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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of Unesco)

CO-ORDINATION OF DRIFTING-BUOY ACTIVITIES
AND RELATED QUESTIONS: HISTORICAL BACKGROUND

1. At its Eleventh Session (Mexico City, 26 February - 6 March 1979), the IOC Executive Council adopted Resolution EC-XI.12 in which it decided "that a Joint IOC/WMO co-ordination mechanism for drifting buoy initiatives should be established within IGOSS at an early date" and requested "the Joint IOC/WMO Working Committee for IGOSS to undertake the establishment of a drifting buoy co-ordination mechanism, as a high priority action".

2. At its Thirty-first Session (Geneva, 28 May - 1 June 1979), the WMO Executive Committee "felt that on a medium time scale, action should be taken for further planning and co-ordination of activities related to the collection of data from mobile and remote stationary platforms, in particular, from drifting buoys /.../. The Committee requested the Secretary General to convene an informal planning meeting on this subject during the fourth quarter of 1979 with a view to preparing a plan of action for consideration by EC-XXXII" (extract of the General Summary of the work of the Session, para. 3.1.4).

3. Subsequently, the Joint WMO/IOC Informal Planning Meeting (IPM) on Drifting Buoy Programmes was convened in WMO Secretariat from 3 to 5 December 1979 and came up with the conclusion that international co-ordination and co-operation in the field of drifting buoys activities were to benefit oceanographic and meteorological, operational and research purposes. It suggested that an international co-ordination group be established to that end and proposed terms of reference for it. At last it designed the tasks of the required staff support (for details, see Appendix 1). But at the same time two distinct conclusions were derived:

- "(i) There are a number of drifting buoy programmes directed towards serving operational meteorological purposes and meteorologists see a need for having an international mechanism to co-ordinate these initiatives;
- (ii) On the other hand, oceanographers are still cautious about the capabilities offered by presently available drifting buoys particularly with respect to current and sea temperature measurement, and felt it was premature to consider any routine operational programme in the near future, although mechanisms to assist the co-ordination of individual development and research initiatives are highly desirable" (extracts of the Final Report of the Meeting, para. 3.1).

4. On the ground of these conclusions, the WMO Executive Committee, at its Thirty-second Session (Geneva, 8 - 28 May 1980), "agreed that, for regional and global meteorological purposes, it now seems highly desirable to press ahead with the implementation of a limited operational drifting buoy programmes /.../. It considered that the WMO Secretariat /.../ should provide the focus for pursuing those aspects of the proposed programme for which central co-ordination is necessary /.../. The Executive Committee suggested that, in the first instance, Members planning to contribute to drifting buoy programmes designate national focal points for purposes of information, exchange and co-ordination" (extracts of the General Summary of the work of the Session, paras 3.1.3.15 and 3.1.3.16). (For details, see Appendix 2).

5. At its Thirteenth Session (Paris, 23 - 28 June 1980), the IOC Executive Council addressed the afore-mentioned second conclusion of the Joint WMO/IOC Informal Planning Meeting on Drifting Buoy Programmes (see para. 3(ii) above). It adopted Resolution EC-XIII.10 in which it requested "SCOR and ECOR to assist the Commission in defining the oceanographic applications of drifting buoys" and instructed the Secretary, inter alia, "to offer the WMO the report of SCOR (and ECOR) with a view to establishing in 1982 a Joint IOC/WMO Interim Group on Drifting Buoy Programmes as referred to in the Final Report of the Joint WMO/IOC Informal Planning Meeting on Drifting Buoy Programmes (December 1979)".
6. In order to fulfill the tasks entrusted to them, SCOR and ECOR created respectively:
- (i) SCOR Working Group 66: Oceanographic Application of Drifting Buoys (terms of reference and membership attached as Appendix 3), and,
 - (ii) ECOR Working Group on Engineering Applications of Drifting Buoys (terms of reference and membership attached as Appendix 4).
7. An IOC/SCOR/ECOR Consultative meeting on Drifting Buoy Programmes was held in London, from 6 to 7 April 1981. Conclusions and recommendations of the meeting (see Appendix 5) were submitted to the Fourteenth Session of the IOC Executive Council (Tenerife, Spain, 22 - 27 June 1981) which supported the Recommendations made by the IOC/SCOR/ECOR Consultative Meeting on Drifting Buoys Programme held in London (April 1980) and agreed that special financial allocations must be made for this purpose /some of the recommendations -see Appendix 5- have financial implications/, being fully aware that drifting buoys are a very important instrument in achieving the goals of IGOSS and ocean monitoring programmes" (extracts of the Summary Report of the Session, under Agenda item 9.1).
8. At its Thirty-third Session (Geneva, 1 - 17 June 1981), the WMO Executive Committee adopted Resolution 7 (EC-XXXIII) in which it urged WMO Members, inter alia, "to expand the use of drifting buoys, both for WWV /World Weather Watch of WMO/ and IGOSS purposes".
- At the same Session, the WMO Executive Committee "requested the Secretary-General to host in 1981 a meeting of Members interested in negotiating a joint tariff agreement for processing of data by Service Argos. The meeting may develop terms and conditions for payment by each Member of its own share directly to Service Argos or another designated agency. It may also provide an opportunity for exchanging ideas and information on future drifting buoy programmes and possible improvements of the operation of the Argos Data Collection and Platform Location System. In this connexion, the Committee stressed again the need for close collaboration between the meteorological and the oceanographic communities, as appropriate, in the development of drifting buoy programmes. It requested the Secretary-General to arrange for full participation of IOC in the Meeting on a Joint Tariff Agreement" (extracts of the General Summary of the work of the Session, para. 3.1.3.5).

