

VIth IHO TIDAL COMMITTEE MEETING
Lisbon, Portugal, 11-13 October 2004

Final Report

1. OPENING

The meeting was opened at 0900 on 11th October 2004 in the Naval Officers Club, Lisbon. The list of participants is given in Annex A.

Captain Carlos Nelson Lopes da Costa, the Technical Director of the Portuguese Hydrographic Service welcomed the delegates attending the VIth Meeting of the IHO Tidal Committee, and wished them a successful meeting generating much stimulating discussion.

The Chairman of the Committee thanked Captain Lopes da Costa for the splendid arrangements made by the Portuguese Hydrographic Service, with special thanks extended to Ms Leonor Martins and Ms Raquel Gomes for the outstanding administrative and secretarial support provided in advance of the meeting.

The Chairman extended a warm welcome to the delegates from Portugal, South Africa, Spain and the USA representing their countries for the first time.

During the morning of October 11th, a Tidal Seminar was held with presentations made by several delegates attending the meeting. In Annex B, a detailed list of the subjects presented is given.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 Adoption of the Agenda

The Agenda was presented to the delegates for consideration and accepted without modification. See Annex C.

2.2 Conduct of the session, timetable and documentation

The timetable was explained and presented to the delegates. See Annex D.

Apologies for absence were received from Australia, China and Germany.

2.3 Report on Intersessional Activities

The Chairman mentioned the work undertaken in connection with the LAT/HAT Questionnaire, the Standard Constituent List and the promotion of the continuing link with GLOSS. He concluded by mentioning the CL promulgated by the IHB concerning the nomination of Chairman for the Tidal Committee, and thanked the delegates for their positive responses.

2.4 Minutes of the Vth IHO TC Meeting

The Minutes of the Vth IHO TC Meeting were accepted without amendment.

2.5 Matters arising from the Vth IHO TC Meeting

The Chairman stated that the activity undertaken concerning the migration to LAT/HAT and the adoption of the Standard Constituent List would be discussed under Agenda Items 3.1 and 3.2 respectively.

Lt Cdr Steve Shipman (IHB) advised the meeting that ISO Technical Committee 211 has yet to respond to the proposal for a new format for the Exchange of Harmonic Constants submitted after the Vth TC Meeting.

3. PROGRAMME MATTERS

3.1 Responses to CL on implementation of LAT/HAT

Lt Cdr Steve Shipman (IHB) presented the results of the questionnaire recently promulgated by CL which resulted in 31 responses out of a possible 74 MS. Details are contained in Annex E.

Delegates expressed the view that where their current Chart Datum was already very close to LAT then no further immediate action was warranted.

The Chairman emphasised the need for MS to continue to seek to implement LAT/HAT at the earliest suitable occasion in the interest of achieving a smooth transition between adjacent national waters.

However, it was appreciated that the high costs of chart re-compilation might, in all probability, be a major factor in dictating the pace of adoption of LAT/HAT by MS.

The Chairman thanked Mr Charles O'Reilly (Canada) and Lt Cdr Steve Shipman (IHB) for their work in compiling the questionnaire.

3.2 Update on Standard Constituent List

The Chairman reported that the list had been extensively updated since the Vth TC meeting, and thanked Mr Bernard Simon (France) for all the valuable support he had provided him with.

The list now contains a total of 427 Constituents which may be considered as a definitive set providing a comprehensive selection for use by MS.

At the request of Dr Minoru Odamaki (Japan) the French and United Kingdom delegates agreed to consider the prospect of listing the nodal corrections against each constituent accompanied by a suitable explanation of their derivation as an Appendix.

3.3 Format for Exchange of Harmonic Constants

The Chairman emphasised the need for a suitable format to promote the efficient exchange of harmonic constants between MS.

Mr Charles O'Reilly (Canada) mentioned that he understood the IOC may be considering the creation of a global database of tidal constituents and suggested they be made aware of the United Kingdom's proposed new format.

Lt Cdr Steve Shipman (IHB) agreed to contact ISO Technical Committee 211 with a view to obtaining their response to the proposed format submitted after the Vth TC Meeting.

