THE INTERNATIONAL HYDROGRAPHIC REVIEW



INTERNATIONAL HYDROGRAPHIC BUREAU MONACO

Vol. LXXIII No. 2 No. 139 OF THE SERIES

SEPTEMBER 1996

OTHER PUBLICATIONS OF THE INTERNATIONAL HYDROGRAPHIC BUREAU

(For other IHO publications and prices, the Catalogue of Publications 1996 can be obtained gratis from the IHB)

٦

	PERIODICAL PUBLICATIONS	
P-3	International Hydrographic Bulletin Contains topical news, reports the work undertaken by the I.H. Bureau and the world hydrographic community, covers recent developments in hydrographic instrumentation and training programmes, describes new survey vessels, etc. Charts and publications issued by Hydrographic Offices are listed each month, and there is a comprehensive monthly bibliography on hydrography and related subjects. (Trilingual English, French, Spanish).	
P-5	IHO Yearbook Particulars and addresses of Hydrographic Offices throughout the world. Published every year. (Bilingual English/French).	
MISCELLANEOUS PUBLICATIONS		
M-4	Chart Specifications of the IHO and Regulations of the IHO for International (INT) Charts Gives chart specifications of the IHO for compiling nautical charts, together with agreed symbols and abbreviations adopted for general use by Member States (English, French and Spanish Editions).	
M-5	Standards of Competence for Hydrographic Surveyors - 7th Edition Describes the Standards for which recognition may be given to programmes of hydrographic training at Category A or B levels. Outlines procedures for submission, documentation, etc. and complete syllabi. (English, French and Spanish).	
M -11	Catalogue of International Charts and Guidance for Regional Coordinators of INT Chart Schemes Describes by means of indexes, texts and chartlets, the IHO International Chart Series at large, medium and small scales and provides directions to assist coordinators in following the principles established for INT charts schemes.	

SPECIAL PUBLICATIONS

S-32 Hydrographic Dictionary

Definition of words and terms used in hydrography and associated activities (English, French and Spanish).

S-47 Training Courses in Hydrography and Nautical Cartography Lists the training courses available on hydrography and nautical cartography in Member States' Hydrographic Offices and elsewhere in

their countries. (English only).

S-50 IHO Tidal Constituent Bank Station Catalogue

Catalogue of stations for which tidal constituents data is held by the Canadian Hydrographic Service on behalf of the IHO. Includes a floppy disk. (Trilingual, English, French and Spanish).

S-51 Manual on Technical Aspects of the UN Convention on the Law of the Sea

Glossary of technical terms with a description of practical applications to boundary delimitation. (English, French and Spanish).

S-52 Provisional Specifications for Chart Content and Display of Electronic Chart Display and Information Systems (ECDIS) Provisional Specifications prepared by CHRIS Working Group on ECDIS.

(English). Appendices :

Appendix 1 - Guidance on Updating the Electronic Chart.

Appendix 2 - Specifications for ECDIS Colours and Symbols.

Annex A - IHO ECDIS Presentation Library

Appendix 3 - Glossary of ECDIS related Terms (also in French and Spanish).

S-57 IHO Transfer Standard for Digital Hydrographic Data

Standard prepared by the IHO's Committee CHRIS for the coding and exchange of hydrographic digital data, including that intended for ECDIS purpose. (English only).

S-59 Status of Hydrographic Surveying and Nautical Charting in Antarctica

A catalogue showing the extent of surveys, charting and oceanic bathymetry for the area south of 60°S latitude based on information provided by IHO Member States. (Bilingual English/French).

S-60 User's Handbook on Datum Transformations involving WGS-84 Contains constants and formulas to relate local/regional geodetic datums to the WGS-84. (English and French).

BATHYMETRIC PUBLICATIONS

- **B-1** General Bathymetric Chart of the Oceans (GEBCO) 5th Edition A series of 18 separate sheets in colour (75 x 110 cm) covering the world, plus one World Sheet in colour (100 x 126 cm).
- **B-4** Information Concerning Recent Bathymetric Data Issued annually, this publication lists, for the previous 12 months, information concerning recent bathymetric data. (Bilingual English/French).
- B-6 Standardization of Undersea Feature Names (Guidelines, Proposal Form, Terminology)
 This publication is intended to ensure maximum standardization of the names of undersea features (English/French, Spanish, Russian, Japanese and Chinese Editions).

B-7 GEBCO Guidelines

This IHO-IOC publication, published by the IHB through collaboration between the IHO and the IOC under the aegis of the Joint IHO-IOC Guiding Committee for GEBCO, describes the role of each participant involved in the production of GEBCO. (English and French Editions).

