Intergovernmental Oceanographic Commission
Training Course Reports
6

Unesco/IOC/NBO Training Course on Tidal Observations and Data Processing

Institute of Marine Scientific and
Technological Information,
and Institute of Marine Technology,
National Bureau of Oceanography

Tianjin, China
27 August - 22 September 1984

Unesco

IOC Training Course Reports

No.	Title	Language versions
1.	IOC Indian Ocean Region Training Course in Petroleum Monitoring, Perth, 18 February-1 March 1980	English
2.	IOC Regional Training Course for Marine Science, Technicians, Cape Ferguson, Queensland, 1-28 June 1980	English
3.	ROPME-IOC-UNEP Training Workshop on Oceanographic Sampling, Analysis, Data Handling and Care of Equipment, Doha, Qatar, 3-15 December 1983	English
4.	Stage COI d'initiation à la gestion et au traitement de l'information scientifique et technique pour l'océanologie, Brest, France, 28 novembre - 9 décembre 1983	French
5.	Curso mixto COI-OMM de formación sobre el Sistema Global Integrado de Servicios Océnicos (SGISO), Buenos Aires, Argentina, 15 - 26 de octubre de 1984	Spanish
6.	Unesco-IOC-NBO Training Course on Tidal Observations and Data Processing, Tianjin, China, 27 August - 22 September 1984	English
7.	Stage COI sur la connaissance et la gestion de la zone côtière et du proche plateau continental, Talence, France, 18 septembre - 4 octobre 1984	French

Intergovernmental Oceanographic Commission
Training Course Reports

6

Unesco/IOC/NBO Training Course on Tidal Observations and Data Processing

Institute of Marine Scientific and
Technological Information,
and Institute of Marine Technology,
National Bureau of Oceanography

Tianjin, China
27 August - 22 September 1984

SC-85/WS/75

Unesco

PREFACE

The Training Course on Tidal Observations and Data Processing was organized in the Institute of Marine Scientific and Technological Information and the Institute of Marine Technology, in Tianjin, People's Republic of China, from 27 August to 22 September 1984, with the financial support of the National Bureau of Oceanography (NBO), the Unesco Division of Marine Sciences and the Intergovernmental Oceanographic Commission (IOC). The course was announced in the coastal Member States covered by the Unesco Regional Offices of Science and Technology for Africa (Nairobi), the Arab States (Paris), South and Central Asia (New Delhi), South East Asia (Jakarta), and the Member States of the IOC Programme Group for the Western Pacific (WESTPAC). Twelve participants from these regions attended the Training Course.

The purpose of the course was to introduce the participants to basic knowledge and methods of tidal observations and data processing, including sea level measurement and data reduction, through lectures, practical training and observation. It was also intended inter alia to contribute to the training of personnel with a view to facilitating the implementation of the Global Sea Level Observing System promoted and coordinated by IOC.

The course was conducted in English, and through interpretation from Chinese into English. A group of Chinese experts and translators prepared a textbook of teaching material for the Training Course. In addition to the Chinese scientists, two visiting lecturers, Dr. David T. Pugh and Dr. Selim A. Morcos, participated in the course. The participants were selected among university graduates with qualifications in oceanography or relevant disciplines. Preference was given to those directly responsible for sea level observations and programmes.

The present Report gives an outline of the Training Course which included lectures, field work and scientific talks by invited speakers. The Report ends with an evaluation of the course by the participants, and general conclusions which may be of help in the preparation of similar courses in the future.

TABLE OF CONTENTS

1. INTRODUCTION

The Training Course on Tidal Observations and Data Processing was held in Tianjin, China, from 27 August to 22 September 1984, and organized under the co-sponsorship of the National Bureau of Oceanography (NBO) of the People's Republic of China, the United Nations Educational, Scientific and Cultural Organization (Unesco) and the Intergovernmental Oceanographic Commission (IOC).

The purpose of this Training Course was to introduce the participants to basic knowledge and methods of tidal observations and data processing, including sea level measurement and data reduction, through lectures, practical training and observation.