3.4 XML Format for Tidal Data

Mr Dan Pillich (Observer) stated that the original consortium established to create Marine XML had ceased to exist. There is now a new consortium which receives EU funding under Framework V currently building a comprehensive system, which will include tidal heights but not yet harmonic constituents. This project has 6-months left to run.

The IOC website provides a portal to the Marine XML pages where more detailed information can be found.

The Chairman thanked Mr Dan Pillich for his contribution and requested that he continue to inform the TC of the final outcome of the project.

3.5 Vertical Datum Management and Migration Strategy

The TC discussed this matter in considerable detail and a summary of the main conclusions are contained in Annex F.

The Chairman emphasised the need for MS to review the level of their Chart Datum on a regular basis in the light of potential changes due to variations in MSL and crustal movement.

3.6 Vertical Reference Framework

Mr Bernard Simon (France) gave a detailed presentation on the modelling issues involved in connecting LAT and the Mean Sea Surface using computed harmonic constants at each triangular grid point. The boundary conditions are taken from the global model which uses satellite altimetry data.

Mr Christopher Jones (UK) gave a short presentation on the Vertical Offshore Reference Framework (VORF) project currently being undertaken by UKHO. The objective is to derive a reliable connection between LAT and MSL in offshore areas in order to facilitate the efficient transformation of bathymetric data rendered on the WGS84 ellipsoid to a variety of different vertical datums.

Mr Stephen Gill (USA) gave a short presentation on the work being undertaken in the USA in this field, drawing particular attention to the connection between ellipsoid, orthometric and bathymetric datums.

Lt Cdr Steve Shipman (IHB) reported on the associated work undertaken by the IAG and FIG - see Annex G. He was requested to maintain a liaison with such groups and to report their activity to the TC accordingly.

The Chairman thanked each delegate for their informative and enlightened presentations.

3.7 Update on IOC/GLOSS Program

Ms Leonor Martins (Portugal) gave a detailed presentation on the IOC/GLOSS Program and handed delegates a copy of the latest status report. She drew the attention of the delegates to the degree of adequacy of the data for each country listed in Annex II.

Where practicable, MS are encouraged to render hourly height observations rather than purely MSL data in order to meet the GLOSS requirements.

The GLOSS Technical Secretary submitted his comments to the TC expressing

his appreciation for the enhanced collaboration from the hydrographic community. See Annex H.

The Chairman thanked Ms Leonor Martins for a most informative presentation.

3.8 Data Gathering in Antarctica

The TC was invited to discuss this issue by the Chairman of the Hydrographic Committee on Antarctica (HCA).

Information concerning the gathering of tidal data in Antarctica especially in the use of radar tide gauges is being sought by the HCA. MS are encouraged to forward their experiences of data gathering in Antarctica to the IHB.

3.9 Update on Strategic Planning Working Group

Lt Cdr Steve Shipman (IHB) gave a comprehensive update on the proposals of the Strategic Planning Working Group (SPWG), which are to be discussed at the 3rd EIHO Conference in April 2005, and how this might impact on the TC. See details contained in Annex I.

3.10 Rationalisation of IHO TRs A2.5 and A6.2

Considerable discussion took place under this item and revised wording for TR A2.5 is contained in Annex J. Dr Minoru Odamaki objected to the proposed wording of paragraph 1 and wished to retain the original wording.

TRs A2.8, 2.9, 6.1, 6.2, 6.7, 6.8 and 6.9, G2.1, 2.2 and 2.3 were all reviewed for continuing relevance. There was one minor amendment proposed for G2.1 and the revised text is given in Annex K, otherwise the TC considered that no further amendments were required at this stage.

The Chairman recommended that all relevant TRs concerning tidal issues be reviewed on a regular basis as a standing item on the agenda of all subsequent TC meetings.

3.11 Rationalisation of IHO Chart Specifications M-4 (Articles B-302.2, B-380.1 and B-405)

The relevant articles of IHO Chart Specifications M-4 concerning tidal issues were all reviewed and the Chairman of the Chart Standardisation and Paper Chart Working Group (CSPCWG) will be informed by the IHB of the following

recommendations :

Article B-302.2 needs to reflect the amendments being put forward to TR A2.5 contained in Annex J.