9. The Meeting on Argos Joint Tariff Agreement was held in Geneva, from 7 to 10 December 1981. The meeting came out, inter alia, with a proposed mechanism for co-ordination of drifting buoy activities called Meteorological and Oceanographic Joint International Committee (MOJIC) for consideration by interested Member States (see Appendix 6).
10. At its Thirty-fourth Session (Geneva, 7 - 24 June 1982), the WMO Executive Committee addressed this proposal and "considered that the WMO Secretariat and the Meeting on Argos Joint Tariff Agreement, which is attended by a large number of national focal points see para. 4 above, could effect the desired co-ordination at this stage" (extracts of the General Summary of the work of the Session, para. 3.1.3,9). (For details, see Appendix 7).
11. The Second Joint IOC/SCOR/ECOR Informal Consultative Meeting on Drifting Buoy Programmes was held in Sidney, B.C., Canada, from 13 to 15 September 1982 (see Conclusions and Recommendations of the Meeting in Appendix 8). It addressed inter alia the question of a cost-effective mechanism for co-ordinating drifting buoy activities and outlined its terms of reference in such a way that the mechanism might actually assist in the successful implementation of drifting buoy programmes. The meeting also reviewed the status of preparation of SCOR and ECOR reports on drifting buoys for oceanographic applications in view of their submission to the Twelfth Session of the IOC Assembly.
12. At its Twelfth Session (Paris, 3 - 19 November 1982), the IOC Assembly considered the Summary Report of the afore-mentioned Informal Consultative Meeting, together with the Report to the Intergovernmental Oceanographic Commission on Oceanographic Drifting Buoys prepared by the Chairman, SCOR Working Group 66 (IOC/INF-518) and the Interim Report prepared by the ECOR Working Group on Engineering Applications of Drifting Buoys (IOC/INF-519) (see General Conclusions and Recommendations of the ECOR Working Group in Appendix 9). The Assembly reviewed the outlined terms of reference for an international co-ordinating mechanism for drifting buoy programmes (see Appendix 10) and adopted Resolution XII-5 in which IOC invites WMO to join IOC in requesting the Joint IOC/WMO Working Committee for IGOSS to prepare a report on an appropriate cost-effective mechanism for co-ordinating oceanographic/meteorological drifting buoy activities, for consideration by the IOC Executive Council at its Seventeenth Session and by the WMO Executive Committee at its Thirty-fifth Session".
13. At its Third Session (Paris, 21 February - 2 March 1983), the Joint IOC/WMO Working Committee for IGOSS addressed the question of an appropriate cost-effective mechanism for co-ordinating oceanographic/meteorological drifting buoys activities: "The Committee noted the existence of the yearly meeting on the Argos Global Tariff Agreement. This meeting not only concludes the annual tariff agreement but also considers questions

requiring international co-ordination in drifting buoy programmes. /.../ The Committee was of the opinion that the establishment of another mechanism would lead to duplication of effort and would not be cost-effective. It therefore proposed that WMO be invited to consider expanding the scope of the Argos Global Tariff Agreement meeting and transform it into a Joint WMO, IOC Co-ordination Group. In so doing, the Committee agreed that the Co-ordination Group should continue to ensure that a preferential and stable tariff agreement is concluded on an annual basis" (extracts of the Summary Report of the Session, para. 41). To that end, the Committee adopted Recommendation 2 (JWC-IGOSS-III) and in the Annex to this Recommendation were listed the following areas of co-ordination that are likely to result in cost benefits:

- "- co-ordination of plans and operations;
- drifting buoy technology and information exchange;
- data management, handling and archiving;
- Argos joint tariff agreement".

(For details, see Appendix 11).

14. At its Thirty-fifth Session (Geneva, 30 May - 3 June 1983), the WMO Executive Council, with regard to Recommendation 2 (JWC-IGOSS-III), "noted that the implementation of the provisions of this recommendation will have financial implications on the WMO regular budget. Therefore, the Council requested the Secretary-General to study the question of the co-ordination of drifting buoy programmes and report his findings to EC-XXXVI. Furthermore, the Council decided that the arrangements for the promotion of drifting buoy programmes, as laid down by EC-XXXIV, should continue (e.g., annual Argos tariff meetings)" (extracts of the General Summary of the work of the Session, para. 3.10).

15. The Third Meeting on Argos Joint Tariff Agreement was held in Geneva from 8 to 10 November 1983. As far as co-ordination of drifting-buoy activities in general was concerned, "the consensus of the Meeting was that the present arrangements should be maintained until such time when ad hoc or special arrangements are needed for specific programmes such as TOGA /Tropical Ocean and Global Atmosphere/. The observing-system element of this Programme foresees the deployment of 150 - 200 drifting buoys in the southern hemisphere and in the tropical oceans. The Meeting realized the need for creating a dedicated co-ordination mechanism to support the implementation of such a large-scale drifting-buoy programme; the composition of such a group should be specifically purpose-oriented, e.g., buoy providers, buoy deployers and logistics experts" (extracts of the Final Report of the Meeting, para. 8.4).

