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International Co-ordination Group for the
Tsunami Warning System in the Pacific

Fifth Session

Lima, Peru, 23-27 February 1976

SUMMARY REPORT

This document is being given a wide initial distribution to all official correspondents of the Commission. Recipients are requested to retain this copy for use at future meetings.

* This document is available in English and Spanish only. The highlights (pages (i) and (ii) and Annex II (recommendations) are also available in French and Russian.

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HIGHLIGHTS OF THE SESSION

The International Co-ordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) held its fifth session in Lima, Peru, from 23 to 27 February 1976. The meeting took place at the Instituto del Mar of the Peruvian Navy, in Callao. Dr. Glenn Flittner, USA, acted as Chairman. The following Member States of the Group were represented : Canada, Chile, Ecuador, France, Peru, Philippines, USA, USSR. Not represented were : China, Guatemala, Japan, Korea, New Zealand, Singapore and Thailand. Mexico sent an observer.

After a discussion of the state of implementation of relevant IOC resolutions and recommendations, representatives of Member States presented their national reports, and the Director of the International Tsunami Information Center (ITIC) reported on developments at the Center. The Group then considered resolutions from other bodies relating to tsunamis, as from the Tsunami Committee of IUGG,* from the UN General Assembly, from the United Nations Conference on Trade and Development (UNCTAD) and the Unesco Intergovernmental Conference on the Assessment and Mitigation of Earthquake Risk. The discussion centered around the further expansion of the Tsunami Warning System, improvements in communication, a pilot project on study of the damage caused by tsunamis on the western coast of South America, and on educational material to raise public awareness of the danger of tsunamis. The Group formulated 13 recommendations, which were adopted at the end of the session, together with the Summary Report (in English). On the last day of the meeting, the Group elected a new Chairman, Mr. G.C. Dohler, from Canada, in succession to Dr. S. Suyehiro (Japan). Tnte C. Vargas Faucheur (Peru) was elected Vice-Chairman. The Secretary was invited to negotiate with the Government of the Philippines on the possibility of holding the next ITSU meeting in Manila, in early 1978.

The Group, in its discussions, highlighted the following items :

1. The Group was impressed by the excellent work done by the Director and Associate Director of the International Tsunami Information Center, but also felt that the existing definition of functions of ITIC is inadequate, and therefore asks for the development of a clearer mandate. It also requests Member States to make voluntary contributions to the IOC Trust Fund, to support staff and special projects at ITIC (recommendations 1,3,4,5 refer).
2. The Group, when discussing whether the infrastructure in all Member States is adequate enough to provide good tsunami warnings, felt that there were two areas where particular assistance had to be given to develop national systems : the South American countries along the Pacific coast, and the island states. As UNEP had decided to include the topic of early warning and preparedness planning for natural disasters among the priority areas for action by the United Nations Environment Programme, the Group recommended to approach UNEP for funding of South American and Island States Projects (recommendations 8 and 11 refer).

* International Union of Geodesy and Geophysics

3. The Group agreed to the importance of exchanging scientists and technicians between Member States, and between Member States and ITIC, in order to establish close working relationship, and to provide training. IOC Trust Fund money is required to implement this effectively; countries are also invited to send such scientists and technicians at their own expense. The co-ordination of this exchange should be in the hands of ITIC (recommendations 6 and 12 refer).
4. In order to raise public awareness, and to give scientists the necessary background material, the Group recommended that more educational material including brochures, slides, films, atlases, etc. should be produced. In this connection it was also felt useful if countries and individual scientists could provide copies of the results of their research to ITIC (recommendations 7 and 13 refer).
5. Concerning technical matters, the Group invited submission of tide gauge records from all possible stations to ITIC, asking World Data Centres (WDC) to arrange for storage and retrieval of these data; it also provided guidelines for reporting of wave heights, requested expansion of dummy tests and considered the availability of geostationary orbital satellites (recommendations 2, 9 and 10 refer).

SUMMARY REPORT1. Opening of the session

The fifth session of the International Co-ordination Group for the Tsunami Warning System in the Pacific was convened at the Conference Hall of the Instituto del Mar, Callao - Lima, Peru, on Monday, 23 February 1975, at 10.15. The Dirección de Hidrografía y Navegación de la Marina acted as the host for this Conference, and together with the Centro Regional de Sismología para América del Sur (CERESIS), made arrangements for logistical support for the Conference.

