Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies



Joint IOC-WMO-CPPS Working Group on the Investigations of « El Niño »

Sixth Session

Viña del Mar, Chile, 24-26 November 1988

Unesco

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IOC-WMO-CPPS/El Niño-VI/3
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In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of «El Niño» *(Also printed in Spanish)*
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP (SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping *(Also printed in French and Spanish)*
12. Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica *(Spanish only)*
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources *(Also printed in French and Spanish)*
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans *(Also printed in French)*
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities *(Also printed in Spanish)*
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
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39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post IDOE Studies of East Asian Tectonics and Resources
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1. OPENING

The session was declared open on Thursday, 24 November 1988 by Captain Carlos Rari White, President of the National Oceanographic Committee of Chile (CONA - Comité Oceanográfico Nacional de Chile). In his address, the President of CONA, who noted that this was the first session of the Joint Working Group (JWG) in Chile, drew attention to his country's active participation from the time that this regional co-operation mechanism was created in 1977, and to its importance as a link between the Regional Investigation of the Phenomenon 'El Niño' Programme (ERFEN) and the global Tropical Oceans and Global Atmosphere project (TOGA) and the World Ocean Circulation Experiment (WOCE).

Dr Fernando Robles, IOC Senior Assistant Secretary and Technical Secretary of the Joint Working Group, stated that the Group's terms of reference were still fully valid, particularly as regards the global programmes referred to. He highlighted the exemplary collaboration between the intergovernmental organizations that made up the JWG and expressed warm thanks to the National Oceanographic Committee of Chile, the local organizers of the session, for the excellent facilities that had been provided.

Participants met at 9 a.m. that day under the chairmanship of Dr David Enfield, Chairman of the Joint Working Group, in the Auditorium of the Hotel San Martín, Viña del Mar, Chile.

The list of participants is contained in Annex III, and a list of acronyms and abbreviations appears in Annex IV.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 Adoption of the agenda

The Joint Working Group adopted the provisional agenda without amendment. The agenda, as adopted, is set out in Annex I.

2.2 Designation of the Rapporteur for the session

The Joint Working Group designated Professor Sergio Avaria (Chile) as Rapporteur for the session.

2.3 Conduct of the session, timetable and documentation

The Technical Secretary explained the working arrangements for the session, proposed a timetable of activities and briefly reviewed the provisional list of documents.

3. REVIEW OF INTERSESSIONAL ACTIVITIES

3.1 Report of the IOC Secretariat

Notwithstanding the severe financial constraints affecting the Intergovernmental Oceanographic Commission (IOC) on account of the shortfall in contributions to Unesco's regular budget, it had continued to provide considerable technical and financial assistance to the scientific programmes in the South Pacific system being organized in conjunction with the Permanent Commission for the South Pacific (CPPS). Co-operation arrangements had been

facilitated by the establishment, in 1986, of the IOC Secretariat for the Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE) in Cartagena de Indias, Colombia. This initial IOC Regional Secretariat had been made responsible for the follow-up and management of the many activities being carried out in conjunction with the CPPS for the South-East Pacific region.

In the context of activities of interest to the JWG, mention was made of those relating to the IOC programme on Ocean Processes and Climate (OPC). As regards the regional components of that programme and notwithstanding the fact that many activities were being carried out under bilateral agreements, an excellent level of co-ordination and consultation was being maintained, through the SCOR-IOC Committee on Climate Changes and the Ocean (CCCO), in respect of the TOGA and WOCE projects. As regards the latter project, the JWG Secretariat had recently initiated a process of frequent consultations with the WOCE International Planning Office situated in the United Kingdom. As a result of this, IOC had been able to provide assistance for the attendance of experts from Colombia, Peru and Chile at a WOCE Regional Planning Workshop held in the Oceanographic Institute of the University of São Paulo, Brazil (July 1987) and at an IOC Expert Meeting and Workshop on Ocean Dynamics and Climate held in Buenos Aires, Argentina (July 1988).

In terms of specific support in developing the ERFEN programme, the IOC had provided assistance for the attendance of six oceanographers from the region at the sixth session of the Scientific Committee for that programme (Lima, Peru, June 1987) and of a similar number of experts for the seventh session of the ERFEN Scientific Committee held recently. The IOC contribution to the continued publication of the bilingual ERFEN Bulletin (English, Spanish) issued by the CPPS was now being placed on a regular footing; this contribution had been temporarily suspended in 1987 because of the financial constraints already referred to.

The operation that had perhaps called for the most closely concerted action between the CPPS Secretariat in Bogotá and the IOC Secretariat for IOCARIBE in Cartagena de Indias, had been the securing of UNDP approval for the UNDP/IOC/CPPS Regional Project on Monitoring and Prediction of the 'El Niño' Phenomenon in the South-East Pacific: Application to Development (Project RLA/88/010). In order to maintain this regional project in the list of approved initiatives for the Fourth Cycle Funding Programme of UNDP (1987-1991), it had been necessary to make many adjustments in the respective project document and considerable negotiations had been involved. Although the figure finally approved by UNDP ($203,700) was somewhat lower than that requested in the successive versions of the project, the final amount assigned represented the culmination of hard negotiations carried out jointly by IOC and CPPS vis-à-vis the UNDP authorities.

As regards the regional aspect of the IOC-FAO joint programme on Ocean Science in Relation to Living Resources (OSLR) and its linking with the biological component of the ERFEN programme, implementation of the SARP projects under the International Recruitment Programme (IREP) which were proposed for the region had suffered delay in comparison with similar experiments being carried out elsewhere. However, preliminary conversations were under way for the carrying out of a comparative pilot experiment on recruitment among clupeoid populations in the northern and central-southern zone of Chile, with the support of the local fishery industry. A second OSLR subprogramme concerning phytoplankton proliferation and red-tide phenomena was at the implementation stage following a symposium on the theme held by the IOC in Takamatsu, Japan, in November 1987.

3.2 Report of the WMO Secretariat

The report on WMO activities carried out between JWG sessions was presented by the WMO representative, Mr Fernando Guzmán of the Ocean Affairs Division of the World Weather Watch Department of WMO. He reaffirmed WMO support, within the limits of available funds, for JWG activities and countries taking part in ERFEN. He drew attention to the proposal, recommended at the previous session, to the effect that two meetings of a similar character might be held one after the other, thus enabling savings to be made by Member States and organizations alike.