Addressing the question of co-ordination of buoy deployments in the framework of experiments such as TOGA and of the further development of the World Weather Watch (WWW) of WMO, "the Meeting felt generally /.../ that a co-ordinated approach to such deployments was necessary. The problem of co-ordination was discussed, but it was felt that this Meeting was not the correct forum in which to decide further on co-ordination mechanisms" (extracts of the Final Report of the Meeting, para. 9.4).

On the other hand, it was suggested "that TOGA had a particular requirement for the position of Technical Co-ordinator at Service Argos, Toulouse, France, for at least the first three years of TOGA, with position functions as set out in Annex VIII /see Appendix 12/. At the same time, the Technical Co-ordinator would act as an interface between the buoy-user community and Service Argos, facilitate the growth of WWW and provide technical input to Members of the Joint Tariff Agreement and to the annual JTA meetings /.../. The Meeting generally agreed on the need for such a technical cō-ōrdination, particularly with regard to the requirements of a specific project such as TOGA, but with reporting procedures still to be decided" (extracts of the Final Report of the Meeting, para. 9.3). It was noted with appreciation that the USA may be prepared to fund up to US\$50,000 of the US\$70,000 that this position would probably require annually, including salary, computer costs, communications, etc...

APPENDIX 1

EXTRACTS OF THE FINAL REPORT OF THE
JOINT WMO/IOC INFORMAL PLANNING MEETING
ON DRIFTING BUOY PROGRAMMES
(Geneva, 3-5 December 1979)

5.2.1 The meeting was in general agreement that for both oceanographic and meteorological and operational and research purposes it would be of benefit to consider international co-ordination and co-operation in the following areas:

- (i) Exchange of information on drifting buoy developments and applications;
- (ii) Co-ordination of deployments, when needed. Also perhaps, the publication of a list of buoy deployments;
- (iii) Exchange of data on an operational basis (primarily applies to operational meteorological data collection programmes at present, but the oceanographic community would be prepared to provide their data for exchange);
- (iv) An international dialogue between oceanographers and meteorologists, on buoy operations for both research and operational purposes seems useful. It was also desired that the interests of both small and large users would be taken into account;
- (v) Co-ordination of tracking of the buoys from one region to another;
- (vi) Co-ordination and study of matters of legal implications such as buoy recovery, buoy markings, customs clearances, etc.
- (vii) The design of a practical composite meteorological observing system based on operational experience during FGGE.

The meeting noted that to achieve this international co-ordination it would be desirable to establish an interim international co-ordination group. The meeting also noted in this context the background provided by and the recommendations of the seventh session of the WMO EC Intergovernmental Panel on the FGGE (...) and in particular the establishment of a drifting buoy co-ordinating mechanism as soon as possible. The meeting stressed that this group should be of an implementation co-ordination nature and one which receives its operational and scientific guidance from qualified bodies.

5.2.2 In discussing possible terms of reference for this proposed group, the meeting noted that buoys will be increasingly valuable as part of composite observing systems for the needs of the WLU, IGOSS, international oceanographic programmes, the World Climate Programme, and other applications and research programmes. Experience has shown that for the proper administration, financial optimization and management of complicated global and regional systems (such as the drifting buoys communication through polar-orbiting satellites), there is a need for international co-operation through a consortium of participating Member States. It would be necessary for this body (panel, committee or board) on drifting buoy activities to meet at least once a year for the planning and co-ordination for related operational and research programmes. In addition to the participation of Members authorized to make programme commitments for their respective Member States, other meeting participants may include representatives of appropriate bodies of the WMO IOC and ICSU, including CBS, CMM, IGOSS and SCOR. The terms of reference of this body would include (but not be limited to):

- (a) Points (i) through (vi) above;
- (b) To establish system requirements based on scientific and operational guidance and review buoy standards;
- (c) To co-ordinate the implementation of buoy arrays for operations and research;
- (d) To provide for needs of individual buoy researchers;
- (e) To co-ordinate data processing contracts, as appropriate;
- (f) To develop strategies for buoy arrays based on scientific and operational guidance;
- (g) To develop deployment plans and contingency plans;
- (h) To provide technical advice.

The meeting recommended that the sessions of the Executive Committee of WMO, and of the Executive Council of IOC, review the needs as described herein for such a body, and to take appropriate action for its establishment as soon as possible.

5.2.3 The meeting felt that it should point out that the proposed body would require continuing staff support to enable it to carry out effectively its terms of reference. Some of the tasks for such a support staff would include:

- (a) Collection and dissemination of information regarding the intentions, implementation status, schedules and operational status of the programmes of the various participating countries;
- (b) Promotion of and assistance to participating countries in the deployment of buoys in cases where international co-operation is required;
- (c) Co-ordination, as necessary, of the national and regional deployment plans of participating countries to facilitate economy and maximum coverage;
- (d) Dissemination of basic information required for the planning and deployment of networks including network spacing between buoys, ocean current drift information, admittance procedures (Argos), parameter requirements, technical standards, etc.;
- (e) Maintaining of a drifting buoy register and an up-to-date buoy system status so that requirements for the maintenance of networks (i.e. fill holes in a network) can be detected at an early stage and appropriate action initiated as necessary;
- (f) Determination of projected requirements for Service Argos buoy data processing to facilitate the bulk purchase of such data processing. Negotiation of a contract with Service Argos for such processing on behalf of participating countries including participating user countries;
- (g) Carrying out of planning and operational liaison with WMO elements responsible for the GTS, GDRS and GOS, IGOSS and ICSU elements.

