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REPORT OF THE JOINT IOC/WMO IMPLEMENTATION CO-ORDINATION MEETING ON IGOSS IN WESTPAC AND NORPAX REGIONS

(Tokyo, 9-13 November 1981)

GENERAL SUMMARY OF THE WORK OF THE MEETING

1. ORGANIZATION OF THE MEETING (Agenda item 1)

1.1 Opening of the meeting

The Joint WMO/IOC Regional IGOSS Implementation Co-ordination Meeting in WESTPAC and NORPAX Regions was opened by Dr. J. Masuzawa on 9 November 1981 at the headquarters of the Japan Meteorological Agency (JMA), Tokyo, Japan.

1.1.1 Dr. J. Masuzawa, Director General of the JMA, extended a warm welcome to the delegates to Japan and to the JMA. Noting the progress of IGOSS in the last decade, he pointed out that mankind's dependence on the ocean for food, natural resources and commerce has made us vulnerable to its whims, thus increasing the need to study the ocean with timely and practical programmes such as IGOSS. The fact that Japan, an island country, is constantly influenced by the ocean prompted the JMA to begin regular collection and analysis of IGOSS-type data as early as in 1946. Ten-day mean sea surface temperature analyses were undertaken adding voice broadcasts of oceanographic information in the late 1940's and radio facsimile of oceanographic products in the mid-1950's. JMA was also the first location of a Japanese Oceanographic Data Centre for IGY and IIOE. Noting these firsts by JMA, he expressed the appropriateness of this first IGOSS regional implementation meeting here and wished the participants fruitful results.

1.1.2 Mr. G.L. Holland, chairman of the Joint IOC/WMO Working Committee for IGOSS, stated that the primary objective of IGOSS was to make available to Member States oceanic data required by them for the provision of efficient and effective ocean services whether these be required for operational applications or research and that to achieve this objective IGOSS is designed to provide an international framework for the operational acquisition and exchange of ocean data and the provision and dissemination of timely ocean data products. He stressed the significance of this regional meeting and recalled the recommendation of the second session of the Joint Working Committee which called for the development of IGOSS in selected regions of the world's oceans and, in particular, to respond to the requirements of Member States in the WESTPAC and NORPAX Regions. The second session also adopted guidelines for IGOSS implementation on a regional basis. He expressed the hope that a regional plan could be developed that would co-ordinate the national and international ocean monitoring efforts to the benefit of all participants. Mr. Holland concluded by thanking Dr. Masuzawa for hosting the meeting in JMA and providing the excellent conference facilities.

1.1.3 Mr. S. Mizuno, speaking on behalf of the Secretary-General of WMO, Professor A.C. Wiin-Nielsen, welcomed the participants and stated that his Organization was particularly pleased with the attendance of experts from almost all the Member States and Oceanographic Institutions actively contributing or planning to contribute to the implementation of IGOSS in the WESTPAC and NORPAX regions. He remarked that WMO was looking forward to the establishment of a closer co-operation between IGOSS and other oceanographic programmes and hoped that the meeting will be successful in doing so. In conclusion, he said that the

WMO Secretariat benefited from a thorough preparation of the meeting by the local Secretariat and, in this relation, expressed appreciation to Dr. M. Yasui, Director of the Marine Department, JMA, and his staff members.

1.1.4 Mr. R. Hunt, IGOSS Operations Co-ordinator, expressed thanks to the JMA, on behalf of the IOC, for the preparations for the meeting. He pointed out that as a result of this meeting IGOSS would take a major step toward regional implementation since, as a result, there would eventually be a dependable regional set of data, continuously available, with adequate density to produce operational products. IGOSS would also serve the needs of Member States better by bringing the global programme to the regional level. The meeting's attention was drawn to the previous meeting: the second session of the IOC Working Group for the Western Pacific (WESTPAC) (Jakarta, 19-29 October 1981) where a regional initiative for ocean monitoring including a major IGOSS component was approved.

1.1.5 The list of participants is included with this summary report in Annex I.

1.2 Election of the chairman

Dr. M. Yasui of Japan nominated Mr. G. Holland of Canada, the chairman of the Joint IOC/WMO Working Committee for IGOSS, as the chairman of the meeting. The nomination was seconded by Mr. Withee of the USA and Mr. Holland was unanimously elected.

1.3 Adoption of the agenda

The provisional agenda was adopted without change and is attached to this report in Annex II.

1.4 Working arrangements

The meeting met primarily in plenary. For agenda items 4 and 5, two groups were formed to consider separately aspects related to the IOS and telecommunications and aspects related to the IDPSS respectively. Mr. G.W. Withee (U.S.A.) and Dr. M. Miyake (Canada) were elected to chair these groups.

2. STATUS OF IMPLEMENTATION OF IGOSS IN THE REGIONS, INCLUDING NATIONAL REPORT (Agenda item 2)

2.1 Relevant review documents were introduced by the Secretariats detailing the status of implementation in the regions of each of the components, IOS, IDPSS and ITA. The national reports were then presented by each delegation including Australia, Canada, the People's Republic of China, France, Japan, Philippines, U.S.S.R. and U.S.A. The main features of these reports are summarized below.

IGOSS Observing System (IOS)

2.2 The IOS was compared to a proposed density and frequency grid of BATHY observations submitted by the IOC/WESTPAC Task Team on Ocean Monitoring. IGOSS

BATHY reports met the requirements of this grid for much of the time within the TRANSPAC Shuttle Corridor (30^{o}-50^{o}N) and in the regions around Japan and Hawaii. However, during the period since the beginning of 1978 the grid criteria were only seldom met in other parts of the Pacific Ocean. National reports indicated that there are many observational programmes related to IGOSS in the regions. Observations from ships-of-opportunity provided the dominant contributions and constituted the backbone of the national and co-operative programmes in the Pacific. Research vessels, although very important, have taken fewer total observations because of their small number compared with ships-of-opportunity. These ships will, however, be the basis for future regional hydrographic sections to augment the grid of BATHY observations. Another important source of data which is not yet exchanged operationally is from coastal and island stations. These data include sea level (directly related to heat content of the upper ocean), sea surface temperature, temperature at specified depths, salinity and chemical parameters such as dissolved oxygen, nitrate, phosphate and silicate.

2.3 Research aircraft have contributed a significant number of observations through the use of the air-dropped expendable bathythermograph (AXBT) instruments. These were used in the NORPAX between the Aleution Islands and Hawaii and between Hawaii and Tahiti.

2.4 Drifting and fixed buoys have been important experimental tools. Fixed buoys have been in operational use for some years but have not yet provided reliable long-term subsurface temperature data due to the high failure rate of the thermistor chains. The deployment of fixed buoys is also restricted by their high unit cost which increases with the depth of the deployment site. Recent engineering work has increased the life expectancy of thermistor chains on such devices. Drifting buoys equipped with thermistor chains have been used experimentally in the research experiment STREX at the site of ocean station "P". Subsurface temperature values from these platforms are expected to play an increasing role in co-ordinated observing systems.

2.5 The meeting discussed several systems for shipboard automated transmission of IGOSS data via satellite. These devices which are in the testing stage could mitigate many of the data problems in IGOSS by reducing errors in compilation and the various transmission links as well as reducing the work of ships' radio officers and eliminating the need to transmit through coastal radio stations. The meeting felt automation of data transmission would provide a major boost to the IGOSS Observing System.

2.6 Future observing techniques discussed by the meeting included the use of expendable CTD (XCTD) and expendable sound velocity profilers (XSV). The major advances in observing techniques were considered to lie in these and in automation. Although remote sensing from satellite instrumentation as demonstrated by SEASAT was potentially important, it was considered to lie beyond the five-year time-frame considered by the meeting.

IGOSS Data Processing and Services System (IDPSS)

2.7 A review of the IDPSS in the regions indicated that most (70%) of some 35 products directly related to IGOSS were sea surface temperature products which depend primarily on satellite infrared information and secondarily on SST from SHIP and BATHY/TESAC reports. Subsurface temperature information has only been of sufficient density and frequency in a few restricted areas to allow for the continuous production of operational products. Recent IGOSS products include information on mixed-layer depth and thermal front analyses. Several products are of the forecast or prognosis type.

2.8 Operational products covering the Pacific are produced by seven developed countries: Australia, Canada, the Federal Republic of Germany, Japan, New Zealand, U.S.S.R. and U.S.A. Dr. S. Pazan, Data Manager of NORPAX, presented some ideas for future IGOSS products in the regions. He demonstrated examples of monthly anomaly charts of heat content, SST and mixed-layer depth. These computer-generated anomaly charts were plotted for the entire Pacific basin and were based on climatology derived from the gridding of archived BATHY/TESAC data. He also demonstrated that global wind speed, atmospheric water vapor and wave height charts generated from SEASAT data showed the type of products which may be available in the future. He recommended that IGOSS emphasize standardization in the preparation of products so that adjacent products would be compatible. He suggested that the co-ordination of this aspect of the products should be the responsibility of IGOSS.

2.9 It was pointed out that the IGOSS telecommunicated data set contained three times the number of reports in the archived set derived from logforms and slides or strip charts. It was noted that the latter often requires up to ten years to become available from archiving agencies while the IGOSS data set is available by definition in the timeframe of ocean data users (48 hours to 30 days). It was stressed that IGOSS assures that these operational data be available in the form of an accessible quality-controlled data set.

IGOSS Telecommunication Arrangements (ITA)

2.10 BATHY reports from the Western Pacific usually enter the GTS at Tokyo, Khabarovsk, Vancouver or Washington D.C. Most of the TESAC reports are entered at Moscow. There are GTS Centres in most Member States where IGOSS data could be accessed or input into the GTS. BATHY exchange is typically good between the major GTS Centres mentioned above.

2.11 At the present time BATHY/TESAC reports are submitted manually from ships to coastal radio stations to be retransmitted to the GTS input Centres. In the Western Pacific there are 12 coastal radio stations designated to receive these reports of the 50 which receive meteorological reports. The non-availability of coastal radio stations and the difficulty in reaching a busy station have been pinpointed as reasons why many ships do not submit real time BATHY/TESAC reports. It was pointed out that by accepting delayed mode (more than 48 hours old) data, IGOSS could expect three to four times as many reports, although some of these data may come from coastal waters with a dense network already.

2.12 As mentioned in section 2.1, automatic transmission devices which transmit through polar orbiting satellites or through geostationary satellites ground systems could solve the coastal radio station problem. Cost constraints may preclude or restrain the use of automated systems by developing countries, therefore efforts to improve the present conventional scheme should be maintained.

2.13 Another alternative to the use of coastal radio stations is INMARSAT which will operate through 19 coast earth stations by 1983. The system will begin working in February 1982 and will provide an additional method of transmitting the data.

2.14 Some remote platforms such as drifting buoys or sea level gauges are designed to transmit via satellites. The data are now received at Service Argos, France, or other satellite systems, processed into the GTS format and entered into the GTS for global exchange.

3. OCEAN MONITORING PROGRAMMES IN THE REGIONS OF RELEVANCE TO IGOSS AND OTHER WMO AND IOC PROGRAMMES (Agenda item 3)

NORPAX

3.1 Dr. D. Cutchin, NORPAX Programme Administrator, presented a report on the goals and methods of the North Pacific Experiment, NORPAX. It was designed to determine how heat stored in the ocean help cause climate anomalies. Following the work of Namias and Bjerknes, the experiment concentrates in the mid-latitude Pacific (30°N - 50°N) and in the tropical Pacific, since heat transfer is slightly different in these regions. Mid-latitude work is encompassed by the Anomaly Dynamics Study(ADS) while tropical work is more diverse including a tide gauge network, ships-of-opportunity observations and short-term experiments such as the Hawaii-Tahiti Shuttle. Scientists from Britain, France, Japan and the U.S.A. are co-operating in this work in which sea surface temperature and especially the anomalies of temperature is the primary parameter. It is recognized that SST anomalies are influenced by large-scale subsurface changes of temperature, thus BATHY data are very important. One important aspect of NORPAX has been to survey observing techniques to find cost-effective methods. Another aspect is to study how much data are needed to resolve parameters adequately. To this end, network analyses have been performed to determine the time and space scales of sampling necessary to resolve the features of interest. NORPAX goals will require a long-term data set to reach close conclusions about modelling and predicting atmospheric anomalies from SST anomalies and these data can be provided by IGOSS subsurface observations. Dr. Cutchin noted that an important factor is surface wind stress in heat transfer but that present data were inadequate. He suggested that the provision of this parameter be improved in order to provide a better data set in the future.

WESTPAC

3.2 Mr. M.C. Manansala (Philippines) introduced a brief report on the WESTPAC meeting held two weeks earlier (19-24 October 1981) in Jakarta, Indonesia. Most

relevant to IGOSS were actions relative to the WESTPAC ocean monitoring efforts. That meeting considered a report by the WESTPAC Task Team on Ocean Monitoring which proposed an open ocean monitoring programme of BATHY/TESAC observations from ships-of-opportunity supplemented by seasonal north-south hydrographic sections carried out by research ships, a suite of coastal and island stations to monitor sea level fluctuations and a programmes of drifting buoy deployments. The WESTPAC meeting adopted programmes in each of these four areas, namely volunteer observing ships, island and coastal stations, hydrographic sections and a drifting buoy programme. In addition, that meeting disbanded the Task Team on Ocean Monitoring and established an ad hoc Task Team on Ocean Dynamics. In the same decision, the meeting requested the Joint IOC/WMO Working Committee for IGOSS to assist in the implementation of the WESTPAC ocean dynamics programme, in particular through co-operation with the task team.

3.3 Dr. W. White, chairman of the WESTPAC Task Team on Ocean Monitoring, introduced the WESTPAC ocean dynamics programme. The basic BATHY/TESAC observing scheme is an observation grid, the density of which varies with the decorrelation time and space scale and the signal to noise ratio of the phenomenon under study; in this case short-term, climate-related variability. The foundation of the programme is a series of ships-of-opportunity recruited by NORPAX, ORSTOM and Australia. These observations are supplemented by sea level observations at some 40 existing and proposed coastal and island stations. Several hydrographic sections to be performed by the various Member States are under consideration which traverse the major current systems of the regions. Several proposals for deployment of drifting buoys using the ships on hydrographic section cruises are designed to provide Lagrangian drifter information as well as data in areas where other observations are lacking. The scientific problem posed by the dynamics programme is to understand the dynamics and the change in dynamics of large-scale ocean circulation. To understand those, the task team will monitor the density structure of the upper 500 m - 1000 m, the momentum, heat and moisture flux at the air/sea boundary and monitor the wind-driven currents.

CCCO

3.4 Dr. T. Asai (Japan) briefed the meeting on the current aspects of CCCO activities related to IGOSS in the Pacific Ocean. CCCO is interested in developing ocean monitoring techniques over the world ocean to support the work of the World Climate Research Programme. In general, these new techniques must be cost effective and comparable with existing techniques. Since the operational phase is intended to begin around 1987 these techniques primarily fall outside the time-frame of this meeting but some techniques and ideas about important areas of the oceans in which to concentrate the observations are relevant and are summarized below. The key oceanic observations in the Pacific basin include:

- East and south of Japan
- Around Hawaii
- South-east of Australia, the Tasman Sea
- The Southern Ocean, particularly the South Pacific sector
- The equatorial zone of the world's ocean
- West of North America
- The Bearing Sea.

The Time Series Meeting in May 1981 recommended current velocity, temperature and salinity measurements in straits and passages, to establish island stations, extend XBT network to basin-wide coverage and have the data available in a "timely way" and to have ships-of-opportunity collect surface water samples. The most relevant CCCO activities to IGOSS in the Pacific include the World Ocean Circulation Experiment (WOCE), the possible Pacific CAGE and the Sections Programme. In addition, IGOSS will be acutely interested in studies to determine the most effective parts of the ocean to monitor, i.e. upper-ocean heat anomalies, western boundary currents and gyres, overflow from the Arctic Ocean and the equatorial current systems.

Report of the chairman of the Task Team of Governmental Experts on the Further Development of the IGOSS Observing System (IOS)

3.5 The chairman of the task team, Mr. G.W. Withee, introduced this item by explaining the motivation behind the task team. He stated that the purpose of the task team is to help formulate the plan of IGOSS in such a way as to bring about the implementation of these plans by Member States. Thus, the task team is the implementation co-ordination arm of the Joint IOC/WMO Working Committee for IGOSS. With respect to the role of IGOSS in the ocean monitoring programme in the WESTPAC and NORPAX Regions, Mr. Withee explained that IGOSS has a key role to play in that IGOSS has been asked by bodies concerned with ocean programmes in the regions, namely WESTPAC and CCCO, to co-ordinate and facilitate operational data exchange and ocean product preparation and exchange within the regions. He pointed out the reason IGOSS had been called upon was that specific benefits can be derived for all Member States of the regions by using IGOSS practices, namely:

(i) Internationally agreed upon formats for the timely exchange of data and products;

(ii) International facilities, namely the GTS, for the timely exchange of data and products;

(iii) Timely receipt of data from data measurement platforms including voluntary observing ships, research ships, drifting buoys, moored buoys and coastal and island stations no matter where they are in the regions;

(iv) Co-ordination of Member States' responsibility for the preparation and dissemination of ocean products within the regions; and

(v) Co-ordination of the preparation of good quality data sets in a timely and operational manner.

Although the potential contribution from IGOSS is large, Mr. Withee cited some deficiencies which must be solved in order to attract the further incorporation of ocean data and products as a part of IGOSS. These are in order of priority:

(i) Quantity of data - The lack of data has been a long-term problem but could be greatly relieved by the addition of delayed-mode data into the GTS;

(ii) Data quality - Some 30% of the IGOSS BATHY messages contain some error. Over 90% of these errors can be easily removed by simple computer

examination of the data at an IGOSS SOC. Use of automatic data observing and reporting systems will essentially eliminate these errors; and

(iii) Telecommunication - At present most of IGOSS data are telecommunicated via HF radio from ship-to-shore. This system is labor intensive and produce errors. A graaual shift to satellite communications will greatly enhance the efficiency of telecommunications.