Measurements of sea level have a long history, and a very broad range of scientific applications. Sea level observations are relevant to problems of marine transport, coastal erosion and coastal defences against flooding. Changes of sea level over larger periods have important implications for coastal habitation and for climate change. Fishery biologists have also emphasized the potential of sea level measurements for monitoring regional changes which may be related to stock levels.

Global studies of sea level require measurements made to common standards by national and regional components. Although these measurements are relatively cheap to make, a basic level of technical training is essential if the required accuracy and datum stability are to be attained. Training in these technical aspects should be coupled with instruction to increase the awareness of the scientific and practical implications of sea level monitoring. It is hoped that this training will contribute to the Global Sea Level Observing System developed by IOC.

2. PARTICIPANTS

More than 35 applications from African, Arab and Asian countries were received in response to the announcements of the Training Course on Tidal Observations and Data Processing. Following consultation by

.../...

Unesco and IOC with NBO, 12 participants were selected. They were from Algeria, Bangladesh, Egypt, Guinea, D.P.R. of Korea, Kuwait, Malaysia, Pakistan, Papua New Guinea, the Philippines, Sri Lanka and Sudan (a list of the names and addresses of the participants is given in Annex I).

Seven of the participants arrived as scheduled, attending the Opening Ceremony in time, four of them arrived that evening and one arrived two days later.

All the participants were scientifically qualified and experienced in some aspects of marine sciences and had a reasonably good command of written English. Only one or two had some difficulty in oral communication in English.

3. TRAINING COURSE PROGRAMME

The Training Course was organized and prepared locally by the Institute of Marine Scientific and Technological Information (IMSTI) of NBO, together with the Institute of Marine Technology (IMT) of NBO. A Course Organizing Committee was formed (see Annex II). In addition, two invited lecturers, Dr. D. Pugh, Unesco/IOC Consultant, and Dr. S. Morcos from the Unesco Division of Marine Sciences, participated in the Training Course. See Annex III for Training Course Programme.

3.1 Opening Ceremony

The Training Course on Tidal Observations and Data Processing was declared open at the Tianjin Guest House on 27 August, 1984. Mr. Luo Yuru, Director General of NBO, attended the ceremony and delivered a speech. In his speech, the Director General emphasized the purpose and the significance of the training course and expressed his wishes for its success. Speaking on behalf of the Government and seven million people in Tianjin, the Deputy Mayor, Mr. Li Lanqing, welcomed the participants and friends from various parts of the world.

On behalf of Unesco, Dr. L. Teller, Unesco Representative for Science and Technology in China, and Dr. S. Morcos from the Unesco Division of Marine Sciences, conveyed to the participants greetings from Mr. A. M. M'Bow,

the Director General of Unesco, from Dr. D. Krause, Director of the Unesco Division of Marine Sciences, from Professor Ronquillo, Chairman of IOC and Dr. Mario Ruivo, Secretary of IOC. In his speech, Dr. Morcos emphasized how highly appreciated were the Chinese contributions in cooperation with Unesco and IOC in the field of marine sciences, especially in the organization of the Training Course on Tidal Observations and Data Processing. In conclusion, he expressed his hope that all the participants would broaden their knowledge throughout the four weeks training course, so as to make an important contribution to development in their respective countries in both the practical and scientific aspects of tidal research when they returned home (the full texts of the opening speeches appear in Annex IV).

3.2 Outline of the Training Course Programme

The duration of the training course was four five-work-day weeks. The following topics were discussed during the training course:

- Basic knowledge of tides;
- Tidal measurement techniques;
- Data reduction and tidal station management;
- Datum levelling;
- Tidal analysis and prediction;
- Chart datum and mean sea level.

Due to the time constraint, the lecturers avoided very detailed treatment; only general ideas were given, with emphasis on field training and exercises. The practical work was supplemented by a series of scientific talks designed to develop the ability of the participants to appreciate the purpose and to apply the techniques of tidal measurement and data processing.

A group of Chinese experts and translators prepared a complete set of teaching materials as a textbook for the training course. This enabled the participants to review the lectures themselves after class in order to consolidate the knowledge they had acquired during the course.