The Joint Working Group welcomed and endorsed the initiative of the CPPS Secretary-General which had led the WMO Executive Council, at its thirty-ninth session, to authorize the WMO Secretary-General to draw up, having regard to the objectives and functions of the CPPS, a formal working agreement between the two bodies. The full text of that agreement was distributed as an annex to the report submitted by the WMO Secretariat.

The Joint Working Group noted the more important themes that the IOC-WMO Joint Working Committee for IGOSS would consider at its fifth session to be held in Paris from 14 to 23 November 1988; these included the General Plan of IGOSS, ways in which the availability of observations of the BATHY/TESAC type could be improved, the necessary codes for the transmission of IGOSS programme data, the new generation of oceanographic satellites, the expansion of the Specialized Oceanographic Centres (SOC), new IGOSS products, IGOSS regional involvement, and the training and technical assistance programme.

The Joint Working Group noted the current situation as regards the Drifting Buoy Programme under which 16 countries were implementing programmes in support of a series of operational scientific research activities, of meteorological as well as oceanographic scope; these included the World Weather Watch, the World Climate Research Programme, IGOSS, WOCE, TOGA and others. Most of the data provided by the buoys was transmitted through the Argos Data Collection and Platform Location System installed in one of the National Oceanic and Atmospheric Administration (NOAA) satellites, operated jointly by the Argos service and the NOAA. During 1988, Argos system users had contracted 681.5 Platform Terminal Transmitter Years for data location and collection services.

According to the Argos service report for August 1988, 608 buoys were transmitting their data via this system; 161 of these also entered their data in the Global Telecommunication System (GTS) using the DRIBU code, these data being collected at the Paris Regional Telecommunication Hub (RTH). The WMO representative also stated that the Marine Environmental Data Service, Canada, had set up a permanent data archive centre which had been granted the status, within the IOC, of a Responsible National Oceanographic Data Centre (RNODC) for information transmitted by buoys. This centre did not transmit data in real time via the GTS and he emphasized that many buoy operators did not agree that their data should be entered in the data bank set up by Canada. Besides the drifting buoys referred to, there were 114 moored buoys and 80 platforms operated by 11 countries. The latter transmitted their data via geo-stationary satellites; data inserted in the GTS system were sent in SHIP code.

The Joint Working Group was informed that during the thirty-seventh session of the WMO Executive Council, held in June 1987, it had been decided to sponsor a Drifting-Buoy Co-operation Panel (DBCP) with the aim of improving co-ordination and co-operation between the drifting-buoy programmes which also

provided support for the programmes previously alluded to; the IOC Assembly had subsequently accepted the WMO invitation to co-sponsor this Panel, which had a Technical Co-ordinator operating in Toulouse, France.

The Joint Working Group was informed that over the past ten years a series of automated shipboard systems had been developed for the observation and transmission of meteorological and oceanographic data. The most frequently used was the Shipboard Environmental Data Acquisition System (SEAS) manufactured by the United States of America. Similar systems produced by other countries also existed and were being installed in Voluntary Observing Ships (VOS). Over 200 of these ships were now equipped in that way and the number was constantly increasing. The JWG agreed that the more widely this type of system was employed, the greater the improvement would be in the quality, quantity and availability of both meteorological and oceanographic data which would be transmitted via the GTS and, hence, be accessible to Member States.

As regards the availability of data of the BATHY/TESAC type, the JWG noted that an average of over 140 BATHY/TESAC reports were transmitted daily through the GTS. The WMO representative was disturbed to see that, of these, only 10 or 12 originated in the Southern hemisphere and that this imbalance appeared to be worsening, despite the new XBT lines that had been established, particularly through the TOGA programme. He pointed out, moreover, that this might be the result of an insufficient number of coastal radio stations or irregularities in the national GTS circuits; it might also be due to the lack of International Maritime Satellite Organization (INMARSAT) stations in the Southern hemisphere. He also informed the meeting that the WMO Commission for Marine Meteorology was currently engaged in efforts to increase the number of coastal radio stations and to improve existing stations so that a greater number of BATHY/TESAC and SHIP type messages might be received, particularly in the Southern hemisphere, and the efficiency of data transmission between these stations and the GTS circuits increased, having regard to the fact that only 33 per cent of coastal radio stations available to accept meteorological messages from ships also accepted oceanographic messages without cost to ships.

The Joint Working Group noted the statistics on the contribution of BATHY/TESAC reports from South American countries for the period 1977-1987 which were transmitted through the GTS, prepared in accordance with monthly data supplied by Argentina (and, since 1987, by Brazil as well). The JWG noted regretfully that during 1985 not one of the observations made succeeded in being transmitted via the GTS; the improvement in these activities that was now being achieved was due apparently to the results of close collaboration between IGOSS and TOGA.

The Joint Working Group was informed that all the WMO Regional Associations had adopted, during their most recent meetings, resolutions concerning the regional development of IGOSS and that, in particular, Regional Association III (South America) whose meeting had taken place in Lima in 1986, had noted with disquiet that support for the IGOSS programme within the region continued to be confined to a small number of countries and that the number of BATHY/TESAC observations was extremely limited. It had noted nevertheless that there were a number of members in the region with the capacity for carrying out observations of the BATHY/TESAC type but they were not doing so; it urged them to make full use of this capacity, including active participation in development of the accelerated phase of IGOSS.

The WMO representative also referred to the WMO Second Long-term Plan in terms of the activities foreseen under it for the next decade which were closely related to ocean processes in the Pacific Ocean and other oceans, to the monitoring and better understanding of the 'El Niño' phenomenon and climatic variability associated with Southern oscillation. He emphasized the need to strengthen joint IOC-WMO action within IGOSS as well as Joint Working Group activities concerning 'El Niño'.

As regards the TOGA project, the JWG was informed that since 1984 over 100 buoys for the measurement of atmosphere pressure and air and sea-surface temperature had been deployed in the Southern hemisphere oceans in support of the TOGA programme. Fifty of these were supplying data on a routine basis through the GTS. The JWG also noted that the XBT network set up under the TOGA project in the tropical Pacific consisted of over 20 ship-of-opportunity lines, the criterion for the selection of vessels being the need to ensure minimum average coverage of at least one ship per month. Observations were transmitted in real time as part of IGOSS, either via satellite or radio; the ERFEN countries were also transmitting XBT type observations carried out along west coast sectors of the Central and South American continent in delayed time.