Mr. Withee stated that all of these problems are under consideration within the IGOSS programme and solutions will be implemented as soon as possible. In the meantime the positive attributes of IGOSS far outweigh the deficiencies and he was convinced that, particularly in such a region as the Pacific Ocean, the prospects for IGOSS to make a major contribution to programmes in the region were very promising. Recommendations proposed by Mr. Withee were discussed under sections 4 and 5 of this report.

4. REQUIREMENTS FOR OCEAN DATA AND PRODUCTS (Agenda item 4)

4.1 Under this item the meeting considered requirements for ocean data and products in the light of the IGOSS General Plan and Implementation Programme 1982-1985 and in the light of the specific regional programmes and plans, such as WESTPAC, NORPAX and CCCO. In this context the meeting agreed that, because of some basin-wide phenomena of interest to oceanographers and climatologists, the regional implementation of IGOSS should include the whole Pacific Ocean and therefore proposed the region of interest as shown in Annex III. The meeting recommended that the South-Eastern Pacific region designated in this annex as "proposed" be developed by the WMO and IOC Secretariats and, in particular, recommended that the details of this expanded Pacific-wide implementation programme be discussed at a future meeting with the additional Member States concerned with this region, principally Mexico, Costa Rica, Panama, Colombia, Ecuador, Peru, Chile and the United States of America. Following this proposal the observing system, telecommunication system and data processing and products system for the Pacific region were discussed as follows.

Observing system

4.2 The meeting, keeping in mind the primary requirements resulting from operational and research programmes, decided that the IGOSS Observing System for the Pacific Ocean should include sea surface temperature, sea surface salinity, sea level, subsurface temperature and subsurface salinity. It was noted that, at the present time, codes for data transmission and exchange exist for all the above parameters except sea level. However, because the TESAC format is awkward for the transmission of single surface temperature and salinity data, the meeting recommended that IGOSS arrange for the development of a special code for these parameters as well as sea level. The meeting recognized the importance of incorporating new technology into the measurement and reporting systems for these parameters. In particular, all Member States should be encouraged to use new satellite data reporting systems on ships, coastal stations and drifting and moored buoys. Discussions and conclusions of the meeting on parameters and observing platforms are summarized in the following paragraphs.

Ocean parameters of interest

Sea surface temperature

4.3 At present, sea surface temperature is provided by voluntary observing ships, drifting and moored buoys, coastal and island stations and satellites. Programmes supplying these data are well-established and the data densities are deemed sufficient for work in the Pacific, particularly in view of the satellite coverage offered by geostationary and polar orbiting systems of Japan, U.S.S.R. and U.S.A. The meeting agreed that, of primary importance at this stage to the IGOSS development, was the agreement on the preparation and distribution of SST products.

Sea surface salinity

4.4 Although it has not been a primary IGOSS parameter in the past, surface salinity is emerging as an important parameter index for climate (notably in the Western Equatorial Pacific, 15°N to 15°S). Voluntary observing ships' routes on which surface salinity is observed are shown and listed in Annex IV. In addition, subsurface salinity is an important climate variable. To augment the hydrographic sections in the Pacific, Canada is proposing to establish a pilot subsurface salinity voluntary observing ships' programme using XCTDs. This programme is included in Annex IV.

Sea level

4.5 Island stations that measure both sea surface temperature, sea level and other parameters have been in use in climate studies for many years. Recently, it has been determined that island sea level variability is an indirect measure of relative dynamic height and heat content over most of the tropical and subtropical North Pacific. Coastal and island stations providing sea level data are shown and listed in Annex V and detailed in Annex VI for individual countries. Principal gaps in the sea level network are in the South Pacific and island stations north of Australia.

Subsurface temperature

4.6 At present the IGOSS BATHY reporting mechanism for exchanging subsurface temperature data is by far the most well-established IGOSS programme. Data are collected by voluntary observing ships, research ships, drifting buoys and moored buoys. The plans and proposals for these measurements appear in Annexes VII, VIII and IX respectively. The meeting noted that, in addition to providing subsurface data, observations from these platforms provide good quality surface temperature measurements.

Subsurface salinity

4.7 Most subsurface salinity data, at present, is collected by hydrographic surveys from research ships and can be reported as part of an IGOSS TESAC report. Recently, Canada is attempting to begin a voluntary observing ships' programme

using XCTDs as shown in Annex IV. The hydrographic sections of interest in the Pacific are shown in Annex VIII.

Observation platforms

4.8 The meeting discussed the Pacific observational network from a measurement system point-of-view.

Voluntary observing ships' programme

4.9 The XBT voluntary observing ships' programme, both existing and proposed, is given in Annex VII. Location of gaps in the monitoring system, principally in the South China Sea, East China Sea, Philippine Sea and a large part of the Mid-to East-Southern and Tropical Pacific is indicated. The meeting noted that much subsurface temperature data are taken from fisheries' ships, but that these data are not presently exchanged as part of the IGOSS system. The meeting requested the Secretariats to appeal to IGOSS National Representatives of the appropriate Member States to encourage their fisheries oceanographic community to arrange for these data to be made available as part of the IGOSS Observing System in an operational mode. As a new contribution to the voluntary observing ships' programme, so long as XBTs are available, China will gradually unfold the work of voluntary observing ships along the shipping lanes from Guangzhou to Singapore, Shanghai to the U.S.A., Guangzhou to Australia and from Shanghai to Canada.

Hydrographic programmes

4.10 Hydrographic programmes can contribute to the ocean data observing network by providing high quality subsurface data for the physical variables: temperature, salinity and current. The proposed hydrographic sections are shown in Annex VIII. Presently Japan is routinely conducting two hydrographic surveys: one in the Western North Pacific and the other of the Kuroshio south of Japan. Routine hydrographic surveys of the Kuroshio south of Japan should be extended farther to the south so that the recirculation of the Kuroshio (i.e. Kuroshio Countercurrent) can be monitored. Other countries that border the western boundary are encouraged to begin making routine surveys of the Kuroshio and East Australian Current, allowing baroclinic transport and mean speed to be monitored. Hydrographic programmes of Member countries are described in Annex VIII.

Climate studies

4.11 In climate studies, much of the heat transported poleward by the ocean takes place in these western boundary currents. The monitoring of the western boundary current such as the Kuroshio and its origin would be useful as a data source to support basin-wide researches. Routine hydrographic survey work in the Western Pacific along 137°E and 155°E should be expanded to four times per year and should also be extended into the southern hemisphere. A similar section from New Caledonia or New Zealand to the equator would be extremely beneficial. Value of routine hydrographic surveys have been shown by Masuzawa and Nagasaka (1975) to provide

detailed meridional structure of ocean climate changes in the gyres of the Western North Pacific. Routine hydrographic surveys complement the voluntary observing ships' XBT monitoring effort.

Coastal and island stations

4.12 Coastal and island stations provide useful data for the Pacific monitoring programme, principally by providing sea level, sea surface temperature and surface salinity data. Coastal and island stations proposed as part of the ocean monitoring network are shown and listed in Annex V.

Drifting and moored buoys

4.13 There are several groups interested in the drifting buoy programmes. Although first-hand objectives and regions of concern are different from group to group, drifting buoys can be very useful for world-wide climate and ocean research. Rapid data exchange for drifting buoys through IGOSS should be encouraged. In addition, drifting buoys with thermistor chains are a very cost-effective way for monitoring the subsurface temperature over wide areas such as WESTPAC and NORPAX regions. Development of a thermistor chain of reasonable durability should be encouraged.

4.14 Two types of ocean measurement buoys exist capable of carrying thermistor chains and surface meteorological sensors, i.e. those moored to the bottom and those drifting. The former are expensive but retrievable; the latter inexpensive and expendable. The feasibility of using moored buoys with thermistor chains for ocean monitoring was investigated by NORPAX. It was established that moored buoys were too expensive (~$ 300 K) to be considered a viable measurement tool. Nothing has changed to alter this opinion, however, in some locations where data are available by no other means, moored buoys may be the only alternative. Drifting buoys, with thermistor chains, are relatively inexpensive (i.e. ~$ 9 K) and offer an alternative method of taking temperature/depth observations in otherwise data-sparse areas. Drifting buoys with little surface exposure and drogued at 250 - 500 m in the Philippine Sea, for example, would remain relatively stationary (moving perhaps 1-2 km per day) and could transmit data daily over a period of two years. Deployment of drifting buoys could be undertaken from routine hydrographic surveys of the WESTPAC ocean monitoring programme. Drifting buoys, without thermistor chains, are even cheaper (i.e. ~$ 3 K), but in routine deployment for monitoring costs can multiply.

4.15 From the ocean monitoring point-of-view, moored buoys provide highly reliable time series data of both meteorological and oceanographic parameters. At present, Japan and the U.S.A. operate a network of these buoys. These networks should further be expanded.

Monitoring from space

4.16 Satellite oceanography has large potential. Monitoring from space could have the capability to provide data coverage and resolution of sea level, sea

surface temperature, wind stress and air/sea heat fluxes on scales that impact on all the scientific objectives. This has been demonstrated from analyses of SEASAT data. However, presently and in the near future, the only satellite sensors available are meteorological sensors in the visible and thermal infrared. Thermal IR is used to estimate sea surface temperature in cloud free areas. Visible radiation can be used to estimate solar insolation. Satellite estimated sea surface temperature can be used to identify and analyse ocean thermal fronts, notably in the Sea of Japan and in the Kuroshio Extension areas. Ocean climate studies require solar insolation estimates and sea level estimates. There is some hope that the former product could be used with a subsurface BT data in models to predict SST. Sea level is known to be measured to an accuracy of 10 cm by the TOPEX radar altimeter proposed for launching in 1987. It is important to have the better estimate of wind stress which can be estimated from an active microwave scatterometer. Such a scatterometer is scheduled for deployment on an ESA satellite scheduled for launching in 1985. The meeting strongly endorsed the deployment of sensors that determine wind stress aboard future satellites.

4.17 With regard to climate-related variability there are two tasks which drifting buoys can address:

- Monitoring the strength of western boundary currents;
- Monitoring wind-driven surface currents.

The existing and planned drifting buoy programmes of Members in the regions are described briefly in Annex IX.

Telecommunication arrangements

4.18 At present the IGOSS BATHY/TESAC reports in the regions are collected through HF transmissions from ships to coastal radio stations or through both polar and geostationary satellites. All operational IGOSS BATHY reports are inserted into the Global Telecommunication System of the WMO/WWW for global distribution.

Coastal radio stations

4.19 In the entire Pacific basin there are only some 12 coastal radio stations which have been designated to receive BATHY/TESAC messages as shown in Annex X. It was noted that many of these stations carry heavy traffic loads and hesitate to receive rather long BATHY or TESAC reports. In addition, it was pointed out that several stations in the mid-Pacific region, either refuse to accept messages or, in practice, do not pass messages received onto the GTS centres. However, it was recognized that this method of data collection will be dominant for the next few years and the meeting strongly recommended that action should be taken, through the concerned Member States and the Secretariats, to ensure that these designated coastal radio stations adequately handle the BATHY/TESAC data from the Pacific Ocean basin.

Satellite data collection

4.20 The most immediate impact satellites can have in the Pacific ocean monitoring programme is to provide for the telecommunication of data in real time. A study recently concluded at Scripps Institution by Warren White demonstrated the feasibility of automatic telecommunication of XBT data from ship-to-shore via the Argos data collection system. The cost of the recording and transmission hardware necessary for this is less than a standard Sippican XBT recorder. Geostationary satellites will be useful in the automatic transmission of island, coastal station and ship data. GMS (Japan) and SMS/GOES (USA) provide data collection coverage in the regions. It is also noted that Service Argos is already used for the location of and data collection from drifting buoys.

WWW/Global Telecommunication System (GTS)

4.21 The main GTS circuits presently used for the exchange of BATHY/TESAC messages in the WESTPAC/NORPAX regions are as follows:

Tokyo	-	Washington	2400 bps	(4800 in 1982)
Tokyo	-	Khabarovsk	1200 bps	
Tokyo	-	Beijing	75 bauds 5 circuits	(4800 in 1984)
Tokyo	-	New Dehli	2400 bps	
Tokyo	-	Melbourne	200 baud	(4800 in 1983)

The meeting noted the plan to upgrade the Tokyo-Melbourne link to 4800 bps circuit and that this circuit could then handle global BATHY/TESAC bulletins.

Delayed mode insertion

4.22 Although it is emphasized that BATHY/TESAC data be transmitted from ships within 48 hours after observation, many ships cannot or do not comply with this regulation and, as a consequence, data are lost from the exchange on the GTS. In addition, it has been estimated that many of these data never get into the IODE/NODC data system and therefore are not available at all to the international community. The meeting noted, in this context, that bulletins inserted into the GTS having a current date of insertion can include delayed mode IGOSS data up to one month after observation. For this reason, all Member States are encouraged to insert BATHY reports into the GTS that have not been already transmitted by ships into the GTS up to one month after observation. In this context, the meeting noted that a recent study by Dr. Yasui of JMA revealed that a multiplicative factor of 3-5 times the present data could be made available by delayed mode insertion. Experts from the U.S.A. and Canada agreed that these factors also applied to the ocean data available in their country. The meeting recommended that the WMO Secretariat encourage Member States to submit such delayed mode data into the GTS.

IDPSS in the Pacific region

4.23 The meeting reviewed the present state of IGOSS product development in the light of national reports and plans and identified pertinent issues. The meeting suggested that the regional IGOSS operational products be:

(a) Surface and subsurface ocean temperature at standard depths of 0, 100, 200, 300 and 400 m;

(b) Mixed layer depth;

(c) Ocean frontal zones.

It is understood that IGOSS operational data products include quality controlled data sets of primary and derived parameters in addition to contoured maps of these parameters.

4.24 A complete list of the significant operational ocean data products now being produced for the Pacific region is given in Annex XI. Some of these products have been officially declared as IGOSS products by the producing countries. Since it is expected that some of the products on this list may serve as the building blocks for future IGOSS products, it is suggested that the Secretariat periodically request countries concerned to update this list.

4.25 The meeting considered the above requirements and agreed that there was a need for the designation of at least four Specialized Oceanographic Centres for IGOSS in the Pacific region. The Secretariats were requested to solicit the support of the following Member countries in this regard: Australia, Canada, France, Japan, U.S.S.R. and U.S.A.

4.26 Delegates also reported on their existing or planned IDPSS activities which are listed below:

Canada

Canada plans to produce a subsurface data set for the North-Eastern Pacific and will also investigate the production of charts similar to those previously mentioned.

China

China will provide a monthly average surface temperature analysis in the general area 124°E to 137°E and north of 17°N.

Japan

Japan plans to expand its present production of subsurface temperature maps with the following:

- sea surface temperature
- temperature at depth of 100, 200, 300 and 400 m
- integrated heat content
- mixed layer depth
- frontal zone analysis

Maps will be constructed on a monthly basis for the area north of the equator and west of 180° longitude and will be updated at 10-day intervals. Presently, a controlled data set of 100 m temperatures in the vicinity of Japan is available on magnetic tape. Plans are to provide a more complete data file of temperatures for the entire North-Western Pacific.

U.S.S.R.

The U.S.S.R. indicated willingness to begin planning for the operational production of mixed layer depth maps of the North Pacific provided sufficient data became available.

U.S.A.

The U.S.A. plans to produce a subsurface temperature data set for the Pacific east of 180° longitude and north of the equator. From this data base the U.S.A. plans to produce charts of the standard temperature fields similar to those given under Japan.

4.27 The meeting requested the Secretariats to contact other Member countries in the Pacific region regarding other plans and activities in the production of IGOSS products. In addition to the above planned products, the meeting invited countries to consider the production of other special IGOSS operational products related to the following variables:

(a) Low frequency changes in sea level
It was suggested that, after the removal of the astromonical tides, long-term averages could be formed . A 15-day average would remove much of the atmospheric synoptic scale signal and still preserve most of the interesting oceanic variability. It was further noted that recent research work has shown the high correlation between sea level (SL) and steric height. This means that a SL data set could possibly be used to fill gaps in the XBT/MBT data set. Research has also indicated that differences between SL measured at island stations, and perhaps also coastal stations, could be used as an index of the strength of major ocean currents. The subject of the production of an operational IGOSS SL data format product should be encouraged as soon as telecommunication links and format designation allow for the rapid acquisition of the data;

(b) Surface currents
Japan presently generates an operational product which displays GEK-determined surface currents in the immediate vicinity of Japan. New types of current measurements plus an improved understanding of the relationship between surface winds and surface currents may permit the production of surface current maps for a much wider area;

(c) Measured sea and swell
Although this data product is now being produced for parts of the Pacific region it might, in the future, form the basis for a declared IGOSS operational product, perhaps under sub-regional plan outlined above for subsurface temperatures;

(d) Surface and subsurface salinity
At present when sufficient data is available on a real time basis an operational product is produced;

(e) Insolation (downward solar flux)
The input of short wave radiation into the ocean at the surface of the sea is an important data set for purposes of predicting changes

in the mixed-layer and, in general, for closing the oceanic heat budget. This input can be estimated from cloudiness observed either from ships or from satellites;

(f) Surface wind stress
This is an important factor for climate-related studies, but the present availability of this parameter is not adequate.

4.28 The attention of the meeting was drawn to the importance of meteorological data in support of air/sea interaction and ocean dynamics studies. The second session of the IOC Working Group for the Western Pacific (WESTPAC-II, Jakarta, October 1981) adopted a recommendation in this respect. The meeting was informed that meteorological data required are those for the determination of radiation flux, stress, heat and water vapour transfer, but realized that more specific requirements may be needed with respect to data formats and parameters (including time and space averaging procedures) before WMO can take any action.