3.3 Scientific Talks

Professor Wen Shengchang, Dèan of Shandong College of Oceanology, Mr. Feng Shizuo and Mr. Yu Zhouwen, two professors from Shandong College of Oceanology, as well as Mr. Fang Guohong, associate research fellow of

the Institute of Oceanology, Acadmia Sinica, were invited to contribute their lectures to the course. Dr. S. Morcos and Dr. D. T. Pugh, Director of the Permanent Service for Mean Sea Level (PSMSL), also participated as visiting lecturers for the course. The topics of the lectures were as follows:

- Tidal observations and mean sea level in the Suez Canal (Dr. S. Morcos)
- Tidal observations and mean sea level in the Red Sea (Dr. S. Morcos)
- The Unesco programme in marine sciences (Dr. S. Morcos)
- The IOC and some of its relevant programmes (Dr. S. Morcos)
- The physics of sea level measurement (Dr. D. Pugh)
- Tidal dynamics (Dr. D. Pugh)
- Storm surges, meteorological effects (Dr. D. Pugh)
- Mean sea level (Dr. D. Pugh)
- Effect of waves on coastal engineering and coastline protection (Prof. Wen Shengchang)
- Introduction on storm surges (Prof. Feng Shizuo)
- On filtering technique (Prof. Yu Zhouwen)
- Numerical modelling of tidal motions (Prof. Fang Guohong)

3.4 Course Evaluation

The evaluations were made after finishing each section's programme (see Section 4). The achievements were considered excellent. All the participants showed good practical aptitude and an appreciation of the theoretical and scientific aspects of data reduction, tidal analysis and prediction.

3.5 Closing Ceremony

The Training Course on Tidal Observations and Data Processing was closed on September 21. At the ceremony, Mr. Luo Yuro, Director General of NBO, spoke on behalf of NBO to express his warm congratulations on the fruitful completion of the course. Mr. Wang Ji, principal instructor on tidal analysis and prediction, spoke at the ceremony on behalf of all the teaching staff to express his congratulations to all the participants on their achievements gained during the course. Mr. Wijayaratna from Sri Lanka and Ms. Okan from the Philippines, on behalf of the participants, also addressed the ceremony expressing their satisfaction for the success

.../...

of the training course (full texts of their speeches appear in Annex V).

Before closing the ceremony, the Director General, Mr. Luo Yuru, issued the Course Certificate to all participants.

4. COMMENTS FROM THE PARTICIPANTS FOR COURSE EVALUATION

4.1 Organization of the Course

The participants felt that the Training Course on Tidal Observations and Data Processing was opportune and that it was useful for developing countries to link with developed countries in the field of tidal research. The participants expressed their thanks to all the people involved in making the course a success.

4.2 Scope and Duration of the Course

The participants felt that the contents of the course arranged were closely relevant to their professions and found them interesting and helpful for their future work. The basic method and technique of tidal observations and data reduction, especially on the management of tidal stations which was introduced during the course, was suitable for developing countries to use as a reference. Most of them were interested in learning about tidal analysis and prediction, but they felt that the time was not long enough to cover this subject. Some participants felt that four weeks had been too long to spend on fairly basic procedural exercises, but that more time would be needed for tidal analysis and prediction. Some participants asked for more time to study in greater detail.

4.3 The Textbook

The participants appreciated the efforts of the Local Organizing Committee in the compilation of a comprehensive textbook for the course, especially published in an English version. They felt that the textbook was of help to everybody in understanding more of the course.

4.4 Administrative Arrangements

The participants were satisfied with the administrative arrangements. They said: "We were from 12 different countries staying in China as family members, because of the environment and hospitality provided by

our Chinese friends. Our hosts have gone out of their way to be very hospitable, and responsive to the various individual needs. As organizers, they have done a very commendable job." Some participants said it would be better if their hotel had not been isolated from facilities like shopping centres and sports activities. The special arrangements made for the Muslim diet were greatly appreciated.

5. GENERAL CONCLUSIONS

The course was considered successful by all involved in the training course. Everything went smoothly according to schedule. It was a pleasure to belong to a group of scientifically qualified participants. The course ended with results even better than expected.

Course programmes were accepted by the participants, but most of the participants requested more time for the lectures on tidal analysis and prediction. During the course, because stress was on the basic knowledge of tidal measurements and data reduction, there was insufficient time concerning tidal analysis and prediction for which only general ideas were introduced.