APPENDIX 2

EXTRACTS OF THE GENERAL SUMMARY OF THE WORK OF THE
THIRTY-SECOND SESSION OF THE WMO EXECUTIVE COMMITTEE
(Geneva, 8-28 May 1980)

Drifting_buoy_programme

3.1.3.13 In view of the proven success of the Drifting Buoy Programme during the FGGE Operational Year, the thirty-first session of the Executive Committee requested the Secretary-General to carry out studies necessary for the short- and longer-term incorporation of drifting buoys in the World Weather Watch. The Committee was unanimous that the momentum and enthusiasm gained during the FGGE in respect of drifting buoys should be maintained and further promoted. It also noted that the eleventh session of the IOC Executive Council had acknowledged the great importance of drifting-buoy technology to oceanographic services and research programmes.

3.1.3.14 With the above consideration in mind, the Executive Committee studied the main conclusions of the two Informal Planning Meetings convened by the Secretary-General, namely: the Joint WMO/IOC Informal Planning Meeting on Drifting Buoy Programmes and the Informal Planning Meeting on New Observing Systems and, in particular, a proposal from these meetings for the establishment of an interim co-ordinating mechanism to promote and co-ordinate drifting buoy activities. In so doing, the Committee took particular note of the statement by the Joint WMO/IOC Informal Planning Meeting on Drifting Buoy Programmes that:

- (a) There are a number of drifting buoy programmes directed towards serving operational meteorological purposes and meteorologists see a need for an international mechanism to co-ordinate these initiatives;
- (b) On the other hand, oceanographers are still cautious about the capabilities offered by presently available drifting buoys, particularly with respect to current and sea temperature measurement, and feel that it is premature to consider any routine operational programme in the near future, although mechanisms to assist the co-ordination of individual development and research initiatives are highly desirable.

It was also noted in this connexion that oceanographic and meteorological requirements for drifting buoy data are different.

3.1.3.15 The Executive Committee agreed that, for regional and global meteorological purposes, it now seems highly desirable to press ahead with the implementation of a limited operational drifting buoy programme as soon as individual Members or groups of Members find themselves able to make the necessary arrangements. Such a programme could then evolve as appropriate into a more broadly based operation serving the needs of both the meteorological and the oceanographic communities.

3.1.3.16 It was agreed that experience during the FGGE had demonstrated the effectiveness of the relatively informal co-ordination mechanism set up to implement the drifting buoy programme for the Experiment. Although the Committee felt that if WMO was to proceed promptly with the implementation of an operational buoy programme as part of the World Weather Watch Global Observing System, some overall planning and co-ordination mechanism would be necessary, it stressed that any such mechanism must be simple, informal and flexible. It considered that the WMO Secretariat, in consultation as necessary with the presidents of CBS, CMM and CIMO, the chairman of the Working Committee for IGOSS and the IOC Secretariat, should provide the focus for pursuing those aspects of the proposed programme for which central co-ordination is necessary - observational standards, procedures for deployment planning, practices for the collection and exchange of buoy data, facilitating regional co-operative programmes, matters with legal implications, and questions relating to possible collaborative funding, as well as general information exchange. The Secretary-General was requested to ensure that the Secretariat provide the necessary support for the development of the operational buoy programme, making use, as far as possible, of the informal channels of communication established during the FGGE. This would probably involve the convening of further informal planning meetings and possibly the establishment in the future of an interim drifting buoy committee. The Executive Committee suggested that, in the first instance, Members planning to contribute to drifting buoy programmes designate national focal points for purposes of information exchange and co-ordination.

3.1.3.17 The Executive Committee stressed the need for very close liaison with the oceanographic community and, in particular, with IOC. It expressed the hope that, in due course, it would prove feasible to move towards a comprehensive international programme supported by and serving the need of both the meteorological and the oceanographic communities.

APPENDIX 3

SCOR WORKING GROUP 66 -
OCEANOGRAPHIC APPLICATIONS OF DRIFTING BUOYS

Terms of reference:

- (i) To review and summarize the existing technological knowledge on drifting buoys.
- (ii) To identify the technological problems needing further investigations, in the laboratory as well as at sea, and the oceanographic institutions willing to work on them.
- (iii) To advise on the standardization of buoy and sensor characteristics in order to obtain comparable measurements under the conditions experienced at sea.
- (iv) To review and summarize the oceanographic results obtained with the drifting buoys method since circa 1972.
- (v) To advise on the best ways of using this method for the study of oceanic surface circulation on meso and planetary scales (i.e., density of horizontal distribution of the buoys etc...).
- (vi) To advise on regions of the world ocean where drifting data are most needed to supplement observations of other types.