The inaugural ceremony marking the opening of the session began with welcoming speeches, by the ITSU National Co-ordinator of Peru, Tnte Cesar Vargas F. and by the Secretary General of the Peruvian Navy, Rear-Admiral Carlos Garrido Leca Soto, who emphasized the need for international co-operation in the field of tsunamis and the Tsunami Warning System in the Pacific, in particular.

Dr. G. Giermann, Deputy Secretary of the Intergovernmental Oceanographic Commission (also representing Unesco) then welcomed the Group in the name of the Director General of Unesco and the Secretary of the IOC, and thanked the Government of Peru and its Department of the Navy for hosting the Conference and providing their fine facilities. (For list of participants, see Annex IV).

2. Adoption of the agenda and election of a rapporteur

The Secretary reported that Dr. Shigehi Suyehiro, Chairman of ICG/ITSU, had submitted his resignation and that a new Chairman would have to be elected before the end of the session to succeed him. Dr. Glenn Flittner, Head of the U.S. Delegation, was asked to serve as temporary chairman for the duration of the session. Dr. George Pararas-Carayannis, Director of the International Tsunami Information Center (ITIC), was elected as rapporteur. The Chairman expressed, in the name of the Group, his sincere thanks to Dr. Suyehiro for his excellent work whilst in office. He asked the Secretary to transmit the best wishes of the group to Dr. Suyehiro. The Chairman, then, with assistance from the Secretary, presented minor comments and modifications to the provisional agenda, after which the agenda was adopted. (Annex I).

3. State of Implementation of IOC resolution VIII-24 and of recommendations from the fourth session of ICG/ITSU, held in Wellington, New Zealand, 4-7 February 1974.

The Secretary reviewed for the Group the status of resolution VIII-24 and the recommendations of the fourth session of the International Co-ordination Group for the Tsunami Warning System in the Pacific which met in Wellington, New Zealand, in February 1974. He informed the Group that implementation of the resolution and the recommendations had made considerable progress. (see also Annex 3 : Report of the Chairman).

4. Consideration of IOC resolution EC-IV.6 concerning ITSU, adopted by the fourth session of the IOC Executive Council, Ottawa, 17-22 June 1974.

The Secretary examined resolution EC-IV.6, adopted by the IOC Executive Council in Ottawa, Canada, in June 1974, which deals with the functions of the International Tsunami Information Center.

The Director ITIC pointed out that an anomaly existed in the functions of ITIC as stated by the subject resolution EC-IV.6 (Annex) which requires re-examination and re-statement. Furthermore, he mentioned that this anomaly was indicated in his report to the Group and proposed re-statement of the functions of ITIC for consideration by the Group. The Group agreed that the functions in their revised form were still unsatisfactory, and recommended that the matter be taken up again as stated in recommendation 1. (for Recommendations, see Annex II).

Referring to paragraph 8 of resolution EC-IV.6, the Director ITIC informed the session of his contacts with the International Council of Scientific Unions (ICSU) on the data archival and exchange requirements of the Tsunami Warning System (TWS). Specifically, he reported that contact on this subject has been carried out by correspondence and telephone with World Data Center "A" Tsunamis, now at Boulder, Colorado. A visit was then made to ICSU headquarters in Paris, in August 1975, by the Director ITIC, for the purpose of discussing the ICSU Guide to International Data Exchange through the World Data Centres. World Data Center "B" Tsunamis in Moscow had also been contacted by correspondence. A plan was being worked out between ITIC and the World Data Center "A" Tsunamis, for data collection as well as digitization, storage, and dissemination of data. A revision of the above Guide has been recommended to ICSU. Recommendation 2 was adopted.

5. Report by the Director, International Tsunami Information Center (ITIC), Honolulu.

The Director ITIC presented a progress report on activities of the Center and the TWS for the last two years. Specifically he gave background material on the TWS and summarized the ITIC history, objectives and initial functions. He also commented on the functions of the Center as stated under item 4 above.

