBU, DRIFTER, BATHY, TESAC, HYDRA, SYNOP and SHIP, removing fields not supposedly used with Argos such as "Past Weather", etc...

7) Combined Meteorological and Oceanographic Drifting Buoys

The work of the Technical Coordinator concerning combined Meteorological and Oceanographic Drifting Buoys is mostly related to the following topics:

- Follow the development and tests on an air pressure port being mounted on SVP drifters. These are being operated by the Global Drifter Center at Scripps Institution of Oceanography, La Jolla, California.
- Follow the development and tests by the NDBC on a cheap air pressure sensor.
- Contact Meteorological Agencies to seek advice and possible commitments during the test period (winter 91/92). United Kingdom (5 units), Australia (3), France (3) and Canada (3) are now participating.
- Update the booklet especially written on that topic according to new informations and comments received from the National Focal Points, the Global Drifter Center, and WOCE and TOGA IPOs.
- Compute statistics on the 8 hours on, 16 hours off duty cycle as requested by GDC.
- Attend SVP 4 session, La Jolla, April 91.

See the annex regarding Combined Meteorological/Oceanographic Drifting Buoys for details.

8) New Argos GTS Processing Chain

The work of the Technical Coordinator concerning the New Argos GTS Processing Chain is mostly related to the following topics:

- Write specification for the new system according to DBCP recommendations and needs.
- Attend the 20 December 1990 and 23 September 1991 meetings on the topic.
- Find a good Climatological File to be used in Quality Control Procedures. The focal point is Scott Woodruf of the NOAA, Environmental Research Laboratories, Boulder, Colorado.
- Write a draft manual on GTS code forms being used with Argos (see also paragraph 6.7).
- Coordinate actions with CLS, Argos.
- Discuss the project with software companies (Digital Equipment, France, SEMA Group and CISI). The TC DBCP spent two weeks in Toulouse in April 1991 for that purpose.
- Study PI access issues and write a report to Kenn Mooney as requested. The TC DBCP particularly recommended not to let PIs accessing the New GTS Chain, basically because it is an operational system designed for operational GTS users and that a minimum of coordination is needed.
- Study the issue of GTS reports being sent from Melbourne on a global basis.

See the annex regarding the New Argos GTS Chain for details.

9) TC statistics

9.1) Compute on a monthly basis, using Argos files and data provided by the LUT operators, the graph showing the distribution of GTS and non-GTS drifting buoys by country. 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. The graph is included in the TC monthly report. See figure 9.1).

9.2) Compute on a monthly basis, the graph showing the distribution of the RMS (of Observation minus First Guess Field) of Air Pressure data. This graph, using 6 months of data, gives a good idea of the quality of the drifting buoy Air Pressure data. The graph is included in the TC monthly report. See figure 9.2).

9.3) Compute the graphs showing the distribution of life times of Air Pressure measurements, using the ECMWF monthly monitoring statistics. See figure 9.3).

9.4) Drifting Buoy GTS status for July 1991, see paragraph 6.5) and figures 6.5.1) to 6.5.8).

10) Miscellaneous

10.1) Check the Quarterly Report on Drifting Buoy and give approval before CLS sends it to WMO and IOC.

10.2) Assist CLS in preparing the Argos monthly status report to WMO.

10.3) Assist Service Argos Inc. in implementing a special software in Landover for processing for GTS purposes the new type of ATLAS moored buoys.

10.4) Update TC files on a PC, using a data base management system (Paradox) and getting the data from Argos files, various status reports. Update an history file on each Argos drifting buoy programme (contacts with PIs, PI authorizing GTS distribution, information on types of sensor installed, etc...).

10.5) Send monthly a list of WOCE WMO numbers to MEDS by Omnet.

10.6) Issue the WMO/Argos cross reference list on a monthly basis and send it to various Meteorological Centers. Send a floppy disk containing the list to the MEDS. It also includes the WMO numbers managed by the Oslo and Edmonton Local User Terminals (LUT) and indicates for each WMO number: The Argos number, the drifting buoy owner, and the dates the WMO numbers have been introduced and removed from the system (Argos or LUT).

10.7) Prepare the TC monthly report

10.8) Prepare the various TC missions

10.9) Prepare documents and the TC reports for the DBCP VI session:

- Report of the Technical Coordinator
- Report on drifting buoy data Quality Control
- Report on Combined Meteorological/Oceanographic Drifting Buoys.
- Draft report on the New Argos GTS Processing Chain sent to CLS for possible amendments.

Drifting Buoys not reporting onto the GTS, as of July 1991

Organism	Country	Total	GTS	Tests or Quality	No Sensor Data	Confid-entiality	Not Compatible	Unknown
NOAA/AOML	USA	144	116	28	0	0	0	0
US Navy	USA	85	23	2	0	60	0	0
NOAA/NDBC	USA	44	33	11	0	0	0	0
IFM/Kiel	Germany	40	0	0	0	40	0	0
Scripps Inst.	USA	37	5	32	0	0	0	0
US Coast Guards	USA	27	8	10	9	0	0	0
Mar. Safe. Agency	Japan	25	0	0	0	25	0	0
Inst. Ocean Science	Canada	22	9	13	0	0	0	0
IFREMER	France	19	0	0	0	0	19	0
Woods Hole IO	USA	16	3	8	0	0	3	2
NOAA/PMEL	USA	16	1	0	0	0	15	0
Un. New Found	USA	15	0	0	15	0	0	0
NOAA/NOS	USA	15	6	9	0	0	0	0
Horizon Marine	USA	14	0	0	0	14	0	0
Atm. Env. Serv.	Canada	14	10	4	0	0	0	0
OCEANOR	Norway	12	0	0	0	0	0	12
METEO France	France	11	9	2	0	0	0	0
Clearwater C.	USA	11	9	2	0	0	0	0
Un. Washington	USA	10	1	3	0	0	0	6
SHELL	USA	10	0	0	0	10	0	0
ABOM	Autralia	10	9	1	0	0	0	0
CSIRO	Australia	9	0	0	0	0	9	0
Univ Hannover	Germany	7	5	2	0	0	0	0
PRL	USA	7	0	7	0	0	0	0
Inst. Marine Res.	Norway	7	0	0	0	0	0	7
Fish. Agency	Japan	7	3	4	0	0	0	0
Sea Bureau	China	6	0	0	0	0	0	6
NZMS	New Zealand	6	6	0	0	0	0	0
Bedford Inst O.	Canada	6	2	4	0	0	0	0
Weather Bureau	South Africa	5	5	0	0	0	0	0
NIOZ	Netherland	5	5	0	0	0	0	0
NATO	Italy	5	0	0	0	0	0	5
CLS, Argos	France	5	0	5	0	0	0	0
Meteo Office	United Kingdom	4	3	1	0	0	0	0
Hydrotech. Lab.	Norway	4	0	0	0	0	0	4
Hydroquel	USA	4	0	0	4	0	0	0
Meteo Inst	Norway	3	1	2	0	0	0	0
Christ. Mich. Inst.	Norway	3	1	2	0	0	0	0
Ocean Res&Dev Ins	Korea	3	0	0	0	0	0	3
Un. Tokyo	Japan	2	0	0	2	0	0	0
Un. Hawaii	USA	2	0	0	2	0	0	0
Un. Campbridge	United Kingdom	2	0	0	0	0	0	2
SMHI	Sweden	2	0	0	0	0	0	2
Polar Cont. Shelf P	Canada	2	2	0	0	0	0	0
NOAA/GLERL	USA	2	0	2	0	0	0	0
Navy Pos. School	USA	2	0	2	0	0	0	0
Com. Energie Atom	France	2	0	0	0	2	0	0
US Army	USA	1	0	0	0	1	0	0
Un. Helsinki	Finland	1	0	0	0	0	1	0
Norv.Polar Inst.	Norway	1	0	1	0	0	0	0
Nat. Inst. Ocean.	India	1	0	0	0	0	0	1
Marine Bio. Asc.	United Kingdom	1	0	0	0	0	0	1
Inst. Marine Res.	Finland	1	0	0	0	0	0	1
CS Draper Lab.	USA	1	0	0	0	0	0	1
Can. Marine Drillin	Canada	1	0	1	0	0	0	0
Bermuda Bio SR	USA	1	0	0	0	0	0	1
Total		718	275	158	32	152	47	54
%		100	38.3	22.0	4.5	21.2	6.5	7.5

Figure 6.5) Status on Operational GTS buoys for the 300 buoys that reported via Argos in July 1991:

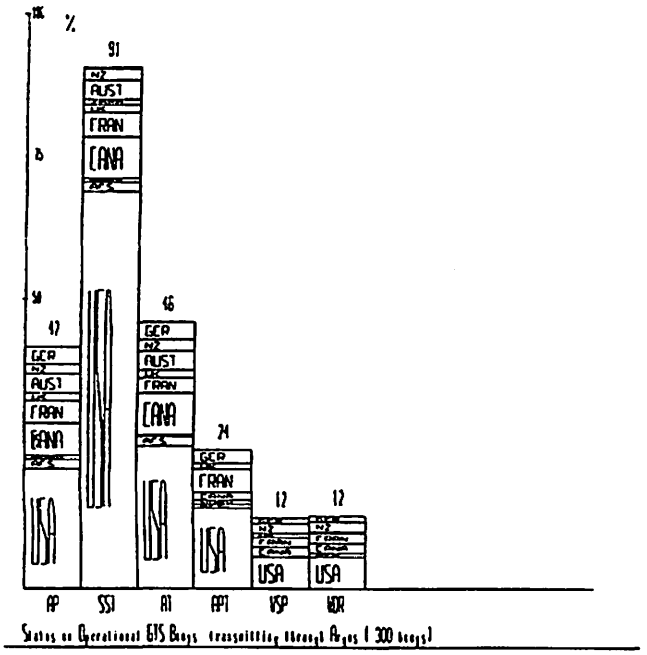


Figure 6.5.1) Distribution by parameter and country

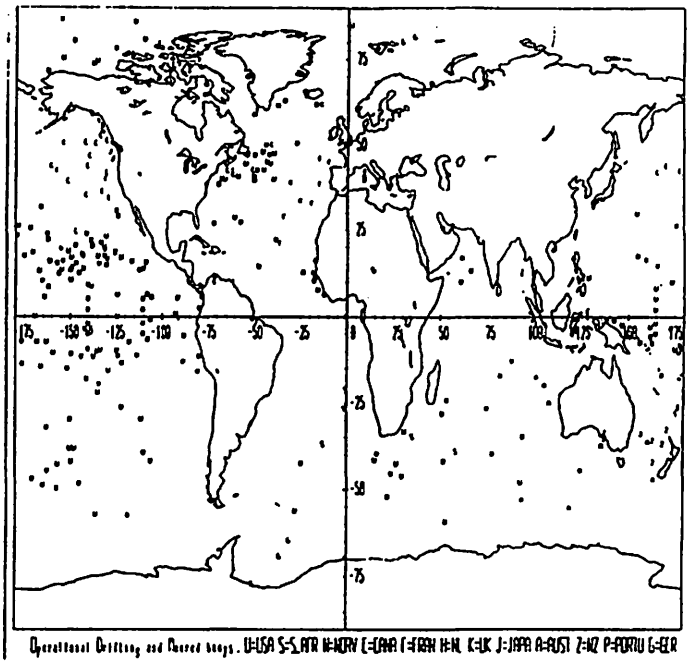


Figure 6.5.2) Positions by country

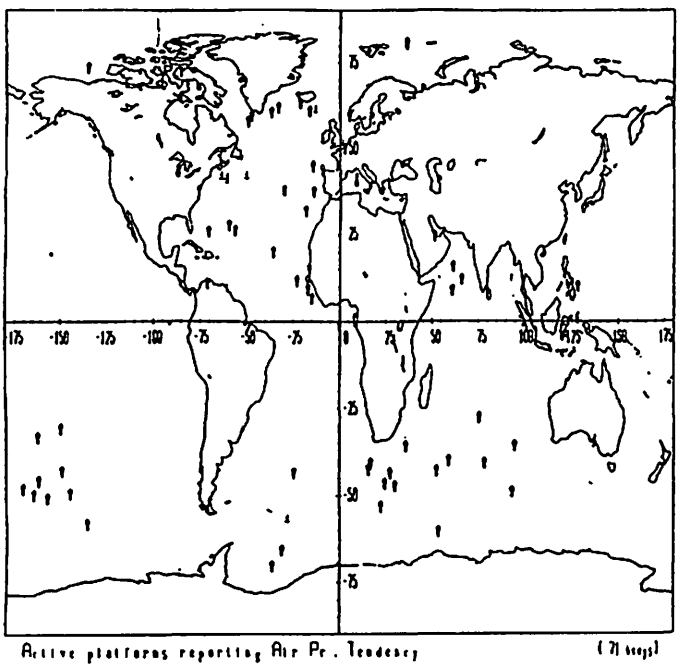


Figure 6.5.3) Positions for Air Pressure Tendency data

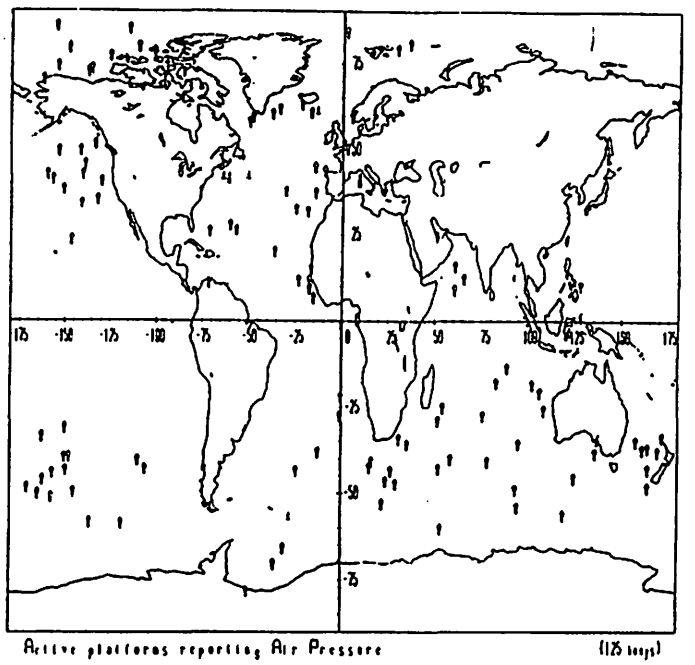


Figure 6.5.4) Positions for Air Pressure

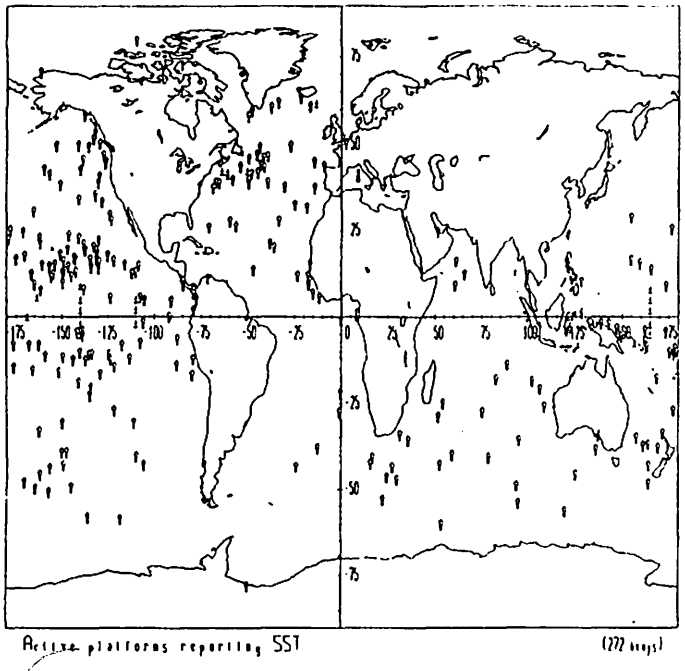


Figure 6.5.5) Positions for Sea Surface Temperature

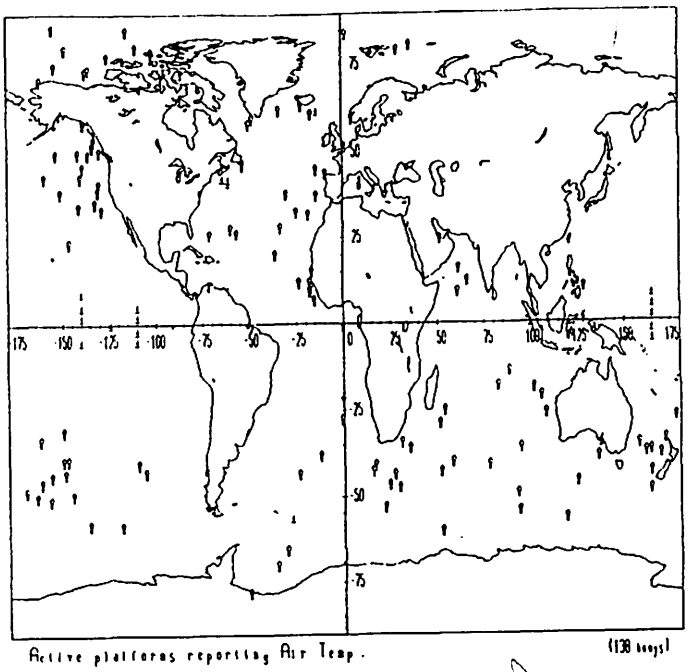


Figure 6.5.6) Positions for Air Tempe

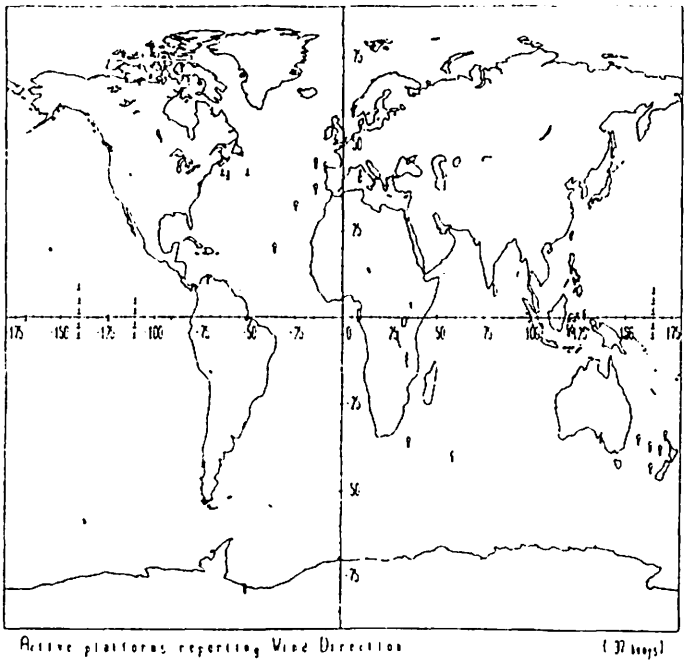


Figure 6.5.8) Positions for Wind Direction

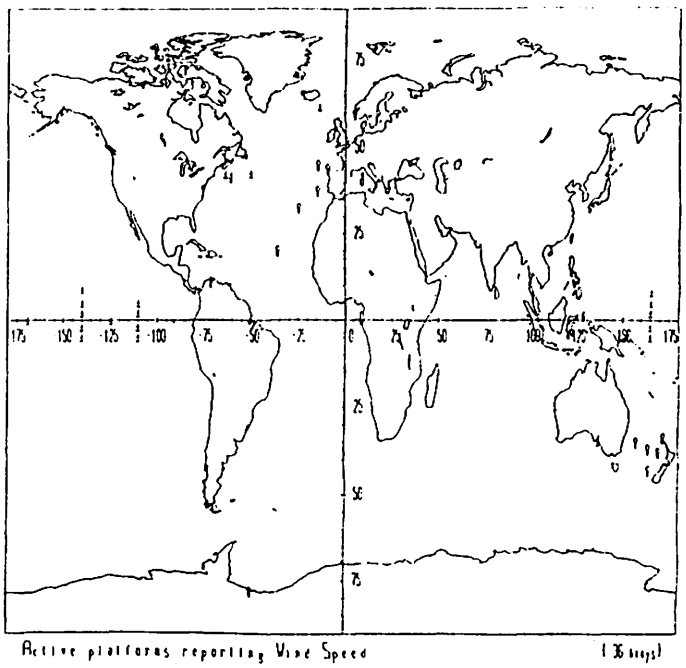
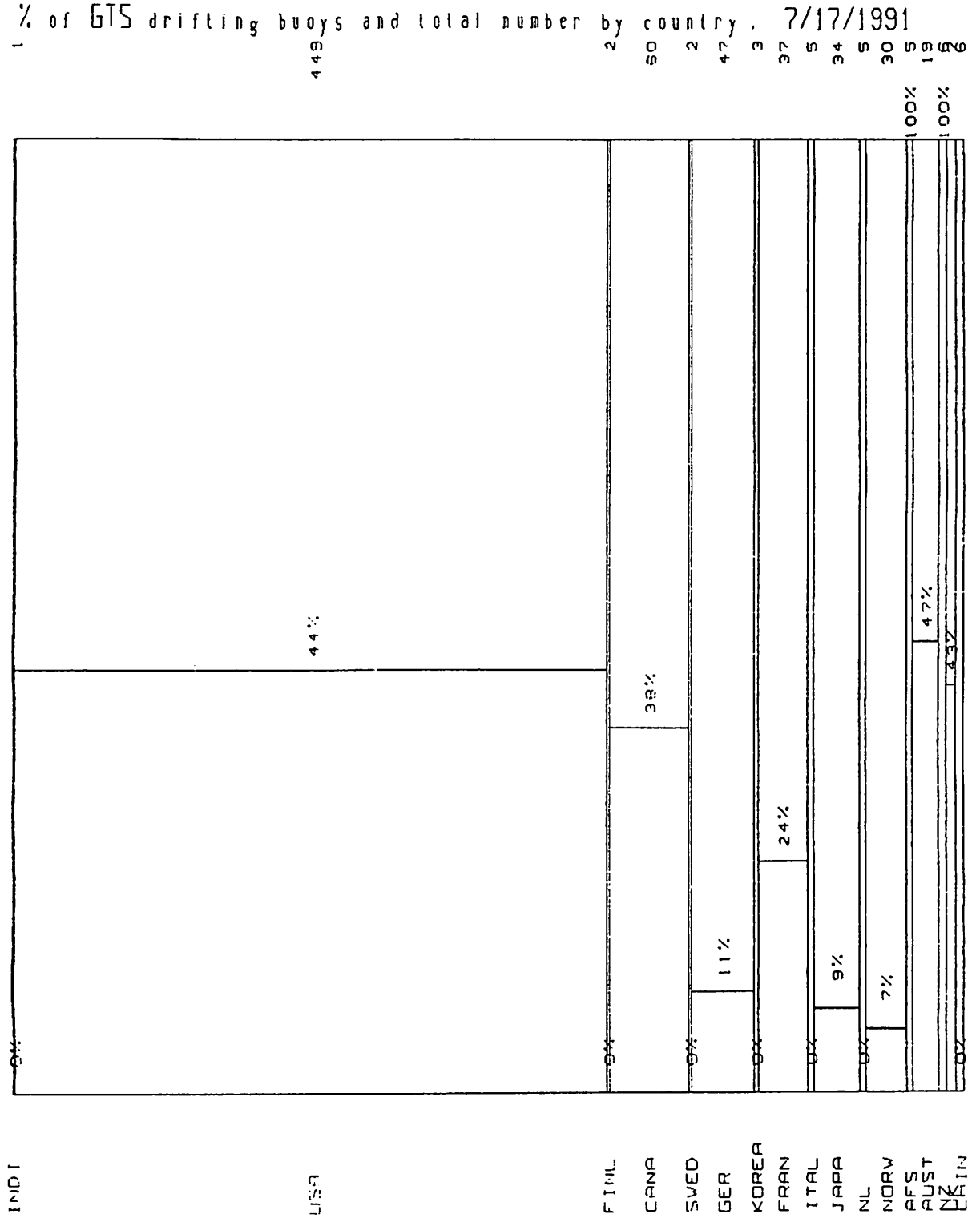


Figure 6.5.8) Positions for Wind Speed

Figure 9.1) Distribution of GTS and non-GTS platforms by country:



Total number of drifting buoys: 718
Total number of drifting buoys reporting to the GTS: 264 = 36.8%

Figure 9.2) Distribution of RMS (Obs. - First Guess Field) for Air Pressure data:

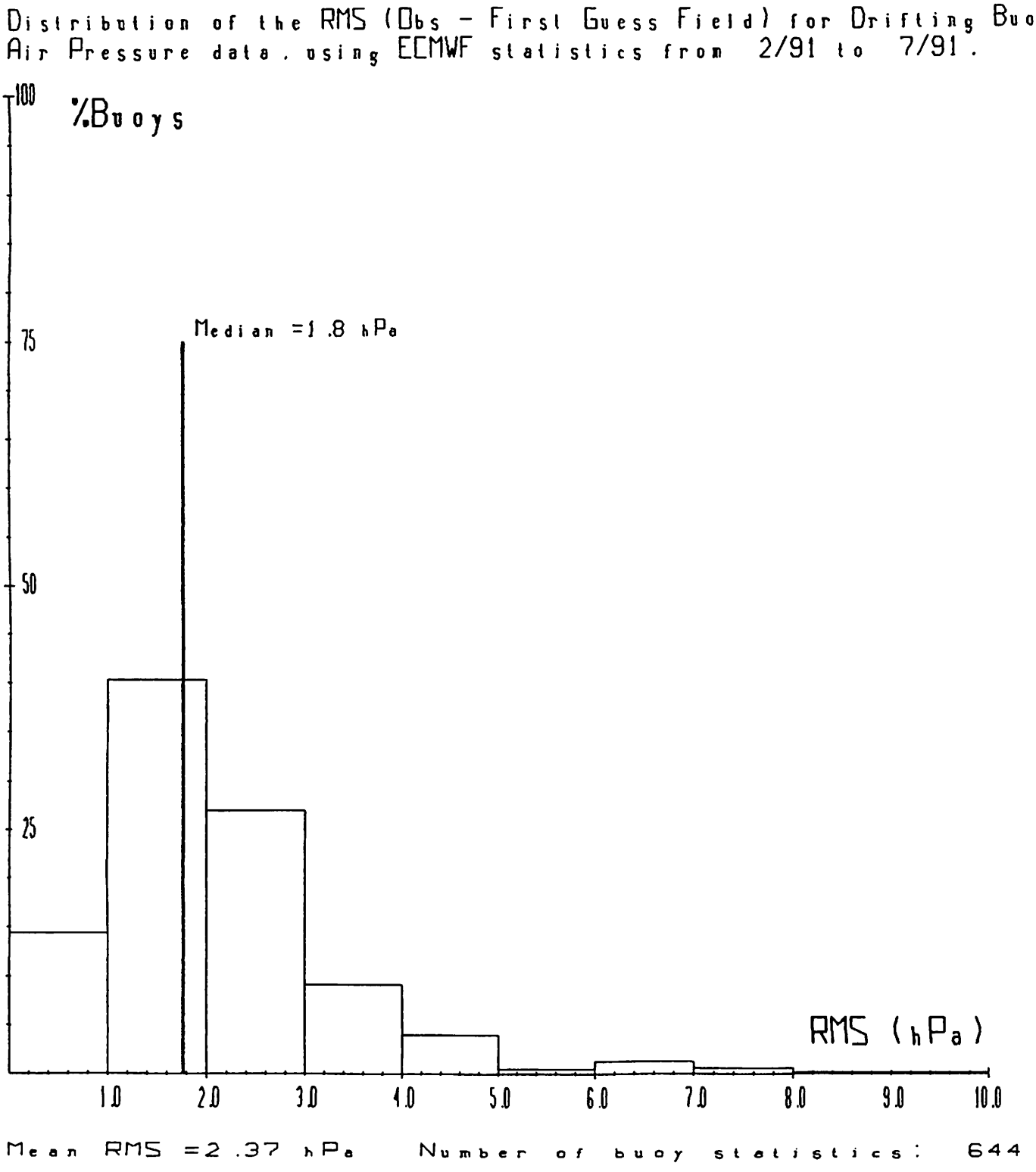
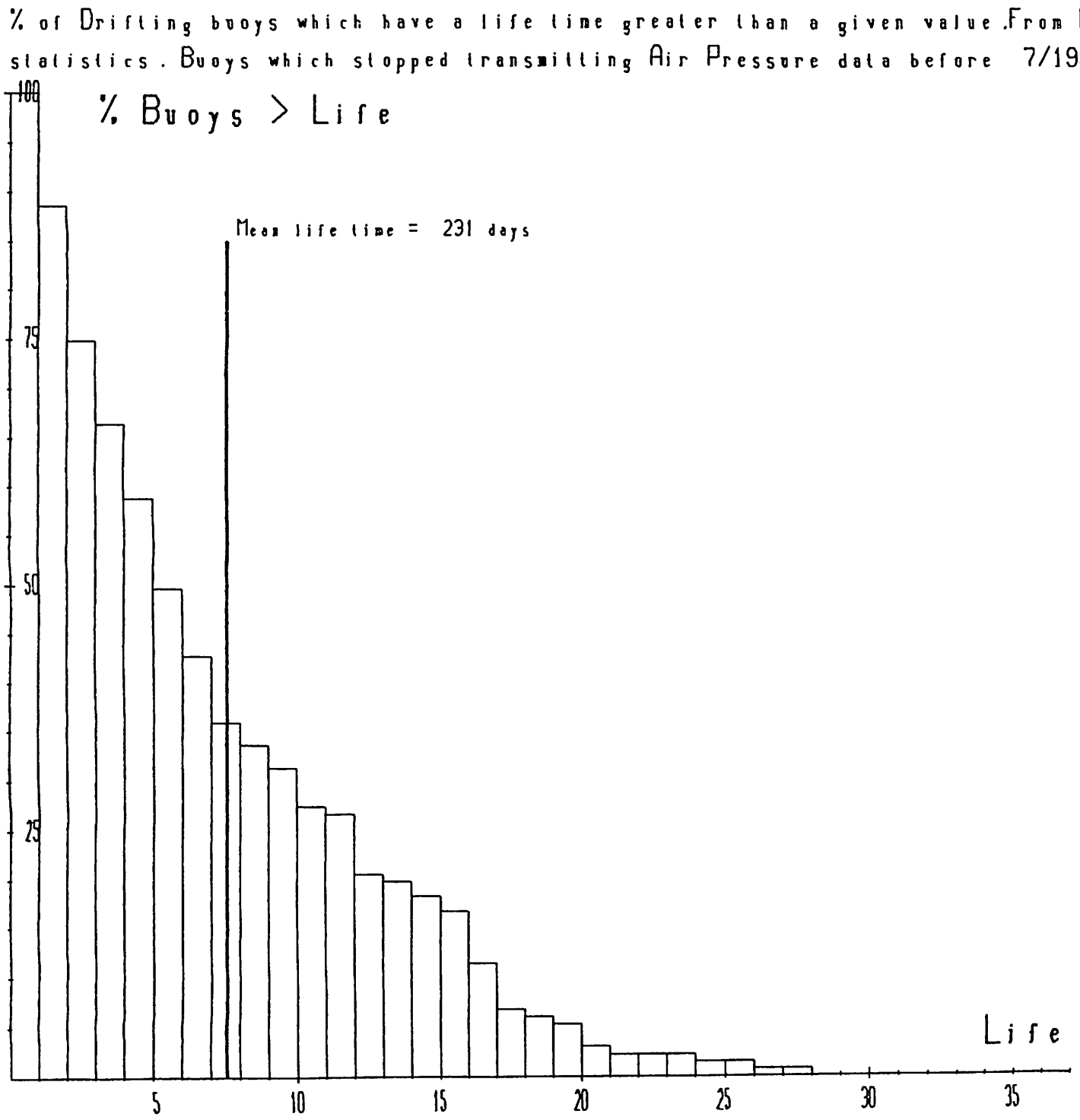


Figure 9.3) Distribution of the Life Time of the Air Pressure sensor:



ANNEX III

List of GTS Bulletin Headers used for GTS distribution of Drifting Buoy data

1. Buoy data processed at the Argos US Global Processing Centre of Landover (USGPC):

Bulletins are routed to the National Weather Service, Washington-DC, and actually distributed globally from this source.

$T_1T_2A_1A_2ii$	Approximate region or Programme
SSVX02 KWBC	Buoys deployed in the Southern Hemisphere and Quality Controlled by the National Data Buoy Center (NDBC, Mississippi);
SSVX04 KARS	Buoys deployed in the North Atlantic;
SSVX06 KARS	Buoys deployed in the Northern Hemisphere;
SSVX08 KWBC	Buoys deployed in the Northern Hemisphere and Quality Controlled by the NDBC;
SSVX10 KARS	Buoys deployed in the Southern Hemisphere;
SSVX12 KARS	Buoys deployed in the Arctic Ocean;
SSVX14 KARS	Buoys or platforms reporting from or around Antarctic area;
SSVX16 KARS	Specific experiments. Buoys from various ocean area;
SSVX40 KARS	ATLAS moored buoys in the Equatorial Pacific Ocean;
SSVX96 KARS	Specific experiment conducted by the NDBC.

2. Buoy data processed at the Argos French Global Processing Centre of Toulouse (FRGPC).

Bulletins are routed to the Service Central d'Exploitation de la Meteorologie (SCEM of Meteo France), Toulouse, and actually distributed globally from this source.