The WMO representative pointed out that the seventh meeting of the TOGA Scientific Group, which had met in Australia from 11 to 15 July 1988, had agreed that it was essential for XBT data to be exchanged internationally on the nearest possible real-time basis so that the possibility might be explored of transmitting at least some of this information through the GTS.

The Joint Working Group was pleased to note that as from the current year, the TOGA Marine Climatology Data Centre, installed in the Marine Information and Advisory Service of the British Meteorological Office (Bracknell), had entered its operational phase, as had the International TOGA Project Office in the WMO headquarters in Geneva.

3.3 Report of the CPPS Secretariat

Activities carried out by the CPPS Secretariat concerning investigation of 'El Niño' and its social and economic effects during the intersessior period were mainly as follows:

The sixth session of the ERFEN Scientific Committee took place in C .ao, Peru, from 22 to 26 June 1987, at which the characteristics of th 1987 moderate 'El Niño' were established. As practically the whole of 1987 .d been marked by anomalies following a reactivation of 'El Niño', the CPPS had held an emergency meeting in Guayaquil from 3 to 5 December 1987 with the notable participation, via telex, of Dr Klaus Wyrtki of the University of Hawaii and Dr Forest Miller of the Inter-American Tropical Tuna Commission, in response to an invitation by the CPPS Scientific Secretariat.

Following these two meetings relating specifically to ERFEN, the CPPS had organized the 'International Symposium on Living Resources and Fisheries in the South-East Pacific', co-sponsored by CPPS/FAO/UNEP/IOC/CEE and other regional institutions. This symposium, attended by over 250 participants, was held in Viña del Mar from 9 to 13 May 1988. On the subject of 'Living Resources and their Environment', studies were discussed which dealt with structural aspects, ocean and climatic processes, and 'El Niño' in relation to living resources.

The CPPS Secretariat had also organized a Technical Consultative Meeting on the Socio-Economic Effects of 'El Niño' in the South-East Pacific which was

held in Guayaquil from 17 to 21 October 1988. An outline project was drawn up which focused on evaluation of socio-economic impacts, the prevention and mitigation of disasters, and the turning to account of positive effects. It was hoped that international funding agencies such as the Inter-American Development Bank (IDB) and other organizations might support this project which was essential to the South-East Pacific countries.

Finally reference was made to the seventh session of the ERFEN Scientific Committee which had been organized by CPPS in conjunction with IOC and WMO and with the support of CONA (Chile). This meeting had been held from 21 to 23 November 1988 in Viña del Mar, the main outcome of its work being the characterization of meteorological, oceanographic and biological-fishery conditions for 1988; the drawing up of an ERFEN Plan of Action for 1989; and discussion of possible ways of improving the data exchange system. As regards the latter point, the Secretary for Scientific Affairs of CPPS, Co-ordinator of ERFEN, mentioned two facilities that currently existed - the ERFEN Bulletin which was issued regularly, and the Climate Analysis Bulletin. He indicated the importance of overcoming obstacles and seeking new and more rapid channels for the dissemination of meteorological and oceanographic data.

In conclusion, he referred to the satisfaction of participants, particularly the ERFEN co-ordinators, at the important contribution to the meeting of the Scientific Committee made by the IOC and WMO co-sponsors and to that of the representatives of the United States of America, the Federal Republic of Germany and the People's Republic of China.

The co-ordinators of the Working Groups on Meteorological, Oceanography and Biology at the seventh session of the ERFEN Scientific Committee then presented summaries, established on a regional basis, of the respective investigations carried out by the ERFEN countries during 1987-1988.

The Joint Working Group noted with satisfaction the reports submitted by the three co-sponsoring organizations. At the same time it drew attention to the quality of the regional conspectus produced at the CC-ERFEN session and presented by the respective co-ordinators.

4. GLOBAL INVESTIGATIONS RELEVANT TO THE SOUTH-EAST PACIFIC REGION

4.1 Tropical Ocean and Global Atmosphere project (TOGA)

The general theme of the importance of global investigations such as TOGA and WOCE for the ERFEN region was introduced by the Chairman of the Joint Working Group. He drew attention to the possible and important interaction between the interannual time-scale and the ten-year and hundred-year time-spans. Various ongoing investigations based on data which enabled the probable occurrence of the 'El Niño' phenomenon over the last four or five centuries to be determined were referred to, as were coupled numerical models. The latter had suggested the possibility that interannual variability, e.g. the frequency and intensity of 'El Niño' events, responded to underlying climatic parameters which varied according to a much longer time-span. The observations quoted clashed with what had occurred over the last 500 years, which included the 'little ice ages' of the sixteenth, seventeenth and eighteenth centuries. However, the weighing of evidence indicated that the corresponding interannual variability would not have been significantly different from current variability if statistics over one or more centuries were averaged out. None the less, he reiterated that these long time-scale studies had shown at least two trends of immediate importance for ERFEN and TOGA:

(i) over a period of 450 years, the most frequent interval between successive occurrences of 'El Niño' of a strongly marked kind (1957-1958, 1972, 1982-1983, etc.) was seven years; and that

(ii) the shortest intervals between those strongly marked episodes occurred at the end of the century (e.g. the present time), statistics reflecting an important centennial fluctuation accordingly.

As a corollary to this introduction, a clearly statistical inference could be drawn to the effect that in 1990 the beginnings would be seen of an 'El Niño' occurrence of the strongly marked type, with a fairly high index. The ERFEN programme should therefore take appropriate precautions in regard to monitoring, preventive and warning measures during 1989, particularly towards the end of the year.

The Chairman of the JWG went on to refer to the current stage of implementation of the TOGA project in the ERFEN region. He described the characteristics of the TOGA-USA programme in the East Pacific which consisted essentially of a single project being carried out through the Atlantic Oceanographic and Meteorological Laboratory (NOAA/AOML, Miami) under the direction of Dr David Enfield and Dr Donald Hansen. With the aid of regional bodies, environmental monitoring was being carried out, measurements of two kinds being transmitted in real time via Geostationary Operational Environmental Satellites (GOES): (a) sea level, sea-surface temperature and meteorological parameters, all measured in fixed coastal and island stations by means of Data Collection Platforms (DCP) (Enfield); and (b) sub-surface data (XBT) collected by ships-of-opportunity (Hansen).