The Director ITIC then went on to report on Tsunami Investigations during the period of 1974-1976, on the Tsunami Warning System, automation on new reporting stations, the ITIC staff and physical facilities, and the implementation of the recommendations of the fourth session of ICG/ITSU. In reviewing the implementation, he commented on the posting of the Associate Director, Mr. Sydney Wigen from Canada, and, the need for continuous support of this office by Member States. The group agreed fully to this statement and adopted recommendation 3 on this subject. In discussing ITIC assistance to developing countries to establish their own national Tsunami Warning Systems, the Director ITIC reported on his contacts with the United Nations Development Programme (UNDP), Unesco and IOC officials and the preparation of a report by ITIC giving background information on the UNDP and guidelines for the preparation and submission of project proposals. The discussion of this matter is reflected under item 6 below.

Subsequently he discussed ITIC liaison activities, the visiting scientist programme, the ITIC Newsletter, and the library. Furthermore, he expanded on his previous report on the compilation of Tsunami Information Data and presented for consideration a series of recommendations. Based on extensive discussions, most of the recommendations from the Director ITIC's report were adopted under the relevant agenda items.

The Chairman thanked the Director ITIC for the excellent work which he, his associate and his staff have performed over the last two years (recommendation 4 refers). The group agreed that Member States should be invited to send

more staff to ITIC or pay money into the IOC trust fund for this purpose: (recommendation 5 refers). It was also decided that some of the trust fund money should be earmarked for further visits of individual scientists and technicians for training purposes to the Center (recommendation 6 refers).

There was a general understanding that ITIC should continue to collect full information and to recommend topics of tsunami research relating to the Tsunami Warning System. Recommendation 7 was adopted accordingly.

6. National reports on current tsunami research and instrumental development

The representatives of Member States reported on latest developments in their respective countries. National reports were presented by the delegates of Canada, Chile, Ecuador, Peru, Philippines, USA and USSR. The Japanese report was acknowledged in the absence of a Japanese representative.

In this connection the group was informed that four countries of the region (Colombia, Ecuador, Peru and Chile) had decided to submit a regional project to UNDP for assistance in the establishment of national warning systems. The request had been prepared with the assistance of the Director ITIC. The four countries were also encouraged to submit requests for support to UNDP under their Country Programmes. The group stressed the importance of sub-regional efforts of this kind, and, in this connection, adopted recommendation 8 asking for assistance to developing island states.

7. Consideration of recommendations from the IUGG Tsunami Committee meeting held in Grenoble, France, 29 August 1975

The group regretted the absence due to sickness of Professor S.L. Soloviev, Secretary of the IUGG Tsunami Committee. The group received brief reports from the Director ITIC, and Dr. E. Silgado from CERESIS, on the recommendations adopted at the IUGG Tsunami Committee Meeting, in Grenoble, France, 29 August 1975. None of the recommendations has direct relevance to ITSU activities.

8. Consideration of resolution 108 (XIV), 12 September 1974, of the United Nations Conference on Trade and Development (UNCTAD) and other relevant resolutions and recommendations.

The Secretary drew the attention of the group to the recent UN concern with the negative effects of natural disasters on developing island countries and the importance of assistance to overcome such natural disasters, and commented on resolution 3202 (S-VI) of the UN General Assembly and resolution 108 (XIV) of UNCTAD.

In view of the concern of the Republic of Philippines in the development of its tsunami warning capability as expressed by its national report, the Secretary observed that Unesco, IOC and ITIC can play an important role in assisting the Philippines and many other island countries in the Pacific.

The Secretary reported on the possible availability of funds from the United Nations Environment Programme (UNEP) for early warning planning and preparedness and referred to decision 8(II), section III, item 2 of the UNEP Governing Council. It was agreed that ITIC should liaise with Member States, particularly island states, for the purpose of planning implementation of regional tsunami warning systems and improving civil familiarization and

preparedness. It was recommended that the proposal contained in recommendation 8 be elaborated by ITIC (see also item 11 below). The Secretary further drew the attention of the group to a draft recommendation of the Inter-governmental Conference on the Assessment and Mitigation of Earthquake Risk, held in Unesco, Paris, 10-19 February. The recommendation as finally adopted, reads as follows :

"The Conference recommends to the Member States to take the following actions with the assistance of Unesco and its IOC, UNDRO* and UNDP :

1. Improve and put into operation stable and precise sensors for recording tsunamis in the open sea.
2. Devise and install long-period, broad-band seismographs at seismological stations; to continue and complete the automatic processing of seismic data; to ensure the integration of hydrophysical and seismological methods of operative tsunami prediction.
3. Improve the communication channels used in the tsunami warning system and also to use special satellites.
4. Extend considerably the network of microbarographs and land base tide gauges.
5. Pursue and further develop the theory of tsunami generation and propagation.
6. Compile schemes of tsunami zoning in the Pacific and other coasts liable to inundation.
7. Carry out reasonable engineering protective measures in the populated localities and to exchange technical information during international symposia.
8. Improve public information and awareness of the tsunami threat.
9. Extend the activities of the IUGG tsunami committee, the ITIC, UNDRO and IOC.
10. Extend or create tsunami warning systems in all countries vulnerable to tsunamis."