$T_1T_2A_1A_2ii$	Approximate region or programme
SSVX01 LFPW	Buoys deployed in the North Atlantic;
SSVX03 LFPW	Buoys deployed in the Southern Hemisphere;
SSVX05 LFPW	Buoys deployed in the Northern Hemisphere, excluding North Atlantic;
SSVX07 LFPW	Buoys deployed in the Arctic Ocean;
SSVX09 LFPW	Buoys or platforms reporting from or around Antarctic area.

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ANNEX IV

DRIFTING BUOY CO-OPERATION PANEL ACCOUNT AS AT 30 SEPTEMBER 1991

	US$		US$
Balance from 1989			7,589
Contributions Paid for Prior Biennium			19,875
Contributions Paid for Current Biennium			191,619
Advance from GTS Chain Fund			15,000
Total Funds Available			234,083
Obligations Incurred			
UCAR	176,000		
SMBA	3,350		
Service Argos	39,500		
Experts	872		
Travel	6,942		
DBCP TIES	1,501		
Administration direct	7		228,172
Balance of Fund at 30 September 1991		US $	5,911
Represented by.			
Cash at Bank			36,412
less: Unliquidated Obligations			30,501
		US $	5,911
Contributions received for prior years			
Canada		2,122	
France		17,753	
	US $	19,875	
Contributions Outstanding			
Canada	US $	15,000	

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ANNEX V

GTS CHAIN FUND ACCOUNT AS AT 30 SEPTEMBER 1991

Contributions Paid		70,892
Less Obligations		0
Balance of Fund	US $	70,892

Represented by:

Cash at Bank		55,892
Advanced to DBCP Fund		15,000
	US $	70,892

* Contributions		Assessed	Paid	Due
		$	$	$
Australia		2,000	2,000	
Canada		15,000	15,000	
United Kingdom		16,892	16,892	
United States of America		45,000	25,000	20,000
WMO/JCRF		12,000	12,000	
	$	90,892	70,892	20,000

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ANNEX VI

UCAR FINANCIAL REPORT FOR YEAR 1 JUNE 1990 TO 31 MAY 1991

C030-WMO - DRIFTING BUOY TECHNICAL COORDINATOR

	90-91 Effective Budget	90-91 Expense	Year End Balance	91-92 Funding	91-92 Effective Budget
TC Salary	39,273	40,048	-776	43,895	43,119
UCAR Salary	690	964	-274	1,250	976
Benefits	12,397	10,529	1,869	12,866	14,735
M & S	46	1	45	25	70
PS	949	178	771	808	1,579
Relocation	15,660	5,087	10,573	0	10,573
Travel	11,569	10,436	1,133	13,460	14,593
Indirect	14,161	14,829	-668	17,696	17,028
Interest Credit		-838	838		838
Total	**94,746**	**81,234**	**13,511**	**90,000**	**103,511**

Previous Year, 1989-90

	89-90 Funding	*89-90 Expense*	*Year End Balance*	*90-91 Funding*	*90-91 Effective Budget*
TC Salary	*38,000*	*37,727*	*273*	*39,000*	*39,273*
UCAR Salary	*1,000*	*1,560*	*-560*	*1,250*	*690*
Benefits	*10,725*	*10,001*	*724*	*11,673*	*12,397*
M & S	*25*	*4*	*21*	*25*	*46*
PS	*730*	*594*	*136*	*813*	*949*
Relocation	*10,000*	*4,340*	*5,660*	*10,000*	*15,660*
Travel	*13,334*	*11,170*	*2,164*	*9,405*	*11,569*
Indirect	*12,186*	*11,859*	*327*	*13,834*	*14,161*
Total	***86,000***	***77,254***	***8,746***	***86,000***	***94,746***

Notes:

TC Salary and UCAR administrative salaries are shown separately. TC Salary for the year was agreed at $39,000. Actual expense of $40,048 exceeds stated salary because UCAR vacation entitlement is charged as accrued. (Assume a UCAR employee with annual salary of $52,000 and vacation entitlement of three weeks. If the employee takes three weeks of vacation, total salary expense would be $52,000. If, however, the employee defers vacation, total salary expense for the year would be $55,000, being

$52,000 salary for time worked plus $3,000 reserve to pay for vacation earned. The expense shown here suggests that the TC had several days of unused vacation entitlement remaining at the end of the year.) UCAR policy is to pay employees for any unused vacation upon termination. Such payment has the potential to cause salary expenses to exceed sums budgeted.

UCAR salaries exceed the effective budget due to carry-forward of the negative balance from the preceding year. This year's expenses are under this year's budget estimate of $1,250.

Benefits apply equally to the TC and UCAR salaries. This is budgeted slightly in excess of actual expense estimates, which produces the remaining surplus despite the minor deficit in Salaries themselves. Any surplus here is intended to offset possible unbudgeted termination vacation pay.

Materials & Supplies remain inconsequential, and Purchased Services have been running beneath budget estimates.

Travel is separated into Relocation and Business Travel. The only expenditure we have had under Relocation during this year was $5,087 for home leave in the April-May period. Although this trip included some business and extended into June, it has all been booked here in the 1990-'91 year and charged to the Relocation account. Business travel has been entirely travel by the TC as authorized by Peter Dexter. A summary of TC travel is attached; note that costs as listed in the summary are approximations and vary slightly from the actual expenses reflected above.

Indirect costs were applied to all expenditures in FY89 (ended 30 Sep 89) at the rates shown for FY90 in the budget--11.85% Administrative Support, 3.44% G&A, and 3% fee. During FY91, Indirect costs were recalculated and consolidated as 20.85% plus 3% fee. This substantial increase generated the deficit balance at year-end shown here.

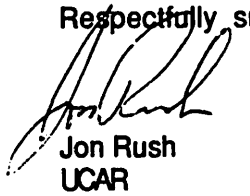
UCAR credits the WMO DBCP TC account with interest UCAR receives on WMO funds on deposit in UCAR's name. This credit amounted to $838 during the year. It is shown here as a credit to expenses rather than an addition to funds in order to avoid confusing it with funding received from WMO under the contract.

The end result at 31 May 91 was a positive balance in all categories except TC & UCAR Salary and Indirect Costs. Incremental funding for the year was $86,000 against expenditures of $81,234, for a 1990-'91 surplus of $4,766. The cumulative total surplus at the end of the year was $13,511.

Adding the year-end balance in each category to the $90,000 WMO funding for the third year of UCAR support gives an Effective Budget for 1991-'92 totaling $103,511.

Additional detail on any of these expenditures is available upon request.

Respectfully submitted,



Jon Rush
UCAR
Joint Climate Projects/Planning Office

27 September 1991

DBCP Technical Coordinator Travel, 1990-'91

	Trip	Purpose	Begin	End	Approx. Cost
1.	DC-SAN-SEA-Ret	WMO/DBTC Discussions at SIO, UW, PMEL	6/24/90	7/1/90	$1,274
2.	DC-Melbourne, Australia-Wellington, NZ-Tokyo-Ret	Attend DBCP-VI, visit JMA, other potential DB participants	10/12/90	11/3/90	$6,959
3.	DC-Edmonton, Canada-Ret	Attend Arctic Buoy Meeting	3/17/91	3/21/91	$1,430
4.	DC-San Diego-Ret	Attend Surface Velocity Meeting	4/7/91	4/10/91	$739
5.	DC-Paris-Toulouse-Strasbourg-Lisbon-JFK-DC	Home Leave, plus some working days in TLS and Paris	4/13/91	6/10/91	$5,087
					$15,489

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ANNEX VII

MODIFICATION NO. 2
TO
SUPPORT AGREEMENT
BETWEEN
WORLD METEOROLOGICAL ORGANIZATION
AND
UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

This Modification No. 2 entered into and effective on this 15th day of April 1991 between the University Corporation for Atmospheric Research (hereinafter referred to as "UCAR") and the World Meteorological Organization (hereinafter referred to as "WMO") WITNESSETH THAT:

Whereas, on July 17, 1989 UCAR and WMO entered into a Support Agreement for the Technical Coordinator to coordinate the drifting buoy programmes of the Member countries and other organizations; and

Whereas, UCAR and WMO now desire to modify said Support Agreement to extend the period of performance and provide a new budget for the extended performance period;

NOW THEREFORE, in consideration of the premise and of the agreements hereinafter set forth UCAR and WMO hereby agree as follows:

a. The period of performance of the Agreement is hereby extended one year from May 31, 1991 to May 31, 1992.

b. Exhibit A is hereby amended by adding the attached Exhibit A, dated February 13, 1991. The attached Exhibit A shall apply to the period June 1, 1991 through May 31, 1992.

c. The first sentence of paragraph 4.01 is hereby deleted and the following is substituted in its place: "WMO's funding obligation hereunder for the period June 1, 1991 through May 31, 1992 shall not exceed actual contributions received from the panel Members up to the total estimated cost of U.S. $90,000.

IN WITNESS WHEREOF UCAR and WMO have executed this Modification No. 2 as of the date first above written.

Witness

BY: Annette Reaves
Annette Reaves

TITLE: Administrative Assistant

UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

BY: Robert Greenwald
Robert Greenwald

Director

TITLE: Contracts and Risk Management

Witness:

BY: Vera Schwarz
Vera Schwarz

TITLE: Admininistrative Assistant

WORLD METEOROLOGICAL ORGANIZATION

BY: J.K. Murithi
J.K. Murithi

TITLE: Director, Administration Dept.

EXHIBIT A

Joint Climate Projects/Planning Office
UCAR Account #C030
Drifting Buoy Cooperation Panel - Technical Coordinator
1 June 91 - 31 May 92
World Meteorological Organization

		Estimated Budget March 4, 1991
Salaries		
UCAR Administrative	1,250	
Technical Coordinator	43,895	
Subtotal		**$45,145**
Benefits		**$12,866**
Materials & Supplies		**$25**
Purchased Services		
Office Space	313	
Phones	100	
Email, Express Service, Etc.	395	
Subtotal		**$808**
Travel		
Coordinator Travel		
International Airfare		
1 US-Europe RT	1,200	
Per Diem--12 days @ $145	1,740	
Miscellaneous	500	
Domestic Airfare--10 trips @ $550	5,500	
Lodging--30 nights @ $90	2,700	
Per Diem--40 @ $33	1,320	
Miscellaneous	500	
Subtotal		**$13,460**
TOTAL Direct Costs		**$72,304**
Indirect Costs		
Administrative Support @ 20.85%	15,075	
Fee @ 3%	2,621	
TOTAL Indirect Costs		**$17,696**
TOTAL Proposed Budget		**$90,000**

Indirect costs shown are proposed FY 91 rates, subject to negotiation and approval by the National Science Foundation. Indirect cost rates for FY 92, undetermined at this time, will be applied as approved to expenditures under this budget in FY 92.

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ANNEX VIII

CONTRACT

between

World Meteorological Organization (WMO)

and

Service Argos Inc.
1801 McCormick Drive, Suite 10
LANDOVER, MD. 20785
USA

The following has been agreed:

I. Service Argos Inc will provide to the Technical Coordinator of the WMO/IOC Drifting Buoy Cooperation Panel, for the period 1 June 1991 to 31 May 1992 inclusive, the following logistic support :

(a) An office and appropriate furniture;

(b) Necessary secretarial support;

(c) Free access to all telecommunications facilities currently available (telephone, telex, telegram, electronic mail etc..);

(d) Access to the computing facilities of Service Argos Inc, including free use of (i) a terminal giving access to the Argos processing centre; (ii) a micro-computer with standard software;

(e) Normal office supplies and facilities (including mail services and photocopies etc.).

II. WMO will pay to Service Argos Inc. for the services noted in I above the sum of US $ 14,000, such payment to be effected within 30 days of the finalization of this contract.

III. Except if specifically agreed otherwise, Service Argos Inc will bear all costs relating to the execution of the services noted in I above.

IV. Neither Service Argos Inc, nor any person employed by it in undertaking the agreed services, is to be considered as an agent or employee of WMO; nor can they claim any advantage, immunity, payment or recompense other than expressly provided for in the present contract; nor are they authorized to engage WMO in any additional expenses or obligations.

V. Service Argos Inc assumes full responsibility for whatever measures it deems necessary to take to insure itself against any loss or damage incurred during the execution of the agreed services.

For the World Meteorological Organization

Signature : J.K. MURITHI

Title : Director, Administration Department

Date : 9 July 1991

For Service Argos Inc

Signature : A.E. SHAW III

Title : President (eff. 8/8/91)

Date : 7/24/91

ANNEX IX

DRAFT UCAR BUDGET 1992/93

Joint Climate Projects/Planning Office
UCAR Account #C030
Drifting-Buoy Co-operation Panel - Technical Co-ordinator
1 June 92 - 31 May 93
World Meteorological Organization

[Estimated Budget - September 18, 1991]

Salaries		
UCAR Administrative	1,250	
Technical Co-ordinator	46,695	
Subtotal		$ 47,945
Benefits @ 28.5%		13,664
Materiel & Supplies		25
Purchased Services		
Office Space	350	
Email, Express Service, etc.	414	
Subtotal		764
Travel		
Domestic Airfare		
7 Trips @ $ 600	4,200	
21 Nights Lodging @ $ 90	1,890	
28 Days Per Diem @ $ 34	952	
Ground Transport @ $ 75/trip	525	
Communication & Fees @ $ 75/trip	525	
Foreign Airfare		
USA-Europe, Australasia, RT		
2 Trips @ $ 1,500	3,000	
14 Days Per Diem @ $ 170	2,380	
Ground Transport @ $ 150/trip	300	
Communication & Fees @ $ 100/trip	200	
Subtotal		13,972
TOTAL Direct Costs		76,370
Indirect Costs		
Administrative Support @ 19.5%	14,892	
Fee @ 3%	2,738	
TOTAL Indirect Costs		17,630
TOTAL Proposed budget		**$ 94,000**

TC Salary is 1991-92 salary plus 4.1% inflation increase plus $ 1,000. Indirect costs shown are proposed FY 92 rates, subject to negotiation and approval by the National Science Foundation. Indirect cost rates for FY 93, undetermined at this time will be applied as approved to expenditures under this budget in FY 93.

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ANNEX X

DRAFT TABLE OF CONTRIBUTIONS FOR 1992/93

	1991/92 contribution (US dollars)	proposed	1992/93 (US dollars)
Australia	10,500.-		11,000.-
Canada	15,750.-		16,500.-
France (FF60,000.-)	10,400.-	(FF63,000.-)	10,900.-
Greece	2,100.-		2,200.-
Iceland	2,100.-		2,200.-
Ireland (pounds 300.-)	500.-	(pounds 315.-)	525.-
Netherlands	1,500.-		1,575.-
Norway	1,500.-		1,575.-
United Kingdom	10,500.-		11,000.-
USA	52,500.-		55,000.-
	Sub-total		112,475.-
Transfer from 1991/92 (approximately)			3,000.-
	TOTAL		115,475.-

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ANNEX XI

THE WOCE/TOGA SURFACE VELOCITY PROGRAM (VCP)

The Surface Velocity Program (SVP) is jointly-sponsored by the World Ocean Circulation Experiment (WOCE) and the Tropical Ocean Global Atmosphere Experiment (TOGA). The Program is deploying satellite-tracked surface drifters to obtain a Lagrangian measure of current in the ocean mixed layer as well as Sea Surface Temperature (SST), salinity, and atmospheric pressure. A summary of SVP can be found in the report of the 6th Session of the Drifting Buoy Cooperation Panel. Progress during the past year has centered around three activities: 1) implementing the program in the Pacific Ocean, 2) planning for implementation within the Atlantic Ocean, and 3) addressing a series of technical improvements to the SVP Lagrangian Drifter designed to result in an increased half-life for the instrument and to add additional measuring capabilities. This progress report will concentrate on the technical improvements which have either been made or initiated during the past year. These include interpretation of results from the Heavy Weather Drifter Test and adaptation and testing of SEACAT salinity sensors and atmospheric pressure sensors to the drifter. Finally, the report discusses the results of preliminary tests of air deployments of SVP drifters.

I. WOCE HEAVY WEATHER DRIFTER TESTS AND DRIFTER SUVIVABILITY

In October 1989, 16 drifters were deployed in the Gulf of Alaska as part of the WOCE Heavy Weather Drifter Test. Half of these drifters were fitted with Holey-Sock drogues and the other half with TRISTAR drogues and a mixture of different subsurface float positions and tether materials were used. In May 1990, 12 of the drifters were recovered for engineering evaluations of their condition. The following observations were made:

1) No systematic biases of drift were found between the Holey-Sock and the TRISTAR drogues (both configurations had a drag area ratio of fifty);

2) A subsurface float on the tether significantly reduces the shock load on the top of the drogue;

3) Significant wear occurs below the surface float thus flexible carroting below the surface float is required;

4) Largest biofouling occurs on the surface float and on tethers made of polypropylene rope impregnated with biofouling paint;

5) Cordura Nylon and stabilized Dacron drogues, polypropylene coated tethering cables and fiberglass surface floats show no perceptible wear and tear after 200 days in heavy weather.