Fixed stations were of three types: marigraphic, meteorological and fixed buoys. The marigraphic stations consisted of various DCP of the Handar make which measured and transmitted sea level and air- and sea-surface temperatures at intervals of three or four hours. They were located (from north to south) at Baltra Island, Libertad, Lobos Island, Callao, Arica, Caldera, San Felix Island, Easter Island and Valparaiso. Because of the form of the South American continent and the location of Easter Island, the Handar stations were very well placed for defining the geostrophic circulation of the South-E Pacific gyre, distinguishing the continental series from the island ser . The dynamic height difference thus established was of the order of 30 cm nd the interannual variation was estimated at least 10 cm., this being sily detectable by marigraphs. Another probable use of marigraphic data - fo these were received in real time - was in carrying out intensive monitoring at monthly, or shorter, intervals, establishing special indices based on sea level and temperatures. These would be of greatest importance in the platforms in north Peru and Ecuador, where the initial arrival of Kelvin waves associated with the beginning of a 'El Niño' episode could be detected, and this information disseminated by means of a warning system.

Meteorological DCP were of the Synergetics make and were located in Talara, Lobos Island, Callao and San Felix, with a back-up maintained in Valparaiso. They measured winds, air temperature, barometric pressure and solar radiation. Special attention was drawn to the Talara station which had functioned extremely well; it was situated in a zone of frequent meteorological disturbance during the occurrence of 'El Niño'. The San Felix station and the nearby meteorological buoy were also highlighted, for they were located in a data-sparse zone where it was believed that important anomalies occurred on the eve of a typical 'El Niño' Southern Oscillation (ENSO) episode.

XBT sampling routes in the East Pacific were indicated, and attention drawn to graphics showing the distribution of data relating to Peru over a 35-year period (1952-1987). The Chairman of the JWG emphasized the importance of processing data for subsequent analysis; this would contribute to the building up of a regional data base and the establishment of a climatology of the sub-surface thermal structure. He highlighted the efforts currently being made by Dr Pablo Lagos (Instituto Geofísico del Peru - IGP) and Dr Donald Hansen (NOAA/AOML) to achieve this with the Peruvian data and stressed how important it was for this work to be extended to the rest of the ERFEN region.

The final point made by the Chairman referred to plans to instal new DCP equipment in Coco Island (Costa Rica) and Malpelo Island (Colombia). The Colombian location was of considerable importance for the region, for sea-level differences measured by existing continental stations in Buenaventura and Tumaco would give a very good definition of the variability of the Colombia Current, which had a very marked annual fluctuation and affected the whole of the Panama basin.

The Colombian delegation expressed its country's interest in participation in the TOGA project, which the Colombian Oceanographic Commission had been developing through contacts with the NOAA/AOML, Miami. The so-called TOGA-Malpelo project would be implemented during 1989 and NOAA/AOML participation would be supported through TOGA. The project's main objective was study of the environmental variations associated with the 'El Niño' phenomenon and of their effects on world climate. The project included the installation of an automated tide-gauge system in Malpelo Island and two digital marigraphs in Buenaventura and Tumaco; the deployment of a number of XBT sensors which would be launched from Colombian ships; and funds for the publication of finds in scientific journals. The Colombian contribution would take the form of cruises, data being collected by means of XBT, CTD, etc., between Buenaventura, Tumaco and Malpelo Island, and the provision of monthly marigraphic data and periodic marigraph measurements. Colombia would also provide technical and scientific personnel to carry out the proposed activities and the research that would ensue. The JWG drew attention to the benefits that the ERFEN programme would derive from the Malpelo Island automated station. It would also be of fundamental importance for the IGOSS programme on sea-level measurement and also for tide prediction at the Colombian level.

Professor Chenglan Bao (People's Republic of China) stated that meteorologists and oceanographers in his country were extremely interested in the 'El Niño' phenomenon from the theoretical as well as the practical standpoint, because of the serious impact of this phenomenon on the global climate and, more especially, on China's climate. Considerable climatic anomalies were recorded in China, for example, following the 1982/1983 'El Niño'.

China and the United States of America were carrying out joint investigation of ocean-atmosphere interaction related to 'El Niño' in the West Pacific. A State Oceanographic Administration (SOA) research vessel carried out cruises in the West Equatorial Pacific twice a year with invited American scientists aboard. The fifth cruise was currently taking place.

A CPPS delegation had visited the SOA in September 1987 while a SOA delegation had paid visits to the CPPS and the four Member States in 1988. A scientific co-operation agreement had been signed in 1987; the first project under this agreement was one concerning 'El Niño'. The SOA had suggested that four CPPS scientists should come to China in 1989, take part in a month's

cruise, and then remain in Beijing for two or three weeks to analyse data. In 1990 two or three Chinese scientists would visit CPPS countries for the same purpose.

The Chinese delegation proposed that travel should be financed by international organizations, such as the IOC, while the scientists' subsistence expenses should be met by the respective countries.

Dr James L. Buizer (United States of America) stressed the importance for the countries represented at the present meeting of the setting up of the International TOGA Project Office in Geneva. He went on to speak of the recent establishment of the Intergovernmental TOGA Board (ITB). This Board, which was made up of representatives of 16 Member States, met each year with the aim of co-ordinating the various support requirements of the countries taking part in TOGA. The Board also served as a forum where countries could indicate national investigation commitments in regard to the 'El Niño' phenomenon. Finally he stated that the second meeting of the Intergovernmental Board would be held in Geneva from 2 to 5 December 1988 and invited participants to request any information they might require concerning the outcome of that meeting.

Dr Christian Henin (France) stated that French oceanographers were involved in Pacific Ocean studies through centres located in Noumea (New Caledonia) and Papeete (Tahiti).

Within the context of TOGA, France carried out a twice-yearly transect in the West Pacific along 165°E, from 10°N to 20°S.

Since 1984 considerable interannual variability had been observed in the thermal and saline structure. Dynamic height had fallen by over 20 dyn.cm. in the West Pacific during 1987 at the same time as ERFEN countries had observed signs of the 'El Niño' phenomenon.