The Chairman requested the Group to take these suggestions into account when considering the relevant parts of the agenda."

9. Proposals for further expansion of the Tsunami Warning System

The Director ITIC reported on liaison work by him and the Associate Director with member and non-member states of ICG/ITSU, and their efforts to co-ordinate the establishment of new seismograph and tide stations into the TWS, and the upgrading of existing stations. He also reported on ITIC efforts to assist IOC in inviting other countries to join ITSU and the TWS in the Pacific. He reported that Mexico was interested in joining. He also reported on the need for additional tide stations and on steps which were taken in expanding the TWS in the Bonin and other Pacific islands.

* United Nations Disaster Relief Office (UNDRO)

Subsequently, he presented a programme development plan outline proposing three-phase automation and expansion of the Tsunami Warning System. The Group agreed that a master plan should be developed and asked the Director ITIC to submit a first draft to the next session of ITSU.

10. Proposals for further improvements in communication including standardization of information exchange and dummy tests

The Chairman drew the attention of the Group to the new manual on the "Wave reporting procedures for tide observers in the Tsunami Warning System" (IOC Manuals and Guides No.6). This manual, through ITIC co-ordination has been translated into Spanish by the Instituto Oceanográfico de la Armada (INOCAR) and will be published in the near future. INOCAR's support was gratefully acknowledged. The Group agreed that translation into other languages of the region is desirable and that such manuals improve considerably communications by standardizing the exchange of data for the Tsunami Warning System.

The Director ITIC presented for consideration three recommendations from his report dealing with methods of improving wave reporting procedures, extending the value of the dummy test in assessing the status of reporting stations, and on the use of geosynchronous satellites for the Tsunami Warning System. Based on extensive discussions recommendations 9 and 10 were adopted.

11. Proposal for a pilot project on study of the damage caused by tsunamis on the western coast of South America (Unesco doc. 18 C/5, para. 2395)

A proposal from Peru, made to the 18th session of the General Conference of Unesco in 1968, for a pilot project on study of the damage caused by tsunamis on the western coast of South America was outlined in detail to the session by the Delegate from Peru.

The Secretary reported that the proposal had been approved by Unesco, but that in order to implement it and have the use of the funds allocated, an action plan should have been submitted by late 1975. As a supplement he suggested that the representative from Peru, in consultation with Ecuador and Chile, draft a proposal and a plan for action with the assistance of Dr. Miller of the U.S. delegation and prepare a submission for UNEP funding. This was approved by the meeting, and appears as recommendation 11.

A similar request was prepared for the Pacific island states under item 8 above. The plan of action is outlined in recommendation 8.

12. State of preparation of educational material to raise public awareness of the danger of tsunamis

The list of educational materials recommended for preparation by the Director ITIC, was reviewed and discussed by the Group. The value of several of these educational materials was recognized. The IOC proposed to support in its 1977 budget a catalogue of tsunami marigrams to be compiled by ITIC. Recommendations 12 and 13 were adopted accordingly.

13. Election of a new Chairman and Vice-Chairman

In accordance with the IOC rules of procedure, Mr. G.C. Dohler from Canada was elected Chairman of the IOC/ITSU.

As the incumbent Vice-Chairman was also Canadian, the Delegate of Canada decided to withdraw him from this post.

Tnte César Vargas F. of Peru was elected Vice-Chairman of the ICG/ITSU.

14. Date and place of the sixth session of the ICG/ITSU

A formal offer from the Government of Chile was received to host the sixth session of the ICG. The Group whilst greatly appreciating this generous offer, decided however, for reasons of better geographical cover, to give preference to a meeting in one of the island states of the Western Pacific, as for example the Philippines, for the sixth session and to hold the Chilean offer in abeyance for a later session. The Secretary IOC was requested to negotiate the matter further with the Government of the Philippines.