The purpose of the WOCE Heavy Weather Drifter Tests was to increase the durability of the WOCE/TOGA Lagrangian drifters through engineering design improvements. To ensure that all drifters manufactured in the future be of the same quality, an SVP Lagrangian Drifter Construction Manual has been completed and widely distributed. This process has led to the adoption of rigid manufacturing standards. All tether connections are now stress relieved using

urethane carrots, rope tethers are replaced by cable tethers and battery power was changed from lithium to alkaline. The WOCE quality drifter is fitted with a Holey-Sock drogue. In addition to its large and relatively concentrated drag, the ease of handling a Holey-Sock drogue helps to facilitate deployments from Voluntary Observing Ships (VOS). In addition, the WOCE quality drifter is now specially-packaged using paper tape to simplify deployment from non research vessels and VOS.

The success of engineering improvements can be assessed from the pilot TOGA Pan Pacific Experiment, which has been active in the equatorial Pacific Ocean since 1988. Several drogue designs, including Ministars and Holey-Socks, and many different lots have been used for this global experiment. The overall average half-life for drifters deployed during TOGA Pan Pacific is 220 days. However, that average reflects a range of performance based on incremental improvements made since the beginning of the experiment. Drifters with carroted tethers and improved drogue attachments (recommendations that arose from the Heavy Weather Test results) were not deployed until August of 1990. By July 1991, approximately 70 of the modified instruments had been launched The first 10 drifters built according to the complete WOCE/TOGA Lagrangian Drifter Manual instructions were completed in fall 1990 and deployed in early 1991. Examination of drifter survivability in Figure 1 shows a definite improvement in drifter life. After roughly 160 days, the percentage of instruments still functioning ranges from 40% for some Ministars (of all TOGA drifters, certain lots of Ministars had the worst performance) to 100% for the latest instruments, built according to the recommendations in the construction manual. Lots of drifters that were refitted to include some of the recommended improvements fall in the middle of the performance range with between 70% and 90% surviving after 160 days. These results are extremely encouraging and show that the design modifications adopted have improved the drifter's survivability.

The greatest cause of drifter loss has been, and still is, the detachment of the drogues from the surface float. A drifter without a drogue will yield meaningful position and SST but not velocity. This problem is greatly reduced by stress relieving the tether connections as recommended in the construction manual but it remains the primary focus of drifter design improvements. A recovery of 15 additional drifters in the California Current is planed for May-June 1992 in connection with the sensor adaptations described below.

2) THE ADAPTATION OF SALINITY AND PRESSURE SENSORS TO THE WOCE/TOGA LAGRANGIAN DRIFTER

i) The Salinity Sensor

The Global Drifter Center (GDC) has been recently working on the adaptation of salinity (under TOGA-COARE support) and pressure sensors (under WOCE support) onto the WOCE/TOGA Lagrangian Drifter. The present transmitting format may easily be modified in order to include a third variable such as salinity. The feasibility of attaching SEACAT Salinity sensors to drifters was explored during a 3 day field test on June 12-14, 1991 (Niiler et al., SEACAT Adaptation to the WOCE/TOGA Lagrangian Drifter, University of California, San Diego, October 1991). Two drifters fitted with Seacat sensors just above the drogue (as seen on figure 2) were deployed off the California Channel Islands while CTD measurements were simultaneously taken for comparison. The first drifter's salinity sensor was unpumped and its initial sampling rate was every 15 min. The second drifter was fitted with two sensors: one unpumped (sampling every 15 min) and one pumped (sampling every 60 seconds). Data was also collected for shorter sampling rates: 21 seconds for the unpumped sensors and 15 seconds for the pumped one.

Salinity as well as temperature data were properly transmitted to ARGOS and were checked against the data received directly through an Uplink Receiver (Figure 3). Instantaneously-sampled salinity and temperature were found to have standard deviations of 0.01psu and 0.015C, respectively. Besides demonstrating the feasibility of measuring and transmitting salinity data, one

of the goals of this three day test was to determine the best sampling scheme. Noise level was affected by pumping rate as well as by choice of averaging. The greater the pumping rate, the lower the noise level in the salinity data collected; yet the unpumped data had a lower noise level than the data pumped at low frequencies.

We have shown through this field test that the adaptation of a Seacat salinity sensor to the WOCE/TOGA Lagrangian Drifter presents no major engineering difficulty. Requirements for power efficiency and low noise level in the salinity data have lead us to recommend a sampling scheme where the satellite receives every three hours the mean and variance of a set of samples taken once a minute for ten minutes. The Global Drifter Center plans to release 70 drifters fitted with salinity sensors in the Pacific warm pool region as part of the TOGA-COARE project.

ii) The Pressure Sensor

The Global Drifter Center is also adapting a pressure sensor onto the WOCE/TOGA drifters (Preliminary Report: A. Sybrandy and P. Niiler, WOCE/TOGA Lagrangian Drifter with Barometer Port, University of California, San Diego, May 91). A successful adaptation of a pressure sensor onto our drifters would provide the meteorological and oceanographic community with a low-cost instrument that not only gives air pressure but also gives accurate sea surface velocities. Twentyfive experimental drifters each fitted with two pressure sensors (AIR and SENSYM) are presently being constructed at SIO. An array of 7 of these instruments will be placed off the coast of California for a period of 6 months after which we expect to recover them for engineering evaluation. The remaining drifters will be field tested by meteorological agencies of Australia, Canada, France and the United Kingdom. Tests of the port have already been conducted with a drifter fitted with a Paroscientific pressure sensor. The drifter data compared favorably with the ship barometer data (Figure 4).

III. NEW METHODS OF DEPLOYMENT

The standard WOCE quality drifter is now specially-packaged for ease of deployment: a single person may throw the drifter from the fantail of a ship travelling anywhere between 2 and 15 knots. The packaging consists of paper tape which eventually dissolves in sea water and allows the drogue to fully extend below the sea surface. Drifters are presently being deployed by various VOS vessels.

Another deployment possibility is being explored through a joint effort between WOCE/TOGA SVP and NAVOCEANCOM: 3 drifters have been successfully deployed by aircraft South East of Hawaii in September 1991. The drifters were dropped from a height of 500 ft at 130 knots. A standard 15 ft parachute was fitted onto the drifter and the drifters made their entries into a sea with 4 ft swell and 15 knot surface winds. The drifters have been transmitting correctly since deployment. This successful operation increases our possibilities of deploying drifters in remote areas.

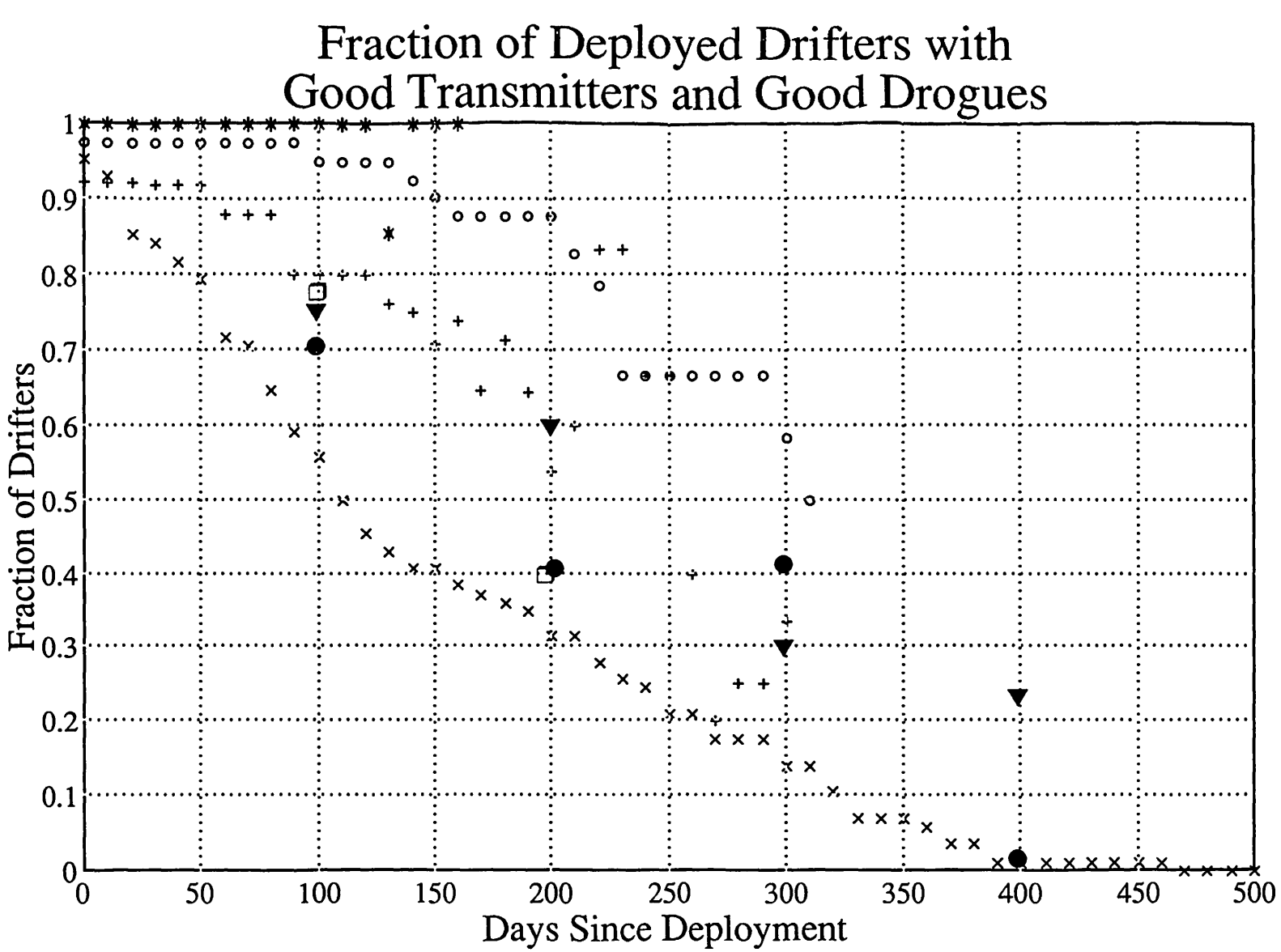


Figure 1. Fraction of deployed drifters with good transmitters and good drogues as a function of time after deployment for a variety of designs and lots, including TRISTAR drifters deployed in 1989 (●), Ministar drifters deployed in 1988-1990 (x), AOML A5-type Holey-sock drifters deployed in 1988-1990 (▼), AOML A6 & A7-type Holey-sock drifters deployed in the latter half of 1990 (□), Holey-sock drifters deployed for the Tropical Instability Wave Experiment in fall 1990 (o), Holey-sock drifters refitted with carroting at the GDC and deployed in fall 1990 (+), and the latest SVP-standard Holey-sock drifters deployed in 1991 (*). Note the improved lifetimes for later-deployed instruments, particularly for the latest SVP-standard design.

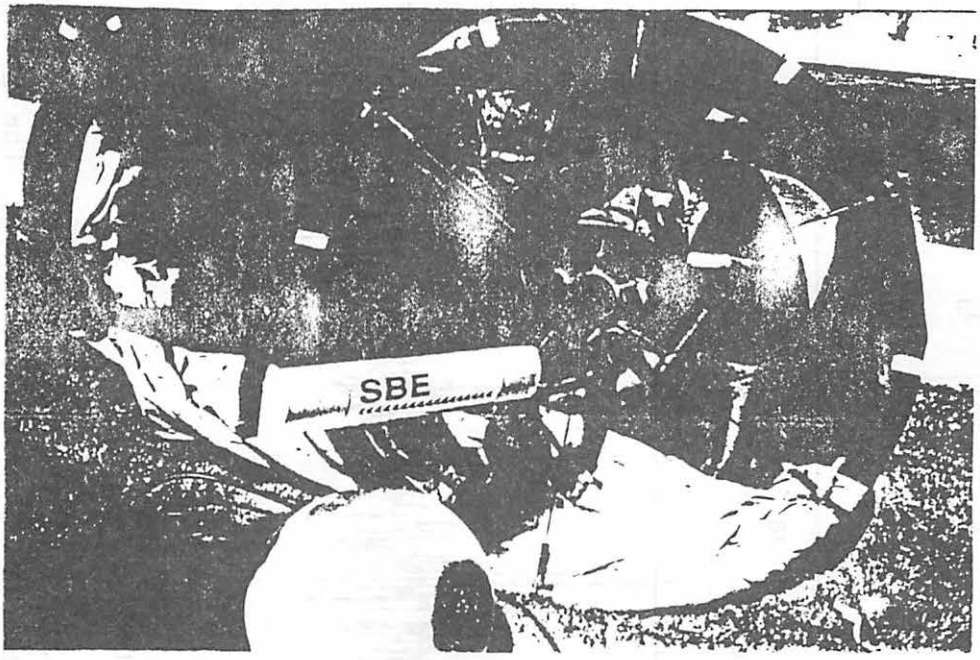


Figure 2: SEACAT salinity sensor fitted just above the holey-sock drogue.

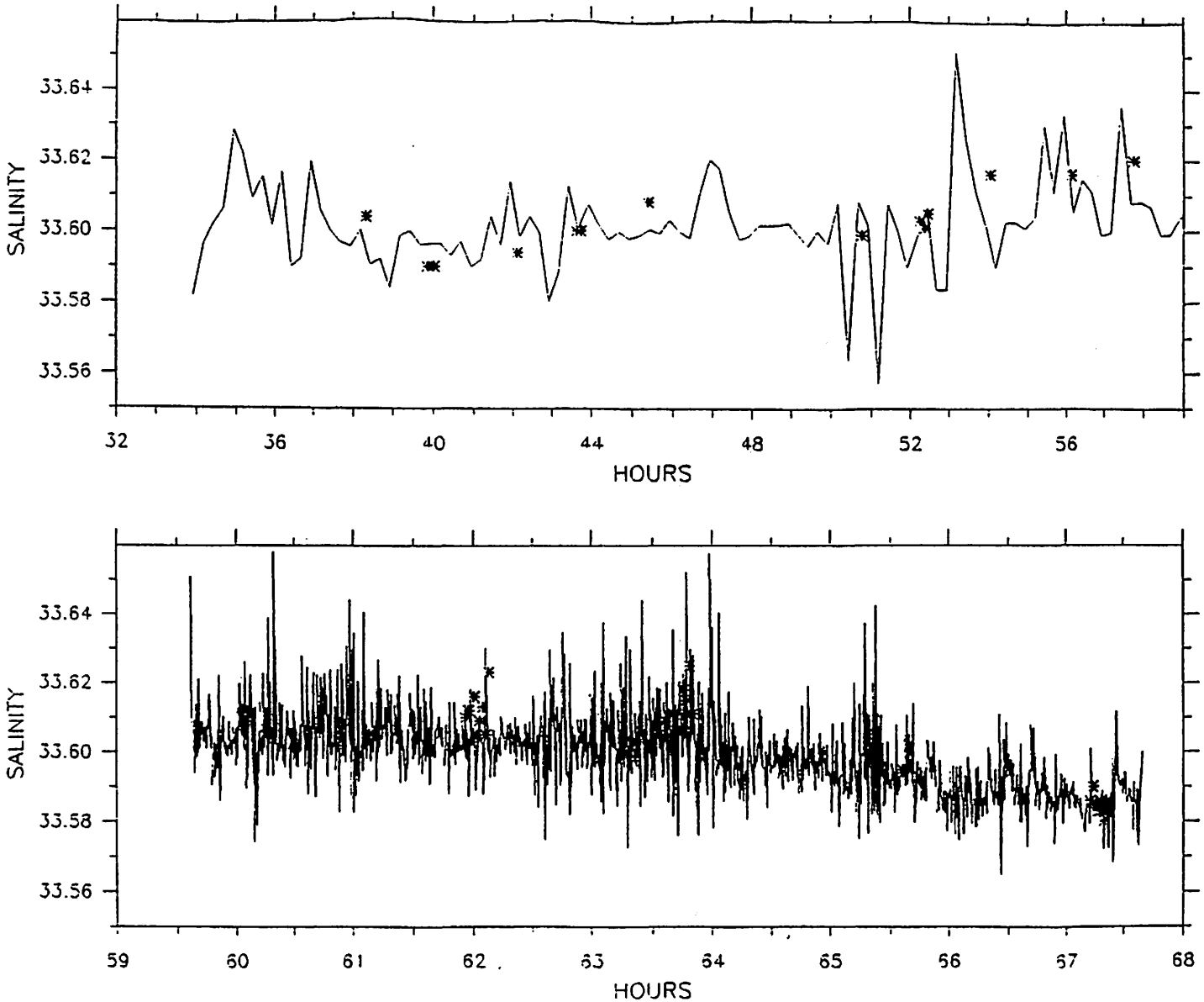


Figure 3: Comparison of raw data collected by SEACAT conductivity sensor (unbroken line) and the value returned via transmission through the ARGOS system (asterisks). The transmitter was programmed to broadcast a value for an hour before updating; thus the ARGOS value lags the raw value by a random value between 0-1 hour. Notice that the raw values were sampled at a very high rate during the later part of the experiment: the time axis on the lower figure has been expanded by a factor of three.