IDPSS guidelines for product preparation

4.29 Pending the completion of the IDPSS Guide, the meeting adopted a set of guidelines for use by Member States in the region when preparing IGOSS products. The meeting noted that considerable work in the area of IDPSS was already being carried out in the region and, therefore, these adopted guidelines took into account existing practices of those Member States as much as possible. The meeting recommended that these guidelines be further developed by the proposed ad hoc IGOSS regional planning group and subsequently distributed for use by Member countries of the region. The recommended guidelines are given in Annex XII.

LONG-TERM PLANNING AND IMPLEMENTATION - A FIVE-YEAR PLAN FOR IGOSS DEVELOPMENT IN THE REGIONS (Agenda item 5)

5.1 The reports of the two study groups developed under agenda item 4 were presented and discussed. The meeting agreed that the development of IGOSS in the Pacific region was necessary to respond to the requirements of the regional Member States for the operational data and to assist with data products for climatological and oceanographic research. Therefore, the meeting requested the IGOSS Secretariat to distribute the report of this meeting accordingly and to urge Member States in the region to implement the recommendations contained herein.

5.2 The meeting also recommended that the Secretariats submit proposals to the governing bodies for an implementation co-ordination meeting early in 1983 to address the South-Eastern Pacific region and to allow for the participation of Member States from Central and South America and to include the operational ocean data requirements of the "El Niño" and ERFEN groups.

5.3 The meeting recognized the need to continue the planning process for IGOSS regional development beyond the preliminary stages described in this report. The mechanism for carrying out this task was therefore discussed. It was decided to establish an ad hoc IGOSS Regional Planning Group made up of experts nominated by Member States. The group would rely heavily on the support of the IGOSS Secretariat in the IOC and WMO and, in this respect, requested that the IGOSS Operations Co-ordinator pay particular attention to the development of the regional plan. In addition, the ad hoc group should request the participation of the Chairman of the IOC WESTPAC Task Team on Ocean Dynamics and the Chairmen of the IGOSS sub-groups of experts. The meeting discussed the value of an IGOSS regional co-ordinator and agreed that such a position would be very beneficial to IGOSS regional development in the Pacific, however, the difficulty of obtaining the financial resources for a co-ordinator was realized.

5.4 The ad hoc group was, therefore, established and the terms of reference given in Annex XIII were adopted. Mr. G. Withee (U.S.A.) was appointed Chairman of the ad hoc group as part of his responsibilities of Chairman of the IGOSS Task Team of Governmental Experts on the Further Development of the IGOSS Observing System. In addition, the following members of the ad hoc group were named subject to the approval of their respective national organizations:

- M. Miyake (Canada)
- J.-R. Donguy (France)
- I. Federev (U.S.S.R.)
- D. Cutchin (U.S.A.)

Australia, China, Japan and Philippines also announced their intention of nominating an expert. Additional experts from interested Member States can be added at a later date, in particular Member States from the South-Eastern Pacific will be invited to participate. The ad hoc group will work mainly by correspondence, however, should meetings be considered necessary these will take place at the expense of Member States or will be subject to the approval of the respective governing bodies.

6. ADOPTION OF RECOMMENDATIONS (Agenda item 6)

The meeting proposed a number of actions to be taken by the Member States in the region or by the Secretariats for IGOSS implementation. These are summarized below:

(a) Member States in the region are invited to follow the regional guidelines for the preparation of IGOSS products (see paragraphs 2.8, 4.29 and Annex XII;

(b) Member States in the region are encouraged to insert onto the GTS late BATHY/TESAC reports up to 30 days after observation (see paragraphs 2.11, 3.5 and 4.22);

(c) The IGOSS implementation in the region should be extended to cover the whole of the Pacific Ocean:

(i) The extended Pacific-wide implementation programme be discussed at a future meeting with the additional Member States in the South-Eastern Pacific region;

(ii) An implementation co-ordination meeting for the extended Pacific region should be convened in early 1983;
(see paragraphs 4.1 and 5.2)

(d) A series of actions are recommended in the field of the IGOSS Observing System:

(i) Development of appropriate code forms for reporting single parameters - sea surface temperature, salinity and sea level (see paragraph 4.2);

(ii) Fisheries oceanographic community to be encouraged to make available to IGOSS subsurface temperature data from fishing vessels (see paragraph 4.9);

(iii) Routine hydrographic surveys of the Kuroshio and East Australian Current and in the Western Pacific (see paragraphs 4.10 and 4.11);

(e) Member States concerned to ensure that designated coastal radio stations accept and adequately handle the BATHY/TESAC data from the Pacific Ocean basin (see paragraph 4.19);

(f) Designation of at least four Specialized Oceanographic Centres for IGOSS in the Pacific region (see paragraph 4.25).

7. CLOSURE OF THE MEETING (Agenda item 7)

7.1 Mr. Holland, chairman of the meeting, thanked the participants for their spirit of co-operation demonstrated throughout the meeting and for their valuable contributions, thanks to which he felt the meeting achieved a great deal. He also thanked Dr. Yasui for the excellent conference arrangements and warm hospitality of JMA extended to the participants. He further expressed his appreciation to the local Secretariat and to the IGOSS Secretariat for their assistance. Mr. Manansala, speaking on behalf of the participants, thanked Mr. Holland for the excellent manner in which he conducted the meeting and wished to be associated with him in thanking Dr. Yasui.

7.2 The meeting closed at 18.30 h. on 13 November 1981.

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AGENDA

1. ORGANIZATION OF THE MEETING

   1.1 Opening of the meeting
   1.2 Election of the chairman
   1.3 Adoption of the agenda
   1.4 Working arrangements

2. STATUS OF IMPLEMENTATION OF IGOSS IN THE REGIONS, INCLUDING NATIONAL REPORTS

   2.1 IGOSS Observing System
   2.2 IGOSS Data Processing and Services System
   2.3 IGOSS Telecommunication Arrangements

3. OCEAN MONITORING PROGRAMMES IN THE REGIONS OF RELEVANCE TO IGOSS AND OTHER WMO AND IOC PROGRAMMES

4. REQUIREMENTS FOR OCEAN DATA AND PRODUCTS

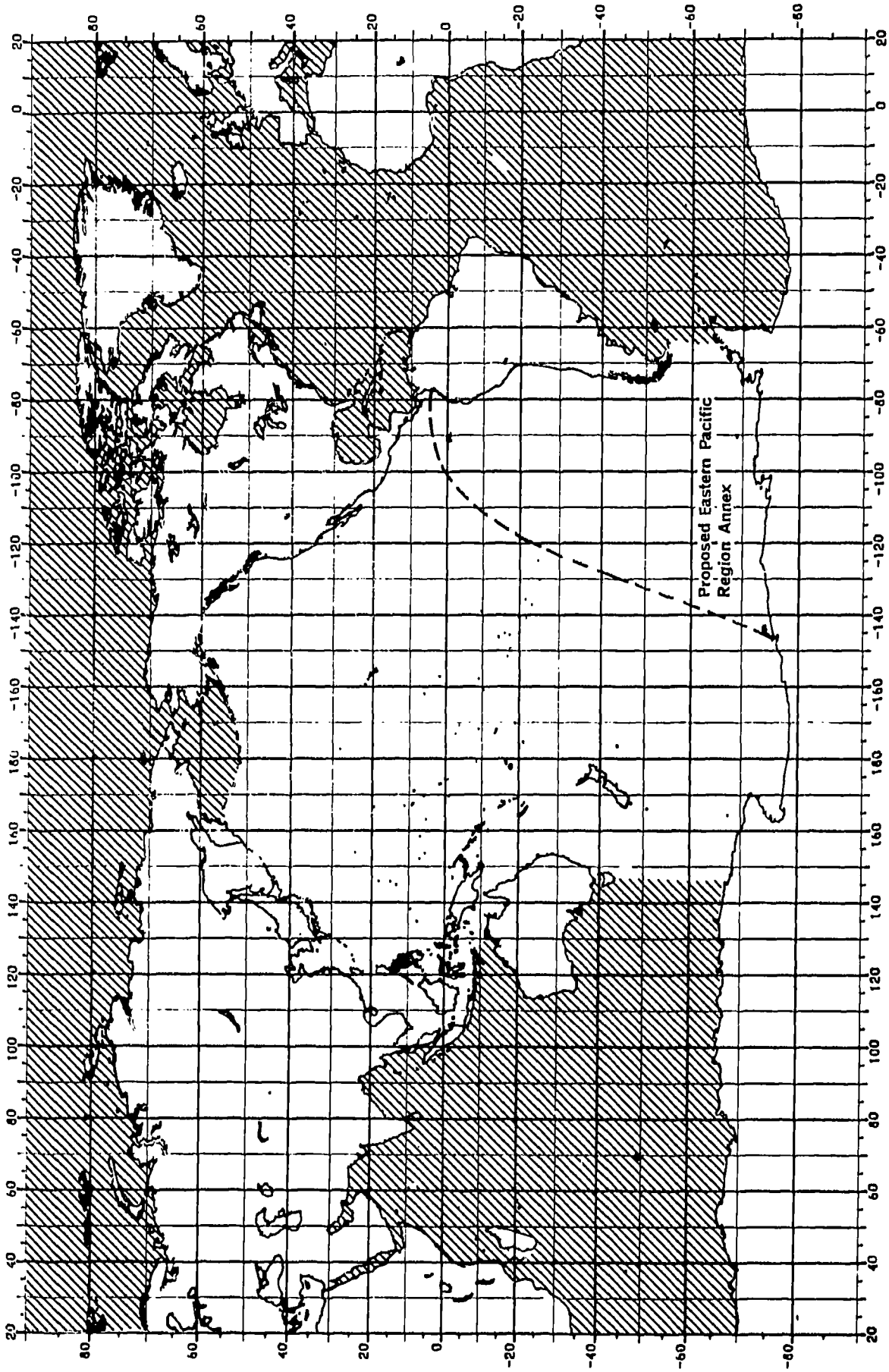
5. LONG-TERM PLANNING AND IMPLEMENTATION - A DRAFT FIVE-YEAR PLAN FOR IGOSS DEVELOPMENT IN THE REGIONS

6. ADOPTION OF RECOMMENDATIONS

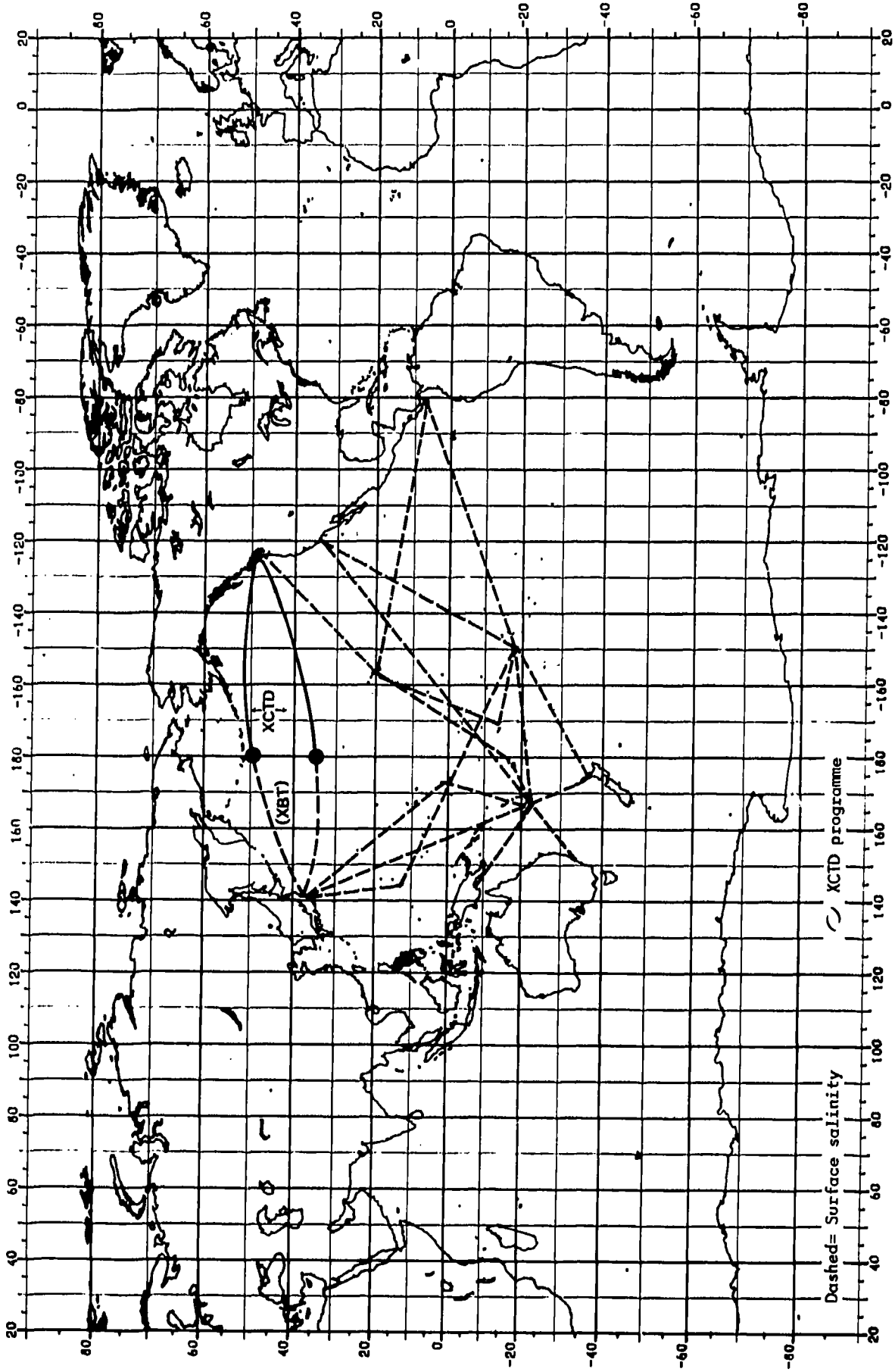
7. CLOSURE OF THE MEETING

ANNEX III

PROPOSED PACIFIC OCEAN MONITORING AREA OF CONCERN
TO THE IGOSS REGIONAL PACIFIC IMPLEMENTATION PROGRAMME



VOLUNTARY OBSERVING SHIPS' PROGRAMME FOR SALINITY



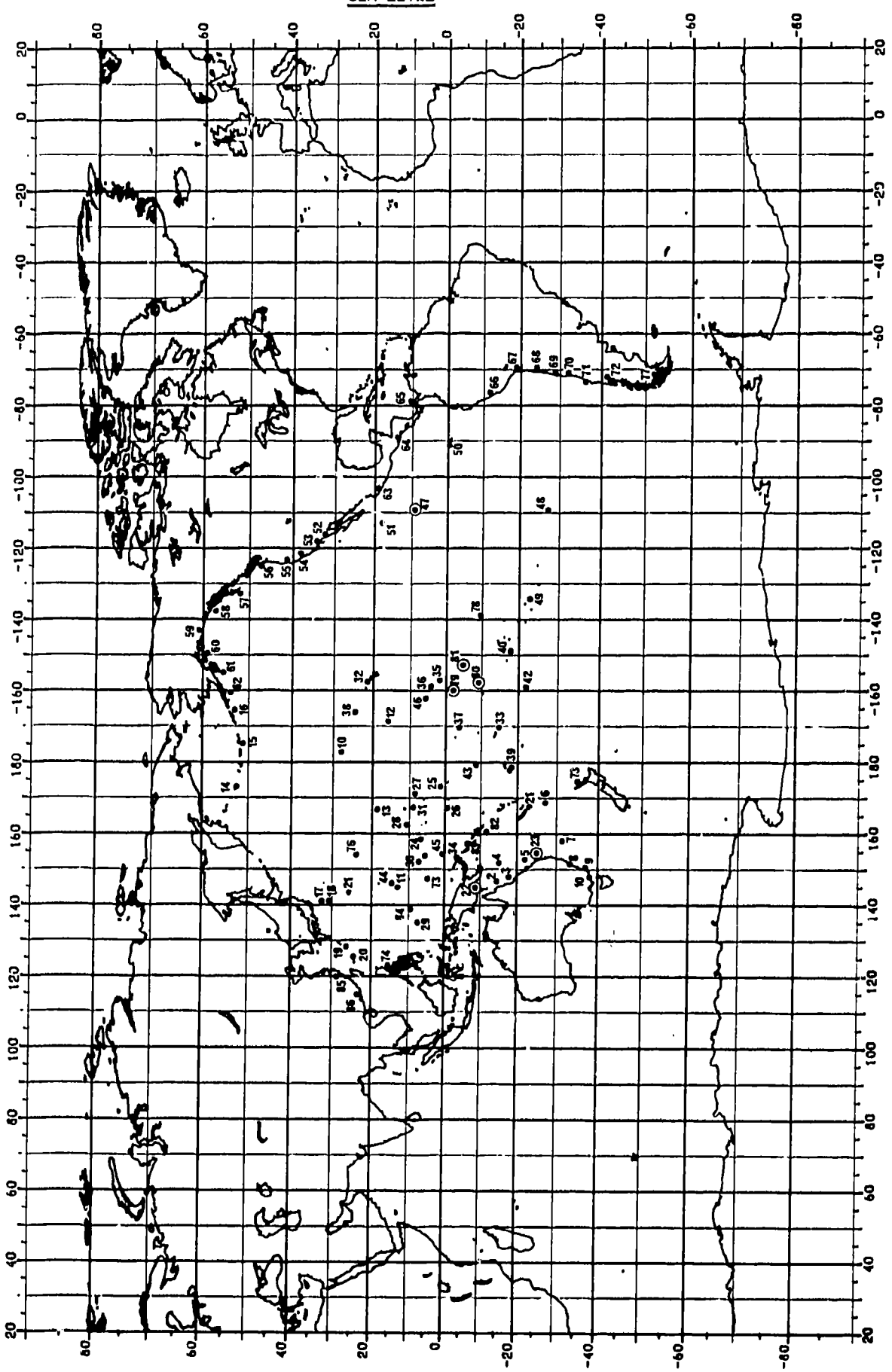
Ships participating in ORSTOM surface salinity experiment