The participants expressed their satisfaction with the administrative arrangements. The hotel was nice, the environment for study was excellent, but it would be better if more social activities were arranged, so as to relax after a day's hard study.

Generally, the travel arrangements were adequate. Most of the participants arrived as scheduled. Only a few of them were late by one or two days, because of flight connection problems in Hongkong, but no lectures were missed. Here, special thanks are due to the Unesco Division of Marine Sciences who made so much effort to ensure the opening of the training course on time.

Locally, the arrangements within the Institute of Marine Scientific and Technological Information and the Institute of Marine Technology worked out well. In order to raise the efficiency of the training course, the textbook specifically prepared for this purpose, proved necessary. Consideration should be given by Unesco and IOC to the preparation of a Manual on Tidal Observations and Data Processing for the use of future training courses.

TRAINING COURSE ON TIDAL OBSERVATIONS AND DATA PROCESSING

List of Participants

Mr. Ali AHMED,
Bangladesh Meteorological Department,
Climate Division,
Agargaon, Dhaka 7,
BANGLADESH.

Tel: 327814

Mr. Arshad ALI,
National Institute of Oceanography,
37-K/6, P.E.C.H.S.,
Karachi 29,
PAKISTAN.

Tel: 434308

Mr. Abdullah AL-SALEM,
Kuwait Institute for Scientific Research,
P. O. Box 24885,
Safat,
KUWAIT.

Home Tel: 813895

Mr. Mejdoub BENZOHRA,
Institut des sciences de la mer
et de l'aménagement du littoral,
Jetée Nord-Alger,
B. P. 90,
Alger-Bourse,
ALGERIA.

Tel: 62-73-19

Mr. Toumany CAMARA,
Centre de Recherche Scientifique,
Conakry-Rogbane,
GUINEA.

Mr. Pekou CHAKUMAI,
Dept. of Transport and Civil Aviation,
Hydrographic Section,
Marine Division,
P. O. Box 457,
Konedobu,
PAPUA NEW GUINEA.

Tel: 211866 Ext. 345

Mr. Ibrahim Elsayed ELBESHIR,
Institute of Oceanography,
National Council for Research,
P. O. Box 2404,
Khartoum,
SUDAN.

Tel: 2509

Mr. KANG GIL U.,
Oceanographic Research Institute of
the Korean West Sea,
Nampor City,
DEM. PEOPLE'S REPUBLIC OF KOREA.

Mr. Chongyan LEE,
School of Physics,
Universiti Sains Malaysia,
Penang,
MALAYSIA.

Tel: 04-883822 Ext. 675

Ms Nena R. OKAN,
Bureau of Coast and Geodetic Survey,
421 Barraca St.,
San Nicolas,
Manila,
THE PHILIPPINES.

Tel: 47-96-11

Mr. Tarek Helmy Mohamed OMRAN,
Suez Canal Authority,
Research Center,
Ismailia,
A. R. EGYPT.

Home Tel: 726302 Cairo

Mr. P. V. WIJAYARATNA,
Department of Coast Conservation,
Maligawatte Secretariat,
Colombo 10,
SRI LANKA.

TRAINING COURSE ON TIDAL OBSERVATIONS AND DATA PROCESSING

Organizing Committee

Chairman

Mr. Hou Wenfeng,
Associate Director,
National Marine Data Center (NMDC),
National Bureau of Oceanography (NBO),
118 Qiwei Road,
Tianjin, CHINA.

Vice Chairman

Mr. Li Yunwu,
Director,
Institute of Marine Technology (IMT),
National Bureau of Oceanography (NBO),
Huanghe Road,
Tianjin, CHINA.

Course Coordinator

Mr. Zhao Xucai,
Secretary,
Division of Science and Technology,
NMDC, NBO.

Principal Instructor on basic knowledge of tides

Mr. Wang Ji,
National Marine Data Center, NBO

Principal Instructors on tide gauges

Mr. Meng Xianyi,
Institute of Marine Technology, NBO

Mr. Wang Degui,
Institute of Marine Technology, NBO

Principal Instructor on datum levelling

Mr. An Zhensheng,
National Marine Data Center, NBO

Administrative arrangements

Mr. Li Cheng,
National Marine Data Center, NBO

Mr. Zhu Shuting,
National Marine Data Center, NBO

Invited Lecturers

Dr. David T. Pugh,
Director,
Permanent Service for Mean Sea Level (PSMSL),
Science Division,
National Environment Research Council (NERC),
Polaris House,
North Star Avenue,
Swindon,
Wiltshire SN2 1EU, U.K.