Membership:

D.J. Baker	USA
G. Cresswell	Australia (Chairman since 1983)
J. Garrett	Canada (previous Chairman)
D. Hansen	USA
F. Madelain	France
J.C. McWilliams	USA
J. Meincke	Federal Republic of Germany
W. Patzert	USA
P. Saunders	UK
C. Stavropoulos	South Africa

Executive Reporter:

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APPENDIX 4

ECOR'S WORKING GROUP ON ENGINEERING
APPLICATIONS OF DRIFTING BUOYS

TERMS OF REFERENCE

- o Identify selected ocean engineering areas that could benefit significantly from the application of drifting buoy technology.
- o Summarize observational needs (for these applications) in terms of parameters, sampling density and duration, and geographical emphasis.
- o Identify technical and operational deficiencies likely to be encountered in applying today's technology to new (engineering) applications.
- o Identify logistical opportunities and constraints associated with these applications.
- o Advise IOC on the probable extent of engineering programs employing drifters during the next decade, and inform the Secretariat of areas in which buoy observations made through IOC and others could provide information suitable for engineering purposes.
- o Establish liaison with SCOR WG-66 and the appropriate World Meteorological Organization (WMO) Advisory Group; identify potential areas of mutual concern.

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APPENDIX 5

CONCLUSIONS AND RECOMMENDATIONS
OF THE IOC/SCOR/ECOR CONSULTATIVE MEETING
ON DRIFTING BUOY PROGRAMMES
(London, 6-7 April 1981)

1. One conclusion of the meeting was that each of the agencies involved could contribute in a definite and specific way. SCOR clearly has the best possibilities for dealing with questions relating to scientific applications of drifting buoys and the scientific basis for measurements made using this technique. ECOR has the potential to involve the industrial sector, both from the point of view of determining the needs of the engineering community and the point of view of bringing scientific needs for improved buoys and sensors to the attention of engineers. The intergovernmental agencies, such as IOC and WMO, offer the capabilities for organizing and coordinating the international aspects of the applications of drifting buoys to oceanographical and meteorological problems.
2. In view of the needs for exchange of timely information on buoy deployments, possible drift of buoys into regions of interest to agencies other than the deployer, and possible assistance with buoy recovery, the meeting recommended that the establishment of a small, quasi-operational buoy information center at an oceanographic laboratory or within the secretariats of IOC, WMO should be investigated.
3. Now that practical ways of recovering satellite-tracked drifting buoys are becoming available, which will lead to an increasing interest in buoy recoveries, particularly in the case of experimental systems, the meeting recommended that IOC, SCOR, and WMO remind all groups involved in planning programs using drifting buoys that recovery plans should be included from the beginning and that such groups can not always expect to rely on the generosity of other agencies downstream of their experimental area without having consulted such agencies during the planning of the experiment.
4. Taking into account the evolution of drifting buoy techniques and the increasing number of buoys being used for scientific purposes, together with the multinational nature of many projects now being planned, the meeting suggested that the idea of an "Argos users' club" for the purpose of combining needs to obtain the lower rates associated with large numbers of platforms, should be reexamined. The meeting felt that IGOSS might provide an appropriate framework for this, although other agencies might serve equally well.
5. One of the problems identified by the meeting was that of conveying the requirements and wishes of oceanographers to the groups concerned with designing and planning future satellite systems, as well as helping the oceanographic community to become aware of the technological possibilities under consideration by the satellite developers. It was felt that the existing links between SCOR, COSPAR, and WMO might be useful for this, provided efforts were made to ensure that this area was covered.

6. The transfer of buoy technology among users and between the research and operational communities needs to be improved. It was felt that ECOR might be able to play a significant role in this. One recommendation of the meeting was that general documentation for the information of potential buoy users should be prepared, perhaps using a consultant employed by IOC or WMO.
7. The meeting took note of the potential problems associated with encounters between drifting buoys and other marine vehicles. It was felt that it would be helpful if IOC could consult with appropriate international bodies to obtain information on the relationship between ~~size~~ of floating bodies and the degree of navigational hazards they might pose.
8. Taking into account the different objectives and capabilities of the various agencies currently involved with drifting buoys, such as SCOR, IOC, IGOSS, WMO, and ECOR, it was felt that occasional informal consultative meetings, such as organized in London, would be of great value in discovering areas of common interest where cooperation or coordination might be beneficial.

APPENDIX 6

EXTRACTS OF THE FINAL REPORT OF THE
MEETING ON ARGOS JOINT TARIFF AGREEMENT
(Geneva, 7-10 December 1981)

The meeting also considered the eventual establishment of a Meteorological and Oceanographic Joint International Committee (MOJIC) with a representative possibly positioned in the WMO headquarters and a technical co-ordinator positioned at Service Argos, Toulouse (France). The possible functions of such personnel are outlined as follows:

MOJIC Representative

- Arrange and co-ordinate commitments from participants;
- Administer the collected funds committed to cover the agreement share;
- Sign agreements with Service Argos;
- Advise Service Argos which programmes are included in the Global Agreement;
- Inform the participants of the balance of utilization and of the proportion of funds unspent;
- Collect additional charges, if any;
- Arrange for the exchange of data;
- Co-ordinate buoy deployment;
- Assist in technical standardization for data format, sensor order, sensor accuracy, etc.;
- Liaise with and support of Service Argos;

MOJIC Technical Co-ordinator

- Co-ordinate quality control procedures;
- Prepare data;
- Clarify problems between Service Argos and participating countries and assist in their solution;
- Act as focal point for the communication of changes in platform status;
- Co-ordinate which platforms are on the GTS.