France had also developed a network of ships-of-opportunity which carried out surface observations covering temperature, salinity, chlorophyll and zooplankton. SURTROPAC (Survey of Tropical Pacific) had begun these observations in 1969. Sub-surface thermal structures had also been observed since 1979 by means of XBT. The main findings concerned evaluation of zonal transport in the tropics, especially during the 1982/1983 'El Niño'. The network covered the whole of the Tropical Pacific and the extreme north of the 'El Niño' 3 Area; it was sampled on a monthly basis along the Panama-Tahiti shipping lane. It was hoped in future to commence observations between Valparaiso and Papeete in co-operation with Chile.

It had been shown that in the Central and West Pacific drastic changes occurred in thermal structures during the 'El Niño' phenomenon because of changes in winds and wind intensity and in the position of the South Pacific Convergence Zone (SPCZ); these, in turn, produced very marked changes in surface salinity. One of the findings of these studies was that the indication of the 'El Niño' was very marked in the equatorial zone of the whole of the South Pacific.

Understanding of long-term changes required close collaboration between scientists in all the Pacific countries. In this connection France was to hold a TOGA meeting in May 1989 at the Noumea Centre which would focus on the results, in terms of observations and theories, of the first four years of the TOGA project. This meeting would not be strictly limited to the West or Central Pacific since studies were of wider scope.

4.2 World Ocean Circulation Experiment (WOCE)

The Technical Secretary, after reminding participants of the main objectives of the World Climate Research Programme (WCRP), described in more detail the aims and purposes of this world experiment, its programme of observations, observation systems and data management. He highlighted the significance of the International WOCE Scientific Conference (Unesco, Paris, 28 November-2 December 1988) in regard to the complete review of the WOCE Implementation Plan, and the importance of active participation by countries in the South-East Pacific region in order to ensure that all their interests were represented adequately. He reiterated the need to provide clarification during that conference concerning the institutional co-ordination mechanisms (intergovernmental or otherwise) at the world and regional levels. The Technical Secretary went on to comment on the recommendations of the IOC Expert Consultation and Workshop on Ocean Dynamics and Climate in South America held in Buenos Aires, Argentina, from 18 to 22 July 1988.

Several delegations and the CPPS representative expressed their interest in a number of aspects of the Technical Secretary's statement on WOCE. The major subjects of concern were the level of resources available for this large-scale experiment; its relationship with the TOGA project; regional and global co-ordination (intergovernmental or otherwise); and its relevance to the ERFEN programme.

5. REQUIREMENTS FOR ONGOING AND PLANNED ACTIVITIES

5.1 Monitoring and Prediction of the 'El Niño' Phenomenon in the South-East Pacific: Application to Development (IOC/CPPS regional project supported by UNDP and other sources)

The Technical Secretary introduced this agenda item, noting that the subject had been reviewed in detail at the seventh session of the ERFEN Scientific Committee held a few days earlier. The ERFEN Scientific Committee had approved Recommendation CC-ERFEN VII.8 on this subject.

The delegation of Chile reaffirmed its support for Project RLA/88/010 while expressing concern at the drastic reduction in the funds assigned by UNDP and requesting a modification to paragraph 1.8 of the project document to the effect that this proposal complemented the ERFEN programme and did not represent its continuation.

The WMO representative referred to the multidisciplinary character of the project and asked that the contribution and participation of WMO should be included in future initiatives of this type.

The Joint Working Group approved Recommendation 'El Niño' VI.1.

Professor Wolf Arntz (Federal Republic of Germany) provided information concerning a complementary proposal on comparative regional investigation of the biological effects of the 'El Niño' phenomenon in the coastal ecosystem along the west coast of South America.

The aim was to carry out comparative investigations concerning the impact of 'El Niño' at different latitudes of the west coast of South America in the area most affected (Buenaventura - Antofagasta and the Galapagos) and the mechanisms that caused these effects on species or communities in these zones. As was known, the whole of the Humboldt Current area had fauna and flora that

were, to a certain extent, common. Although admittedly they were not the same species, they were often species that were very close to being a genus. It had been observed that the effects of 'El Niño' could be very different, for in the north the impact was greater than in the south as regards mortality and proliferation. However, in many cases the data collected by different scientists were not comparable, varying as they did in time and space, in the vertical as well as the horizontal sense. Furthermore, although effects were clearly visible, in many cases no experiments had been carried out to identify the most important ecological factor involved.

In order to tackle the problem, the data collection system in the various centres had to be improved or intercalibrated and experiments should be launched to see in what form the 'El Niño' phenomenon was affecting the area and not simply to record the effects (although a fuller inventory of effects was necessary).

The first step would be the holding of a workshop in which groups would discuss methodology, recommend the form that investigations would take and define final projects and the most urgent requirements of co-ordinated research (involving specialists in study of the benthos, plankton, algology, fishery biology, ornithology and mammology, with the support of marine chemists working on nutrients).

The tentative date for the Workshop was 19 to 27 September 1989 and it would be held at the Charles Darwin Station, Santa Cruz, Galapagos, Ecuador.

Delegations from the ERFEN countries expressed unanimous support for the proposal by the Federal Republic of Germany and offered the fullest possible co-operation in the venture.

The JWG stressed the advantages that joint CPPS-IOC sponsorship represented for effective regional co-ordination.

5.2 Regional Component of the IOC Global Sea-level Observing System (GLOSS)

At the request of the Joint Working Group Officers and in the light of his recent experience as IGOSS Operations Co-ordinator and IOC Technical Secretary, Mr John Withrow of the delegation of the United States of America introduced this agenda item.

He reviewed the present state of IGOSS development at the global level and its relationship with components in the South-East Pacific region. He noted that over 50 Member States had incorporated IGOSS stations in the programme at the global level and that all the Member States in the ERFEN region were implementing GLOSS stations which were providing the respective data. He also noted that a GLOSS station had been brought into service recently by Chile in San Felix island.

The Chairman of the JWG then gave a brief description of the TOGA sea-level measurement system and was followed by the delegates of Chile, Colombia and Peru who provided information on their countries' contributions to GLOSS.

As regards the Malpelo Island project referred to by Dr Enfield in his statement, Colombia was asked by the JWG to bring this station into the GLOSS system as soon as it became operational.