Surface salinity

HACHIYO MARU	Noumea - Japan
PACIFIC ISLANDER	Noumea - Japan - Tahiti
ALLUNGA, LILOUET, DILKARA	Australia - Fiji - Hawaii - West Coast. Direct return U.S.A. - Australia
ROSTAND, ROUSSEAU, RODIN, CEZANNE	Noumea - Tahiti - Panama
LA PEROUSE	Noumea - New Zealand
SEA PRINCESS, FUA KAVENGA	Circuit in South-West Pacific
MOANA	Noumea - Wallis Island
TIARE MOANA	Tahiti - New Zealand
POLYNESIA	Tahiti - California
1 CHEVRON TANKER	Panama - Hawaii - Pagopago - Tahiti

COASTAL AND ISLAND STATIONS PROPOSED AS PART OF THE PACIFIC OCEAN MONITORING NETWORK

- SEA LEVEL -



Island sea level stations (preliminary 1981)

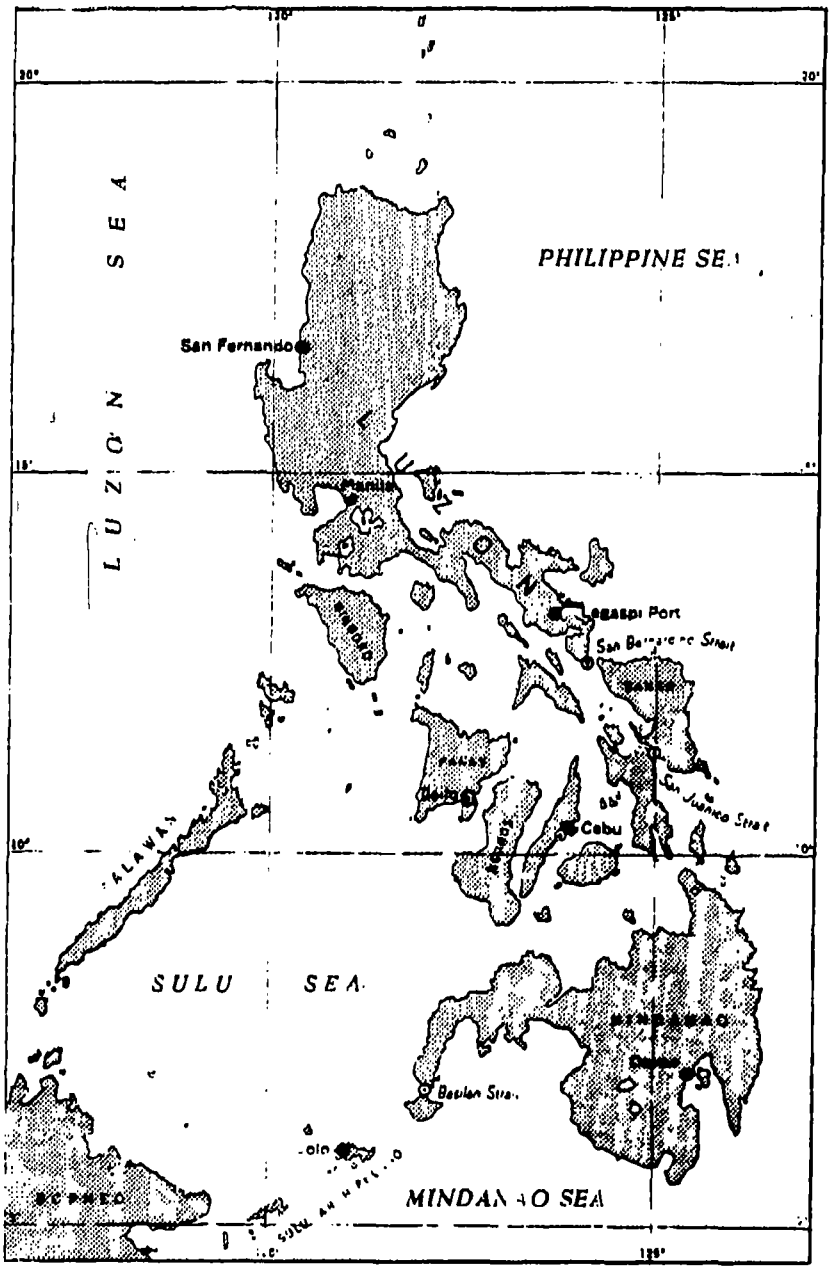
STATION	LATITUDE	LONGITUDE	START DATE	
Midway	29°N	174°W	1947	(10)
Guam	13°N	145°E	1954	(11)
Johnston	17°N	169°W	1950	(12)
Wake	19°N	167°E	1950	(13)
Massacre Bay	53°N	173°E	1943	(14)
Sweeper Cove	52°N	170°W	1943	(15)
Dutch Harbor	54°N	167°W	1934	(16)
Miyake Jima	34°N	139°E	1964	(17)
Hachijo Jima	33°N	140°E	1957	(18)
Naze	28°N	129°E	1961	(19)
Naha	26°N	127°E	1966	(20)
Ogasawara	27°N	142°E	1974	(21)
Lord Howe	31°S	159°E	proposed	(7)
Norfolk	28°S	168°E	proposed	(6)
Port Moresby	10°S	157°E	proposed	(22)
Cato	25°S	153°E	proposed	(23)
Ponape	6°N	158°E	1974	(24)
Tarawa	1°N	172°E	1974	(25)
Nauru	0°S	166°E	1974	(26)
Majuro	7°N	171°E	1974	(27)
Enewetok	11°N	162°E	1974	(28)
Malakal	7°N	134°E	1974	(29)
Truk	7°N	152°E	1947	(30)
Kwajalein	9°N	168°E	1946	(31)
Honolulu	21°N	158°W	1905	(32)
Pago Pago	15°S	171°W	1948	(33)
Rabaul	4°S	152°E	1974	(34)
Christmas	1°N	157°W	1975	(35)
Fanning	3°N	159°W	1975	(36)
Canton	2°S	171°W	1975	(37)
French Frigate Shoals	23°N	166°W	1975	(38)
Fiji	18°S	178°E	1975	(39)
Papeete	17°S	149°W	1975	(40)
Noumea	22°S	166°E	1975	(41)
Rarotonga	21°S	159°W	1977	(42)
Funafuti	8°S	179°E	1977	(43)
Saipan	14°N	145°E	1978	(44)
Kapingamarangi	1°N	154°E	1978	(45)
Palmyra	5°N	162°W	1978	(46)

Source: K. Wyrtki, University of Hawaii, USA; D. Rochford, C.S.I.R.O., Cronulla, Australia

Clipperton	proposed		(47)
Easter			(48)
Rikitea	French Polynesia		(49)
Baltra	Galapagos		(50)
Socorro	Mexico		(51)
La Jolla			(52)
San Pedro			(53)
Fort Point			(54)
Crescent			(55)
Tofino			(56)
Langaro			(57)
Sitka			(58)
Yakutat			(59)
Seward	Alaska		(60)
Kodiak			(61)
Sand Point			(62)
Manzanillo			(63)
Acajutla			(64)
Balboa			(65)
La Punta			(66)
Arica			(67)
Autofagasta			(68)
Coquimbo			(69)
Valparaiso			(70)
Talcahuano			(71)
Puerto Montt			(72)
Marsden Point	New Zealand		(73)
Legaspi	Philippines		(74)
Moen Island			(75)
Marcus Island			(76)
Punta Arenas			(77)
Hiva Hoa	Marquesas		(78)
Jarvis		proposed	(79)
Penrhyn		proposed	(80)
Malden		proposed	(81)
Honiara	Solomons		(82)
Anewa Bay			(83)
Yap			(84)
Kanmen	China		(85)
Xiamen			(86)

Philippines

Station	Latitude	Longitude	Initial date of observation
Manila	14°35'N	120°58'E	March 1947
Legazpi	13°09'N	123°45'E	May 1947
Cebu	10°18'N	123°54'E	June 1947
Davao	7°05'N	125°38'E	March 1948
Jolo, Sulu	6°04'N	121°00'E	November 1947
San Vicente, Cagayan	18°31'N	122°09'E	Proposed



LOCATION OF REFERENCE STATIONS IN THE PHILIPPINES

● Tide Stations ⊙ Current Stations

SEA LEVEL STATIONS IN MEMBER COUNTRIES

Australia

The Division of Oceanography CSIRO maintains a merchant ship programme, a coastal station observation system obtains data from their own research vessels. There are ten stations in the region situated either on the east coast or on islands.

Canada

Canada will participate in IGOSS sea level activity with a minimum of two stations of the West Coast with sea level information, temperature and salinity.

China

To meet the needs of the International Tsunami Information Centre in informing on a tsunami in the Far East, China intends to provide sea level data obtained two weeks before and after a tsunami occurs in Xiamen and Kanmen stations. Besides sea level observations, these two stations also carry out observations of surface water temperature and surface salinity. The location of the two stations is:

- Xiamen ($118^{o}04'E$ $24^{o}27'N$)
- Kanmen ($121^{o}17'E$ $28^{o}05'N$)

Japan

There are over one hundred tide stations in Japan. Some of them have meteorological sensors. Among them, stations which are located on the isolated islands like Izu or Ryukyu Islands, can produce valuable data for climate and other basin-wide studies. Those data are worth being exchanged on a real time basis through IGOSS.

New Caledonia

French tide stations at Noumea, Papeete, Rikitea, are operated by the University of Hawaii. Surface salinity and temperature series measurements are performed in several islands but are presently yielding only scientific measurements. Clipperton Island would be a useful station for reporting sea level, perhaps through a geostationary satellite.

Philippines

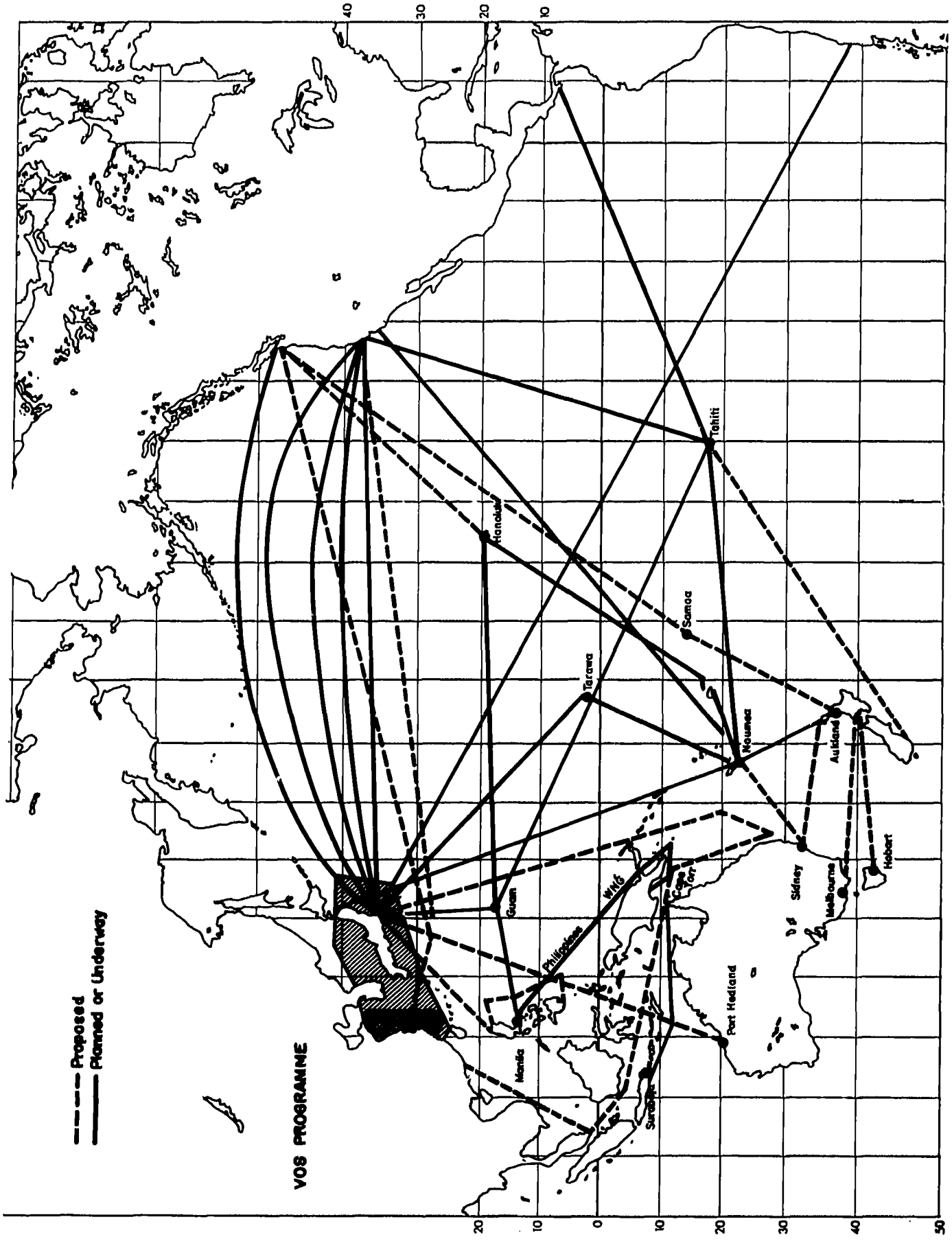
The Philippine Bureau of Coast and Geodetic Survey, at present, operates and maintains tide stations at Manily, Legaspi, Cebu, Davao and Jolo. Float-type, self-recording tide gauges are maintained at these stations giving analogue records of sea level on a 24-hour basis. The tidal marigrams are sent (by mail) to Manila

for processing at the end of the month. At these tide stations, temperature and salinity of sea surface is also routinely taken and reported. Monthly tabulations are also sent to the Manila Office. All these observations could be made available to the IGOSS system. It is now available to several international institutions and organizations on an exchange basis. There are also some plans to establish other tidal stations in the country. One in Port San Vincente, northern Luzon, has been planned some 3-4 years before and is only awaiting the automatic tide gauge to be operational.

U.S.A.

U.S. sea level stations shown in Annex V are operated by the National Oceanographic and Atmospheric Administration (NOAA) and usually report sea level on an hourly basis. Many of these stations have meteorological sensors. In addition to stations on the North American coast, the U.S. operates stations in Hawaii and U.S. Trust territories in the Pacific, and the latter are particularly valuable for climate research.

VOLUNTARY OBSERVING SHIPS' PROGRAMME
- XBT ONLY -



Existing and proposed XBT voluntary observing ships' programme

ROUTE	VOYAGES PER YEAR	NAME OF SHIP	COUNTRY*	NUMBER OF XBT'S PER YEAR
Oakland-Yokohama	8-10	Fillmore	U.S.	320
	8-10	Van Buren	U.S.	320
	8-10	Grant	U.S.	320
Oakland-Yokohama	8-10	Trenton	U.S.	320
	8-10	Princeton	U.S.	320
	8-10	Lexington	U.S.	320
	8-10	Haruna	U.S.	320
	8-10	Asia	U.S.	320
	8-10	Yamashin	U.S.	320
	8-10	Queensway	U.S.	320
	8-10	Pacific Arrow	U.S.	320
	8-10	Hici	U.S.	320
	8-10	Hakone	U.S.	320
	8-10	Japan Ace	U.S.	320
	8-10	Beishu	U.S.	320
	8-10	Kasha	U.S.	320
	8-10	Hakusan	U.S.	320
Seattle-Yokohama	8-10	Lions Gate Bridge	U.S.	320
	8-10	Golden Gate	U.S.	320
Tahiti-Aust. Papua-Washington	17	Austral Moon	U.S.	200
		Austral Rainbow	U.S.	200
		Austral Lightening	U.S.	200
Japan-Aust.	4	Marcona Transporter	U.S.	100
Peru-Japan-Indonesia-Calif.	6	Marcona Explorer	U.S.	400
Hawaii-Phillipines	6	U.S. Navy Ships	U.S.	200
Panama-New Zealand Australia	4	Columbus Caribbean	U.S.	350
		Columbus Louisiana	U.S.	350
Chile-Japan	12	Arauco	U.S.	300
		Aracama	U.S.	300
		Austral	U.S.	300
				8980 TOTAL

* Country designates country of sponsorship of XBT programme, not nationality of ship

ROUTE	VOYAGES PER YEAR	NAME OF SHIP	COUNTRY*	NUMBER OF XBT'S PER YEAR
Noumea-Japan	22	Hachiyo	French	1200
Japan-Tahiti-Noumea-Japan	12	Pacific Islander	French	360
Noumea-Tahiti-Panama	24	Rostrand	French	360
		Rousseau	French	360
		Rodin	French	360
		Cezanne	French	360
Hong Kong-Noumea	8	Poyang	French	450
Australia-Noumea Fiji-Hawaii-U.S.A	15	Paralla	French	360
		Allunga	French	360
		Dilkara	French	360
		Lilouet	French	360
Noumea-New Zealand	12	La Perouse	French	360
Sidney-Singapore Japan-Sydney	8-9	Kyoten	Australian	200[1]
Port Hedland-Japan	8-9	Kristi Bakke	Australian	180[1]
Sydney-Noumea	8-9	Allunga	Australian	120[1]
Hobart-Adelaide	8-9	Mary Holyman	Australian	60[1]
Sydney-Auckland	24	Union Rotura	Australian	360[1]
Melbourne-Wellington	12	Union Lyttleton	Australian	180[1]
Melbourne-Antarctic	1	Supplyship	Australian	75[1]
Freemantle-Kuwait-Singapore	8-9	Strathmore	Australian	720[1]
				7145 TOTAL

* Country designates country of sponsorship of XBT programme, not nationality of ship

[1] – proposed

ROUTE	VOYAGES PER YEAR	NAME OF SHIP	COUNTRY*	NUMBER OF XBT'S PER YEAR
Auckland-Fiji	24	Marama	New Zealand	2
Auckland-Japan	12	Aotea Godwit	New Zealand	2
		Grand total		16125

2 possible

Sources: D. Rochford, C.S.I.R.O., Cronulla, Australia; W.B. White and G. Meyers, Scripps Institution, U.S.A.; J. Donguy, O.R.S.T.O.M., Noumea, New Caledonia; R. Heath, New Zealand Oceanographic Institute, Wellington, New Zealand.