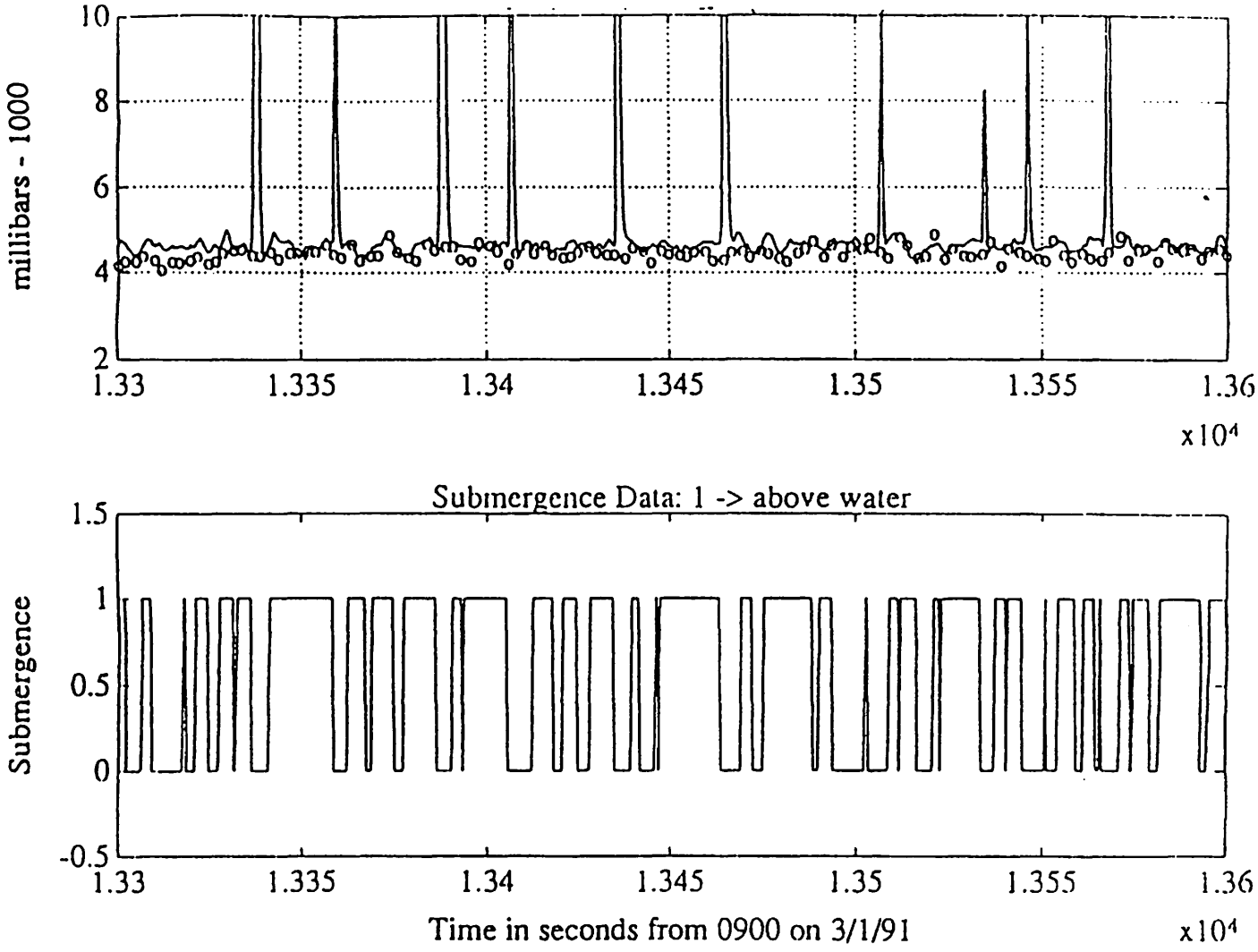


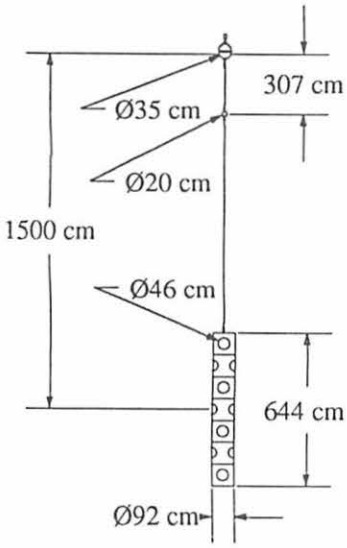
Figure 4: Barometer signals from a Paroscientific sensor in the ship lab 3m above mean water line (circles, upper panel) and signal from identical sensor located inside the drifter float (solid, upper panel). The lower panel displays the seawater switch data; switch closure is denoted by zero. Note that the ship lab barometer reads a bit (0.2 mb) lower than the drifter barometer: this is because it is 2m above the level of the barometer port of the drifter. The large excursions of pressure are when the port submerges.

GLOBAL DRIFTER CENTER DEPLOYMENTS FOR 91 AND ESTIMATED DEPLOYMENTS FOR 92 (WOCE QUALITY DRIFTERS)

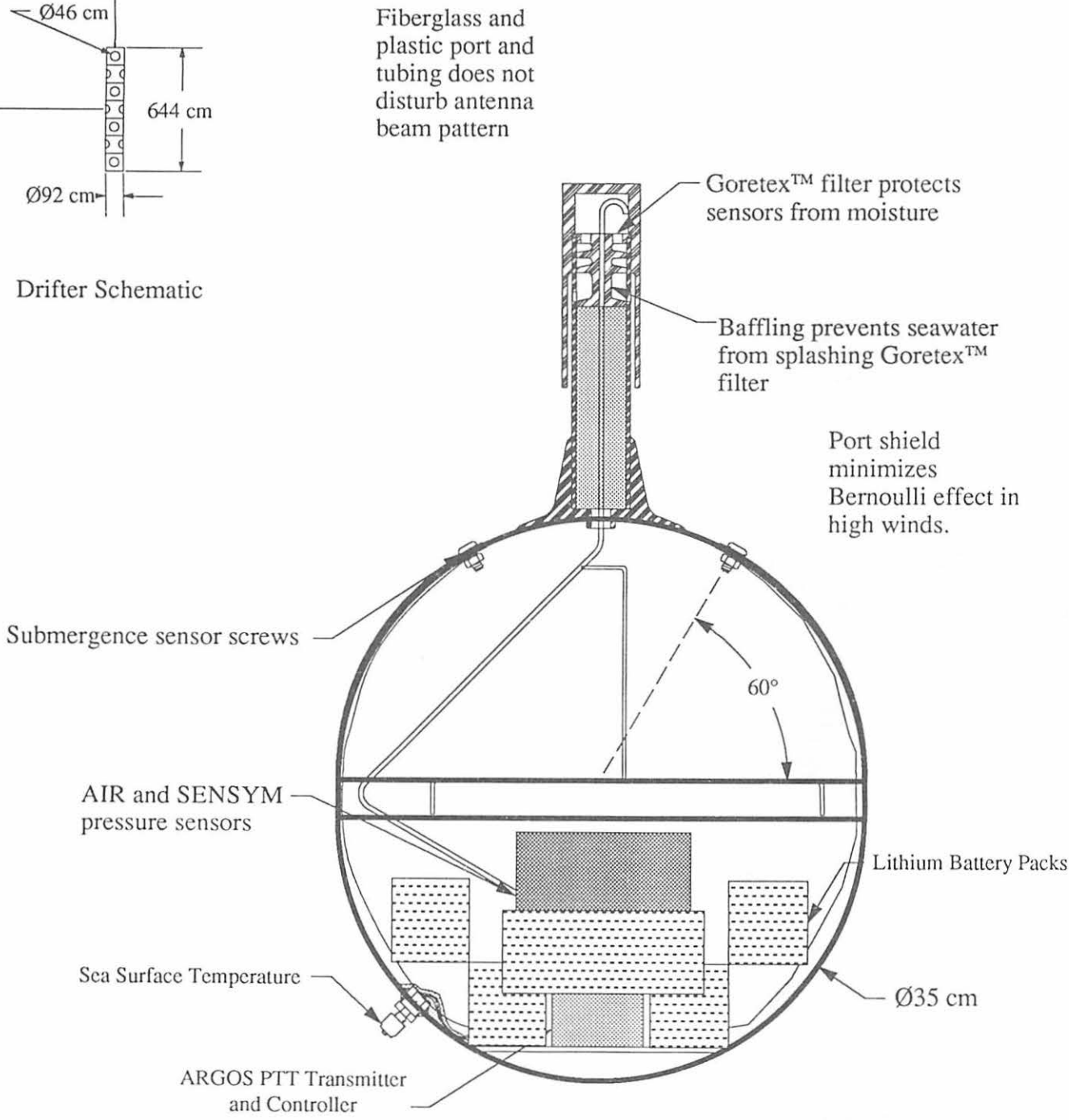
September 4, 1991

OCEAN	PROJECT	DEPLOYED 6/90 TO 10/91	TO BE DEPLOYED BEFORE 2/92	ESTIMATE FOR 92
Pacific	TOGA	108	5	60
	TOGA/COARE			70
	WOCE NE PACIFIC	40	10	35
	WOCE SE PACIFIC	25	40	100
	WOCE NW PACIFIC	11		3
Pacific Joint Projects	WOCE Taiwan/USA			36
	WOCE USSR/USA			50
Atlantic	WOCE N ATLANTIC			60
	SUBDUCTION	20	10	30
	Barometer Fitted Drifters (tests)		25	

PLAIN TEXT: Funded
UNDERLINE: Requested



Drifter Schematic



Surface Float Schematic

WOCE SVP Barometric Drifter

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ANNEX XII

PROPOSED OPERATING WORKING PROCEDURES FOR DRIFTING-BUOY DATA QUALITY CONTROL

The following principles were adopted or agreed upon by the Panel at previous sessions:

(i) *Meteorological Centres are in the best position to undertake data quality control (DBCP-VI).*

(ii) *Principal Investigators and Meteorological Centres share the responsibility of data quality control (DBCP-VI).*

(iii) *The Technical Co-ordinator is in the best position to act as a focal point between GTS users and Principal Investigators (DBCP-V, VI).*

(iv) *Argos is responsible for assuring that gross errors are automatically eliminated from reports distributed on GTS (DBCP-VI).*

In order to implement these principles, the following operating procedures or actions are suggested:

1. **PGCs**

Each Principal Investigator (PI) of an Argos programme reporting data on GTS, to designate a person responsible for making changes on PTT or sensor information present in the Argos system. Let us call this person the Programme GTS Co-ordinator (PGC). The PGC can, of course, be the PI himself but could also be a designated programme Technical Co-ordinator, as is done for the EGOS programme. If such a person does not exist as yet, for a given Argos programme, the Technical Co-ordinator of the DBCP would contact the Principal Investigator and discuss the issue in order to find someone. In a few cases, when a PI allows his platforms being distributed on GTS but does not want to be involved in the process, the Technical Co-ordinator could act as a PGC (i.e. the Technical Co-ordinator of the DBCP can directly ask Argos to make a change).

2. **PMOCs**

If possible, the DBCP to request one or more agencies or institutions to volunteer as being Principal Meteorological or Oceanographic Centre responsible for controlling Argos GTS data on an operational basis (PMOC), for given physical variables, either regionally or globally. Presently, at least the following centres which are operating quality control procedures either in real time or deferred time, locally and/or globally, express the willingness to act as PMOCs:

- the Centre de Météorologie Marine (METEO FRANCE/CNRM/CMM, Brest, France);
- the European Centre for Medium Range Weather Forecasts (ECMWF, Reading, United Kingdom);
- the National Data Buoy Center (NOAA/NDBC, Stennis Space Center, Mississipi, USA);

- the Ocean Product Center (NOAA/OPC, Camp Spring, Maryland, USA);

- the United Kingdom Meteorological Office (UKMO, Bracknell, United Kingdom).

It is desirable that the following centres agree to act as PMOCs:

- the Australian Bureau of Meteorology (ABOM, Melbourne, Australia);

- the Japan Meteorological Agency (JMA, Tokyo, Japan);

- the New Zealand Meteorological Service (NZMS, Wellington, New Zealand);

- the South African Weather Bureau (SAWB, Pretoria, South Africa)*.

National focal points for drifting-buoy programmes should be requested to designate national PMOCs and possibly to act themselves as PMOCs.

3. Bulletin Board

After cost estimates which are performed by Service Argos Inc. and the Technical Co-ordinator, the Chairman of DBCP will propose a mechanism for creating a bulletin board (Omnet, Argos, others). The Panel proposed to name the bulletin board "BUOY.QC".

3.1 ECMWF, OPC, METEO FRANCE and UKMO monitoring statistics will be delivered on the bulletin board.

3.2 Any suggestion for modification (i.e. recalibrate or remove sensor from GTS) or any problem noticed (e.g. bad location) on a drifting buoy reporting data on GTS should be placed on the bulletin board. Meteorological centres should be encouraged to make such suggestions.

3.3 Any feed back available on a recalibration actually implemented shall be placed on the bulletin board.

3.4 Any information deposited on a bulletin board shall remain for 30 days only.

4. Operating Procedures for Dealing with Potential Problems on GTS (Drifting-Buoy Data, see diagramme)

4.1 PMOCs noticing potential problems on GTS should suggest an action via the bulletin board. A standardized, telegraphic format is proposed (see Appendix): one message per platform, showing the WMO number and the proposed change, directly in the "subject" line, with additional comments appearing in the text itself, using a free format if felt necessary by the PMOC (see example in Appendix). The format will soon be finalized by a sub-group of experts before these procedures are actually implemented.

4.2 PMOCs noticing bad location or bad sensor data episodically appearing on GTS message should copy the message on the bulletin board, indicating from which LUT the message was transmitted. Although it is recommended that LUT operators access the bulletin board as well, if not possible, the Technical Co-ordinator of the DBCP or the responsible PGC or a designated PMOC (see paragraph 4.6.2) would keep them informed by telefax.

---

* The Government of the Republic of South Africa has been suspended by Resolutions 38 (Cg-VII) and 2/74/4 (Twentieth Session of the General Conference of UNESCO) from exercising its rights and enjoying its privileges as a Member of WMO and Member State of IOC, respectively.

4.3 A 7-day delay will be respected by the Technical Co-ordinator before he actually contacts the PGC to propose the change, so that other meteorological centres may also have the opportunity to comment on the suggestion and, in that case, the Technical Co-ordinator is given the responsibility to decide which request to consider. Other data users who access the bulletin board are encouraged to check its contents regularly.

4.4 Then, if the PGC accepts the modification, he will request Argos to make the change. In order to keep the GTS user community informed, Argos (CLS and SAI user offices) will announce the change by means of the bulletin board (a standardized message is proposed in the Appendix) between 24 and 48 hours before it is actually implemented and will effect the change as prescribed. It is recommended that the PGC also request appropriate LUTs to implement the same changes. However, before the new Argos GTS processing chain is operational, messages can be deposited by Argos within 48 hours around the time a change is implemented.

4.5 If the PGC is not willing to go ahead with a proposed change, the Technical Co-ordinator of the DBCP will deposit a standard message on the bulletin board (see Appendix) in order to inform PMOCs back.

4.6 Local User Terminals will be urged to adopt these proposed quality control operating procedures.

4.6.1 It is desirable that LUTs not willing to participate distribute drifting-buoy data on GTS to local users only (i.e. no global GTS distribution).

4.6.2 LUT operators participating and having access to the bulletin board should be encouraged to inform the bulletin board each time a change is implemented, using the same format as Argos (see paragraph 4.4). If LUTs have no access to the bulletin board, they should be encouraged to inform the Technical Co-ordinator of the DBCP of actual changes so that he can inform the bulletin board.

4.7 While the Technical Co-ordinator is on travel or away from his office, a PMOC will be asked to check the bulletin board on his behalf and take similar action. This responsibility could be assigned on a rotating basis.