Article B-380.1 needs to reflect that vertical clearances shall be referred to HAT instead of MHWS where the tide is appreciable.

Article B-405.3 needs to have reference to Indian Spring Low Water deleted.

3.12 French Manual of Tides

Mr Bernard Simon (France) gave an update on the status on the French Manual of Tides. He emphasised that the objective was to provide a manual aimed at the practical needs of hydrographers, but stated that because the reviewer was an oceanographic scientist the level of technical content has not yet been agreed.

The issues concerning the subsequent translation of the French text into English and Spanish will be taken up by Lt Cdr Shipman (IHB).

The Chairman emphasised the importance of ensuring that both the subsequent translations are a true and accurate representation of the French text.

3.13 TC Terms of Reference

The revised TORs were promulgated by CL after the Vth TC Meeting and comments were received from China and France. These comments were discussed and embodied in a newly structured set of TORs contained in Annex L, which will be sent, by the IHB, as a CL to MS for approval.

The Chairman expressed the appreciation of the TC for the work undertaken by Lt Cdr Shipman (IHB) in revising the TORs.

4. Any Other Business

No items were raised.

5. Review of Action Items

Item 3.2 - France and United Kingdom to consider adding the listing of nodal corrections to the Standard Constituent List

Item 3.3 - Lt Cdr Steve Shipman (IHB) to contact ISO Technical Committee 211 for a response to the proposed format for the Exchange of Harmonic Constants.

Item 3.6 - Lt Cdr Steve Shipman (IHB) to maintain a liaison with IAG, FIG and other associated groups and to report their activity to the TC accordingly.

Item 3.4 - Mr Dan Pillich to provide advice on the final outcome of the Marine XML project.

Item 3.10 - Lt Cdr Steve Shipman (IHB) to inform the TC on how the amendments to the TR will be handled.

Item 3.11- Lt Cdr Steve Shipman (IHB) to ensure that the Chairman of the CSPCWG is informed of the TC recommendations affecting the three M-4 Articles.

Item 3.12 - Lt Cdr Steve Shipman (IHB) to follow up on the present state of the translations.

6. Venue and Date of VIIth IHO TC Meeting

The TC confirmed after a brief discussion that future meetings still needed to be held in countries not normally represented in order to promote better participation. The Chairman undertook to contact Australia requesting they host the VIIth TC Meeting in May 2006. Malaysia or Venezuela, in that priority, would be considered as alternative venues.

7. Adoption of Draft Report

The draft report was prepared and discussed. The subsequent amendments would be incorporated into the final draft and circulated to the delegates for comment at the earliest opportunity. The Final Report would then be posted on the IHO website.

8. Closing Remarks

The Chairman thanked the Portuguese Hydrographic Service for the excellent facilities provided for the meeting. He mentioned especially the outstanding administrative support provided, the superb social programme arranged for the visit, and the generosity of the hospitality received.

Lt Cdr Steve Shipman (IHB) on behalf of the Directing Committee of the IHB thanked the Portuguese Hydrographic Service for hosting the VIth TC Meeting.

The VIth meeting was then closed at 1130 on 13th October 2004.