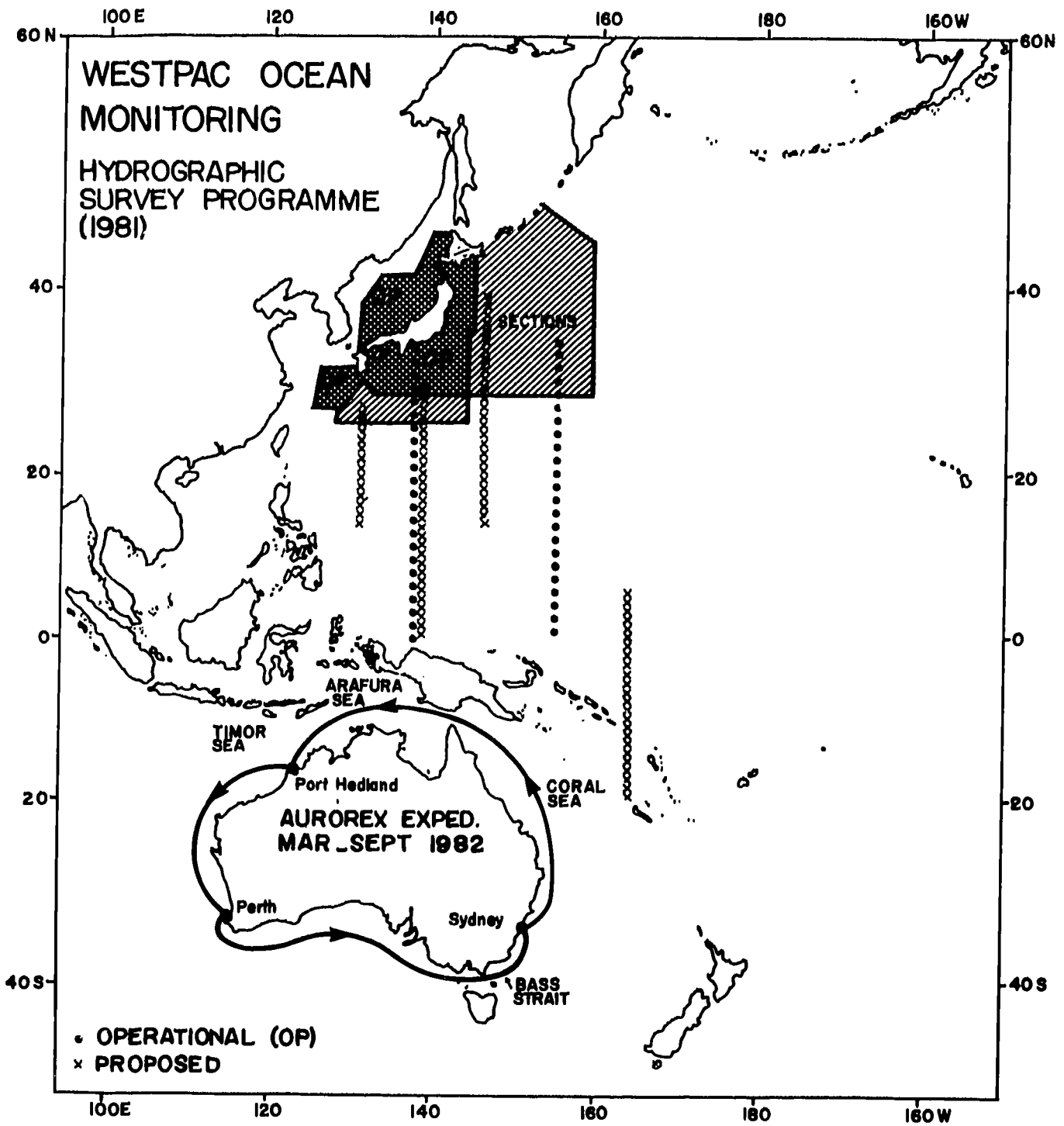
Other programmes proposed

1. A project due for implementation starting December 1981 to obtain, on a regular basis, XBT sections from a merchant vessel plying between Cape York and Surabaja and from the Philippines to Western New Guinea.

2. Canadian proposal to get XBT between Honolulu and Vancouver aboard several ships already operated by France.

3. Chinese proposal to carry out XBT along the shipping lanes from Guangzhou to Singapore, Shanghai to the U.S.A., Guangzhou to Australia and from Shanghai to Canada.

HYDROGRAPHIC SURVEY PROGRAMME IN THE PACIFIC OCEAN



Hydrographic programmes of Member countries

Australia

The AUROREX expedition. This is a major expedition being planned by the Division of Oceanography, CSIRO, commencing March 1982 and finishing in September 1982, which will involve a complete circumnavigation of the Australian Continent. In particular, the expedition will pass through the Coral Sea and Arafura Sea and, subject to approval, Indonesian waters before returning to Port Hedland on the west Australian coast and continuing back to Sydney via Perth and Bass Strait. A full range of oceanographic measurements including XBT and CTD casts, water samples and current meter records will be taken. Drifting buoys will be deployed. Primary objectives in making sections across the Timor Sea are an understanding of the genesis of the West Australian Current and an examination of features of the North-West Continental Shelf motion and an assessment of the interconnexion between the Western Pacific and the Indian Ocean.

The Bureau of Meteorology (BOM), the Royal Australian Navy (RAN) and the Australian Ocean Data Centre (AODC) are currently discussing the feasibility of transmitting RAN bathythermal observations into the IGOSS network via the GTS. Should this programme succeed, approximately 2,500 observations will be available annually from the Southern, South Pacific and Indian Oceans. The coverage will depend on RAN deployment policy but will provide a valuable contribution to these data-sparce areas.

Canada

In the Eastern Pacific Canada will continue the hydrographic programme along line "P" at a frequency of at least three times a year. These data will be transmitted through IGOSS.

China

MBT data obtained from the near-shore areas in the East China Sea and South China Sea can be provided as a part of IGOSS one month after observation.

Japan

Presently, two hydrographic surveys in the Western North Pacific and of the Kuroshio south of Japan are routinely conducted by Japan.

New Caledonia

There is a proposal for hydrographical transits twice a year along 165°E 20°S - 5°N. Measurements would be 0-1200 metres, temperature, salinity, oxygen, nutrients, chlorophyll, zooplankton, currents from profiler and from GEK.

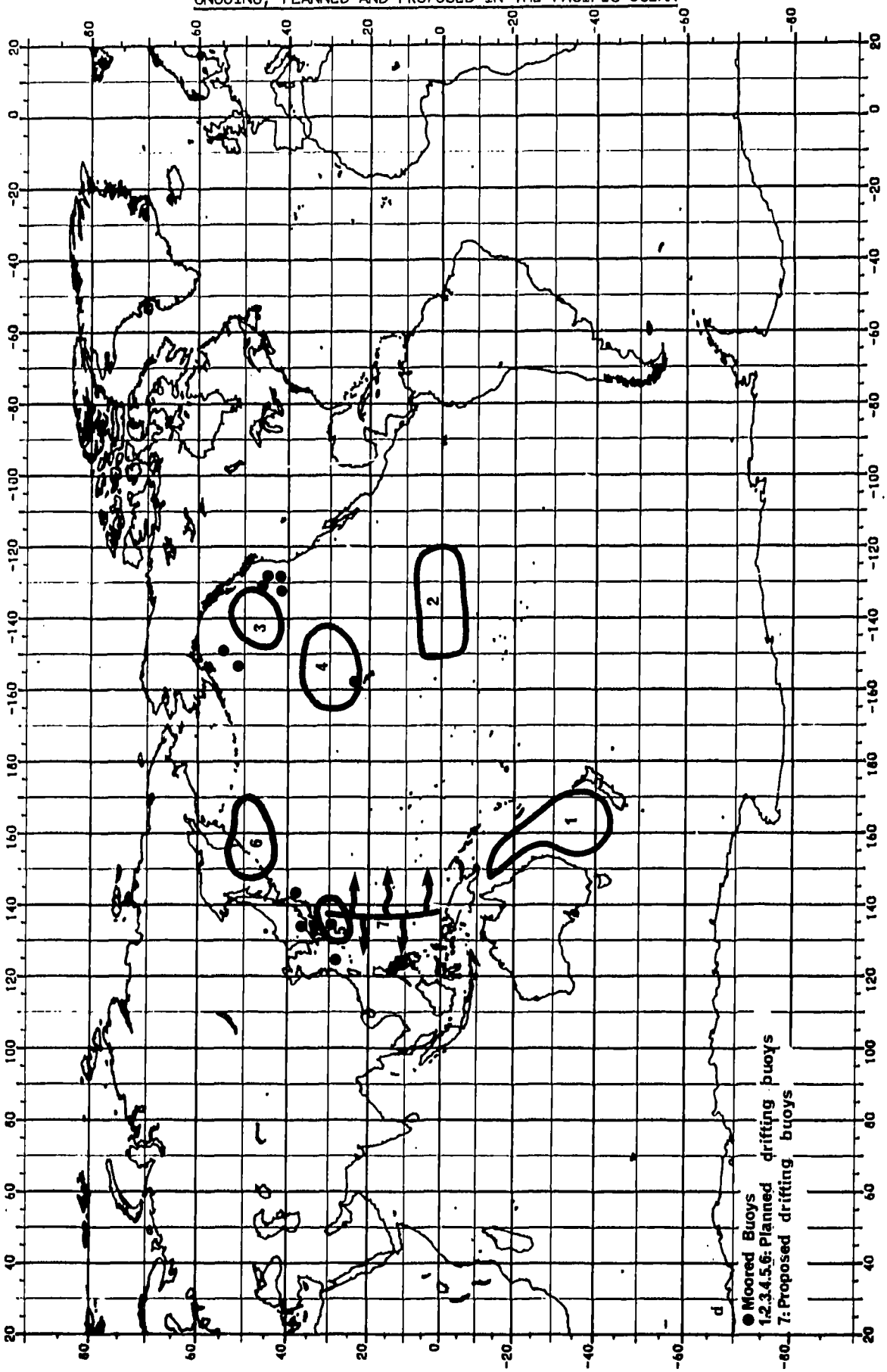
Philippines

The Philippine Bureau of Coast and Geodetic Survey conducts hydrographic surveys in waters in and around the archipelago. These include ports and harbours, straits, channels, bays, gulfs, the seas between the various islands and adjacent waters in the South China Sea, the Philippine Sea and Celebes Sea. Routine temperature and depth observations during these investigations are obtained. These data could be fed into the IGOSS system to increase the data coverage of the programme.

U.S.S.R. hydrographic survey programme

From now until 1985, four or five more ships will be added to the U.S.S.R. research ships operating in the Pacific. During 1982-1985, the U.S.S.R. research vessels will continue to obtain the deep-water ocean information. The information obtained will be exchanged in the international BATHY/TESAC format in the usual manner. In accordance with the WESTPAC/II.1 decision, beginning from 1982, the U.S.S.R. might conduct a Section (see Annex VIII). The U.S.S.R. has plans to continue observations of the programme of standard sections in the energy-active regions.

DRIFTING AND MOORED BUOY PROGRAMMES
ONGOING, PLANNED AND PROPOSED IN THE PACIFIC OCEAN



Drifting buoy programmes

Australia (1)

(a) As of 1 October 1981, seven Australian buoys are operating, six of them having a life expectancy of between one to nine months, the seventh, which was redeployed after recovery, has a life expectancy of 18 months;

(b) The buoys are used in an ocean analysis and forecasting scheme for the Tasman and Coral Seas. The buoys are tracked by satellite;

(c) The Bureau of Meteorology is proposing in its three-year forward programme to introduce an additional 20 drifting buoys and, if funding is approved, the programme will commence in two to three years' time. Data from the buoys are fed into the GTS.

Equatorial Pacific Ocean Climate Studies (EPOCS) (2)

The EPOCS oceanographic full programme is focused on the study of processes in the near surface and deep ocean that are responsible for the changes in the temperature of the equatorial sea surface. In order to study these processes, a number of observational systems will be used including drifting and moored buoys. About 20 drifters measuring SST in this region will be deployed annually. A maximum of 13 moored buoys with current meters will be deployed between 85°W and 135°W.

Canada (3)

It is anticipated that several drifting buoys (an array of at least six to eight buoys) with thermistor chains will be deployed in the area of the previous location of Ocean Station PAPA each year.

U.S.A.

FRONTS (4)

The objective of this programme is to study the sub-tropical fronts in the Pacific Ocean. Eleven drifting buoys measuring location and sea surface temperature were deployed at 31°N 153°W in January 1980. Most of these buoys are still operating.

PEQUOD

Free drifting buoy deployments have been a large part of the U.S. Pacific Equatorial Ocean Dynamics Programme. Over 20 buoys have been deployed to this time in the Central Equatorial Pacific Ocean east of 180° longitude. At the present time, there are no plans for future deployments.

Japan (5)

In the Kuroshio, south of Japan, about ten drifting buoys have been deployed since 1979, three for each year, under the Kuroshio Utilization Programme in Japan. This programme is to be continued until 1986.

Note: The area indicated by a number between brackets is shown on the map.

U.S.S.R. (6)

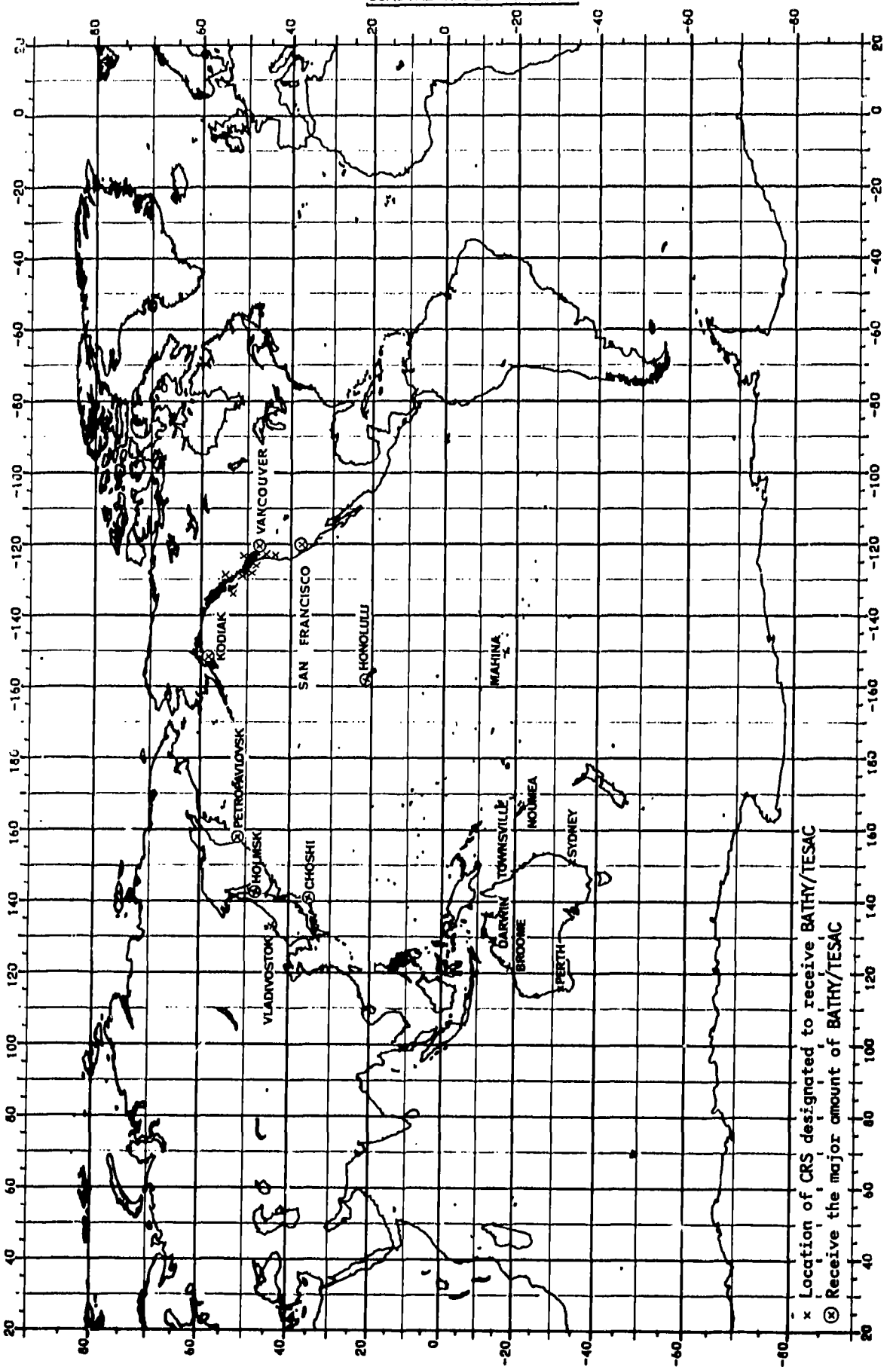
The U.S.S.R. is planning to put into operation in 1983-1985, a network consisting of several hygrometeorological stations (moored buoys) in the WESTPAC region with the utilization of the data obtained for international exchange.