15. Adoption of the Summary Report and recommendations

The draft report of the meeting and the recommendations annexed to it, were adopted by the Group.

16. Closure of the session

The Chairman thanked the Group and the staff provided by the Peruvian Government and by CERESIS for their excellent work and co-operation making the meeting a very successful one.

He closed the meeting on Friday afternoon, 27 February 1976, at 17.00.

ANNEX I

A G E N D A

1. Opening of the session
2. Adoption of the agenda and election of a rapporteur
3. State of implementation of resolution VIII-24 and of recommendations from the fourth session of ICG/ITSU held in Wellington, New Zealand, 4-7 February 1974.
4. Consideration of IOC resolution EC-IV.6 concerning ITSU, adopted by the fourth session of the IOC Executive Council, Ottawa, 17-22 June 1974.
5. Report by the Director, International Tsunami Information Center (ITIC), Honolulu
6. National reports on current tsunami research and instrumental developments
7. Consideration of recommendations from the IUGG Tsunami Committee meeting, held in Grenoble, France, 29 August 1975
8. Consideration of resolution 108 (XIV), 12 September 1974, of the United Nations Conference on Trade and Development (UNCTAD) and other relevant resolutions and recommendations
9. Proposals for further expansion of the Tsunami Warning System
10. Proposals for further improvements in communication including standardization of information exchange and dummy tests
11. Proposal for a Pilot Project on study of the damage caused by tsunamis on the western coast of South America (Unesco doc. 18 C/5, para. 2395)
12. State of preparation of educational material to raise public awareness of the danger of tsunamis
13. Election of a new Chairman and Vice-chairman
14. Date and place of sixth session of the ICG/ITSU
15. Adoption of the Summary Report and recommendations.
16. Closure of the session

ANNEX II

RECOMMENDATIONS ADOPTED BY THE INTERNATIONAL CO-ORDINATION
GROUP FOR THE TSUNAMI WARNING SYSTEM IN THE PACIFIC
AT ITS FIFTH SESSION

RECOMMENDATION ITSU-V.1

MANDATE OF THE INTERNATIONAL TSUNAMI INFORMATION CENTER

The International Co-ordination Group for ITSU,

Considering that the revised functions of the ITIC, as adopted by the IOC Executive Council at its fourth session (res. EC-IV.6) are still unsatisfactory;

Being of the opinion that the ITIC should be developed into a semi autonomous international body under the auspices of the IOC;

Recommends that the Secretary IOC, in consultation with the Director ITIC and the relevant US authorities, develops a clear mandate for the ITIC, in particular its functions; and

Invites the Secretary to submit this new mandate in writing to the Member States of ITSU, before February 1977, for approval at the sixth session of the International Co-ordination Group and subsequent adoption by the IOC Executive Council

RECOMMENDATION ITSU-V.2

TIDE GAUGE RECORDS

The International Co-ordination Group for ITSU

Recommends that Member States supply to ITIC, from all possible analogue tide gauge stations, a record of recognizable tsunamis from a period 25 hours before the arrival of the initial waves to at least 25 hours after, or as long as the disturbance is visible on the records, whichever is greater. The records may be submitted either as original diagrams for copying and return, as an accurate copy from which computer digitization will be possible, or as a digital record, with all maxima, minima, and points of inflection;

Advises ITIC :

- a) to solicit such material from all possible sources;
- b) to publish for each Tsunami a listing of gauges from which the tsunami record is available, together with appropriate supplementary information; and
- c) to arrange with World Data Centres for the storage and retrieval of the tsunami data for the benefit of research.

RECOMMENDATION ITSU-V.3

ASSOCIATE DIRECTOR ITIC

The International Co-ordination Group for ITSU,

Having noted the accomplishments of the Associate Director in his period of service at ITIC,

Requests the Government of Canada to consider extending the period of service of the present incumbent, Mr. Sydney Wigen, in view of the numerous important tasks at present in hand.

RECOMMENDATION ITSU-V.4

EXPRESSION OF THANKS TO ITIC MANAGEMENT

The International Co-ordination Group for ITSU,

Noting with approval the accomplishments of the ITIC reported on at this meeting; and

Noting especially the dynamic and forceful leadership of the Director and Associate Director in the past year, on behalf of all Member States;

Highly commends the Director and Associate Director for their joint efforts; and further

Expresses appreciation to their national sponsors, the governments of the United States and Canada, for assigning these scientists to serve the international community concerned with the dangers of tsunamis.