Dr. Selim Morcos,
Division of Marine Sciences,
Unesco,
7 Place de Fontenoy,
75700 Paris, FRANCE.

TRAINING COURSE ON TIDAL OBSERVATIONS AND DATA PROCESSING

Programme and Time Table

Monday 27 August	am.	Opening Ceremony
		Mutual introduction and national report
	pm.	Reception
Tuesday 28 August	am.	Basic knowledge on tides (Mr. Wang Ji)
	pm.	Basic knowledge on tides (Mr. Wang Ji)
Wednesday 29 August	am.	Basic knowledge on tides (Mr. Wang Ji)
		Lecture by Dr. Pugh
		Basic knowledge on tides (Mr. Wang Ji)
	pm.	Basic knowledge on tides (Mr. Wang Ji)
		Lecture by Dr. Pugh
Thursday 30 August	am.	Lecture by Dr. Pugh
		Tide gauges (Mr. Meng Xianyi and Wang Degui)
	pm.	Visit to Institute of Marine Technology
Friday 31 August	am.	Lecture by Dr. Pugh
		Tide gauges (Mr. Meng and Mr. Wang)
	pm.	Tide gauges
		Lecture by Dr. Pugh and course review
Saturday 1 September	am.	Visit to Eastern Qing Tombs
Sunday 2 September		Sightseeing
Monday 3 September	am.	Lecture by Dr. Morcos
		Tide gauges (Mr. Meng and Mr. Wang)
	pm.	Tide gauges
		Lecture by Dr. Morcos
Tuesday 4 September	am.	Lecture by Dr. Morcos
		Tide gauges (Mr. Meng and Mr. Wang)
	pm.	Tide gauges
Wednesday 5 September	am.	Lecture by Dr. Morcos
		Tide gauges
	pm.	Tide gauges
Thursday 6 September	am.	Departure to Qinhuangdao tidal station for field training
Sunday 9 September	am.	Return to Tianjin from Qinhuangdao
Monday 10 September	am.	Data reduction (Mr. Xu Lisheng)
	pm.	Data reduction (Mr. Xu Lisheng)
Tuesday 11 September	am.	Data reduction
	pm.	Data reduction
Wednesday 12 September	am.	Data reduction (Mr. Xu Lisheng)
	pm.	Data reduction
Thursday 13 September	am.	Levelling practice (Mr. An Zhensheng)
	pm.	Levelling practice
Friday 14 September	am.	Levelling practice (Mr. An Zhensheng)
	pm.	Levelling practice
Saturday 15 September		Sightseeing trip to Beijing
Monday 17 September	am.	Harmonic analysis of tides (Mr. Wang Ji)
	pm.	Harmonic analysis of tides
Tuesday 18 September	am.	Computer practice at Institute of Marine Technology
	pm.	Report by Prof. Feng Shizuo
Wednesday 19 September	am.	Report by Prof. Yu Zhouwen
	pm.	Report by Mr. Fang Guohong
Thursday 20 September	am.	Tidal predictions (Mr. Wang Ji)
	pm.	Tidal predictions
Friday 21 September	am.	Chart datum and mean sea level (Mr. Wang Ji)
	pm.	Course review
		Closing Ceremony

OPENING CEREMONY OF THE TRAINING COURSE ON TIDAL OBSERVATIONS AND DATA PROCESSING

Opening Address by Mr. Luo Yuru, Director General of NBO

Distinguished friends,
Ladies and gentlemen,

First of all, allow me on behalf of the National Bureau of Oceanography and the Chinese National Commission for Unesco to express my congratulations on the opening of the Training Course on Tidal Observations and Data Processing and my warm welcome to the expert and friends from Asian, African and Arab countries. We also appreciate Dr. Teller, Unesco Representative for Science and Technology to China, and Dr. Morcos from the Division of Marine Sciences of Unesco, coming to Tianjin in the midst of pressing affairs to guide the course. We would like to thank Mr. Li Lanqing, Deputy Mayor of Tianjin Municipality for his strong support to the training course.