Since support of these activities involves a number of problems as well as additional costs, the meeting encouraged participants to consider the details involved in such a service, its value to users, methods of its finance and support and possible alternative configurations for it. Proposals and comments should be submitted to the WMO Secretariat sufficiently in advance of the next Argos Global Agreement Meeting so that they may be made available for consideration by participants.

APPENDIX 7

EXTRACTS OF THE GENERAL SUMMARY OF THE WORK OF THE
THIRTY-FOURTH SESSION OF THE WMO EXECUTIVE COMMITTEE
(Geneva, 7-24 June 1982)

Drifting buoy programme

3.1.3.7 The Executive Committee recalled that it formulated at its previous sessions the policy guidance on the co-ordination of drifting buoy activities and that these may be summarized as follows:

- (a) The implementation of limited operational drifting buoy programmes should be pursued for regional and global meteorological purposes;
- (b) There is a need for establishing an overall planning and co-ordination mechanism, but at this stage of development the WMO Secretariat should assume the co-ordinating responsibility. The subject of co-ordination should include:
 - (i) Observing standards;
 - (ii) Procedures for the collection and exchange of buoy data;
 - (iii) Facilitation of regional co-operative programmes;
 - (iv) Questions relating to possible collaborative funding;
 - (v) General information exchange;
- (c) An Interim Drifting Buoy Committee may be established at an appropriate time in the future in the light of further programme development; this Committee may be co-sponsored jointly by WMO and IOC;
- (d) National focal points on drifting buoy programmes should be designated for the purpose of information exchange and co-ordination;
- (e) Close liaison with the oceanographic community, in particular with IOC should be maintained;
- (f) A global tariff agreement should be negotiated with Service Argos on a yearly basis.

3.1.3.6 The Executive Committee considered that the above policy guidance was still valid and noted with appreciation the actions taken by the Secretary-General and Members concerned in compliance with the above guidance, notably the designation by 12 Members of national focal points on drifting buoys and the convening of the Meeting on the Argos Joint Tariff Agreement in Geneva in December 1981. The Executive Committee was pleased with the outcome of the Meeting on the Argos Joint Tariff Agreement which prepared a Global Agreement for a preferential tariff for services to be provided by Argos. It also noted with satisfaction that this Global Agreement was joined by a large number of Members of WMO and IOC with a total number of platforms of about 230 of which the majority are drifting buoys. The Executive Committee further considered that the establishment of Argos Local Users Terminals (LUTs) had become an important factor for enhancing the usefulness of Service Argos for synoptic meteorological purposes and understood that this matter was under active consideration within the World Weather Watch Integrated System Study.

3.1.3.9 With regard to a proposal of the Meeting on the Argos Joint Tariff Agreement concerning the establishment of a meteorological and oceanographic joint international committee, the Executive Committee felt that the creation of such a body was premature but agreed that a programme co-ordination be effected by designated officials within the WMO Secretariat and Service Argos in Toulouse, France. However, the Executive Committee considered that the Secretariat and the Meeting on Argos Joint Tariff Agreement, which is attended by a large number of national focal points, could effect the desired co-ordination at this stage.

3.1.3.10 The Executive Committee stressed again the need for the information exchange of drifting buoy programmes, including technical information on drifting buoys. Although an annual information service bulletin on buoys issued jointly by IOC and WMO Secretariats contains a limited amount of information on drifting buoys, it felt that an appropriate information circular devoted to meteorological drifting buoy programmes issued more frequently was required by Members of WMO. Such a circular may include information on the plans of Members for the deployment of drifting buoys, including position of deployment, and their technical characteristics. It would help countries to plan their future programmes and avoid duplication of efforts.

3.1.3.11 The Committee recognized the importance of distributing drifting buoy data on the GTS and was informed that an arrangement had been made with the RTHs concerned, Service Argos as well as with the operators of Local User Terminals (LUTs) for appropriate drifting buoy data to be inserted into the GTS. In this respect, it hoped that Members and manufacturers when designing drifting buoys consider the compatibility with relevant WMO code forms so that a maximum amount of drifting buoy data will be made available on the GTS to Members of WMO. The Executive Committee noted the general success of the drifting buoy programme and expressed its hope that a satellite system consisting of two ARGOS equipped polar-orbiting TIROS N Type satellites for platform location and data collection would be maintained. This, it felt, would ensure the continued viability of the operational drifting buoy programme.

3.1.3.12 The Executive Committee noted with satisfaction that close collaboration had been established with IOC on buoy programmes and other ocean data activities. It was informed that a joint IOC/SCOR/ECOR meeting to consider oceanographic requirements for drifting buoy programmes would be held in September in Canada in 1982 and that WMO would be invited to be represented.