LIST OF PARTICIPANTS

MEMBERS

COUNTRY	NAME AND ADDRESS	TELEPHONE AND FAX NUMBERS
Canada	Mr. Charles O'Reilly Chief / Tidal Analysis and Prediction Canadian Hydrographic Service PO 1006, Dartmouth, Nova Scotia, Canada B2Y4A2	Tel: +1-902-426-5344 Fax: +1-902-426-1893 E-mail: OreillyC@mar.dfo-mpo.gc.ca
Chile	CDR (Ret) Alejandro Cabezas Hydrographic and Oceanographic Service – Chilean Navy Errazuriz 254, Playa Ancha P.O. BOX 324, Valparaiso Chile	Tel: +56-32-266520 Fax: +56-32-266522 / 266542 E-mail: Acabezas@shoa.cl
Denmark	Dr. Palle Bo Nielsen Royal Danish Administration of Navigation and Hydrography Overgaden o. Vandet 62B Postbox 1919 1023 Copenhagen K Denmark	Tel: +45 32 68 96 24 (direct) Fax: + 45 32 57 43 41 E-mail: pbn@frv.dk
France	Mr. Bernard Simon Établissement Principal du SHOM N° 13 rue du Chatellier, BP 30316, 29603 Brest Cedex France	Tel : + 33 2 98 22 18 68 Fax : + 33 2 98 22 08 99 E-mail : simon@shom.fr
IHB	LT CDR Stephen Shipman Professional Assistant Hydrography IHB – 4, Quai Antoine 1er. BP 445, MC 98 011 Monaco CEDEX	Tel: +377 93 10 81 06 Fax: + 377 93 10 81 40 E-mail: sshipman@ihb.mc
Japan	Dr. Minoru Odamaki Director, Oceanographic Data and Information Management Division Hydrographic and Oceanographic Department Japan Coast Guard Tsukiji 5-3-1, Chuo-ku, Tokyo, 104-0045, Japan	Tel: + 81 3 3541 3818 Fax: + 81 3 3545 2885 E-mail: Minoru-odamaki@kaiho.mlit.go.jp
Norway	Hr. Noralf Slotsvik Section Manager Norwegian Hydrographic Service Lervigsveien 36, N-4014 Stavanger	Tel: +47 51858813 Fax: +47 51858701 E-mail: noralf.slotsvik@statkart.no
Portugal (also representing)	Ms. Leonor Martins Chief, Tidal Section Instituto Hidrográfico (Portuguese Hydrographic Service)	Tel: + 351 21 094 30 33 Fax: E-mail: leonor.martins@hidrografico.pt

GLOSS)	Rua das Trinas, 49 1249-093 Lisboa Portugal	
South Africa	Ms. Ruth Farre Superintendent Tidal Information South African Navy Hydrographic Office Private Bag X1, Tokai, 7966 Republic of South Africa	Tel: +27 21 787 2403 Fax: +27 21 787 2233 E-mail: hydrosan@iafrica.com (ATT: R. Farre)
Spain	Mr. Juan Conforto Sesto Head of the Oceanographic Section Instituto Hidrografico de la Marina Plaza de San Severiano, 3 11007 – Cadiz Spain	Tel: + 34 956 59 94 01 Fax: +34 956 25 85 48 E-mail: jconses@fn.mde.es ; oceanihm@retemail.es
United Kingdom	CDR John Page Head, Tidal Section UKHO Taunton, Somerset, TA1 2DN United Kingdom	Tel: 0044 (0)1823 – 337900 extn 3504 Fax: 0044 (0)1823 - 284077 E-mail: John.Page@ukho.gov.uk
	Mr. Christopher Russell Jones Deputy Head of Tidal Section UKHO Taunton, Somerset, TA1 2DN United Kingdom	Tel: 0044 (0)1823 - 337900 extn 3533 Fax: 0044 (0)1823-284077 E-mail: christopher.jones@ukho.gov.uk
United States of America	Mr. Stephen Gill Chief Scientist for the NOS Center for Operational Oceanographic Products and Services NOAA 1305 East-West Highway, Station 6515, Silver Spring, Maryland USA 20 910	Tel: + 1 301 713 29 81 ext 139 Fax: +1 301 71 343 92 E-mail: Stephen.gill@noaa.gov
Observer	Mr. Bohdan Pillich R&D Coordinator SevenCs AG Ruhrstrasse 90 22761 Hamburg Germany	Tel: + 49 40 851 724 23 Fax: + 49 40 851 54 40 E-mail: pi@sevencs.com