These publications as well as a free catalogue and information papers are available from:

THE INTERNATIONAL HYDROGRAPHIC BUREAU 4 quai Antoine I^{er} B.P. 445 MC 98011 MONACO CEDEX Telephone: +377 93.10.81.00 Telefax: +377 93.25.20.03 Teles: 479164 MC-INHORG e-mail: ihb@unice.fr

INTERNATIONAL HYDROGRAPHIC ORGANIZATION



XVth INTERNATIONAL HYDROGRAPHIC CONFERENCE

Monaco, 14-25 April 1997

The XVth International Hydrographic Conference will take place in Monaco, between Monday, 14 April and Friday, 25 April 1997. The Opening Ceremony will be held on Monday, 14 April and it is expected that HSH Prince Rainier will participate. Secretary General William O'Neil of the International Maritime Organization will present the opening address.

The Conference will be held in the Centre de Congrès-Auditorium of Monaco. Apart from the business meetings of the Organization, there will be an Exhibition of Charts, a Commercial Exhibition of Hydrographic and Cartographic Equipment and a Technical Symposium. The latter two events will take place during the second week, from 21-24 April. Several research and survey vessels of the IHO Member States will be on display during the Conference.

The Conference is the most important event of the IHO and all its 61 Member States are expected to be present to review the past accomplishments and current activities of the Organization and to discuss its future objectives and work programmes.

For further information, please contact:

The International Hydrographic Bureau 4 Quai Antoine 1er B.P. 445. MC 98011 MONACO CEDEX Telephone : (377) 93 10 81 00 Fax : (377) 93 25 20 03 e-mail : ihb@unice.fr



representing and serving the world hydrographic surveying community with individual and corporate members in sixty countries

The Hydrographic Society

UNIVERSITY OF EAST LONDON LONGBRIDGE ROAD TELEPHONE: 081 597 1946 · FAX: 081 590 9730 ESSEX RM8 2AS ENGLAND · .

AUSTRALASIAN PO Box 1447

North Sydney NSW 2059 Tel : + 61 2 925 4800 Fax : + 61 2 925 4835

BENELUX

RWS — Dir Noordzee Postbus 5807, 2280HV Rijswijk (ZH), The Netherlands Tel : 703 366600 Fax: 703 90 06 91

DENMARK

Sokortafdelingen Botoratemetervej 8 DK 2400 Copenhagen NV Tel : + 45 35 87 50 89 Fax : + 45 35 87 50 57

UK c/o UEL

Longbridge Road Dagenham Essex RM8 2AS Tel: 081 597 1946 Fax: 081 590 9730

DAGENHAM

PO Box 732 Rockville Maryland 20848-0732 Tel : 301 460 4768 Fax : 301 460 4768

USA

The JOURNAL of NAVIGATION Published for the Royal Institute of Navigation

EDITOR: PROFESSOR J. F. KEMP

The Journal of Navigation contains original papers on every aspect of navigation – over and through land, sea, air and space – including those papers presented at the meetings of the Institute together with the following discussion. Papers cover every aspect of the subject from the highly technical to the descriptive and historical. Subjects include: electronics, astronomy, mathematics, cartography, command and control, psychology and zoology, operational research, risk analysis, theoretical physics, operation in hostile environments, instrumentation, ergonomics, and financial planning and law. The journal also publishes selected papers and reports from study groups, and book reviews. Contributions come from all parts of the world.

The Journal of Navigation is essential reading for:

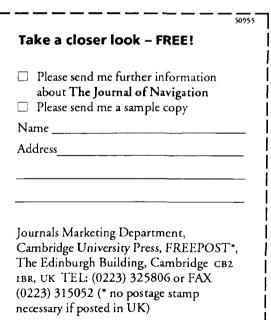
- Professional and amateur navigators at sea, in the air or on land
- Managers and executives of companies involved in the operation of airlines, shipping fleets or trucking
- Military personnel concerned with communications, command, control and information
- Managers and executives of companies involved in the development, production and sales of navigational equipment
- Governmental Departments responsible for the safety of air, marine and road traffic, including the deployment of emergency services
- Scientists and engineers in research establishments involved in navigational topics
- Academic staff associated with teaching or research in navigational topics, or with an interdisciplinary interest in navigation.