The Chairman of the JWG then referred to the results of the meeting of the Committee for the International Association for the Physical Sciences of the Ocean (IAPSO) concerning the geodesic control of marigraphs, which had taken place from 8 to 10 November 1988 at the Woods Hole Oceanographic Institute, with the co-sponsorship of NOAA. The meeting had dealt with aspects of geodesy, tectonics, geomagnetism, geophysics, physical oceanography, altimetry by satellite, absolute gravity, modelling of the geoid, and other matters relevant to the question of sea-level measurement. The main feature in the technical specifications recommended was that the principal reference framework should be based on the norms of the International Earth Rotation Service (IERS). Dr Enfield reiterated the need for, and potential importance of the application of these methods for the levelling of the regional tide-gauge system, including the possibility of recovering information for long-time series from historical records.

5.3 Regional Component of the IOC-WMO Integrated Global Ocean Services System (IGOSS)

Mr John Withrow was also invited to introduce this agenda item, particular emphasis being placed by him on the IGOSS programme for sea-level measurement in the Pacific basin. He noted that as a result of a recent recommendation by the IOC-WMO Working Committee for IGOSS, the pilot project for sea-level measurement in the Pacific had been upgraded to the status of a permanent operation. On this same subject, he also referred to the Committee's action to develop a flexible code scheme; the first parameter of this new scheme to be established was that relating to sea-level codes.

Mr Withrow then went on to describe the state of implementation of the BATHY/TESAC Observation Programme. He noted that in the South-East Pacific region sampling arrangements were particularly lacking, even to cover basic investigation needs. He urged Member States in the region to step up their efforts to increase their BATHY/TESAC reports. He informed participants that IGOSS had implemented the TRACKCOD support code for measurements gathered along shipping lanes. He urged Member States to use this regional and global programme code. Mr Withrow then reviewed the regional situation of the ships-of-opportunity component.

The delegations of Chile, Colombia and Peru gave details of their current efforts under the BATHY/TESAC programme. These statements were followed by a full discussion concerning the urgent need for the exchange of XBT data so as to enable integrated regional 'products' to be developed on the basis of this information.

Concluding discussion of this agenda item, the Technical Secretary gave preliminary information concerning an IGOSS proposal keyed to the interests of the fishing industry. It was based on a number of previous recommendations made by the Working Group for IGOSS. As an initial step Chile had been selected as the potential Member State for developing this venture, with a view to its subsequent extension to the region. The proposal would be thoroughly reviewed with the competent Chilean authorities during a mission to that country by the IGOSS Co-ordinator, to take place in December 1988. Mr Ricardo Rojas, IGOSS focal point in Chile, pointed to the need to channel this initiative through current implementation arrangements for IGOSS in his country. Finally the Technical Secretary announced that aspects relating to this proposal would be examined at a symposium on operational oceanography for fisheries to be held in Canada in October 1989 under the joint auspices of the IOC and the WMO.

5.4 Regional Marine Observing System Component of the Global Observing System of WMO

The WMO representative stated that during the Tenth World Meteorological Congress, many Member States had noted the importance of ocean-atmosphere interaction studies and their influence on WMO activities. These studies referred to the exchange of heat, moment, humidity, chemical constituents (liquid and solid) and gaseous pollutants between the atmosphere and the ocean. He also drew attention to the development of coupled ocean-atmosphere modelling and other aspects of investigation such as those which referred to the 'El Niño' phenomenon; these studies had a bearing on a number of WMO programmes. He added, furthermore, that the Tenth Congress had highlighted regional activities such as the integrated studies on the 'El Niño' phenomenon and had agreed that the WMO should, as far as was possible, devote considerable attention to such activities, particularly those which concerned operational aspects and marine meteorological services. Similarly, the Ninth Meeting of Regional Association III, held in Lima in April 1986, had attached great importance to action designed to equip the region with meteorological services, particularly through improvements in the collection of meteorological data by vessels, the expansion of marine meteorological services and the introduction of the Port Meteorological Officer system (PMO). Mr Guzmán referred to the current situation of the regional marine meteorological system, stating that of the four Member States on the region's west coast, only two had responsibility for issuing bulletins and warnings for ships at sea and for providing forecasts for coastal waters; three operated the PMO system in one or more ports in their respective countries; two countries operated eight coastal radio stations which accepted SHIP reports without cost to ships. Of these seven were located in Chile and one in Peru. Colombia planned to establish two coastal stations on each of its ocean coasts.

At the fifth session of the Joint Working Group mention had been made of the lack of efficiency of the GTS system in the ERFEN region and Recommendation 'El Niño' V.1 had been adopted; this requested the WMO to support countries in improving the transmission of real-time data through the GTS. The lack of real-time data available to marine meteorological services and for research activities might be due to the influence of the following two factors:

(i) Volume of observations

Under the Voluntary Observing Ship programme (VOS), vessels using ocean shipping lanes were recruited for the purpose of effecting and transmitting meteorological and oceanographic observations. This made an important contribution to the Global Observing System of the World Weather Watch and was the main source - both currently and for the future - of meteorological information obtained from the ocean surface. Use of new technological means (satellites, automated buoys) supplemented the observations obtained.

In accordance with WMO technical regulations, each Member State should recruit vessels in its national registers in order to install mobile stations on board, thus helping to achieve the common aim of ensuring sufficiently complete ocean coverage. It was desirable to secure uniform coverage but this was difficult owing to the very considerable differences in the volume of sea traffic, which was denser in the Northern hemisphere in comparison with the tropics and the Southern hemisphere.

Voluntary Observing Ships were classified under three heads: selected, supplementary and auxiliary. In the four ERFEN countries only two ships had been recruited with the result that availability of data in the region was virtually nil.

One Member State in the region had asked the WMO Secretariat for a study which would determine the potential availability of SHIP reports in delayed time; this information was provided by the World Climatological Data Bank (British Meteorological Service). The study showed that reports in delayed time from ships in the South-East Pacific were also sparse; a distribution by Mardsen squares indicating the number of observations in each showed fewer than ten observations per month in some cases. This same shortfall was demonstrated in a review of data availability carried out in region III between 7 and 13 March 1988. And yet there were commercial shipping lanes in the Pacific Ocean which were extremely busy and they represented an excellent potential means of increasing the number of observations.