LOCAL OBSERVERS

COUNTRY	NAME AND ADDRESS	TELEPHONE AND FAX NUMBERS
---------	------------------	---------------------------

Portugal	<p>CDR Carlos Ventura Soares Head, Oceanography Division Instituto Hidrográfico (Portuguese Hydrographic Service) Rua das Trinas, 49 1249-093 Lisboa Portugal</p>	<p>Tel: + 351 21 094 30 30 Fax: E-mail: oceanografia@hidrografico.pt ventura.soares@hidrografico.pt</p>
	<p>LT Jesus Correia Oceanography Division Instituto Hidrográfico (Portuguese Hydrographic Service) Rua das Trinas, 49 1249-093 Lisboa Portugal</p>	<p>Tel: + 351 21 094 30 31 Fax: E-mail: jesus.correia@hidrografico.pt</p>
	<p>Ms. Marina Serpa Tidal Section Instituto Hidrográfico (Portuguese Hydrographic Service) Rua das Trinas, 49 1249-093 Lisboa Portugal</p>	<p>Tel: + 351 21 094 32 33 Fax: E-mail: marina.serpa@hidrografico.pt</p>
	<p>Ms. Joana Reis Tidal Section Instituto Hidrográfico (Portuguese Hydrographic Service) Rua das Trinas, 49 1249-093 Lisboa Portugal</p>	<p>Tel: + 351 21 094 30 33 Fax: E-mail: joana.reis@hidrografico.pt</p>
	<p>Ms. Helena Kol Instituto Geográfico Português (Portuguese Geographic Service) Rua Artilharia Um, 107 1099-052 Lisboa Portugal</p>	<p>Tel: +351 21 381 96 51 Fax: +351 21 381 96 94 E-mail: hkol@igeo.pt</p>
	<p>Mr. Gonçalo Crisóstomo Instituto Geográfico Português (Portuguese Geographic Service) Rua Artilharia Um, 107 1099-052 Lisboa Portugal</p>	<p>Tel: +351 21 381 96 00 (ext. 223) Fax: +351 21 381 96 94 E-mail: gcrisostomo@igeo.pt</p>

TIDAL SEMINAR

- **A new Vertical Reference System for Denmark, and Sea Level Measurements in Greenland**
(Dr Palle Bo Nielsen, Royal Danish Administration of Navigation and Hydrography, Denmark)

- **The status of the European Sea Level Service (ESEAS)**
(Hr Noralf Slotsvik, Norwegian Hydrographic Service, Norway)

- **Experiences in Vertical Positioning using RTK-GPS related to vertical reference framework, and Japanese tidal observations in Antarctica**
(Dr Minoru Odamaki, Director, Oceanographic Data and Information Management Division, Hydrographic and Oceanographic Department, Japan Coast Guard, Japan)

- **An Overview of the work on tides in the Portuguese Hydrographic Institute**
(Ms Leonor Martins, Portuguese Hydrographic Service, Portugal)

- **The Renewal of Harmonic Constants at the Portuguese Hydrographic Institute**
(Ms Joana Reis, Portuguese Hydrographic Service, Portugal)

- **Sea Level Variability off Atlantic Canada from Operational Satellite Altimetry, and Mitigation of Coastal Hazards**
(Mr Charles O'Reilly, Canadian Hydrographic Service, Canada)

- **UKHO Tidal Prediction System “TotalTide 2005”**
(Commander John Page, Hydrographic Office, United Kingdom)

Agenda

1. Opening

- a. Welcoming address

2. Administrative Arrangements

- a. Adoption of the Agenda
- b. Conduct of the Sessions
- c. Report on Intersessional Activities
- d. Minutes of the Vth IHO TC Meeting
- e. Matters arising from the Vth IHO TC Meeting

3. Programme Matters

- 3.1 Responses to CL on implementation of LAT/HAT
- 3.2 Update on Standard Constituent List
- 3.3 Format for Exchange of Harmonic Constants
- 3.4 XML Format for Tidal Data
- 3.5 Vertical Datum Management and Migration Strategy
- 3.6 Vertical Reference Framework
- 3.7 Update on IOC/GLOSS Program
- 3.8 Data gathering in Antarctica
- 3.9 Update on Strategic Planning Working Group
- 3.10 Rationalisation of IHO TRs A2.5 and A6.2
- 3.11 Rationalisation of IHO Chart Specifications M-4
(Articles B-302.2, B-380.1 and B-405)
- 3.12 French Manual of Tides
- 3.13 TC Terms of Reference