The Journal of Navigation is published by Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, England. Subscription rates: Volume 46: January, May and September 1993; £83/\$155, £29/\$53 for single parts; delivery by airmail £12 per year extra (dollar price includes airfreight to New York). ISSN 0373-4633



Why you should read The Journal of Navigation

- It deals with the whole range of navigation, not just satellite navigation, but history, finance and law, navigation of birds and animals so you are informed about the whole range of your subject
- It varies the type of article to suit the information being given; it includes book reviews and short discussion papers, not just full length research articles.
- Material is of a very high standard all articles are refereed, and material is published in an average time of 6 months so that what you read is current and topicald
- It often carries a group of papers about one topic, so that you get a complete picture of the current situation



In USA, Canada & Mexico, write to Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, USA



Lighthouse

JOURNAL OF THE CANADIAN HYDROGRAPHIC ASSOCIATION

A journal dedicated to promoting the free exchange of information within the hydrographic community and to advancing the technical and professional ability of hydrographers.

It includes a variety of articles and topical news on advances in hydrography and historical perspectives.

Published twice yearly, in April and November, and is free to Association members.

Yearly subscription rates to non-members: Residents of Canada \$20.00 Non-residents \$25.00 (Cdn.)

For further information regarding membership, article submission and advertising, please address all correspondence to:

The Editor, LIGHTHOUSE Canadian Hydrographic Association P.O. Box 5050 867 Lakeshore Road Burlington, Ontario Canada L7R 4A6 Phone: (416)336-4856

GeologicalMagazine

Scope

Geological*Magazine* is a bi-monthly journal covering the entire field of earth sciences. Coverage extends from hard rock to soft rock geology, palaeontology to geochemistry, turbidites to magmas, mineralogy to orogeny.

Why you should read Geological Magazine

- Journal of international standing and distribution
- Coverage of all geological topics
- Extensive book review section keeps you up-to-date with other publications in your field
- Original scientific papers by leading authors
- Numerous diagrams and maps illustrate each article
- Important Rapid Communications section

Essential reading for...

- practising geologists in industry •
 geological research workers •
- teachers and students of geology •
- conservationists and land use specialists
 - earth science librarians •

Special offer

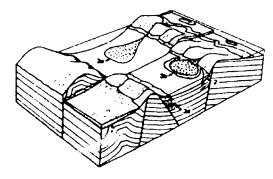
Get the world's most celebrated geological magazine for less than half price! As a special offer to students and members of the societies listed, we are offering **Geological**Magazine at a greatly reduced price.

Individual members of the following societies can subscribe for just £72 (normally £152).

Geological Society of London • Geological Society of Australia • Geological Society of New Zealand
European Union of Geosciences • Palaeontographical Society • Geologists' Association

Offer to students

Subscribe now and pay only £36! A huge saving on the normal subscription rate of £152.



Editors

M. J. Bickle, C. P. Hughes, I. N. McCave & N. H. Woodcock, *Department of Earth Sciences, University of Cambridge*

Subscription

Volume 132 in 1995 published bi-monthly. £152; £72 for members of selected societies (see panel for details); £36 for students; airmail £31 per year extra. ISSN 0016-7568.

52072

Take a closer look – FREE!

□ Please send me a free sample copy of **Geological**Magazine

 \square Please send me further information

Name ____

Address ___

Send your order to: Journals Marketing Department, Cambridge University Press, FREEPOST*, The Edinburgh Building, Cambridge, CB2 IBR, UK.

Tel: +44(0)1223 325806 Fax: +44(0)1223 315052 (*No postage stamp necessary if posted within UK)

In USA, Canada and Mexico send to: Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, USA.

Tel: (914) 937 9600 x 154 Fax: (914) 937 4712





Via Prisciano, 42 - 00136 Roma - Tel./Fax 06/3452841

INTERNATIONAL HYDROGRAPHIC REVIEW

FOREWORD

The International Hydrographic Review is published twice a year (March and September) in separate English and French editions.

Original articles are welcomed on hydrography, oceanography, cartography, geodesy, navigation, photogrammetry, radio aids, automation, new instruments, equipment and hydrographic vessels, as well as on the history and organization of hydrographic offices.

The latest date for receipt of manuscripts is:

- 1 January for the March issue,

- 1 July for the September issue,

Articles should be addressed to: The Directing Committee, International Hydrographic Bureau, B.P. 445, MC 98011 MONACO Cedex (Principality of Monaco).

Up to 50 reprints per article can be supplied free to the author(s). They must be ordered prior to publication, and may be in either language or a proportion in each. Further copies ordered are charged at cost price, plus postage.

The Directing Committee does not hold itself responsible for statements or opinions expressed by contributors to the Review. It is the normal practice that articles are accepted based on external reviewers.

Notes for contributors

Papers should be as concise as possible and an abstract of up to 150 words is desirable. Uncommon expressions or constructions and particularly professional jargon should be avoided since a large proportion of readers are necessarily reading the Review in a language that is not their mother tongue.