This training course is one of the cooperative programmes between Unesco and its IOC and the National Bureau of Oceanography of the People's Republic of China, the first of its kind in the field of marine sciences which is co-sponsored by Unesco and NBO. The purpose of the training course is to introduce to the participants the basic knowledge and methods of tidal observations and data processing. In addition to the industrious work of the Local Organizing Committee, it is due to the strong support from Unesco/IOC that the plan for the training course has been carried out in such short time. I would like to take this opportunity to express my thanks to everybody involved in making the training course run successfully.

As you all know the collection and processing of tidal data are of great importance to navigation, fishery, harbour construction and coastal zone development, as well as to the understanding of the overall marine environment. In a sense, man's understanding of the ocean began with the understanding of tidal phenomena. Without basic knowledge of the tides along its coast, no maritime country can solve problems related to the ocean. We are glad to host this training course so as to contribute to raising the developing countries' ability in tidal observation and data processing.

Marine science is a big topic of worldwide importance. To study the topic we must rely on the cooperation among various countries of the world, which is of more practical significance for the developing countries. I am sure, the Training Course on Tidal Observations and Data Processing will provide us with a good chance to exchange experience between each other. We must learn from each other, to enhance friendship, and go forward together. In the first place, the Chinese scientists should learn from colleagues in various countries, their advanced experience in tidal work.

Let us work together to promote our exchange and cooperation in the field of marine science.

Lastly, I wish the training course a success.

OPENING CEREMONY OF THE TRAINING COURSE ON
TIDAL OBSERVATIONS AND DATA PROCESSING

Opening Address by
Mr. Li Lanqing, Deputy Mayor of Tianjin Municipality

Distinguished friends,
Ladies and gentlemen,

First of all, allow me, at a time when all the Chinese people are busy preparing National Day celebrations, to express my warm welcome to our friends from Asian, African and Arab countries, on behalf of Tianjin Municipal Government and the seven million people of Tianjin. You are welcome in Tianjin to attend the Training Course on Tidal Observations and Data Processing sponsored by the National Bureau of Oceanography and Unesco and its IOC. We feel greatly honoured to be the host city for the training course.

Tianjin is an industrial city which is growing in modern times. Since the founding of the People's Republic of China, under the leadership of the Communist Party and the Government, Tianjin has achieved great progress. At present, we are marching forward towards the four modernizations under the guidance of the policy of being open to the outside world, and reform. Nations, big or small, each have special qualities. Today the "ocean tide" has brought our friends to the Bohai Coast of Tianjin from various parts of the world. You are welcome to tour the Tianjin city after your study, and we hope that you will feel able to make valuable comments about our development.

Let us march forward hand in hand along the road of understanding and of utilizing the ocean.

I wish the training course complete success.

I wish you a pleasant stay here in Tianjin.

Thank you.

OPENING CEREMONY OF THE TRAINING COURSE ON
TIDAL OBSERVATIONS AND DATA PROCESSING

Opening Address by
Dr. S. Morcos, Division of Marine Sciences, Unesco

Ladies and Gentlemen,

I have great pleasure in welcoming you to this Opening Ceremony of the Training Course on Tidal Observations and Data Processing, sponsored by the National Bureau of Oceanography of the People's Republic of China, Unesco and its Intergovernmental Oceanographic Commission (IOC).

I would like to take this opportunity to convey to you all, the greetings of the Director General of Unesco, Mr. Amadou Mahtar M'Bow, and his very best wishes for a successful meeting.

It is worthwhile to mention that the origin of this training course dates back to the Director General's visit to China, and to the Aide-Memoire of 15 August 1983, signed by the Minister of Education of the People's Republic of China, the Chairman of the Chinese National Commission for Unesco and the Director General of Unesco. Under Point 9 of the Aide-Memoire, specific marine science activities are illustrated as follows:

"In the field of marine science, the Chinese scientists have participated broadly in various expert meetings, training courses and ocean trips. Both sides are satisfied and pleased with the achievements gained through cooperation. In order to help developing countries to develop their marine science, China would like, through Unesco and under its auspices, to receive several marine scientists from developing countries to undertake study tours in China; to organize advanced training courses for marine scientists from developing countries; to receive several marine scientists from developing countries to take part in marine investigation on board; to provide developing countries with several sets of tide gauges and the consultant services of Chinese marine science specialists."