RECOMMENDATION ITSU-V.5

USE OF THE IOC TRUST FUND IN SUPPORT OF ITIC ACTIVITIES

The International Co-ordination Group for ITSU,

Recognizing the need and desire of Member States to establish regional and national Tsunami Warning Systems, and automation of the Tsunami Warning System in the Pacific, and that the development of these systems will impose additional costs on ITIC;

Recommends that IOC Member States make voluntary contributions, preferably on an annual basis, to the IOC Trust Fund, in order to provide support for the staff and special projects being undertaken by ITIC and to allow development of these programmes.

RECOMMENDATION ITSU-V.6

USE OF THE TRUST FUND FOR TRAINING PURPOSES

The International Co-ordination Group for ITSU

Recommends that IOC Member States make voluntary contributions to the IOC Trust Fund in order to enable individual scientists and technicians from ITSU member countries to receive training at ITIC, Honolulu; and

Also recommends that agencies in these countries consider sending scientists and technicians to the ITIC at their own expense, in order to enable them to receive specialized training with new instrumentation, techniques and civil preparedness procedures.

RECOMMENDATION ITSU-V.7

TSUNAMI RESEARCH

The International Co-ordination Group for ITSU

Recommends that each Member State participating in the Tsunami Warning System in the Pacific, in particular those interested in tsunamigenic phenomena, prepare and submit to ITIC an annual report on tsunami research being carried out in their country; each report should include a bibliography and abstracts of both published and unpublished research.

RECOMMENDATION ITSU-V.8

ASSISTANCE TO DEVELOPING ISLAND STATES

The International Co-ordination Group for ITSU,

Taking into account the growing UN concern with the "negative effects of natural disasters on developing island countries" as reflected in General Assembly resolution 3202 (S-VI) and resolution 108 (XV) of the United Nations Conference on Trade and Development (UNCTAD) (amongst others) on assistance to developing island states "to overcome the effects of natural disasters",

Recommends that Unesco, its IOC and the ITIC, should encourage and assist island Member States of ITSU, to build up their scientific and technical infrastructures for the purpose of developing regional and/or national projects related to natural disasters and tsunami warning systems, research and training, and

Recommends also that those island states not yet members of ITSU, should join the International Co-ordination Group at the first opportunity.

Further recommends that, in order to achieve this, IOC seek funding from UNEP to carry out the following three stage action programme on planning of early warning and preparedness, to be implemented through ITIC :

1. The Director or Associate Director to make a liaison and familiarization visit to each of the developing island states in the south and southwest Pacific expressing interest in such a visit. The primary purposes of the visit will be to establish working contacts, to bring awareness of the services ITIC can provide in developing plans and organization for national or regional Tsunami Warning Systems, and to gain insight into the Tsunami hazards of each of these states, and potential needs and available resources to alleviate these hazards (funds required US \$6.000).
2. to convene workshops in each of the two regions (south-east Asia and south Pacific, in order to plan a programme of action for regional and national tsunami warning systems including technical problems of tide and seismic sensing, communications and civil preparedness (funds required for each US \$ 20.000, = US \$40.000).
3. to conduct a technical Workshop and Seminar in Honolulu, with the assistance of local tsunami, seismic, communication and civil preparedness specialists, for experts from each of the interested Member States (funds required US \$ 25.000).
4. In addition to travel expenses for the above three projects, some part-time secretarial assistance will be required (funds required US \$4.000).

The above programme should if possible be completed prior to the sixth session of the ICG/ITSU.

Total funds needed : \$ 75.000

RECOMMENDATION ITSU-V.9

WAVE HEIGHTS

The International Co-ordination Group for ITSU

Recommends that ITIC should inform tide stations of the TWS biennially of the recommended format for reporting the initial amplitude and subsequent maximum wave heights at regular intervals following a tsunami arrival; and

Also recommends that the scope of the tsunami dummy test should be expanded to include a report on the condition of the stations, and the tidal height at the time of the test; the latter can subsequently be verified from tide tables.