APPENDIX 8

CONCLUSIONS AND RECOMMENDATIONS OF THE
SECOND JOINT IOC/SCOR/ECOR INFORMAL CONSULTATIVE MEETING
ON DRIFTING BUOY PROGRAMMES

(Sidney, B.C., Canada, 13-15 September 1982)

1. The Meeting urged the IOC and WMO Secretariats to continue their efforts towards the establishment of a small quasi-operational buoy centre, as previously recommended by the London Consultative Meeting. It also proposed that the Joint Working Committee for IGOSS prepare a report on an appropriate cost-effective mechanism for co-ordinating drifting buoy activities.
2. The Meeting felt that some means of communicating regularly and involving engineering interests on a continuing basis will be desirable in future activities. It was also noted that neither the ECOR or SCOR WG's had addressed the problems of development of new buoy technology.
3. The Meeting recommended to IOC and WMO that they seek an alternative method of funding the Argos processing centre which would avoid the assessment of charges on the basis of each buoy.
4. The Meeting supported the need for improved codes and formats for drifting buoy data exchange and archival. It also urged that means be found to establish a global drifting buoy data bank.
5. The Meeting agreed that Recommendation 6 of the First IOC/SCOR/ECOR Consultative Meeting on Drifting Buoy Programmes is still valid and addressed IOC and WMO Secretariats to provide financial support for hiring a consult to prepare general documentation for the information of potential buoy users.

APPENDIX 9

GENERAL CONCLUSIONS AND RECOMMENDATIONS OF THE
ECOR WORKING GROUP ON THE
ENGINEERING APPLICATIONS OF DRIFTING BUOYS
(Interim Report)

- o The oceanographic and meteorological research communities should take the lead in evolving drifting buoy systems and the international programs to encourage their use.
- o ECOR should continue to be consulted in the formulation of international buoy programs so that the engineering community can be informed of future buoy programs and the environmental data which will result from them.
- o Drifting meteorological buoy programs will be of major importance to engineers if these programs result in improved operational weather forecasting in offshore areas of interest.
- o Drifting oceanographic buoy programs will be of importance to engineers if these programs result in improved data on mean environmental parameters and the probability and magnitude of extreme events in offshore areas of interest.
- o The need exists in the engineering community for an inexpensive drifting buoy system suitable for nearshore operation with a spatial resolution of 0.2-1 km and with a minimum of several position fixes daily.
- o IOC/SCOR/ECOR partnership should examine the availability of such a buoy system in consultation with buoy and satellite development engineers and the technical representative of the present ARGOS system.

APPENDIX 10

EXTRACTS OF THE SUMMARY REPORT OF THE
TWELFTH SESSION OF THE IOC ASSEMBLY
(Paris, 3-19 November 1982)

The Assembly noted the main recommendations made by the Second IOC/SCOR/ECOR Consultative Meeting on Drifting Buoy Programmes (Sidney, B.C., September 1982) which requested the Joint IOC/WMO Working Committee for IGOSS to establish a small ad hoc working group to prepare a report on an appropriate cost-effective mechanism for co-ordinating drifting buoy activities. The Assembly agreed that it was important for Member States to study the proposal carefully and provide guidance on the future activities of IOC subsidiary bodies and SCOR and ECOR Working Groups dealing with the drifting-buoy programmes. 131

Regarding Resolution EC-XIII.10 by which the IOC Executive Council requested SCOR 'to prepare a final report on drifting buoys for oceanographic applications for consideration by the Twelfth Session of the Assembly' and instructed the Secretary 'to offer the WMO the report of SCOR (and ECOR) with a view to establishing in 1982 a Joint IOC/WMO Interim Group on Drifting Buoy Programmes as referred to in the Final Report of the Joint WMO/IOC Informal Planning Meeting on Drifting Buoy Programmes (December 1979)', the Assembly noted with satisfaction the reports of SCOR and ECOR submitted to the Assembly, and thanked SCOR and ECOR for their collaboration. (...) 132

The Representative of WMO stated that, although the 34th Session of the WMO Executive Committee did not take a decision to establish a new joint mechanism with IOC for co-ordination of drifting-buoy programmes, it foresaw the establishment of such a mechanism at an appropriate time in the future, in the light of further programme developments. 134

The Assembly approved the recommendations of the Second IOC/SCOR/ECOR Consultative Meeting on Drifting Buoy Programmes, but made some amendments to the proposed functions of an ad hoc working group referred to above. 135

The Assembly agreed that the ad hoc group should: 136

- (i) be made up of experts from Member States and international organizations operating or planning drifting buoy programmes;
- (ii) prepare a report for submission to the governing bodies of the IOC and WMO for action no later than the end of 1983;
- (iii) include in the study a delineation of the benefits resulting from an effective international co-ordination mechanism for drifting buoy programmes and data management;
- (iv) make recommendations identifying the immediate and long-term actions required;

- (v) study the appropriateness of including the following functions in those of the co-ordinating mechanism:

Co-ordination of operational programmes.

Preparation and distribution of Summary Reports (quarterly) of buoy operations.

Preparation and issue of periodic GTS bulletins on operational buoys.

Monitoring distribution of LUT data over the GTS.

Monitoring positions and movements of operational buoys.

Transfer of buoy technology particularly with regard to developing countries.

Assistance with multilateral agreements.

Development of guidelines for Member States operating LUTs.

Information dissemination.

Advice to planning bodies.