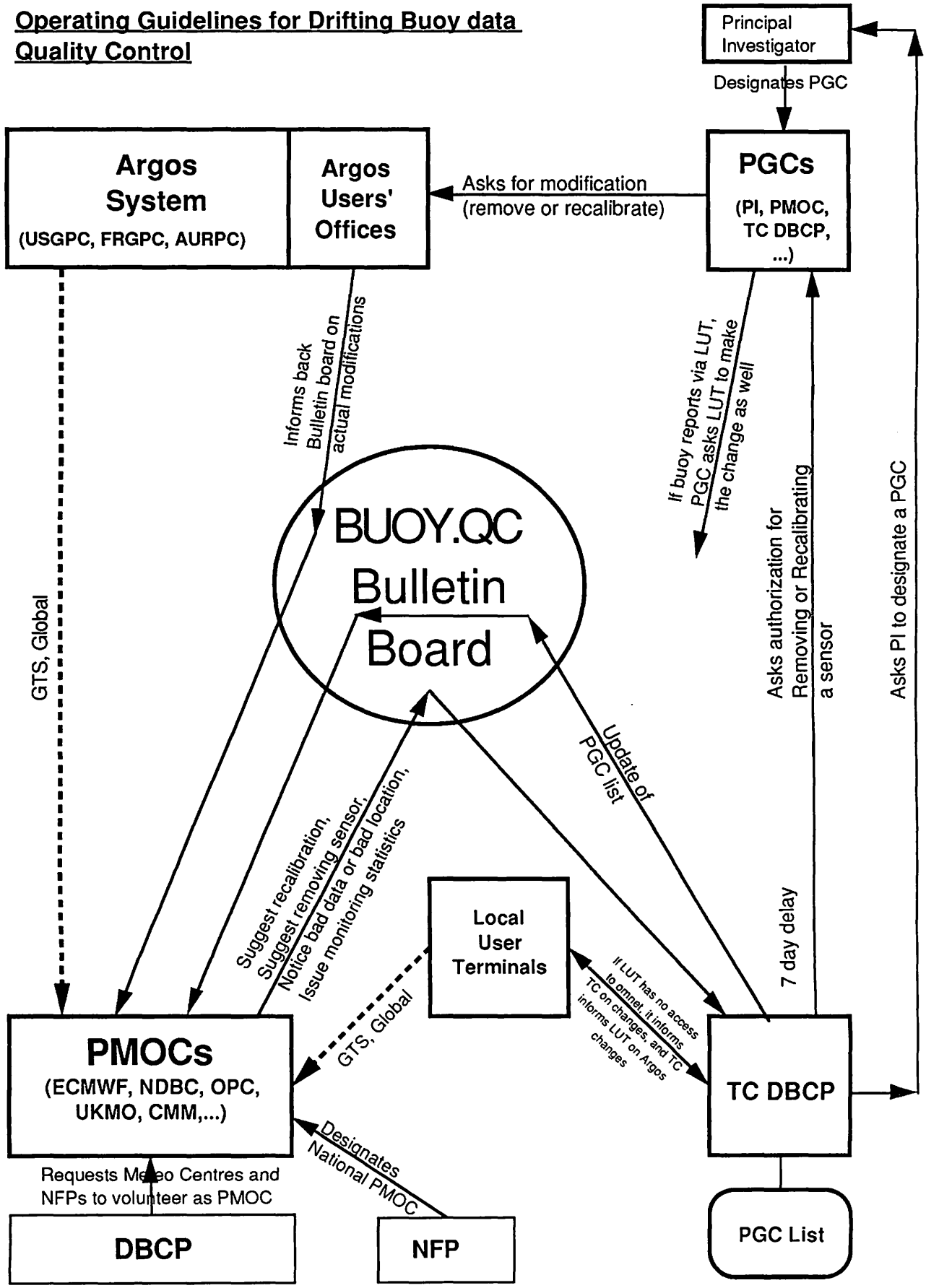
5. List of PGCs

This list will be published by the Technical Co-ordinator on a monthly basis via the bulletin board or regular mail, so that action can still be taken while he is on travel or away from his office.

6. DBCP, WMO and IOC Secretariats

They will promote these quality control operating guidelines and encourage participation in this scheme.

Operating Guidelines for Drifting Buoy data Quality Control



APPENDIX

Standardized Format for Information Deposited on the Bulletin Board

Notations:

- 1 - Uppercases are constant field values and will appear as shown in the subject line; e.g. ASK will appear as 'ASK' in the subject line.

- 2 - Lowercases are used to designate variable data fields; If the name of the field is on 5 characters, then the field value must be coded using 5 characters (completed with spaces if necessary); e.g. ttt can be coded as 'AP ' to indicate Air Pressure or as 'SST' to indicate Sea Surface Temperature.

- 3 - The line 12345678901234567890123456789012 is just here to indicate the number of characters used (32 maxi) and their position; It has no other specific meaning.

1. Proposals for status change (by Meteo Centres, i.e. PMOCs):

When detecting bad data circulating on GTS, Meteorological Centres can propose changes on buoy status (remove or recalibrate sensor) via the bulletin board. Proposals are done using a standardized telegraphic format in the subject line. Comments can be added in the body text.

Format:

```
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
h A S K   t t t   w m o # #   p p p   o v a l u e
```

Meaning:
It is proposed to remove or recalibrate one or more sensors for one given buoy.

h : One figure, 1 to 9, to indicate the number of the request for the same buoy, for example, the first proposal would be coded 1ASK..., and if another Meteo Centre feels necessary to comment on the same proposal, it can suggest another action and name it 2ASK, etc...

ttt : Type of proposal:
RMV for removing sensor data from GTS
REC for recalibrating a sensor
CHK for checking data carefully

wmo## : WMO number of the buoy (A1bwnbnbnb)

ppp : Physical variable (sensor) to consider:
AP : Air Pressure (coded as 'AP ')
AT : Air Temperature (coded as 'AT ')
SST : Sea Surface Temperature
WD : Wind Direction (codes as 'WD ')
WS : Wind Speed (coded as 'WS ')
APT : Air Pressure Tendency

POS: Position of the buoy
TZ: Subsurface temperatures (codes as 'TZ '): The depths of the probes and proposed actions should be placed in the body text, not in the subject line (not enough room)
ALL: All buoy sensors (e.g. remove all buoy data from GTS)
Blank: (coded as 3 space characters, i.e. ' ') Informations are detailed in the body text.

o: Operator to use for proposed recalibration (mandatory and used only when ttt='REC'):
+ : Add the following value to the calibration function
- : Subtract the following value from the calibration function
* : Multiply the calibration function by the following value (e.g. rate for recalibrating wind speed sensor)

value: Value to use for proposed recalibration (mandatory and used only when ttt='REC'); the value is coded on 5 characters and completed with space characters if necessary. It is provided using the following physical units:

Air Pressure :	Hecto Pascal
Temperatures :	Celsius degrees
Wind speed :	m/s
Wind Direction :	Degrees
Air Pressure Tendency :	Hecto Pascal
Positions :	Degree + Hundredth
Rate :	No unit

Examples:

No.	Delivered	From	Subject					Lines
1	Oct 15 10:53	NDBC.CENTER	1ASK	REC	17804	AP	+2.2	0
2	Oct 15 13:15	NDBC.CENTER	1ASK	RMV	62501	ALL		5
3	Oct 16 8:02	J.ANDRE	2ASK	REC	17804	AP	+2.4	4
4	Oct 17 7:34	TOGA.ECMWF	1ASK	CHK	44532	POS		5
5	Oct 17 10:18	J.ANDRE	1ASK	REC	44704	WS	*1.5	0

Message1: NDBC proposes to recalibrate Air Pressure sensor of buoy 17804 by adding 2.2 hPa.

Message2: NDBC proposes to remove buoy 62501 from GTS distribution. Explanations are given in the body text (5 lines).

Message3: Meteo France comments (2ASK) on NDBC proposal for recalibrating air pressure sensor of buoy 17804. Meteo France suggests to add +2.4 hPa instead of +2.2 hPa. Argumentation is provided in the body text (4 lines).

Message4: ECMWF suggests to check positions of buoy 44532. Details are given in the body text (5 lines).

Message5: Meteo France proposes to recalibrate Wind speed sensor of buoy 44704, by multiplying data by 1.5.

2. Argos or LUT answer for changes actually implemented

When a change is implemented on GTS platforms, a message shall be deposited the bulletin board, by Argos or the LUT considered, no later than 24 hours after the change was implemented. All the information will be encoded into the subject line, the body text being empty. the format of the subject line is as follow:

Format:

```
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
c c c c   t t t   w m o # #   p p p   o v a l u e   h h : m m
```

Meaning:

Argos (i.e. the French Global Processing Center of Toulouse (FRGPC) or the US Global Processing Center of Landover (USGPC)) or Local User Terminals (LUT) inform the bulletin board each time a change is actually implemented on a buoy status.

cccc : Originating Center:
LFPW = FRGPC, Toulouse
KARS = USGPC, Landover
ENMI = Oslo LUT
BGSF = Sondre Stromfjord LUT
CWEG = Edmonton LUT

ttt, wmo##, ppp, ovalue : Same as for paragraph 1.

hh:mm: UTC time the change is implemented in hours and minutes. The date is the date the message is deposited on the bulletin board and is therefore given by the mail system itself.

Example:

No.	Delivered	From	Subject	Lines
6	Oct 15 18:15	A.SHAW	KARS REC 17804 AP +2.3 12:16	0

Message6: Buoy 17804 Air Pressure sensor was recalibrated by adding +2.3 hPa. the change was done at 12h16 UTC on 15 October. As you may notice, two proposal had been made for this buoy: NDBC proposed +2.2 hPa and Meteo France proposed 2.4 hPa. The Technical Co-ordinator of the DBCP contacted both agencies and it was then decided to apply a 2.3 hPa correction.

3. PGC Answer if the proposal was denied

Format:

```
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
D E N I   t t t   w m o # #   p p p   o v a l u e
```

Meaning:

The proposal was denied by the Principal GTS Co-ordinator (PGC) of the drifting buoy programme. No action was taken. Complementary information can be included in the body text.

ttt, wmo##, ppp, ovalue: same meaning as in paragraph 1. ovalue is mandatory and used only when ttt='REC'.

Example :

No.	Delivered	From	Subject	Lines
7	Oct 15 19:12	J.ANDRE	DENI RMV 62501 ALL	0

Message7: In the body text: Data were sent on GTS before deployment by mistake. The buoy is now deployed and data look good. There is therefore no need for removing data from GTS distribution.

ANNEX XIII

Project for a New Argos GTS Processing Chain

1. Historical background since 16 - 19 October 1990

* Sixth DBCP session, Melbourne, 16-19 October 1990 :
The Panel approves recommendations of the Informal Meeting of Experts (May 1990). Both solutions are discussed. The DBCP decides, in principle, to develop solution 2 and to begin with Phase 1 as soon as possible. Detailed specifications of Phase 1 should be written before the Chairman of the DBCP gives a formal go-ahead.

* November - December 1990 :
The Technical Coordinator of the DBCP writes detailed specifications according to DBCP VI discussions and recommendations.

* 20 December 1990, Landover :
Informal Consultation on the New Argos GTS Chain. Attended the meeting, David Gilhousen of the National Data Buoy Center, Paul Julian of the NOAA, National Meteorological Center, Michael Szabados of the National Ocean Service, Jean Luc Bessis, Director of Service Argos Inc, Chris Estes and Stephen Harris of SAI, Alain Fontanaud of CLS, Service Argos, Etienne Charpentier, Technical Coordinator of the DBCP, Ken Mooney of the US TOGA Project Office, Terry Bryan, Chairman of the Joint Tariff Agreement, and Derek Painting, Chairman of the DBCP. Detailed specification requirements are finalized and a development schedule is adopted; the project should be developed in two stages; stage 1 would provide a fully working system able to deal with DRIBU, SHIP, SYNOP, BATHY, TESAC and HYDRA GTS code forms and Stage 2 would add Quality Control Procedures and new sensor processing facilities. Financial issues are discussed: It was agreed in principle that the panel would pay 50% of stage 1 in a sum not exceeding $90000. It was also agreed in principle that the second stage would be integrated in the Argos Development programme and the cost amortized over several years.

* January 1991 :
According to the conclusions of the Informal Consultation on the New Argos GTS Chain, the TC DBCP writes a revised specification document. Seeking additional DBCP commitments, the document is issued and distributed by WMO to National Focal Points for Drifting Buoy Programmes as well as major Argos users and WOCE and TOGA International Project Offices. The document is also presented by CLS to Digital Equipment Corporation, France (DEC) for a formal financial evaluation.

* Mid February 1991 :
DEC informs CLS that development of the project would cost approximately 3.6 MF. This price goes much beyond the former estimation of 1.8 MF which was discussed in Melbourne.

*March 1991 :
CLS asks other software development companies to make financial evaluation. CLS chooses SEMA Group and CISI in addition to DEC.

*17-25 April 1991 :
CLS meets the TC DBCP, DEC, SEMA and CISI.
Due to a misunderstanding on the work asked, particularly concerning new GTS code forms, DEC evaluation was overestimated. This as well as technical discussions related to specific topics and suggested revised specifications lead DEC to consider reducing the bill. Some specifications, such as raw data simulation and more complex QC tests were moved to a third stage, which development can be decided later by the panel. Most of GTS code forms, except DRIFTER, have been proposed to be developed by CLS and the TC DBCP.

* 31 May 1991 :
Based on revised specifications, DEC estimated the project at 2.6 MF, SEMA at 4.0 MF and CISI did not evaluate the project.

* 27 June 1991 :
The Chairman of the DBCP asks CLS, Service Argos to commence work on Phase 1 of the project using DEC as a contractor.

* Early July 1991 :
DEC starts development of Stage 1. The TC DBCP updates the specification document according to recommended modifications.

* 23 September 1991 :
Meeting in Landover with the Chairmen of DBCP and JTA, CLS and the TC DBCP in order to formalize previous actions and to prepare following DBCP VII and JTA sessions.

2) Goals for a New Argos GTS Processing Chain

The system should be flexible enough to handle more complex transfer functions and PTT formats, leading to a potential increase of the number of platforms distributed on GTS that could not be processed with the existing Argos system.

Improve general monitoring facilities in order to easily investigate possible problems with GTS platforms and to take action if needed.

Quality Control procedures should (i) avoid "garbage" from being disseminated on GTS, (ii) not remove possibly good data from GTS and (iii) increase the number of data distributed on GTS.

The system must be able to deal with various kind of GTS code forms: DRIFTER, SYNOP, SHIP, BATHY, TESAC, HYDRA and BUFR.

3) Technical specifications

The number indicated inside brackets [] shows at which stage the considered specification should be operational.

Sensor data processing:
* Standard B1-B5, compatibility with the existing Argos system [1]
* Various kind of original binary formats (e.g. binary, BCD, ASCII, Gray) [1]
* Mathematical formula to convert raw data into physical units [2]
* Pieces of software to convert raw data into physical units [3]
* Geo-Magnetic Variation Correction for wind direction data [2]
* Times of observation can be indicated in the PTT message [1]
* Checksum can be coded in the PTT message to validate the integrity of the message [2]
* Compression Index by Sensor [2]

Multiplexing method:
A standard method, compatible with Argos XBTs, a couple of German buoys and the TOGA ATLAS moored buoys (deployed in the Equatorial Pacific Ocean) has been proposed [2].

Quality Control procedures:
* Existing Gross Error and User limit checks [1]
* Climatological (limits depending upon location and period of the year) [3]
* Time continuity checks [3]
* Beached Platform test [3]
* Sensor Blockage test [3]
* All bits identical test [3]
* Compression Index [1]
* Checksum error test [2]
* Multiplexing error test [2]

Monitoring related activities:
GTS Data base using a Data Base Management System [1]
Raw data simulation [3]: for testing the processing types entered in the system, these are applied on simulated PTT messages before actual distribution of the data.
GTS Manager for facilitated access to the system [1]

Statistics, reports [1]:
Statistics are automatically updated in the system and reports such as the existing Argos monthly Status Report and the Drifting Buoy Quarterly Report can be produced but are not included in the project.

Distribution of the data:
GTS Bulletin containing GTS messages of the following code forms can be handled:

DRIFTER [1]
BATHY [1]
TESAC [1]
SYNOP [1]
SHIP [1]
HYDRA [1]
BUFR [2]

4. Development plan and financial evaluation

Development plan proposed

July 91	:	Development starts with DEC as a contractor
July 91 to September 92	:	Developments and Tests for stage 1,
March 92	:	End of the detailed conception for stage 1,
July 92	:	End of the coding for stage 1,
July to September 92	:	Tests for stage 1,
October to December 92	:	Qualification period for stage 1,
1 January 93	:	Stage 1 is operational,
October 1992 to June 93	:	Development of stage 2 "on the flight",
July 93	:	Stages 1 and 2 are operational.