Proposed WESTPAC programme (7)

Drifting buoys can be deployed from routine hydrographic surveys in the interior ocean where drift velocity can be compared with that expected from the geostrophic flow field. The residual would be related to direct wind-driven currents.

IGOSS TELECOMMUNICATION POSSIBILITIES FOR DATA COLLECTION

- COASTAL RADIO STATIONS -



LIST OF OCEANOGRAPHIC PRODUCTS IN THE PACIFIC REGION

Parameters	Name and full address of issuing agencies or institutes	Type of products (analysis, forecasts, warnings, etc.)	Presentation and dissemination (plain language, fax charts, etc.) and availability (routine or request)	Area covered	Remarks
AUSTRALIA		MELBOURNE BROADCAST (AXM) DARWIN BROADCAST (AXI)			
Mean sea surface temperatures	Bureau of Meteorology P.O. Box 1289K Melbourne 3001	Analysis	Fax chart-routine	$23^{o}N$ - $23^{o}S$ $100^{o}E$ - $180^{o}E$	Weekly - Tuesdays
CANADA					
Sea surface temperature	CFWS METOC Centre Esquimalt	Analysis, twice weekly	Radio facsimile, mail	Northeast Pacific	WMO Publication No. 9 Vol. D
Sea surface temperature mean and anomaly charts	CFWS METOC Centre Esquimalt	Analysis monthly	Mail	Northeast Pacific	WMO Publication No. 9 Vol. D
Sea surface temperature	CFWS METOC Centre Esquimalt	Analysis, twice weekly	Mailed chart and radioteletype - message	Northeast Pacific	WMO Publication No. 9 Vol. D Apr-Oct only for fisheries
FEDERAL REPUBLIC OF GERMANY					
a) 10 day-mean sea surface temperature (^{o}C) b) number of observations c) standard deviation if c) negative: data interpolated with neighbouring grid point values in data sparse areas. In this case values of b) contain statistical information	Deutscher Wetterdienst -Zentralamt- Frankfurther Str.135 D-6050 Offenbach		Discrete values at each grid point (distance between grid points about 200 nm) Dissemination by air mail once weekly	Northern hemisphere	
a) monthly mean sea surface temperature (C) b and c) see above	- ditto -	Plotted data	Discrete values at each grid point (distance between grid points about 200 nm) Dissemination by mail -once monthly	Northern hemisphere	

Parameters	Name and full address of issuing agencies or institutes	Type of products (analysis, forecasts, warnings, etc.)	Presentation and dissemination (plain language, fax charts, etc.) and availability (routine or request)	Area covered	Remarks
JAPAN					
Sea surface temperature	Oceanographic Division, Marine Department, Japan Meteorological Agency 3-4 1-chome, Otemachi Chiyodaku 100 Tokyo	Analysis (10-day mean)	Fax chart and publication (routine)	0 - 53 N 110 - 180 E	WMO Publication No. 9, Vol. D; IOC T.S. No. 12
Sea surface temperature	- ditto -	Analysis (monthly mean)	Fax chart and publication (routine)	0 - 53 N 110 - 180 E	WMO Publication No. 9, Vol. D; IOC T.S. No. 12
Sea surface temperature	- ditto -	Analysis (10-day mean derived from I.R. data of G.M.S.)	Fax chart (routine)	49 S - 48 N 90 E - 171 W	WMO Publication No. 9, Vol. D
Anomaly of sea surface temperature	- ditto -	Analysis (monthly)	Publication (routine)	10 - 53 N 110 - 180 E	IOC T.S. No. 12
Sea surface current	- ditto -	Analysis (monthly)	Fax chart and publication (routine)	24 - 48 N 124 - 158 E	WMO Publication No. 9, Vol. D; IOC T.S. No. 12
Sub-surface temperature (at 100 m)	- ditto -	Analysis (monthly)	Fax chart and publication (routine)	24 - 48 N 124 - 158 E	WMO Publication No. 9, Vol. D; IOC T.S. No. 12
Sea water temperature at sea surface and sub-surface (at the depths of 100, 200 m) and sea surface current	Oceanographic Division, Hydrographic Department Maritime Safety Agency 3-1, 5-chome Tsukiji, Chuo-ku 100 Tokyo	Analysis (bi-monthly)	Fax chart and publication (routine)	24 - 46 N 124 - 148 E (Publication) 29 - 38 N 128 - 145 E (Fax chart)	IOC T.S. No. 12 Fax chart is available except for temperature at the depth of 200 m
Sea water temperature at sea surface and sub-surface (at the depths of 100, 200 m) and sea surface current	- ditto -	Analysis (seasonal)	Publication (routine)	28 - 46 N 122 - 155 E	IOC T.S. No. 12

Parameters	Name and full address of issuing agencies or institutes	Type of products (analysis, forecasts, warnings, etc.)	Presentation and dissemination (plain language, fax charts, etc.) and availability (routine or request)	Area covered	Remarks
JAPAN					
Sea surface temperature	Japan Fisheries Information Service Centre, No. 5 Sogo Building, 7, 1-chome Kojimachi, Chiyoda-ku 102 Tokyo	Analysis (every 5 days)	Publication (routine)	26 - 45 N 125 - 160 E	
Sea surface temperature	- ditto -	Analysis (weekly)	Publication (routine)	Japan Sea	
Sea surface temperature	- ditto -	Analysis (weekly)	Publication (routine)	27 - 35 N 126 - 140 E	
Sea surface temperature	- ditto -	Analysis (every 5 days)	Publication (routine)	0 - 70 N 100 E - 80 W	
Sea surface temperature	- ditto -	Analysis (2 times/ week from April through July)	Publication (routine)	39 - 50 N 140 - 180 E	
NEW ZEALAND					
Sea surface temperature	New Zealand Meteorological Service P.O. Box 722 Wellington	Analysis (5 days mean)	Mailed	New Zealand, Tasman Sea area	

Parameters	Name and full address of issuing agencies or institutes	Type of products (analysis, forecasts, warnings, etc.)	Presentation and dissemination (plain language, fax charts, etc.) and availability (routine or request)	Area covered	Remarks
UNION OF SOVIET SOCIALIST REPUBLICS					
Sea surface temperature	Hydrometeorological Centre of the USSR 9-13 Bolshevistskaya Street Moscow 123376	Analysis (5-day mean)	On 2, 7, 12, 17, 22 and 27 of each month (all year round) in plain language, by mail, available on request	North Pacific	IGOSS product
Sea surface temperature	- ditto -	Forecast (5-day mean, 10-day lead time)	On 2, 12, 22 of each month from 2 October to 2 March, in plain language, by mail, routine	North Pacific	IGOSS product
Sea surface temperature	- ditto -	Analysis (30-day mean)	Pictorial chart on 5 of each month, available on request by mail	North Pacific	IGOSS product
Sea surface temperature	- ditto -	Analysis (5-day mean)	Pictorial fax chart on 2, 7, 22 and 27 of each month transmitted at 12.10 GMT, routine	Tropical zone of the world ocean	IGOSS product WMO Publication No. 9, Vol. D

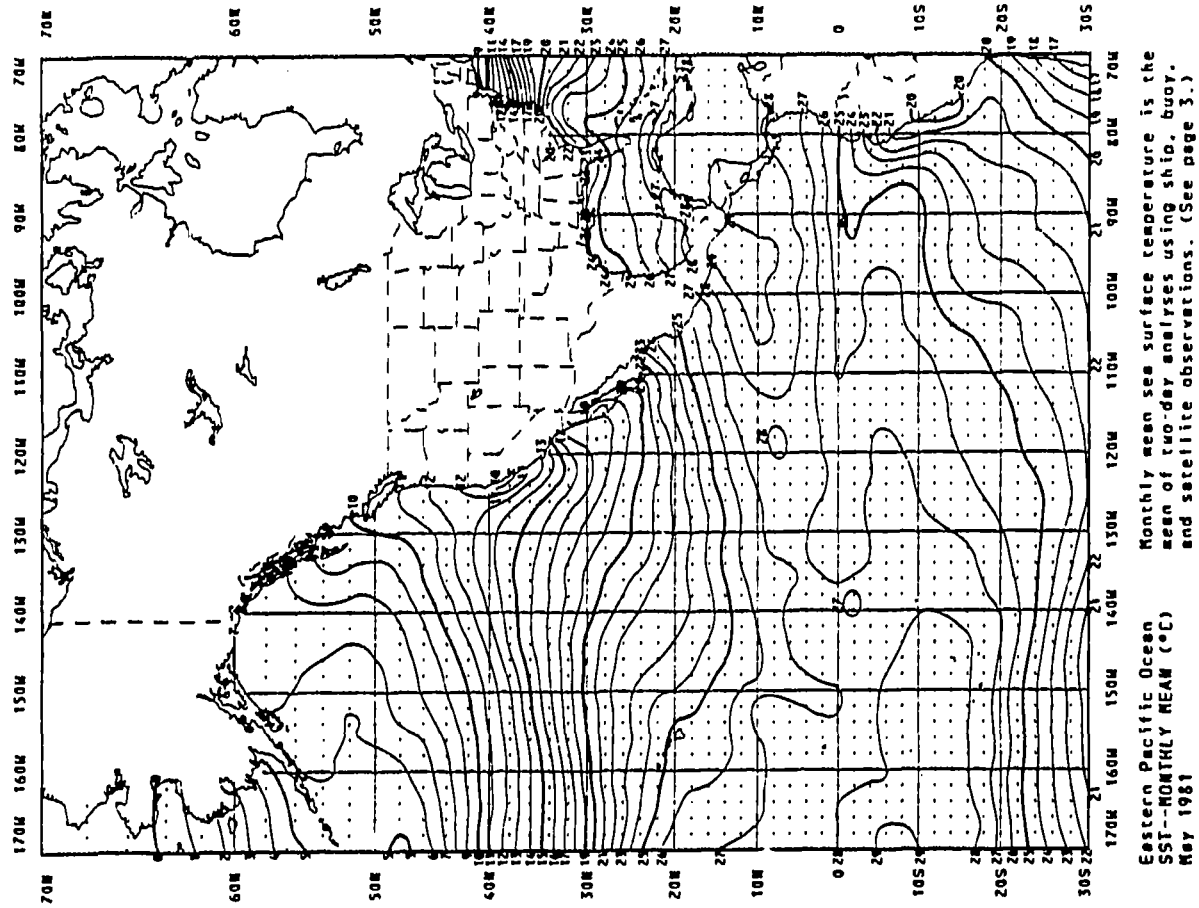
Parameters	Name and full address of issuing agencies or institutes	Type of products (analysis, forecasts, warnings, etc.)	Presentation and dissemination (plain language, fax charts, etc.) and availability (routine or request)	Area covered	Remarks
UNITED STATES OF AMERICA					
Sea surface temperature, and location of thermal boundaries	NOAA/NWS Seattle Ocean Services Unit 1700 Westlake Ave. Seattle, Wash. 98109	Analysis	Mail, public display locations, radiofacsimile	42°- 58°N 124°- 134°W	Data sources are synoptic ship reports and infrared satellite imagery
Sea surface temperature	NOAA/NESS Washington Science Center Rockville, Md. 20852	Gridded fields photographic displays	Fax charts, mail, GTS	Global	Daily, weekly, monthly
Sea surface temperature	NOAA/NWS	Analysis, gridded	GTS	Global	Every other day
Sea surface temperature and mixed layer depth	NOAA/National Marine Fisheries Service (NMFS) 8604 La Jolla Shores Dr. La Jolla, Cal. 92037	Weekly analyses	Fax map	Eastern tropical Pacific	
Sea surface temperature	- ditto -	Weekly analyses	Fax map	Eastern North Pacific	July-October only
Fishing information	- ditto -	Monthly and bi-weekly analyses and narrative	Mail	North Pacific and eastern tropical Pacific	
Sea surface temperature	Naval Eastern Oceanography Center (NEOC) Naval Air Station Norfolk, Va. 23511	Analysis	Fax chart 1055Z (Monday/Fri.)	28N156W, 40N068E 02N083W, 08N021E	Synoptic ship observations and climatology
Primary layer depth		Analysis	Fax chart 1110Z (Monday/Fri.)	28N156W, 40N068E 02N083W, 08N021E	Ship and aircraft observations and climatology

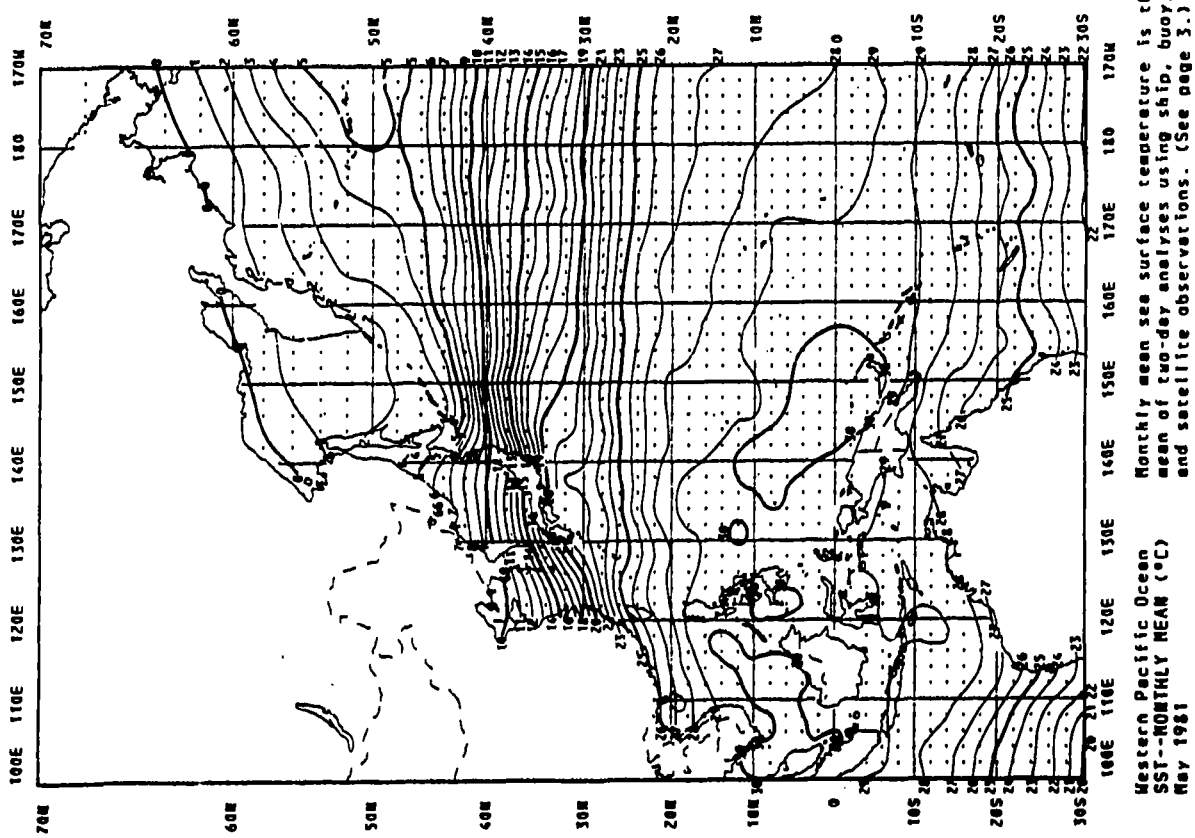
Schedule is subject to change as required. A daily fax schedule is broadcast at 0000/1200Z frequencies (kHz):

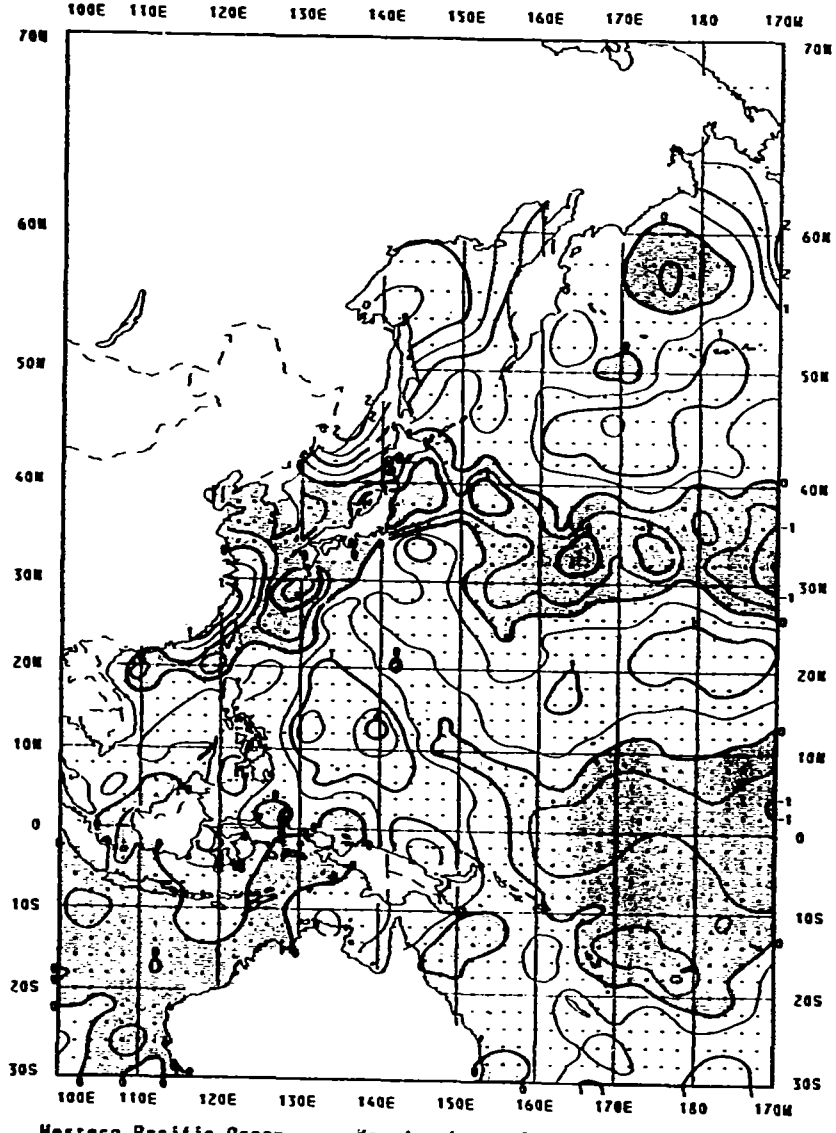
NEOC, Norva	4975, 8080, 10865	continuously
	3357	2000Z - 1400Z
	16410	1400Z - 2000Z
	20015	1200Z - 2400Z