"Unesco expresses its appreciation of the above-mentioned Chinese contributions. Further consultations are required concerning concrete projects."

"China expects to send participants to various international meetings, seminars and symposia organized by Unesco in developed countries. In the meantime, it is hoped that Unesco will give financial assistance to Chinese marine scientists for study tours in developing countries concerned. Unesco will fully respond to such wishes and will include as much as possible the participation of the Chinese marine scientists in its programme activities."

Tides, the subject of this training course is one that finds its immediate application at the local, as well as at regional and global levels. The tide is one of the oldest phenomena observed by man, and measurement of tides and mean sea level has found application in many human and economic spheres and activities such as navigation, harbour building, coastline protection and fishing. On a regional and global basis, the need for a baseline for geodetic surveys, to measure changes in coastal land and to relate changes in mean sea level to climatic changes, have encouraged regional and international cooperation as illustrated by the foundation of the Permanent Service for Mean Sea Level (PSMSL) in Bidston, U.K.

Because of Unesco's long experience and dedication to the cause of training marine scientists in developing countries, and because the present activity is the first to be undertaken by Unesco in this field in the People's Republic of China, a special effort has been made by all concerned in the National Bureau of Oceanography, the Chinese National Commission, the Permanent Delegation of the People's Republic of China to Unesco, and the staff of Unesco and IOC, to ensure the great success of this training course. The most important component for a successful course are the trainees themselves. Special efforts were made, both by Unesco and IOC and by the Chinese authorities, to select the trainees in order to ensure a high degree of competence in the course. I have great pleasure, therefore, in congratulating the trainees who are present here today, and who were selected from a long list of applicants from the regions of South East Asia, South and Central Asia, Africa and the Arab States. The high number of applications showed great interest, both in the subject of the course and in its venue.

From its side, the Chinese National Bureau of Oceanography has chosen Tianjin to host the training course because of the presence of its two national institutions in oceanography: the Institute of Marine Scientific and Technological Information and the Institute of Marine Technology. Following the announcement of the training course, the National Bureau of Oceanography mobilized a number of its competent scientists to teach in the course; a complete set of lectures has been written and translated into English, and is now available for distribution to the participants.

Unesco greatly appreciates the logistics support, housing facilities and excursions which are being provided by our host. The participants, I am sure, will thoroughly enjoy the traditional hospitality of our host country.

For its part, Unesco and IOC announced the course widely, selected trainees in cooperation with the Chinese authorities, and provided air tickets for the selected trainees. In addition, in order that the training course might benefit from previous experience of similar training courses, and with a view to gaining an exchange of views with the trainees and the teaching staff, two Chinese scientists, Mr. Zhao Xucai and Mr. Wang Ji, were invited to participate in the Training Course on Mean Sea Level for the Countries of the CINCWIO Region, at the Institute of Oceanographic Sciences, Bidston, U.K. in June to July of this year. I am confident that this trip to Bidston will contribute to the success of the present training course.

In addition, Unesco and IOC have provided the services of Dr. David T. Pugh, Director of the Permanent Service for Mean Sea Level (PSMSL) in Bidston, U.K. Dr. Pugh, along with myself, will give a few lectures on selected subjects, thus ensuring a wide coverage of international expertise in the course.

At this point, I would also like to take the opportunity to convey to you the greetings of Dr. Dale Krause, Director of the Unesco Division of Marine Sciences, who visited this Institute last year and initiated the preliminary discussions for the organization of this training course. Greetings are also offered from Professor Ronquillo, Chairman of the Inter-governmental Oceanographic Commission and Dr. Mario Ruivo, its Secretary.