Liaison with IOC/WMO/Service Argos and others.

Interaction with regional organizations.

Data management planning.

Advice and liaison related to data archival.

Data quality.

International data exchange.

The Assembly noted that many of these functions are similar to those of the 'Meteorological and Oceanographic Joint International Committee Representative' described in Section 7.2 of the IOC/WMO document 'Extracts of the Final Report of the Meeting on Argos Joint Tariff Agreement', 7-10 December 1981.

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The Assembly recommended that the Chairmen of SCOR and ECOR Working Groups on Drifting Buoys, the Rapporteur of the Group on Drifting Buoys of the WMO Commission for Marine Meteorology, and the Working Committee on IODE, be represented at meetings of the ad hoc group if the Agenda calls for their attendance.

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APPENDIX 11

EXTRACTS OF ANNEX II TO THE SUMMARY REPORT OF THE
THIRD SESSION OF THE
JOINT IOC/WMO WORKING COMMITTEE FOR IGOSS
(Paris, 21 February-2 March 1983)

Recommendation 2 (JWC-IGOSS-III)

JOINT WMO/IOC CO-ORDINATION GROUP ON DRIFTING BUOY PROGRAMMES

The Joint IOC/WMO Working Committee for IGOSS,

Noting Resolution XII-5 adopted by the Twelfth Session of the IOC Assembly which, inter alia, invited WMO to join IOC in requesting the Joint IOC/WMO Working Committee for IGOSS to prepare a report on an appropriate cost-effective mechanism for co-ordinating oceanographic/meteorological drifting buoy activities;

Considering that co-ordination and co-operation are desired between planners and operators of oceanographic and meteorological drifting buoy programmes;

Recommends that a WMO/IOC co-ordination group on drifting buoy programmes be established as described in the Annex to the present Recommendation.

Annex

By Resolution XII-5 the Twelfth Session of the IOC Assembly requested the Joint IOC/WMO Working Committee for IGOSS to prepare a report on an appropriate cost-effective mechanism for co-ordinating oceanographic/meteorological drifting buoy activities. This proposal was supported subsequently by WMO. As was suggested by the IOC Assembly, the Third Session of the Joint Working Committee:

- (i) considered the need for a cost-effective co-ordinating mechanism for drifting buoy activities;
- (ii) delineated the areas of benefits likely to result from an effective international co-ordination mechanism for drifting buoy programmes and data management;
- (iii) made recommendations on immediate and long-term actions required.

Needs for and benefits of a joint IOC/WMO co-ordinating mechanism

The Joint Working Committee realized that there were many differences between oceanographic and meteorological requirements for the use of drifting buoys. Nevertheless, co-ordination and co-operation between planners and operators of oceanographic and meteorological drifting buoy programmes are desired.

The items listed below point out the areas of co-operation which must be included at national and international levels and illustrate where close co-ordination and co-operation are likely to result in cost benefits. They include:

- co-ordination of plans and operations;
- drifting buoy technology and information exchange;
- data management, handling and archiving;
- Argos joint tariff agreement.

Proposed actions

The Joint Working Committee recommends that the WMO-sponsored annual Argos Global Tariff Agreement Meeting be expanded and transformed into a Joint WMO/IOC Co-ordination Group on Drifting Buoy Programmes, with a view to its undertaking the four functions listed above. The Joint Working Committee recommends also that the first meeting of the expanded and transformed group should be convened at the time scheduled for the Third WMO-sponsored Argos Global Tariff Agreement Meeting, i.e. 25-28 October 1983.

The Joint Working Committee further recommends that the IOC and WMO Secretariats jointly provide the secretariat services to the above-mentioned co-ordination group. The Joint Working Committee felt that it would be very desirable for a special staff post to be allocated in one of the secretariats to support the drifting buoy programmes.

With the further development of the drifting buoy programmes, the Joint Working Committee sees the need to establish a post to deal with operational and technical matters. The Joint Working Committee recommends that Member States be invited to second such a post.

The Joint Working Committee agrees that plans for the future development of drifting buoys co-ordination beyond the actions listed above should be produced by the Co-ordination Group in consultation with IOC and WMO.

The Second Argos Global Tariff Agreement Meeting (Geneva, November 1982) recommended the preparation of a "Guide to data collection and location services using Service Argos". This Guide will be drafted by experts nominated by WMO and Service Argos. The Joint Working Committee recommends that IOC designate an expert to assure input on oceanographic aspects.

APPENDIX 12

EXTRACTS OF ANNEX VIII TO THE FINAL REPORT
OF THE THIRD MEETING IN ARGOS JOINT TARIFF AGREEMENT
(Geneva, 8-10 November 1983)

The functions of the Technical Co-ordinator could be:

- to co-ordinate quality control procedures;
- to clarify problems between Service Argos and participating countries, and assist in their solution;
- to act for the communication of changes in PTT /Platform Transmitting Terminal status;
- to co-ordinate which platforms are on the GTS;
- to assist in the standardization of data format, sensor order, sensor accuracy, etc.;
- to arrange for the exchange of data;
- to supply information about buoy developments and applications in order to promote an international dialogue between oceanographers and meteorologists;
- to monitor the operation to get periodic tapes of principal data of all programmes authorized under the Global Agreement.