RECOMMENDATION ITSU-V.10

USE OF SATELLITES

The International Co-ordination Group for ITSU

Recommends that use of the Geostationary Orbital Environmental Satellite (GOES) system be considered essential for rapid data acquisition and dissemination of Tsunami watches, warnings and both seismic and tidal information;

Noting that the USA has positioned a GOES satellite at 135°W. Longitude, but that the area of the Philippines Sea, Japan, Kuril Islands, Kamchatka, Indonesia, Papua-New Guinea and the Solomon Sea still remains out of communications range;

Further recommends that the Secretary IOC explore the availability of other geosynchronous satellites and that countries planning to launch similar satellites give consideration to compatibility of communication codes and instrumentation for possible participation in the TWS.

RECOMMENDATION ITSU-V.11

PILOT STUDY ON TSUNAMI HAZARDS

The International Co-ordination Group for ITSU,

Noting that the 18th General Conference of Unesco approved a pilot project on study of the damage caused by tsunamis on the western coast of South America, as proposed by the Delegation of Peru;

Bearing in mind the interest of the United Nations Environment Programme (UNEP) in early warning planning and preparedness;

Recommends that a pilot study be carried out to predict the potential tsunami hazard areas and produce corresponding inundation maps which will be used for development planning and risk zoning for Civil Defence purposes;

Further recommends that IOC seek funding from UNEP to carry out the following action programme :

1. A four-week workshop (to be co-ordinated by ITIC in Honolulu) for experts designated from each of the four participating countries (Colombia, Chile, Ecuador and Peru), to process the necessary basic input data using state of the art computer programmes. Each participant will select the area to be thus studied in accordance with his own country's interests.

The workshop will involve the discussion of the physical aspects of the problem and an understanding of the corresponding computer programmes (with the participation of experts from the Hawaii Institute of Geophysics). Funds required for travel and per diem : US \$11.000; funds required for computer time at HIG : US \$1.000.

2. Each country will apply the results of the workshop and produce a tsunami risk map and a report, for a priority area of their own interest. Funds required for computer time : US \$4.000.

The programme should be completed within six months after funds are made available.

Total request for funds : US \$ 16.000

RECOMMENDATION ITSU-V.12

TRAINING

The International Co-ordination Group for ITSU

Recommends that ITIC co-ordinate the exchange of scientific and technical personnel between ITSU Member States, for the purpose of providing training and familiarization with automation equipment, new instrumentation, and new methods and procedures of the Tsunami Warning System and of Civil Defense.

RECOMMENDATION ITSU-V.13

EDUCATIONAL MATERIAL

The International Co-ordination Group for ITSU

Recommends that Unesco, IOC and national and international agencies, provide support for the following educational materials related to tsunamis, and that the preparation of these materials be co-ordinated by ITIC :

1. Preparation and publication of the final version of the "Catalogue of Tsunamis in the Pacific Ocean" by Iida, Cox, Soloviev and Pararas-Carayannis. Material to be compiled at ITIC, including updating, expanding and correcting the preliminary catalogue;
2. With the support of IOC, preparation and publication in the languages of the region of an expanded version of the IOC tsunami brochure (prospectus) which would help arouse public awareness of the danger of tsunamis, and also the protective action that should be taken upon receipt of a tsunami warning;
3. Preparation and publication of an updated annotated bibliography of tsunami publications for use by the scientific community, Civil Defense Agencies, Libraries and the general public (the last bibliography was published in 1964);
4. Preparation and publication of an illustrated semi-technical text book on tsunamis, presenting selected papers on tsunami origin, propagation, and run-up, on the regional and Pacific tsunami warning systems, and on the sociological aspects of tsunamis;
5. Compilation of a catalogue of tsunami marigrams for historic tsunamis recorded at selected tide gauge stations throughout the Pacific, for publication by IOC.
6. Translation and publication of the manual on wave reporting procedures in other languages of the region;
7. Compilation from different countries of existing films and miscellaneous footage on actual or simulated tsunamis, to serve as a data base for researchers and as a viewing aid in presenting information on tsunamis to the general public;

8. Preparation of an educational film on tsunamis, tsunami effects and on the International Tsunami Warning System for dissemination to interested countries;
9. Creation of a photographic file at ITIC and the compilation into a report of collected photographs of tsunami waves and their effects;
10. Preparation of series of narrated tsunami slide presentations on the Pacific Warning System, on the Honolulu Observatory, on ITIC, and on community preparedness;
11. Preparation and publication of a bibliography on engineering studies relative to tsunami problems for specific shore-line projects;
12. Preparation and publication of a Directory of Tsunami Scientists;
13. Preparation and publication of a manual establishing a methodology for estimating tsunami inundation;
14. Preparation and publication of tsunami travel time charts for new tide stations;
15. Preparation and publication of seismic wave travel time charts for expedient earthquake epicenter determination.