The central component of the IGOSS observing system continued to the BATHY/TESAC observations, and these represented an important source of the data covering surface temperature, salinity, currents, etc. which were collected and exchanged. The total number of BATHY/TESAC observations exchanged via GTS in 1987 exceeded 56,000 (46,000 in 1986) and figures for 1988 showed constant progress in the availability of real-time data. Implementation of the TOGA project had made a significant contribution to obtaining BATHY type information.

Among suggestions for improving the obtaining of observations it was proposed to appoint Port Meteorological Officers (PMO) in the main ports in the ERFEN countries. These Officers were essential for they were responsible for recruitment, the calibrating of instruments on board and collection of the ships' observation registers.

(ii) Data collection system and telecommunication arrangements for data transmission

Mr Guzmán pointed out that in the ERFEN region there was no coastal radio station north of Callao, which hampered reception of observations carried out at sea. The International Maritime Organization (IMO) had adopted the SAFETYNET system as a requirement for ships from 1992 onwards; this formed part of the Global Maritime Distress and Safety System. Very successful tests with this system had been carried out at sea in 1987 with the INMARSAT used jointly by the IMO, the IHO (International Hydrographic Organization), the WMO and a number of North Atlantic countries.

At the last meeting of Regional Association III, it had been pointed out that the introduction of INMARSAT would have wide repercussions on Member States as regards the collection of ship messages, dissemination of their products, and forecasting and warnings in general.

He stated that there was a total of 20 INMARSAT terrestrial stations and that only seven of these accepted meteorological bulletins from ships without charge to them, while only two accepted BATHY/TESAC information. In South America there were no stations that accepted this type of information. In view of this situation the following ways of improving data collection might be suggested:

(a) the establishment of an information station north of Callao to enable these data to be collected, bearing in mind that countries requiring aid could apply to the WMO for this through the Voluntary Co-operation Programme;

(b) the checking of the operation of existing coastal stations to see if they functioned while maritime traffic was transmitting meteorological and/or oceanographic observations;

(c) the identification of difficulties that ships might experience in making contact with these coastal stations.

In regard to Recommendation 'El Niño' V.1, the linking via the GTS circuits of National Meteorological Centres with their respective Regional Centres had improved, this being carried out at the present time by satellite or microwave facilities (Santiago-Buenos Aires link). Control exercises for data transmission were continuing.

A number of delegations stated that notwithstanding the fact that links existed, data distribution was not always being carried out and this redistribution process should be checked.

The delegation of Chile informed the meeting that in the past the Chilean Meteorological Directorate had not been able to provide the meteorological services that it had wished to do. Chile had requested WMO support in order to improve them. This operation was in its initial stage of implementation and two consultants had been requested whose task would be to lay the foundations for the establishment and regular provision of the information that such a service was intended to supply, and to improve facilities for the reception of SHIP and BATHY/TESAC messages. Improvements were also being made in the GTS at the national level, the ultimate aim being the automation of the system. It was proposed that ocean observation messages received should be immediately inserted in the GTS instead of being collected, as occurred at present, through the Naval Meteorological Service. The consultants would also be required to indicate the best way of using available personnel, and what contribution would be made by the PMO. They were confident that once the consultants' task was completed, the activities described would be launched during the first half of 1989, reaching their culmination during the first seven months of 1990.

The Chairman of the JWG stressed the enormous interest in the region in developing capacity for receiving, processing and analysing satellite data, especially images in the infra-red (thermal) band received from the GOES and NOAA satellites, and the current and future altimetric data provided by GEOSAT, ERS-1 and TOPEX. He laid special emphasis on the fact that as of now technology enabled a researcher to process and analyse images at his own desk making use of the new PC type World Stations. He pointed out that image analysis software programmes for this type of computer were at the development stage in many parts of the United States and he believed that they would be available for the region within a period of one to two years, either commercially or through agreements and exchanges with laboratories such as the NOAA/AOML, Miami.

5.5 Future regional requirements for 'El Niño' monitoring

The Chairman invited Dr Pablo Lagos, Vice-Chairman of the JWG, and member of the delegation of Peru, to describe a regional proposal for the appreciable improvement of monitoring possibilities in respect of the 'El Niño' phenomenon

through the quasi real-time publication of a Climate Warning Bulletin. This medium of exchange would make use of various information sources operating in the region and easily accessible to the proposed system.

The Vice-Chairman's proposal led to a wide-ranging and informative discussion among the delegations and representatives of the organizations present. The view of the JWG was that the initiative warranted the drawing up of a pilot project on the basis of the components suggested by Dr Lagos.

The representative of the United States of America offered to explore the possibilities of aid by his country in order to strengthen the regional electronic system for data transmission so that the distribution of the Climate Warning Bulletin might be expedited. He noted that this possibility of aid would be substantially improved if other sources contributed to it (IOC, WMO, CPPS and OAS, among others).

The Joint Working Group approved Recommendation 'El Niño' VI.2.

6. ELECTION OF OFFICERS

The delegation of Colombia proposed Dr David Enfield for re-election as Chairman, and Dr Pablo Lagos as Vice-Chairman of the Joint Working Group. This proposal was supported by all the delegations and Dr Enfield and Dr Lagos were re-elected unanimously.

7. DATES AND PLACE OF THE SEVENTH SESSION

It was proposed that the seventh session take place in about two years' time, in conjunction with a session of the ERFEN Scientific Committee and, if possible, during the first two weeks of November. The IOC, WMO and CPPS were asked to co-ordinate the final dates and place for the seventh session of the Group with the host country.

8. ADOPTION OF THE SUMMARY REPORT

The summary report and recommendations of the session were adopted.

9. CLOSURE

In closing the session, the delegation of Colombia expressed the Joint Working Group's appreciation of the excellent facilities, support and courtesy extended to it by the National Oceanographic Committee of Chile.

The Chairman and Vice-Chairman warmly endorsed this expression of appreciation and thanked participants for the confidence they had shown in re-electing them for a further period.

The session was closed at 5 p.m. on 26 November 1988.