Any permission needed to incorporate material published elsewhere is the responsibility of authors, and it will be assumed that such permission has been obtained.

Texts should be submitted in English or French (or both), though by special arrangement articles in Spanish could be accepted for translation in the Bureau.

Articles should be provided in floppy disk, in Wordperfect or compatible for DOS or WINDOWS. The floppy disk should be accompanied by a typed copy of the article.

Bibliographic references should be listed at the end of the article in the standard Harvard form. Footnotes should be kept to a minimum, and metric measures used throughout.

Illustrations, already numbered and titled, should be supplied ready for reproduction by the offset method and for reduction to 12.5 x 21 cm, the effective size of a Review page. Positive transparencies (repromats) are preferred. Photographs should be black and white with good definition and be limited to those necessary for an understanding of the text. Colour transparencies cannot be accepted. Coloured photographs and plates can only be accepted under special terms that must be discussed directly with the Editor. Reproduction of charts and maps must provide clear definition of the features to be portrayed.

As the Review is a two-language publication a minimum of wording should be shown on the illustrations themselves, explanations being confined to the legend beneath.

Printer's proofs are corrected in the Bureau and are not normally sent to authors.

THE INTERNATIONAL HYDROGRAPHIC REVIEW



Vol. LXXIII

No. 2

(No. 139 OF THE SERIES)

PUBLISHED AND PRINTED BY

THE

INTERNATIONAL HYDROGRAPHIC BUREAU

B.P. 445 - 4, quai Antoine I^{ER} MC 98011 MONACO Cedex PRINCIPALITY

SEPTEMBER 1996

INTERNATIONAL HYDROGRAPHIC ORGANIZATION

MEMBERS OF THE IHO

ALGERIA ARGENTINA AUSTRALIA BAHRAIN BELGIUM BRAZIL CANADA CHILE CHINA CUBA CROATIA CYPRUS DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA DENMARK DOMINICAN REPUBLIC ECUADOR EGYPT FIJI FINLAND FRANCE GERMANY GREECE GUATEMALA ICELAND INDIA INDONESIA IRAN ITALY JAPAN MALAYSIA MONACO MOZAMBIQUE **NETHERLANDS**

NEW ZEALAND NIGERIA NORWAY OMAN PAKISTAN PAPUA NEW GUINEA PERU PHILIPPINES POLAND PORTUGAL REPUBLIC OF KOREA REPUBLIC OF SOUTH AFRICA RUSSIAN FEDERATION SINGAPORE SPAIN SRI LANKA SURINAME SWEDEN SYRIAN ARAB REPUBLIC THAILAND TONGA TRINIDAD AND TOBAGO TURKEY UKRAINE UNITED ARAB EMIRATES UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND UNITED STATES OF AMERICA URUGUAY VENEZUELA YUGOSLAVIA ZAIRE

INTERNATIONAL HYDROGRAPHIC BUREAU

DIRECTING COMMITTEE

President: Rear Admiral Christian ANDREASEN, USA, NOAA (Ret.) Directors: Mr. Adam J. KERR, MSc. (Canada) Rear Admiral Giuseppe ANGRISANO, Italian Navy (Ret.)

For conditions of sale see Catalogue of IHO Publications.



TABLE OF CONTENTS

_

-	Strategic Considerations for International Hydrography in the 21st Century (A. BOND)	7
-	The Electronic Chart and its Provisional Substitutes (J.N. PASQUAY)	17
-	The Effect of Data Density on the Accuracy of Foot-line Determination through Maximum Curvature Surface by Automatic Ridge-tracing Algorithm (ZIQIANG OU and P. VANÍČEK).	27
-	On the Estimation of Standard Deviations in Multibeam Soundings (J. EEG)	39
-	The New Oceanographic Equipment of the "D'Entrecasteaux" (M. LE GOUIC)	53
-	Looking Forward to Better Feature Detection (C.K. ELLIS)	67
-	Probing the Problems and Prospects of International Hydrography (A.J. KERR)	89
-	The Use of "EOF" in the Mean Sea Level Oscillations Study - An Application to Cadiz (M. Bruno, B. Fraguela, J. Alonso, R. Mañanes, A. Ruiz-Cañavate, J. Rico)	99
-	Hourly Oceanographic and Acoustic Variations in the Strait of Gibraltar, and Multibeam Echosounder Technology (A. RUIZ-CAÑAVATE and J. RICO)	109
-	Computer Assisted Nautical Chart Updating - A Chilean Navy Hydrographic and Oceanographic Service Project (H.M. GORZIGLIA)	121
_		
-	Fifty years ago	139