Parameters	Name and full address of issuing agencies or institutes	Type of products (analysis, forecasts, warnings, etc.)	Presentation and dissemination (plain language, fax charts, etc.) and availability (routine or request)	Area covered	Remarks*
UNITED STATES OF AMERICA					
Sea surface temperature	Naval Western Oceanography Center (NWOC) Pearl Harbor, Hi.	Analysis	Fax chart 1200Z	60N100E, 60N175E 05N100E, 05N175E (West Pacific)	Synoptic ship observations and climatology
Sea surface temperature	Naval Oceanography Command Center (NOCC) Guam	Analysis	Fax chart 1215Z	60N170E, 60N115W 05N170E, 05N115W (East Pacific)	Synoptic ship observations and climatology
Schedule is subject to change as required. A daily fax schedule is broadcast at 0000/1200 frequencies (kHz): NWOC - 2122, 9440, 13862.5 continuously; 4802.5 0600 - 1800Z; 16398, 21785 1800 - 0600Z. NOCC - Guam: 10966, 3377.5, 22865 continuously; 10255, 13807.5, 18620 0100 - 1300Z; 4975, 7645, 23820, 18620 1300 - 0100Z					
Ocean surface currents	Fleet Numerical Oceanography Center (FNOC) Monterey, Ca	Analysis and Prognosis	Regularly scheduled fax broadcast	Northern hemisphere	Fall 80
Advective mixed layer depths	- ditto -	Prognosis	Regularly scheduled fax broadcast	Northern hemisphere	Fall 80
PLANNED PRODUCTS					
NEW ZEALAND					
Sea surface temperature	New Zealand Meteorological Service P.O. Box 722 Wellington	Analysis (daily)	Fax chart, mailed	1 January 1981	Ship, satellite and buoy data

Some examples of ocean service products covering parts of the Pacific Ocean

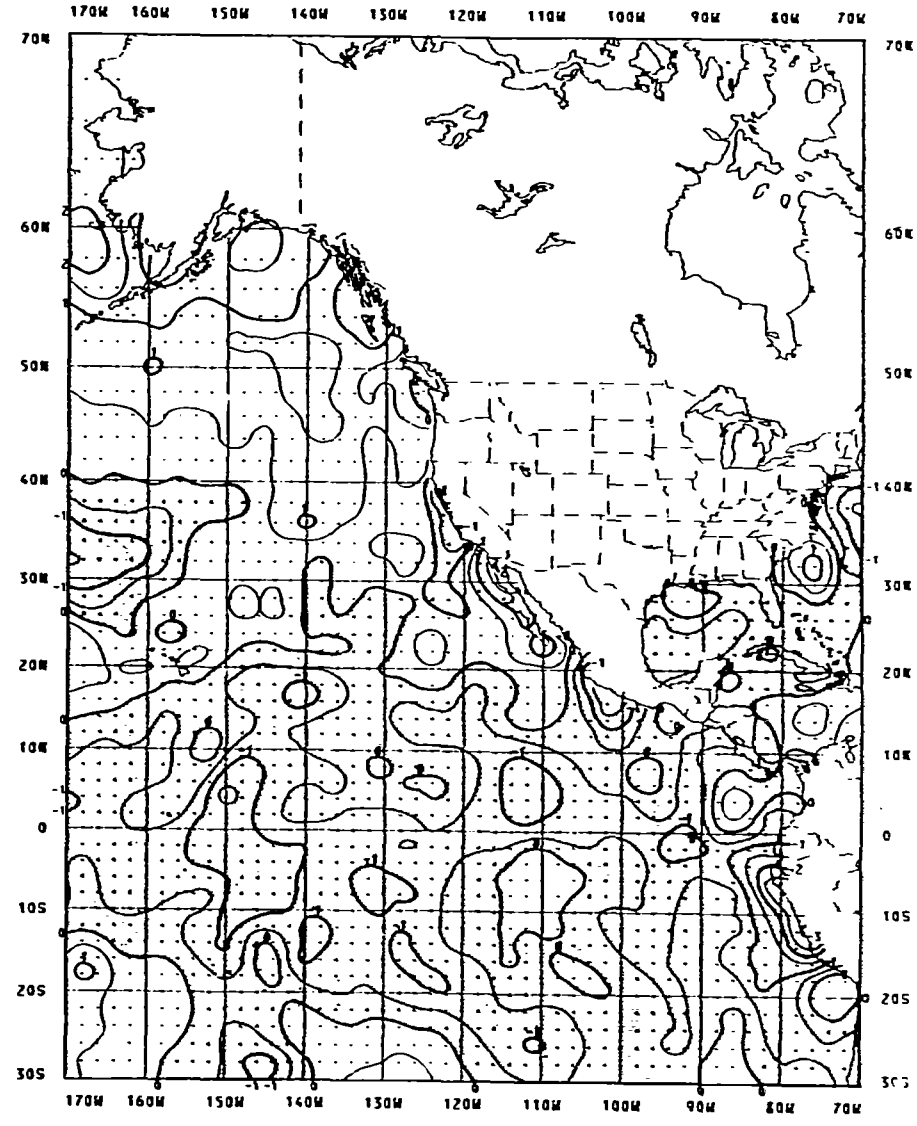






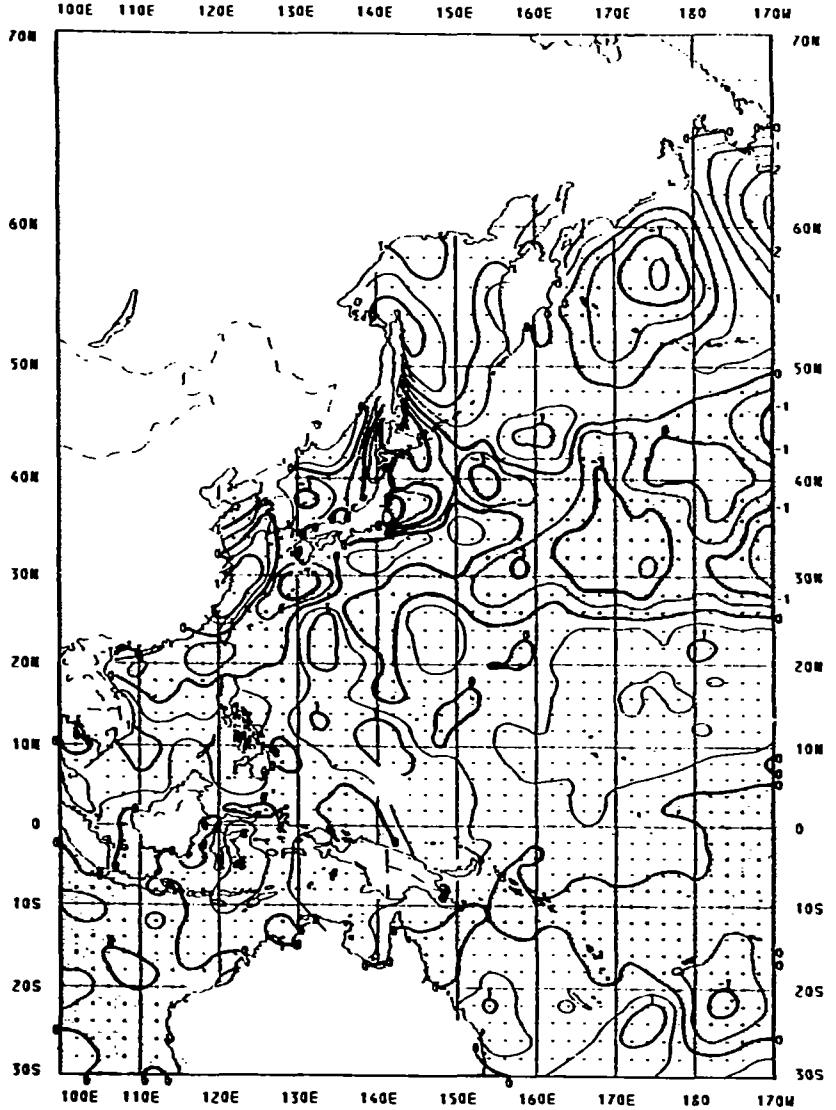
Western Pacific Ocean
SST--YEARLY CHANGE (°C)
May 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year.



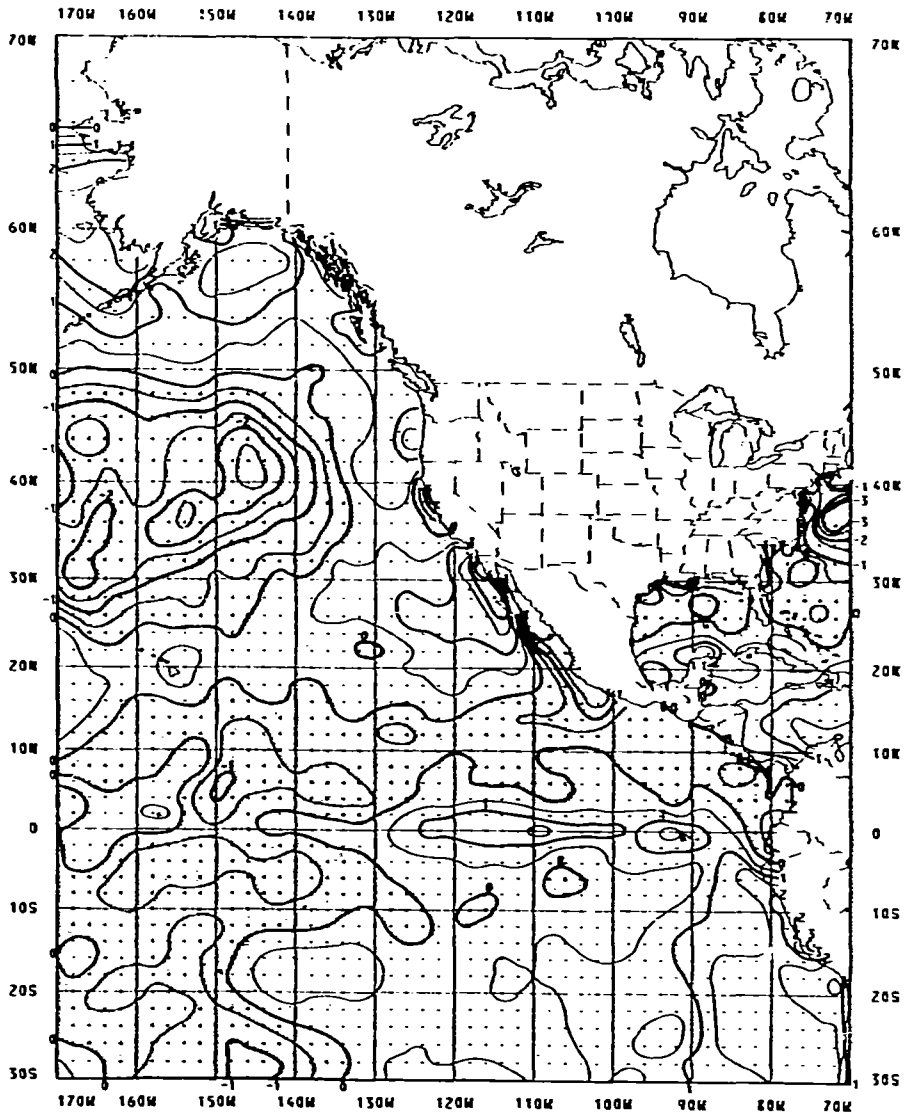
Eastern Pacific Ocean
SST--YEARLY CHANGE (°C)
May 1981

Yearly change is the difference between the monthly mean SST for this month and for the corresponding month last year -- shading shows where this year's monthly mean is colder than the corresponding monthly mean last year



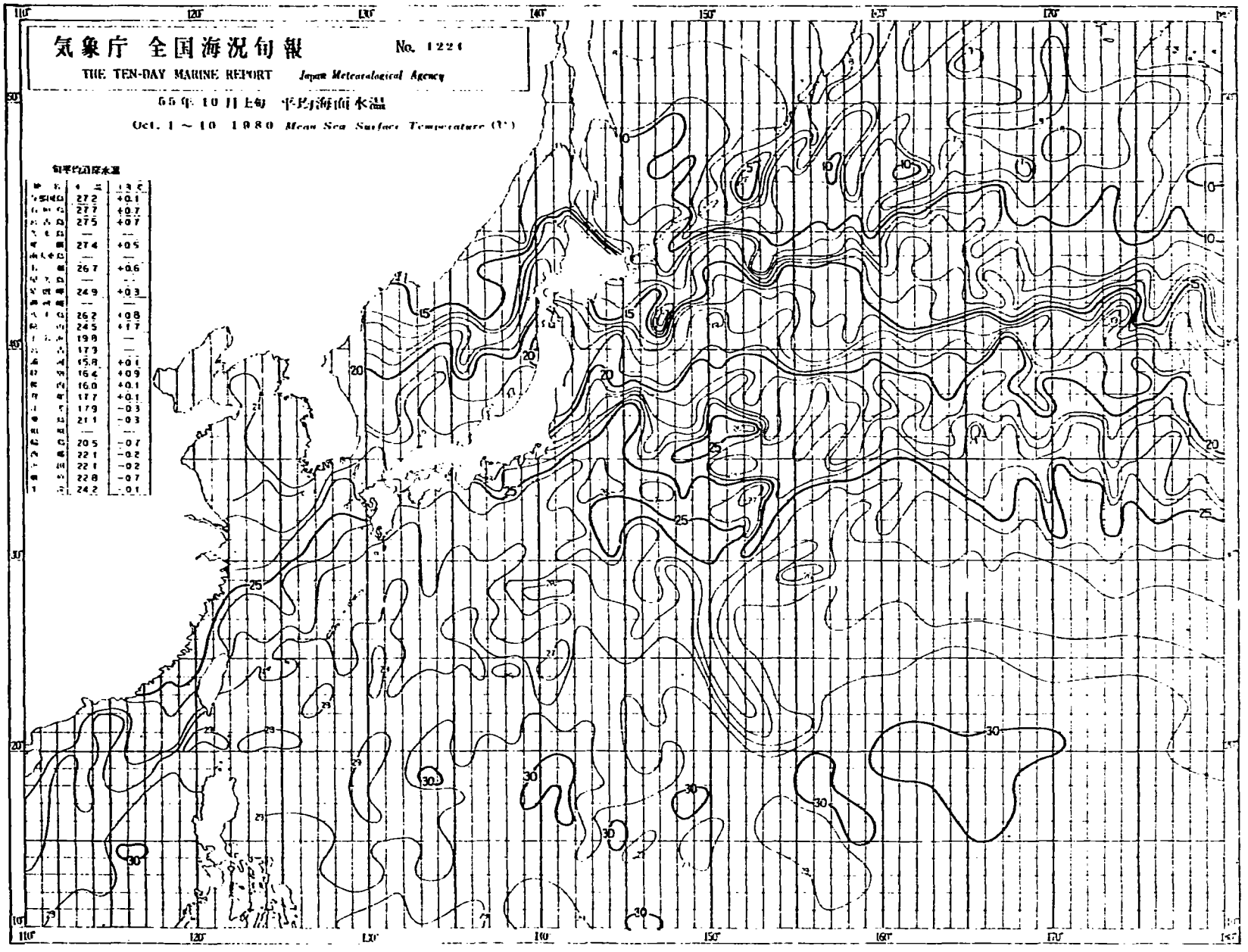
Western Pacific Ocean
SST--MONTHLY ANOMALY (°C)
May 1981