ANNEX III

REPORT OF THE CHAIRMAN ON ACTIONS TAKEN ON THE RECOMMENDATIONS
OF THE FOURTH SESSION OF THE ICG FOR ITSU AND ON
IMPORTANT EVENTS SINCE THAT SESSION

Recommendation No. 1 - Functions of the International Tsunami Information
Center (ITIC)

The activities of the ITIC have been vigorous with the support of the IOC of Unesco and the National Weather Service/NOAA. In the following, important items are summarized :

1. New Associate Director of the ITIC

Mr. Sydney Wigen from the Regional Hydrographers Office at Victoria, B.C., Canada, was appointed as the first Associate Director of the ITIC and commenced duties on 1 September 1975. Initially Mr. Wigen has been seeking to improve liaison between ITIC and agencies and individuals concerned with seismic and tsunami observation, research and warnings.

2. Visiting scientists

In 1974-75 Dr. Alexander Poplavsky of the USSR and Mr. Ricardo Montaner of Chile visited the ITIC for a period of 6 weeks each; and in 1975-76 Mr. Cesar Vargas Fauchaux of Peru and Mr. Pedro Cabezas Gonzales of Ecuador visited the ITIC for similar periods.

3. Co-ordination with WDC "A" - Tsunamis

Improved co-ordination with WDC "A" Tsunamis has been established with respect to the reprinting and publishing of tsunami catalogues.

4. Co-ordination by ITIC of a UNDP proposal for a Regional Tsunami Warning
System in South America (Ecuador, Peru, Chile)

See report under recommendation No. 2 below.

Recommendation No.2 - Expansion of the Tsunami Warning System

Canada has declared the tide gauge station at Tofino, B.C., to be classified category 1 and the tide gauge station at Langara, B.C., category 3. Japan has added a further tide gauge station at Titijima (Chichijima) Island, as part of the warning system.

The ITIC prepared a report on technical assistance available from the United Nations system in support of national Tsunami Warning Systems, as requested by interested developing countries. The Director of ITIC visited South America in June and July 1975 with IOC support, and presented this report to appropriate government agencies in Ecuador, Peru and Chile. In each country agreement was reached with officials for the preparation of a proposal for financial and technical support necessary for the establishment of national Tsunami Warning Systems, to be presented to the United Nations Development Programme (UNDP). This initiative should be acknowledged as a great step forward for the expansion of tsunamis warning systems around the Pacific Ocean.

Recommendation No. 3 - Wave Reporting Procedures

The Secretary IOC, in consultation with United States authorities, revised the publication "Wave Reporting Procedures for Tide Observers in the Tsunami Warning System" and this has now been published as IOC Manuals and Guides no. 6.

Translation of the above publication into Spanish has been completed by the Instituto Oceanografico de la Armada of Ecuador. The Chairman has requested IOC to make a special effort to issue this document to all Member States of ITSU at an early date, in accordance with this recommendation.

Important events since the fourth session of ITSU

1. A new Member State of ICG/ITSU

The Government of Singapore accepted membership of the ICG/ITSU on 2 March 1975, becoming the fifteenth country in the Tsunami Warning System. It is hoped that other potential members in the Pacific Region, among which Fiji and Mexico sent observers to the fourth session of ICG/ITSU, will join ITSU in the near future.

2. Fourth session of the IOC Executive Council

The fourth session of the IOC Executive Council was held in Ottawa, Canada, 17-22 June 1974, and the three recommendations made at the fourth session of ITSU, Wellington, 4-7 February 1974, were officially adopted (res. EC-IV.6).

3. Publication of Tsunami prospectus

A Tsunami prospectus has been prepared and published by IOC in English, French, Spanish and Russian. It was also translated into Japanese in an abridged form and distributed among visitors to the "OCEANEXPO", Okinawa, together with the other language texts.

ANNEX IV

LIST OF PARTICIPANTS/ LISTA DE PARTICIPANTES

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