Financial evaluation

The cost of the development is 2.641 MF : 1.822 MF for Stage 1 and 819 KF for Stage 2.
At this cost, which only concerns the development, we have to add 350 KF which are broken down into:

- Acquisition of two Vax stations (one in Toulouse and one in Landover) which will be used to implement the GTS manager office
which needs graphic possibilities (managing of every GTS platforms, calibration curves, production of meteo report, statistics, curves, ...).
The cost of one Vax station is 150 KF.

- Acquisition of specific softwares called Rallye and Dec Decision which will be used to interrogate the GTS database.
The license cost on a Vax station is 25 KF.

The involvment of CLS has been estimated to 4 days per month during 2 years, that is to say 96 days. In terms of cost, it means 300 KF.

Since 5th DBCP session, CLS has been very involved in the definition of the new GTS chain and sometimes, up to four persons worked on the project. It represents 70 days of work, that is to say, in terms of cost, 220 KF.

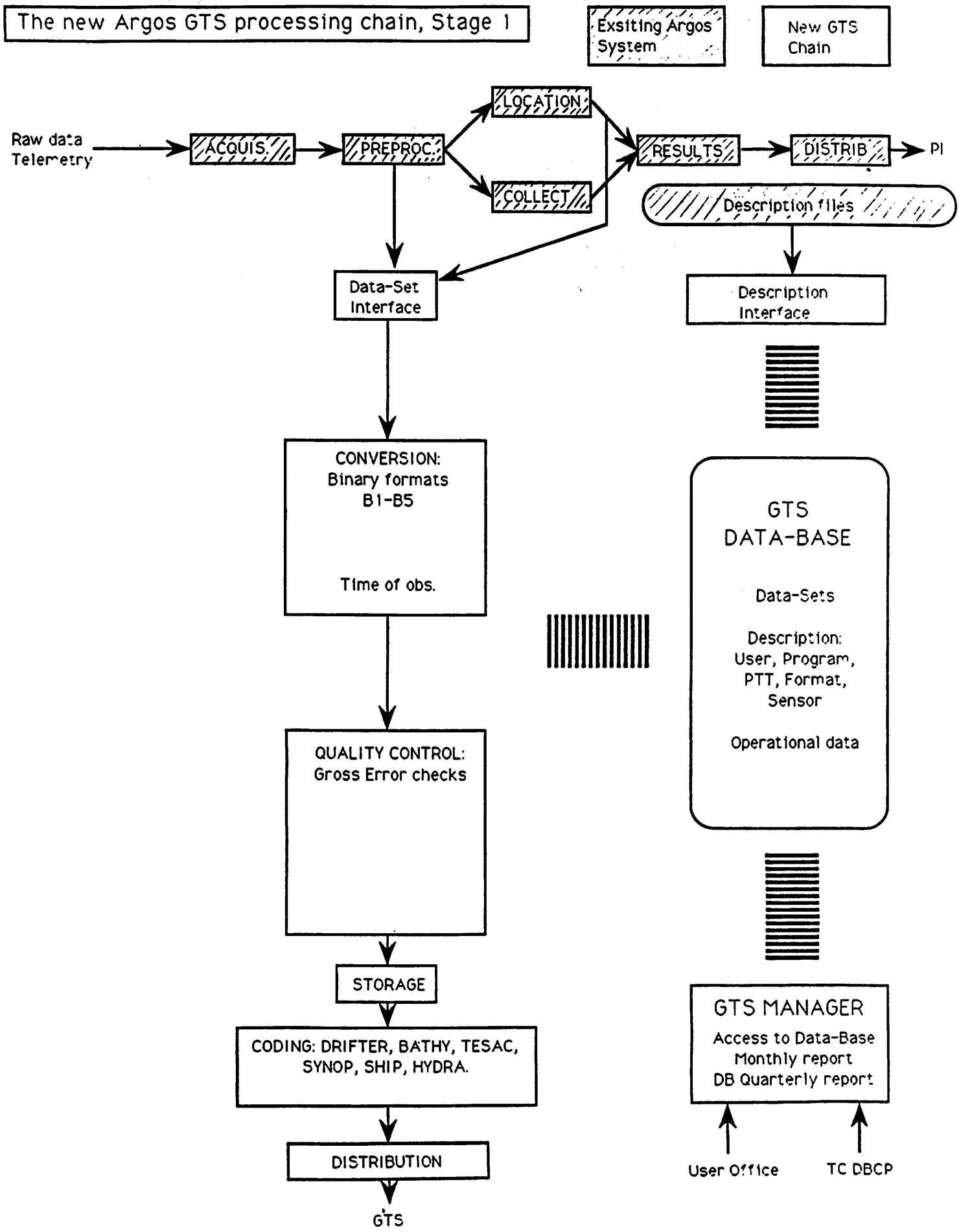
5. Commitments

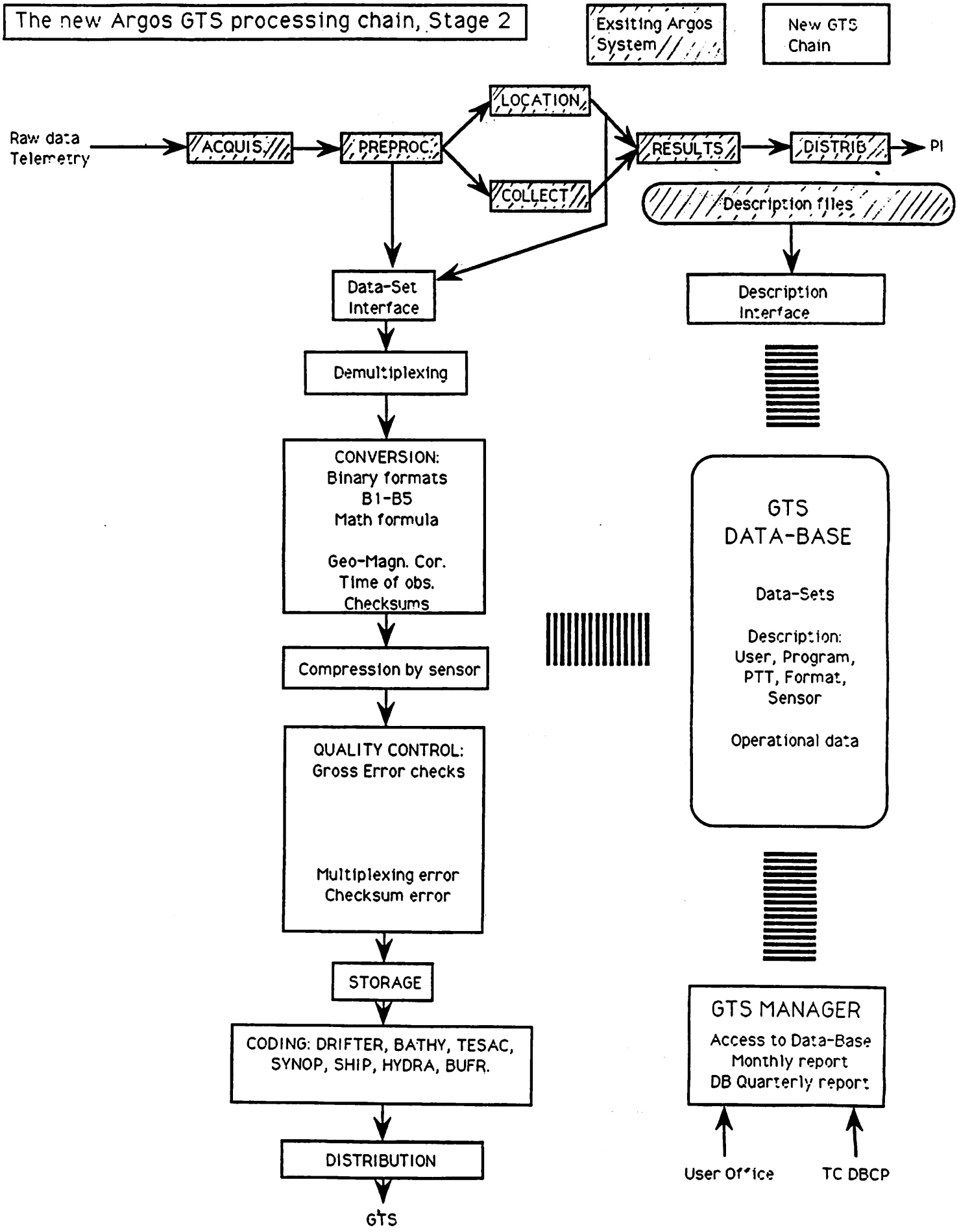
DBCP

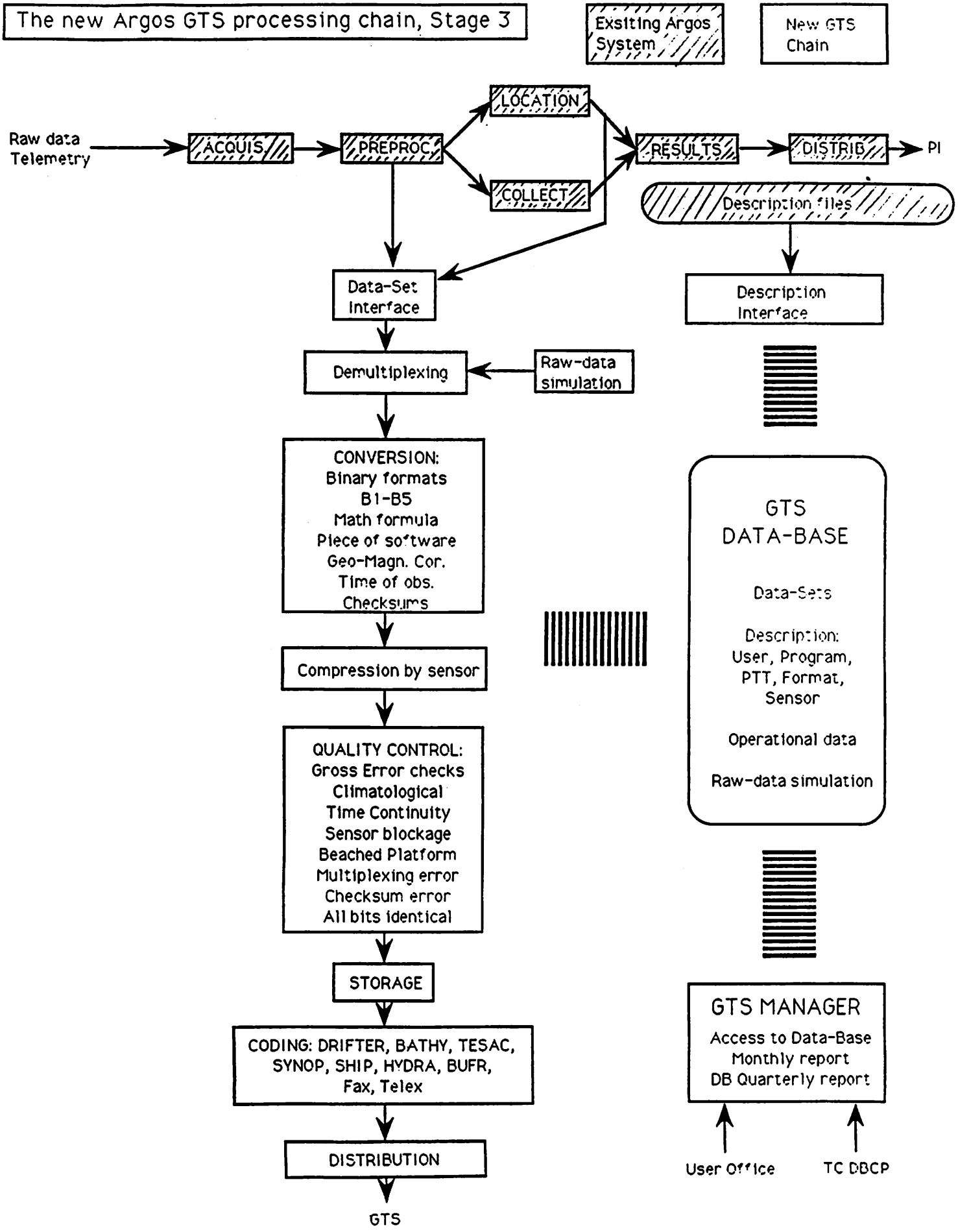
Through the work of its Chairman and its Technical Coordinator.
Through National Contributions: 90 000 US$ will be the financial participation of the DBCP.

CLS, Service Argos

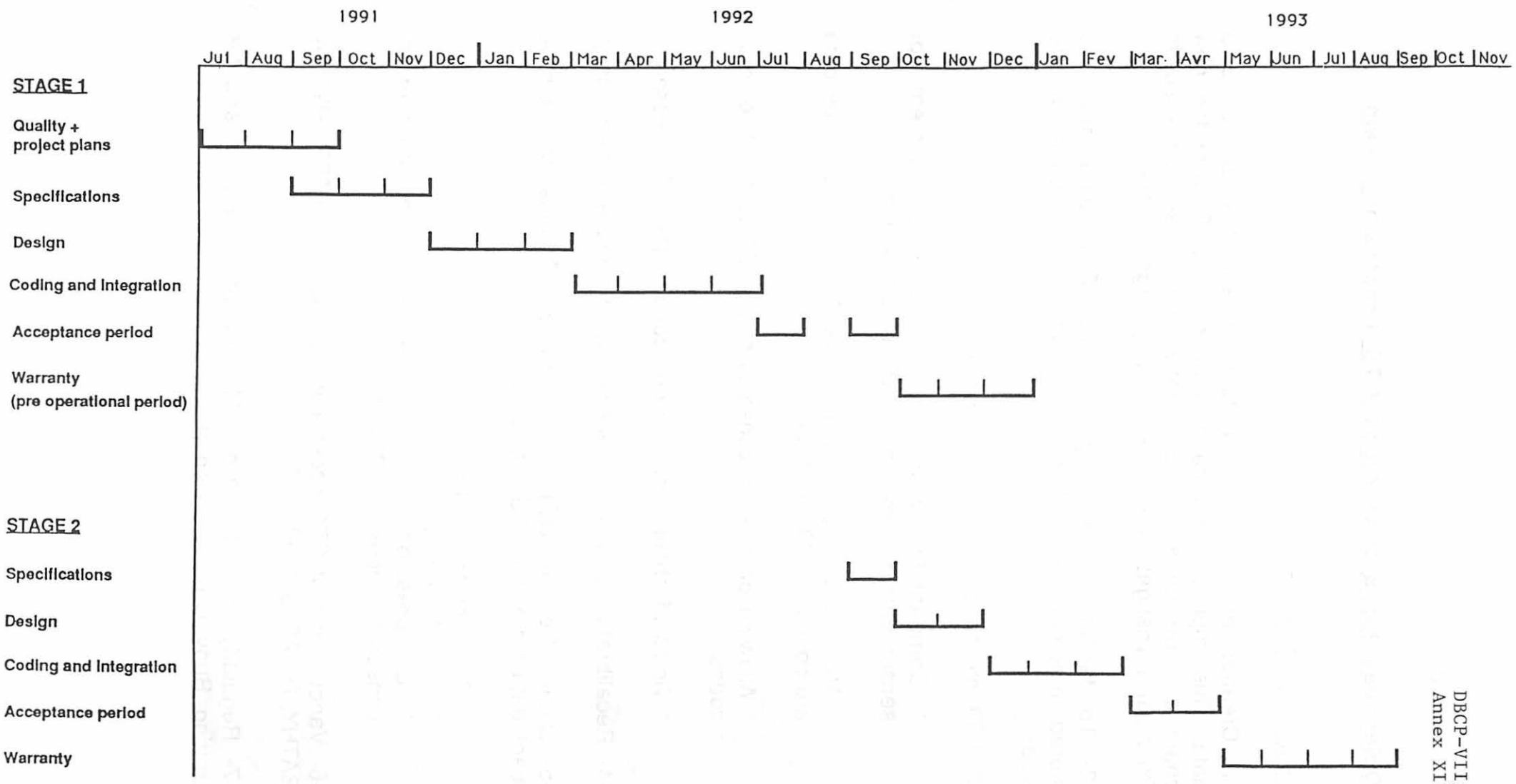
CLS will follow-up the development of the project and will perform all the tests required to validate the new GTS chain.