ANNEX I

AGENDA

1. OPENING

2. ADMINISTRATIVE ARRANGEMENTS

   2.1 Adoption of the agenda
   2.2 Designation of the Rapporteur for the session
   2.3 Conduct of the session, timetable and documentation

3. REVIEW OF INTERSESSIONAL ACTIVITIES

   3.1 Report of the IOC Secretariat
   3.2 Report of the WMO Secretariat
   3.3 Report of the CPPS Secretariat

4. GLOBAL INVESTIGATIONS RELEVANT TO THE SOUTH-EAST PACIFIC REGION

   4.1 Tropical Ocean and Global Atmosphere project (TOGA)
   4.2 World Ocean Circulation Experiment (WOCE)

5. REQUIREMENTS FOR ONGOING AND PLANNED ACTIVITIES

   5.1 Monitoring and Prediction of the 'El Niño' Phenomenon in the South-East Pacific: Application to Development (IOC/CPPS regional project supported by UNDP and other sources)
   5.2 Regional Component of the IOC Global Sea-level Observing System (GLOSS)
   5.3 Regional Component of the IOC-WMO Integrated Global Ocean Services System (IGOSS)
   5.4 Regional Marine Observing System Component of the Global Observing System of WMO
   5.5 Future regional requirements for 'El Niño' monitoring

6. ELECTION OF OFFICERS

7. DATES AND PLACE OF THE SEVENTH SESSION

8. ADOPTION OF THE SUMMARY REPORT

9. CLOSURE

ANNEX II

RECOMMENDATIONS

Recommendation 'El Niño' VI.1

MONITORING AND PREDICTION OF THE 'EL NINO' PHENOMENON IN THE SOUTH-EAST PACIFIC: APPLICATION TO DEVELOPMENT

(IOC-CPPS regional project supported by UNDP - RLA/88/010)

The Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño',

Recalling, inter alia, Recommendation 'El Niño' III.1, Recommendation No. 5 of the sixth session of the Scientific Committee for ERFEN, and Recommendation No. 8 of the seventh session of that Committee,

Noting with satisfaction the efforts made by Member States of the Permanent Commission for the South Pacific (CPPS) in the implementation of the ERFEN programme,

Bearing in mind the adverse socio-economic repercussions of this recurring phenomenon on coastal communities, the fishing industry and the agricultural sector on the Pacific coast of South America,

Observing the relationship between the regional manifestation of the 'El Niño' phenomenon and other ocean-atmospheric disturbances on both the Pacific Basin and global scales,

Considering the links between the ERFEN regional programme and World Climate Research Programme (WCRP) components such as TOGA and WOCE,

Recognizing the combined IOC and CPPS action in the successful outcome of the negotiations concerning the present project,

Recommends:

(i) that the IOC and CPPS Secretariats once again urge the United Nations Development Programme (UNDP) authorities to ensure that the competent bodies receive rapid official information concerning approval of project RLA/88/010 in its updated version, stressing that this constitutes important support for the initial phase of acceleration of the ERFEN programme;

(ii) that Member States of the Joint Working Group and, more especially, Chile, Colombia, Ecuador and Peru, speed up the process of implementation of project RLA/88/010, applying to the UNDP for its financing.

Recommendation 'El Niño' VI.2

CLIMATE WARNING BULLETIN

The Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño',

Having regard to the modernization of the oceanographic and meteorological observation system in fixed stations by means of the use of Data Collection Platforms (DCP) along the west coast of South America financed under the TOGA-United States programme,

Noting that these platforms carry out observations and transmit data to the GOES satellite which can be received by existing terrestrial stations in countries in the region or by means of electronic links with the United States,

Drawing attention to the existence of new communication data-processing equipment which facilitates the rapid exchange of data,

Stressing, once again, the need in the region to improve the exchange of real-time data,

Recommends:

1. To the CPPS:

   (i) that the monthly publication of a Climate Warning Bulletin be put in hand at the earliest possible moment, the Bulletin to contain graphics showing daily values of the main oceanographic and meteorological variables observed in strategically selected platforms, together with climate indices and other information relevant to the monitoring of the 'El Niño' phenomenon;

   (ii) that the capacity for distribution and reception of this Bulletin be arranged as quickly and as frequently as possible during periods marked by signs of the imminent occurrence of an 'El Niño' phenomenon;

2. To the IOC and the WMO:

   that they co-operate in the publication of the Bulletin by suitable means or through the RLA/88/010 project, as may be appropriate.

ANNEX III

LIST OF PARTICIPANTS

1. MEMBER STATES

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ANNEX IV

LIST OF ACRONYMS AND ABBREVIATIONS

AOML	Atlantic Oceanographic and Meteorological Laboratory (NOAA)
CCCO	Committee on Climate Changes and the Ocean, SCOR-IOC
CC-ERFEN	ERFEN Scientific Committee, CPPS
CONA	Comité Oceanográfico Nacional, Chile
CPPS	Permanent Commission for the South Pacific
DCP	Data Collection Platform
EEC	European Economic Community
ERFEN	Regional Investigation of the Phenomenon 'El Niño' (Colombia, Chile, Ecuador, Peru), CPPS
ENSO	El Niño and the Southern Oscillation
FAO	Food and Agriculture Organization of the United Nations
GLOSS	Global Sea-level Observing System, IOC
GTS	Global Telecommunication System, WMO
IAPSO	International Association for the Physical Sciences of the Ocean
IDB	Inter-American Development Bank
IGOSS	Integrated Global Ocean Services System, IOC-WMO
IGP	Instituto Geofísico del Perú
IHO	International Hydrographic Organization
IMARPE	Instituto del Mar del Peru
IMO	International Maritime Organization
IOCARIBE	Sub-Commission for the Caribbean and Adjacent Regions, IOC
IOC	Intergovernmental Oceanographic Commission
ITB	Intergovernmental TOGA Board
NOAA	National Oceanic and Atmospheric Administration (U.S.A.)
OAS	Organization of American States

OPC	Ocean Processes and Climate, IOC
OSLR	Ocean Science in Relation to Living Resources, IOC-FAO
PMO	Port Meteorological Officers
RTH	Regional Telecommunications Hub, WMO
SARP	Sardine/Anchovy Recruitment Project, IREP-OSLR
SCOR	Scientific Committee on Oceanic Research
SHN	Servicio de Meteorología Naval, Chile
SOA	State Oceanographic Administration, China
SOC	Specialized Oceanographic Centre, IOC
SPCZ	South Pacific Convergence Zone
TOGA	Tropical Oceans and Global Atmosphere project
Unesco	United Nations Educational, Scientific and Cultural Organization
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WOCE	World Ocean Circulation Experiment
WMO	World Meteorological Organization