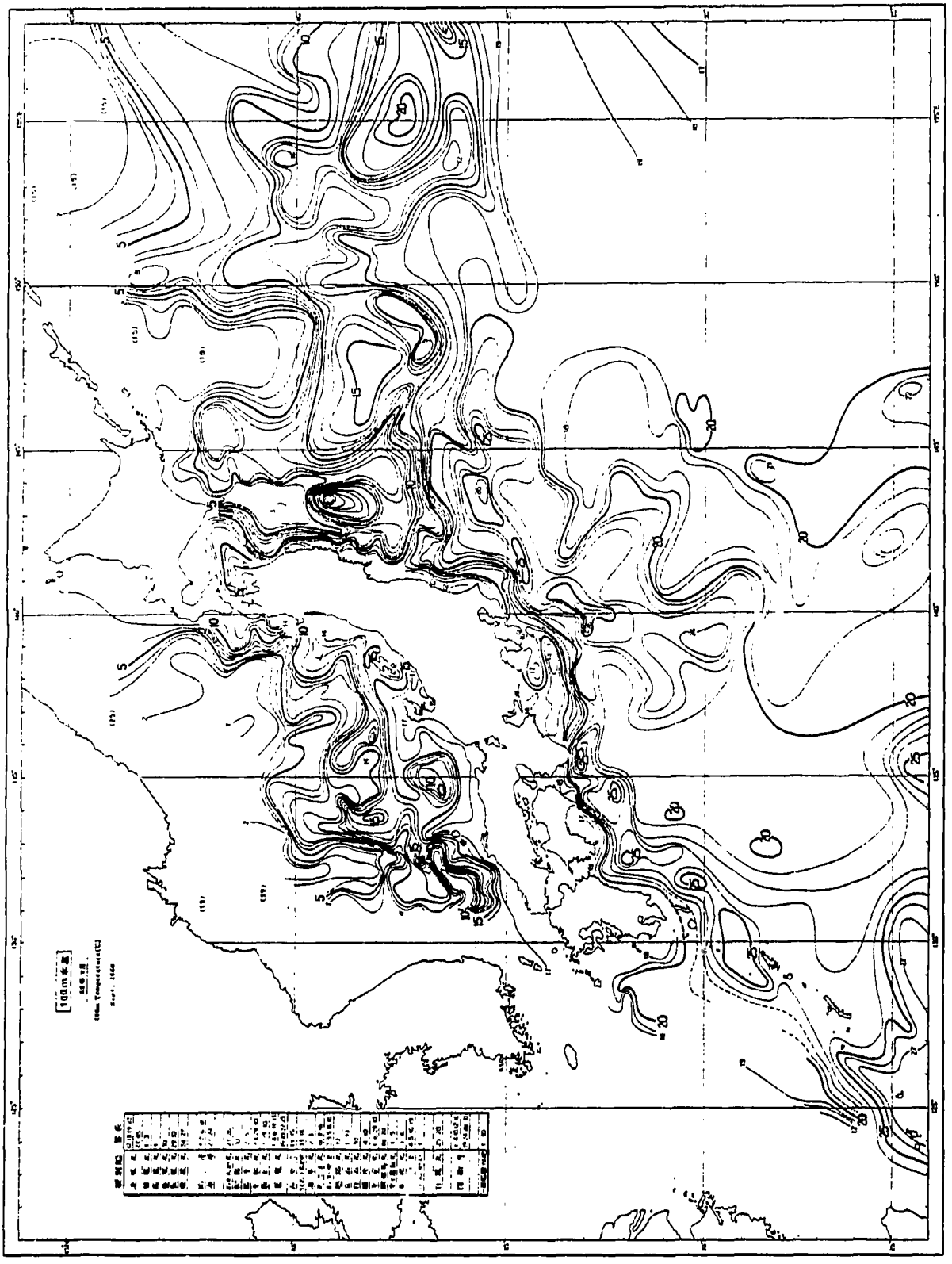
Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)

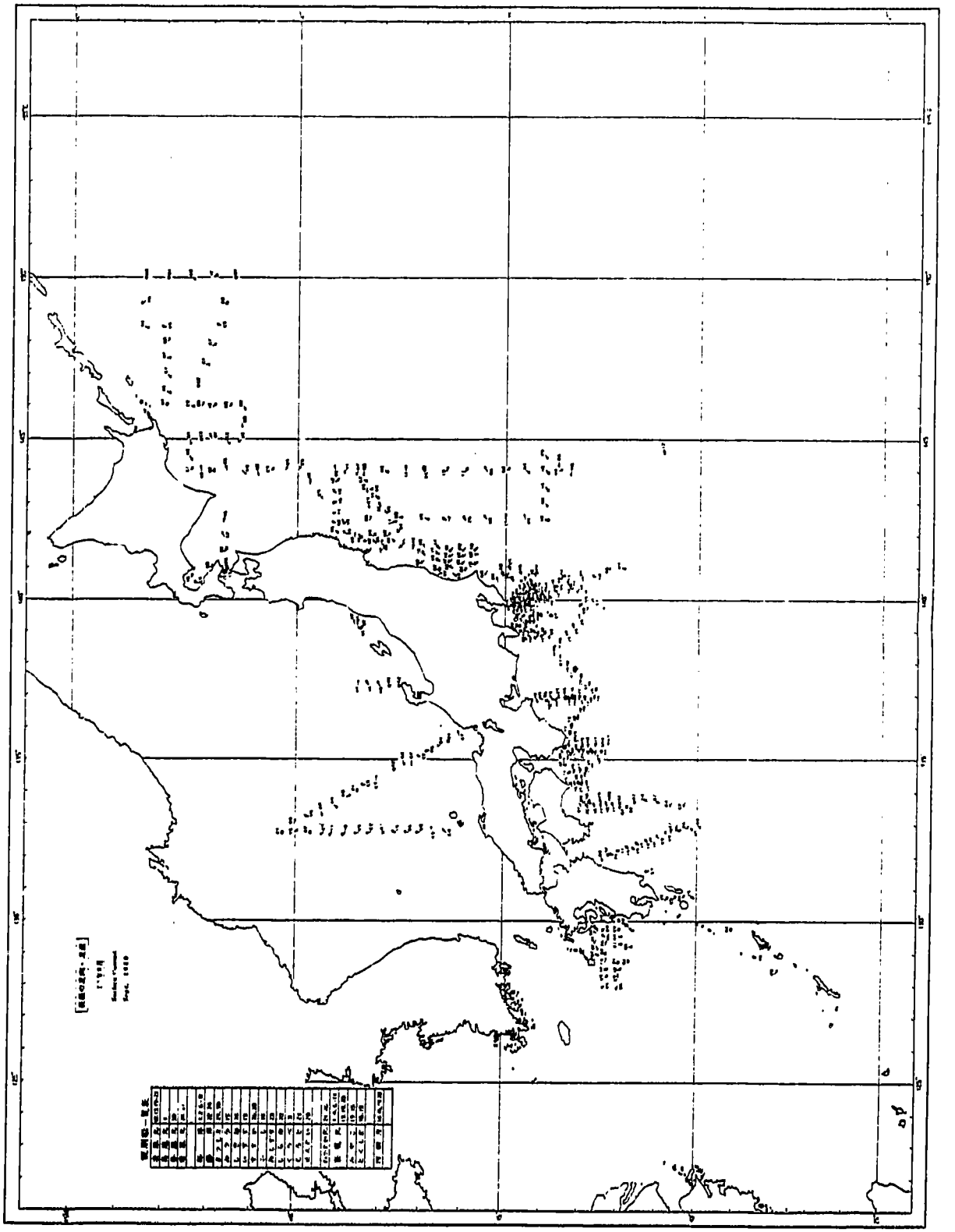


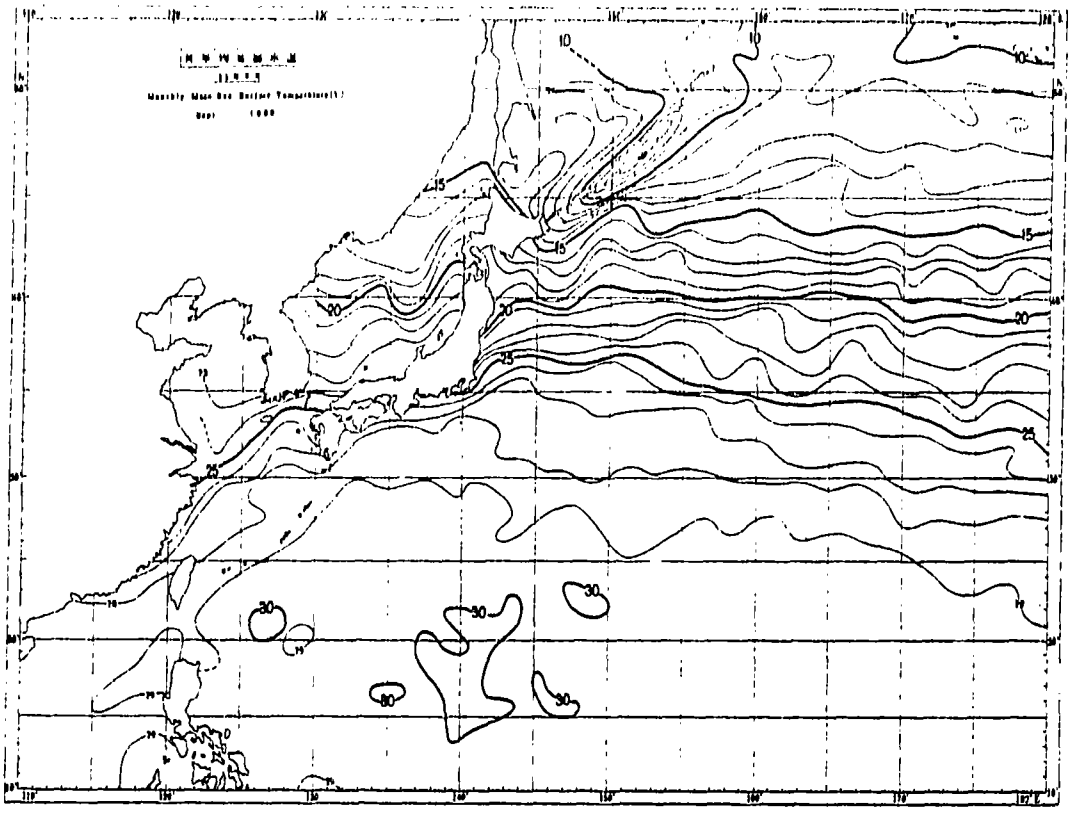
Eastern Pacific Ocean
SST--MONTHLY ANOMALY (°C)
May 1981

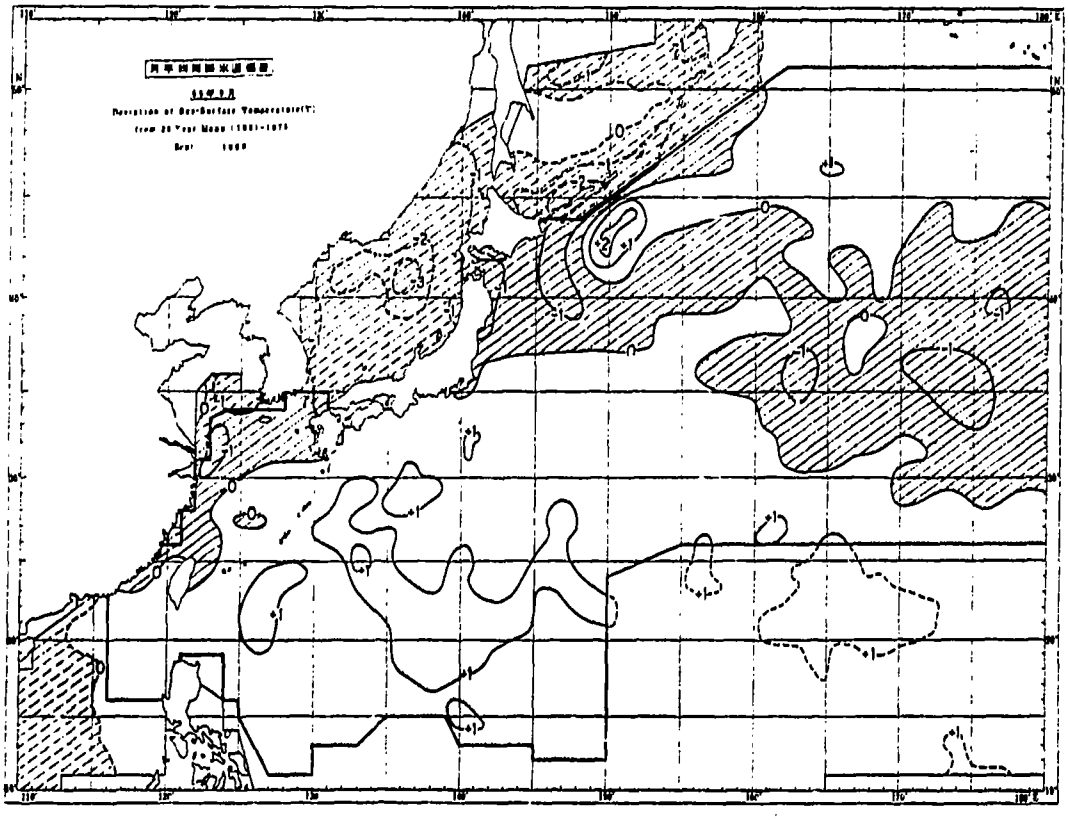
Monthly anomaly is the difference between the monthly mean sea surface temperature and the climatological monthly mean value -- shading shows where the monthly mean is colder than climatology. (See page 3.)


気象庁 全国海況旬報
No. 1224
THE TEN-DAY MARINE REPORT Japan Meteorological Agency
55年 10月上旬 平均海面水温
Oct. 1 ~ 10 1980 Mean Sea Surface Temperature (℃)
旬平均表面水温
110°
120°
130°
140°
150°
160°
170°
50°
40°
30°
20°
10°









REGIONAL GUIDELINES FOR THE PREPARATION OF OCEANOGRAPHIC PRODUCTS

Introduction

Regarding the preparation of the regional data sets and maps the responsible countries are encouraged: (1) to follow a standard set of procedures; (2) to provide for substantial overlapping of products so that the degree of strandardization and compatibility can easily be assessed. The extent of overlap should be 20^{o} latitude and longitude at a minimum.

Also in constructing future IGOSS products six aspects of standardization need consideration:

- Definition of the algorithms used to produce analysed fields;
- Quality control procedures;
- Interpolation procedures, both horizontal and vertical;
- Mean climatological fields;
- Map projections;
- Parameter symbols.

The analysed data sets which have been identified as potential IGOSS products are:

- Heat content
- Mixed layer depth
- Frontal zones.

Definitions of secondary parameters

Heat content

"Heat content" is tentatively defined as:

$$\text{heat content} = Cp \int_{o}^{D} \rho T dZ; \quad D = 100, 200, 300, 400 \text{ m}$$

where ρ = density of water
Cp = heat capacity of water
T = temperature of water
z = depth of water.

Since "heat content" is a function of depth, four depths of integration have been allowed.

Mixed layer depth

"Mixed layer depth" is now calculated using one of the two following algorithms:

$$D \ni \frac{\partial T}{\partial Z} > \text{THRESHOLD}$$

Where ΔT = change in temperature over a depth change ΔZ and the threshold are determined empirically and depend upon location. With this method mixed layer depth may not be accurate where inversions exist. An even simpler definition of

mixed layer depth is used extensively and should be considered. The definition is:

$$D \ni |T_o - T_d| > \text{THRESHOLD}$$

Where the threshold is empirically determined and T_o is the surface temperature and T_d is temperature at depth. Further considerations of the "best" mixed layer definition should be considered by the proposed ad hoc Task Team on IDPSS products.

Frontal zones

Frontal zones analyses are presently constructed by calculating the of the zorizontal temperature gradient,

$$|\bar{\nabla}_H T|$$

This parameter must be estimated using finite differences with temperatures used in the analyses T interpolated both horizontally establishing a uniform grid for differencing. This analysis should be done at least at 0, 100, 200, 300 and 400 m.

Editing procedures

The quality controlled data set is a product leading to the development of other products. Therefore, quality control in each nation should be standardized to conform to IGOSS guidelines.

The recommended IGOSS quality control procedures will consist of four steps in order of application:

- Examination for gross errors in location and time ;
- Elimination of exact and near-duplicates ;
- Elimination of reports based on the size of the anomaly relative to the local standard duration;
- Objective editing of vertical profiles to eliminate "unreasonable" profiles.

The first two editing steps should not differ significantly from SOC to SOC. SOCs producing subsurface analyses should exchange quality control manuals describing procedures and should endeavour to make these manuals consistent.

Interpolation procedures

Interpolation procedures used by Member countries in the construction of IDPSS products are generally subjective at this time. It was strongly recommended that Member countries institute standard objective methods in the development of new products as discussed herein.

Mean fields

Existing mean fields were reviewed. Presently, long-term normals are available only for SST, generally for 30 years, the same as for most meteorological data sets.

Most near subsurface temperature products will be produced for IDPSS using BT or XBT data. If intercomparison of combination of products is to be possible

the mean fields used in these IDPSS products must be the same. Therefore, it is recommended that five-year means (1976-1980) based upon the BT or XBT data should be reference fields in the operational analysis. Review of this recommendation is required by the ad hoc Task Team on IDPSS.

Projections

Some existing types of projection of products were examined. Standardization of the projection among each centre in the NORPAX and WESTPAC regions were stronlgy recognized to be essential for keeping the continuity among the products. The Mercator projection for the standard parallel 22°30' is considered to be desirable. Map scales should be kept uniform for all IDPSS products as already stated in the "Guide to the IGOSS Data Processing and Services System" (Joint IOC/WMO publication).

Symbols

The symbols proposed in the draft Guide IDPSS are generally suitable for the preparation of the products in the regions. Symbols for heat content, mixed layer depth, sea level and frontal zone indicators must be agreed upon before the operational issue of products.

Sea level

The usefulness and importance of mean sea level analysis is well recognized for monitoring the relative height of the sea surface. Member countries are strongly encouraged to prepare operational sea level analyses for the Pacific in the near future. Monthly mean sea level maps will be constructed on a grid compatible with heat content, subsurface and frontal analyses. Again quality control procedures should be consistent among Member countries.

Satellite data products

Satellite data products are already an important data source for operational oceanographic products. It is recommended that present procedures for incorporating satellite data into SST be documented and this documentation be exchanged between SOCs incorporating satellite data into their products.

TERMS OF REFERENCE OF THE IGOSS

AD-HOC GROUP ON REGIONAL DEVELOPMENT

1. To prepare a Co-ordinated Regional Implementation Plan for IGOSS in the Pacific region, taking into account:

   (a) The requirements of ocean/atmosphere programmes of IOC and WMO (WESTPAC, NORPAX, WWW, WCP, etc.) and of Members in the region;

   (b) The IGOSS General Plan and Implementation Programme 1982-1985;

   (c) The guidelines for implementing IGOSS on a regional basis;

   (d) The conclusions and recommendations adopted at the ICM/Tokyo 1981, which should provide the basis for the further development;

2. To elaborate phased implementation projects for individual elements of IGOSS, i.e. IGOSS Observing System, IGOSS Data Processing Services System and IGOSS Telecommunication Arrangements.

3. To submit to the chairman of the Joint Working Committee for IGOSS a progress report by the end of August 1982.