The new Argos GTS processing chain, Stage 1
Exsiting Argos System
New GTS Chain
Raw data Telemetry
ACQUIS.
PREPROC.
LOCATION
COLLECT
RESULTS
DISTRIB
PI
Description files
Data-Set Interface
Description Interface
CONVERSION: Binary formats B1-B5
Time of obs.
GTS DATA-BASE
Data-Sets
Description: User, Program, PTT, Format, Sensor
Operational data
QUALITY CONTROL: Gross Error checks
STORAGE
CODING: DRIFTER, BATHY, TESAC, SYNOP, SHIP, HYDRA.
DISTRIBUTION
GTS
GTS MANAGER
Access to Data-Base
Monthly report
DB Quarterly report
User Office
TC DBCP


The new Argos GTS processing chain, Stage 2
Exsiting Argos System
New GTS Chain
Raw data Telemetry
ACQUIS
PREPROC
LOCATION
COLLECT
RESULTS
DISTRIB
PI
Description files
Data-Set Interface
Description Interface
Demultiplexing
CONVERSION:
Binary formats
B1-B5
Math formula
Geo-Magn. Cor.
Time of obs.
Checksums
Compression by sensor
QUALITY CONTROL:
Gross Error checks
Multiplexing error
Checksum error
STORAGE
CODING: DRIFTER, BATHY, TESAC, SYNOP, SHIP, HYDRA, BUFR.
DISTRIBUTION
GTS
GTS DATA-BASE
Data-Sets
Description:
User, Program, PTT, Format, Sensor
Operational data
GTS MANAGER
Access to Data-Base
Monthly report
DB Quarterly report
User Office
TC DBCP


The new Argos GTS processing chain, Stage 3
Exsiting Argos System
New GTS Chain
Raw data Telemetry
ACQUIS
PREPROC
LOCATION
COLLECT
RESULTS
DISTRIB
PI
Description files
Data-Set Interface
Description Interface
Demultiplexing
Raw-data simulation
CONVERSION:
Binary formats
B1-B5
Math formula
Piece of software
Geo-Magn. Cor.
Time of obs.
Checksums
GTS DATA-BASE
Data-Sets
Description:
User, Program, PTT, Format, Sensor
Operational data
Raw-data simulation
Compression by sensor
QUALITY CONTROL:
Gross Error checks
Climatological
Time Continuity
Sensor blockage
Beached Platform
Multiplexing error
Checksum error
All bits identical
STORAGE
GTS MANAGER
Access to Data-Base
Monthly report
DB Quarterly report
CODING: DRIFTER, BATHY, TESAC, SYNOP, SHIP, HYDRA, BUFR, Fax, Telex
DISTRIBUTION
GTS
User Office
TC DBCP

DEVELOPMENT PLAN



Objectives for a New Argos GTS Processing Chain

1) Objectives of Stage 1

-1- Creation of an entire separate processing chain for GTS data. This implies that data distributed on GTS from the new chain can be processed differently than these delivered to Principal Investigators via the existing Argos system.

-2- To facilitate monitoring activities, GTS data are also stored in a data base. Data remain in the data base for one week.

-3- PTT message and data processing:

* Compatibility with the existing Argos System for sensor data processing (B1-B5 processing types)

* Allowing any sensor order possible in the way raw data are coded in PTT messages.

* Allowing data being coded in binary, BCD, ASCII or gray codes.

* Times of observation can be coded in the PTT message.

-4- Recalibration of biased sensors can be implemented easily.

-5- Quality Control (QC): The following QC tests can remove [bad] data from the GTS distribution:

* Gross error checks,
* User limit checks,
* Compression index by message (i.e. number of consecutive identical PTT messages > 1)

-6- Various kind of GTS codes can be used: DRIFTER, HYDRA, BATHY, TESAC, SYNOP, SHIP.

-7- Regularly issue the Argos Monthly Status Report and the Drifting Buoy Quarterly Report.

2) Objectives of Stage 2

-1- A Standardized Multiplexing method (i.e. a PTT can transmit to the satellite using different binary coding formats) compatible with existing TOGA/ATLAS moored buoys has been proposed, so that a large amount of sensor data can be processed for one given platform.

-2- New data processing options:

* Mathematical Formula to convert raw data into physical units,

* Geo-Magnetic Variation correction for wind direction data,

* Use of Checksums to validate the up-link data transmission.

-3- A Compression Index by Sensor (CIS) is used to increase the number of data distributed on GTS (e.g. when there is no consecutive identical messages, one could still find identical sensor fileds)

-4- Quality Control:

* The Compression Index by Sensor test can remove data from GTS distribution. (CIS<2, no checksum)

* Checksums and De-Multiplexing procedures can generate alarms.

-5- Development of the BUFR binary GTS code.

3) Objectives of Stage 3

-1- Raw data simulation option to test parameters entered in the system: Simulated raw data telemetry, entered by an operator, can be processed in order to compare the New GTS Chain results with expected physical sensor data.

-2- Pieces of Software: Small FORTRAN programmes can be implemented to process complicate transfer functions.

-3- Quality Control,

Tests generating alarms and positioning flags in GTS messages:

* Climatological checks,
* Time continuity checks,
* Detection of blocked sensors
* Beached platform test,

Test positioning flags in the GTS data base:

* All bits identical test.

-4- Possibility to generate Fax and Telex messages containing processed data under a standardized format.

Transition from the existing Argos system to the New Argos GTS Chain

1) July 92: NGC tested at FRGPC

No actual distribution on GTS,
GTS data generated, tested and validated internally.
Work done by CLS in conjunction with the TC DBCP

2) August 92: Tests at a designated Meteorological Centre

GTS messages are distributed from the FRGPC to METEO-FRANCE for meteo validation by a designated meteorological centre.
Collaboration between CLS, TC DBCP and meteorological centres, coordinated by TC DBCP

3) End of September 92:

"Go ahead" given by the designated meteo centre

4) 30 September 92:

New chain implemented and declared operational in both USGPC and FRGPC.

Operating the New Argos GTS Processing Chain

1) Creation at Argos of a "GTS group":

This group includes:

-1- A group coordinator (from Argos staff, i.e. person in charge)
-2- The User Offices (at SAI and CLS)
-3- Operational Services (at SAI and CLS)
-4- The TC DBCP

2) Responsibilities:

The GTS Group is responsible

-1- To guarantee that GTS distribution requests are well implemented with raisonable delays.

-2- To guarantee the reliability and efficiency of the New Argos GTS Chain.

-3- Deal with issues related to GTS

The GTS group coordinator:

-1- Liaise with TC DBCP who represents GTS users.
-2- Interface between TC DBCP and User Offices
-3- Follow GTS activities at Argos

The User Offices are responsible for:

-1- Implementing GTS distribution requests and changes as requested by PGCs.
-2- Liaise with PGCs concerning operational distribution of GTS data.

The Operational services:

-1- Guarantee the reliability and efficiency of the New Argos GTS Chain (24 hour operational service).

The TC DBCP:

-1- Acts as an expert for GTS matters
-2- Represents GTS users for Argos
-3- Liaise with the group coordinator for any GTS issue related to Argos.
-4- Possibly act as a PGC if he was designated by the PI.

Data collected at Argos Regional Processing Centres

The New Argos GTS Processing Chain is to be implemented at the Argos Global Processing Centres of Landover (USGPC) and Toulouse (FRGPC) and at the Argos Regional Processing Centre of Melbourne (AURPC). The new system will provide more flexibility in sensor data processing, will allow more GTS code forms to be handled (e.g. DRIFTER, SYNOP, BATHY, TESAC...) and will improve the Quality of GTS reports, thanks to new Quality Control Procedures.

The new GTS chain shall be fully operational in September 1993. Among technical specifications not decided yet, is one concerning real-time GTS distribution of data collected via Argos Regional Centres.

Especially concerned are the drifting buoys managed by the Australian Bureau of Meteorology, the New Zealand Meteorological Service and the National Data Buoy Center (of NOAA, USA) for TOGA.

In order to substantially reduce delays, two options are possible:

1: Direct insertion on GTS from AURPC:
2: GTS distribution from GPCs using AURPC raw data:

Option 1: Direct insertion on GTS from AURPC:

The implementation of the New Argos GTS Processing Chain itself in the Argos centre of Melbourne depends upon the computer power available there. If it is sufficient enough (i.e. computers replaced), the chain might be implemented to process a limited number of regional platforms (e.g. no more than a hundred platforms). The data would be directly inserted on GTS via the Australian Bureau of Meteorology for Global distribution.
This implies the automatic transfer of PTT and sensor description information (created and up to date, particularly of the TOGA buoys) from the Argos Global Processing Centers.

Advantages:

1. Shorter Delays for local users.

Drawbacks:

1. The lack of computer power may lead to less powerful sensor data processing and/or Quality Control, or might fail if the number of platforms to process is too large, unless funds are available to replace the computers. According to CLS sources, the cost to replace the computers would be approximately US$60000.

2. Duplicates on GTS since data are also inserted from the Global Processing Centres for Global Distribution.

Option 2: GTS distribution from GPCs using AURPC raw data:

The raw data telemetry collected by the Local User Terminal of Melbourne could be transmitted in real time to the Global Processing Centers of Toulouse and/or Landover, for data processing and dissemination onto the GTS from these sources.

Advantages:

1. New GTS Chain fully implemented there. All Quality Control Options available.

2. Global GTS distribution from Toulouse via RTH Paris and from Landover via NWS, Washington DC (depending upon which centre is responsible for processing a given platform) ==> shorter delays for European and American Users.

Drawbacks:

1. Longer delays for local users (time to transmit the data sets from Melbourne to Toulouse and then time for GTS distribution from RTH Paris or NWS Washington DC to Melbourne).

2. Cost of data transmission via X25 network from Melbourne to Toulouse. According to CLS sources, the cost of data transmission for 30 platforms would be approximately US$24000 per year.

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ANNEX XIV

OPERATING PROCEDURES FOR THE DRIFTING BUOY CO-OPERATION PANEL

1. To the extent that the panel is a formally established body of the WMO and IOC, panel members will be the representatives of Members of WMO or Member States of IOC which expressed a willingness to participate in the panel activities.

2. The panel will meet annually. Representatives of any institution or programme actively involved in the use, development or deployment of drifting buoys, or which specifically require drifting buoy data, may participate in the meetings.

3. The panel will elect a chairman and vice-chairman, from among panel members, to carry out the work of the panel between sessions. The chairman will prepare reports for the WMO and IOC, as required, and act as the focal point for communications amongst the panel members.

4. The chairman may call on individual panel members for assistance in matters such as representing the panel at meetings of other bodies, preparing of reports on specific topics, etc..

5. The panel requires the support of a full-time technical co-ordinator. The costs associated with this position will be supported through voluntary contributions to a trust fund specifically designated as being for the purpose. These arrangements will be reviewed annually.

6. The panel requires support from the Secretariats of WMO and IOC in the dissemination of invitations to panel meetings and the preparation of documents and reports related to meetings.

7. The terms of reference for the panel are those given in WMO Executive Council Resolution 10 (EC-XXXVII) and IOC Executive Council Resolution EC-XIX.7. The panel also adopts as terms of reference for its technical co-ordinator those suggested by the WMO Executive Council in Resolution 10 (EC-XXXVII) and the IOC Executive Council in Resolution EC-XIX.7.

8. The working language of the panel, including for correspondence, will be English.

9. The panel's operating procedures will be revised as required at the annual meeting. The chairman will prepare recommendations to be distributed before the meeting.

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ANNEX XV

DRIFTING-BUOY CO-OPERATION PANEL WORKPLAN AND OBJECTIVES FOR THE SEVENTH YEAR

PART A

Summary of the tasks

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

2. Maintain a catalogue of existing on-going drifting-buoy programmes.

3. Maintain a list of focal points for national contributions and within other relevant bodies with potential for involvement in drifting-buoy programmes.

4. Identify sources of drifting-buoy data not currently reported on the Global Telecommunication System and determine the reason for their non-availability.

5. If deemed necessary, make proposals to the Panel for co-ordination activity as a result of the above actions to address items 2 to 5 and 7 in the terms of reference for the Drifting-Buoy Co-operation Panel.

6. Arrange for the circulation of information on the Panel's activities, current and planned drifting-buoy programmes and related technical developments.

7. Arrange for the implementation of a new GTS processing system to be established in the Argos processing centres.

8. Continue the arrangements (including finance) to secure the services of a technical co-ordinator.

9. Review programme and establish working priorities of the technical co-ordinator.

10. Prepare annual report of the Drifting-Buoy Co-operation Panel.

11. Assist the South-west Indian Ocean Tropical Cyclone Committee to implement a planned drifting-buoy programme in the South-west Indian Ocean.

12. Assist in the planning and implementation of the drifting-buoy component of the global ocean-observing system to be included in the proposed system for global climate monitoring.

13. Keep up-to-date with the latest drifting-buoy technical developments and in particular participate in the evaluation of the new low-cost drifter developed under WOCE.

14. Implement working guidelines for buoy data quality control as agreed by the Panel at its seventh session.

Task	Carried out by*	Supported/assisted by	Reported to/action by	Relevant terms of reference of the panel
1	Technical co-ordinator (1, 8)	Panel members and WMO/IOC Secretariats	Chairman for presentation to the panel	1, 2
2	Technical co-ordinator (1, 3, 8)	Panel members and WMO/IOC Secretariats	Chairman and panel for information	1, 2
3	Technical co-ordinator (1, 3, 5, 8)	Panel members and WMO/IOC Secretariats	Chairman and panel for information	1, 2, 7
4	Technical co-ordinator (1, 7)	Panel members and WMO/IOC Secretariats	Chairman and panel for information	5
5	Technical co-ordinator and chairman (1, 3, 4, 5, 8, 9)	WMO/IOC Secretariats and others as appropriate	To panel for consideration and appropriate action or for direct action by chairman	1, 2, 3, 4
6	Technical co-ordinator (1. 3, 4, 5, 8, 9)	Chaiman, WMO/IOC Secretariats and CLS/Service Argos	Wide circulation by WMO/IOC Secretariats and CLS/Service Argos	6, 7
7	Chairman and technical co-ordinator (1, 2, 3, 7)	WMO/IOC Secretariats and financing Member countries	Panel and users	1, 2, 5
8	Chairman and sub-committee	WMO/IOC Secretariats	WMO/IOC Secretariats	8
9	Chairman/panel		Panel (at next session)	8
10	Chairman	Technical co-ordinator	Executive Councils of WMO and IOC	9
11	Chairman	Technical co-ordinator and WMO/IOC Secretariats	Panel	3, 4, 5, 7
12	Chairman	WMO/IOC Secretariats	Panel	1
13	Technical co-ordinator (1, 4, 5, 8)	Chairman and panel members	Panel	6, 7
14	Operational services	Panel members and Technical Co-ordinator	Panel	2, 3, 5

PART B

* When the Technical Co-ordinator is involved in carrying out a task, the figures in parenthesis relate to the terms of reference for the Technical Co-ordinator.

ANNEX XVI

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ANNEX XVII

LIST OF ABBREVIATIONS AND ACRONYMS

ABOM	Australian Bureau of Meteorology
ATLAS	Autonomous Temperature Line Acquisition System
BUFR	Binary Universal Form for the Representation of meteorological data
CBS	Commission for Basic Systems (of WMO)
CGC	Co-ordination Group on the COSNA
CLS	Collecte-Localisation-Satellites (Service Argos)
CMM	Centre de Météorologie Maritime (of CNRM)
CNRM	Centre National de Recherches Météorologiques (of Météo France)
COSNA	Composite Observing System - North Atlantic
DBCP	Drifting-Buoy Co-operation Panel (of WMO and IOC)
EGOS	European Group on Ocean Stations
ECMWF	European Centre for Medium-range Weather Forecasts
GCOS	Global Climate Observing System
GDC	Global Drifter Centre (of SVP)
GLOSS	Global Sea-Level Observing System (of IOC)
GOOS	Global Ocean Observing System
GTS	Global Telecommunication System (of WMO)
IABP	International Arctic Buoy Programme
ICSPRO	Inter-secretariat Committee on Scientific Programmes Relating to Oceanography
ICSU	International Council of Scientific Unions
IGOSS	Integrated Global Ocean Services System (IOC-WMO)
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data and Information Exchange (IOC)
IPO (WOCE)	(WOCE) International Project Office
ITPO	International TOGA Project Office
JCRF	Joint Climate Research Fund (of WCRP)
JMA	Japan Meteorological Agency
JTA	(Argos) Joint Tariff Agreement
LUT	Local User Terminal

MEDS	Marine Environmental Data Service (of Canada)
NDBC	National Data Buoy Center (of NOAA)
NOAA	National Oceanographic and Atmospheric Administration (of USA)
NZMS	New-Zealand Meteorological Service
ODAS	Ocean Data Acquisition Systems, Aids and Devices
OPC	Ocean Product Center (of NOAA)
PGC	Programme GTS Co-ordinator
PI	Principal Investigator
PMEL	Pacific Marine Environmental Laboratory (of NOAA)
PMOC	Principal Meteorological or Oceanographic Centre
RNODC	Responsible National Oceanographic Data Centre (IODE)
SMLA	Soviet Maritime Law Association
SOC	Specialized Oceanographic Centre (IGOSS)
SVP	Surface Velocity Programme (of WOCE and TOGA)
TOGA	Tropical Oceans and Global Atmosphere experiment (of WCRP)
UCAR	University Corporation for Atmospheric Research
UKMO	United Kingdom Meteorological Office
WCRP	World Climate Research Programme
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment (of WCRP)
WWW	World Weather Watch (of WMO)