Sometime during the training course, I shall take the opportunity to give you a complete briefing on the activities of the Division of Marine Sciences within the framework of the Major Programmes of Unesco: "The Ocean and Its Resources", and "Management of Coastal and Island Regions", as well as a briefing on the activities of IOC. At this stage, I should mention that IOC has recently decided to play an active role in the promotion and establishment of sea level monitoring systems, in support of the programme on Climatic Changes and the Ocean (CCCO) and other programmes, with a view to building up progressively the basis for ocean monitoring systems. In this context, a plan for a global tide gauge network, to be built on regional components, is under consideration. For example, the training course in Bidston this year was addressed to the needs of the CINCWIO region (Cooperative Investigation in the North and Central Western Indian Ocean), in order to assist the Member States concerned to improve their tide gauge installations, and to enable them to participate in mean sea level monitoring on a regional and world basis. In this respect, we should also mention that China has kindly offered two tide gauges to be installed in two of the countries from which the trainees were selected.

To the participants in this training course, I wish to say that we will expect you to return home and apply what you have learned here. We sincerely hope that you can make an important contribution to development in your country in both the practical and scientific aspects of tidal research.

We also hope that you will form bonds of friendship here among your colleagues which will endure for a long time and will link you both scientifically and culturally.

Before closing, I should like to mention that this training course comes at a time when the relationship between the People's Republic of China and Unesco, particularly in the sphere of science and technology, is being given considerable support with the recent opening in Beijing, of the new Unesco Office for Science and Technology. The Unesco Representative to China, Dr. Leo Teller, is here with us today.

Finally, I would like to express, on behalf of the participants and myself, our great appreciation of the opportunity given to us to learn something from our host country, known for its long tradition in tidal

research, since "tidal action was the theoretical area that aroused the interest of Chinese thinkers. Wang Chong, in his first-century work, Lun Heng, recognized lunar influence on tides. By the twelfth century, a number of Chinese scientists had produced studies on the lunar theory of tides and compiled still-accurate tidal tables. The Qiantang bore (Qiantangchao) at Hangzhou was the primary focus of study." Moreover, scientists from developing countries can learn a great deal from the rapid development of marine sciences in a country faced with the immense task of exploring a long coastline, together with a large number of coastal islands and very long continental shelf.

Let us, therefore, broaden our knowledge in the next four weeks, and learn not only from the accomplishment of our host country in the field of tidal research, but also from their success in the exploration of their immense shoreline and seas.

CLOSING CEREMONY OF THE TRAINING COURSE ON TIDAL OBSERVATIONS AND DATA PROCESSING

Closing Speech by Mr. Luo Yuru, Director General of NBO

Ladies and gentlemen,
Friends and comrades,

The four weeks' Training Course on Tidal Observations and Data Processing has come to a successful conclusion. During this month, you have gained basic knowledge of tides, datum levelling, tidal observation techniques, data reduction as well as tidal analysis and prediction, and have achieved a great deal. Allow me on behalf of the National Bureau of Oceanography to express my warm congratulations to all of you.

As I mentioned at the Opening Ceremony, this training course was the first of its kind, jointly run by the NBO and Unesco and its IOC. Its main purpose was to introduce to the participants the basic knowledge and methods of tidal observations and data processing through lectures, practical training and observation. Through the joint efforts for cooperation between the instructors and the participants, our training course has turned out to be a success and you have made greater progress than expected. This is because of the fine professional qualities and hard work of all the participants. Some participants were so absorbed in their study as to forget food and sleep. We Chinese comrades should learn from you this hardworking spirit and eagerness to learn. Here, once again, I would like to express my thanks to the Government of Tianjin Municipality and Local Organizing Committee of the course for their strong support.

After the training course, you will go back to your country to make greater contributions to the development of marine science in your own country. I am sure the knowledge you have learned here at the training course will be useful to you.

Considering the different conditions in each country, China would like to continue to provide technical assistance in the field of tidal observations and data processing, including the siting and establishing of tidal stations, as well as tidal data processing.

Before closing my speech, I have one thing to mention, that is, we lack experience in running such training courses. Therefore, there must have been some problems in the management of the course. I wonder if our arrangements both in curriculum and accommodation have met your needs. I do expect you to leave your valuable opinions behind so that we may do a better job in running such training courses in the future.

Lastly, allow me to express my congratulations again on your great achievements during the course. I wish you great progress in your respective posts when you are back home. I also wish you a happy journey and good health.

Thank you.