4. Any Other Business

5. Review of Action Items

6. Venue and date of the VIIth IHO TC Meeting

7. Adoption of Draft Report

8. Closing remarks



VIth. IHO TIDAL COMMITTEE MEETING
LISBON, PORTUGAL, 11-13 OCTOBER 2004

TIMETABLE

	OCTOBER 11	OCTOBER 12	OCTOBER 13
09:00 - 09:15	1. Opening , Naval Officers Club Welcoming address	<u>Program Matters continued:</u> 3.5 Vertical Datum Management and Migration Strategy 3.6 Vertical Reference Framework 3.7 Update on IOC/GLOSS Program 3.8 Data gathering in Antarctica	<u>Program Matters continued:</u> 5. Review of Action Items 6. Dates and venue of the VIIth IHO/TC meeting
09:15 - 11:00	TIDAL SEMINAR		
11:00 - 11:20	Tea/coffee break	Tea/coffee break	Tea/coffee break
11:20 - 13:00	TIDAL SEMINAR continues	3.9 Update on Strategic Planning Working Group 3.10 Rationalisation of IHO TRs A2.5 and A6.2	7. Adoption of Draft Report 8. Closure
13:00 - 13:15	Official photograph		
13:00 - 14:00	Lunch break	Lunch break	Lunch break
14:00 – 15:20	TC Meeting commences 2. Administrative Arrangements Adoption of the Agenda Conduct of the Sessions Report of Intersessional Activities Minutes of Vth IHO TC Meeting Matters arising from Vth IHO TC Meeting 3. Program Matters 3.1 Responses to CL on implementation of LAT/HAT 3.2 Update on Standard Constituent List	<u>Program Matters continued:</u> 3.11 Rationalisation of IHO Chart Specifications M-4 (Articles B-302.2, B-380.1 and B-405) 3.12 French Manual of Tides 3.13 TC Terms of Reference	14.00 Depart for the IHPT 14.30 Visit the Portuguese Hydrographic Service 17.00 Return to the hotel
15:20 - 15:40	Tea/coffee break	Tea/coffee break	
15:40 - 17:00	<u>Program Matters continued:</u> 3.3 Format for Exchange of Harmonic Constants 3.4 XML Format for Tidal Data	<u>Program Matters continue:</u> 4. Any Other Business	
17:00	End of first day session	End of second day session	
18:00 20:30			Depart for Cascais (visit tide gauges) Welcome reception at <i>Messe de Cascais</i> hosted by IHPT

FEEDBACK ON MIGRATION TO LAT / HAT

Following the 5th Meeting of the IHO Tidal Committee the IHB issued CL 55/2003 seeking information from Member States regarding the use of LAT/HAT. Replies were received from the following 31 countries:

Algeria, Argentina, Australia, Bahrain, Chile, China, Cuba, Denmark, Ecuador, Finland, France, Greece, Iceland, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Portugal, Slovenia, South Africa, Spain, Sweden, Thailand, Turkey, United Kingdom, USA, Venezuela.

The following 12 countries reported that they currently used LAT/HAT:

Country	Charts using LAT	Comments
Algeria	30 of 30	
Australia	264 of 418	4 or 5 per year
Bahrain	9 of 9	HAT adopted in 1998
Cuba	104 of 144	5 per year
Denmark	93 of 163	93 charts for Greenland. The 70 for Denmark and Faeroe Islands will not be converted. North Sea and Faroese charts will include a conversion table from 2004.
France	620 of 620	Does not use HAT. The relationship between HAT (PHMA) and national level (PMVE) will be documented in nautical publications.
Norway	236 of 236	However LAT is not explicitly stated. LAT was introduced as CD on 1 January 2000.
Pakistan	16 of 16	MSL used for vertical clearances.
South Africa	13 of 100	4 per year
Spain	350 of 350	Some existing small scale charts have not yet been converted however the difference between the datum used and LAT is small.
UK	767 of 820	4 per year. 13 charts with no or no appreciable tide not being converted. HAT is not currently used but is being considered during the production of new editions.
Venezuela	40 of 42	10 per year

The following 8 countries are either intending to convert or considering converting to LAT/HAT:

Country	Charts considered	Comments
Argentina	148 of 176	2 per year. Current CD approximates to LAT.
Ecuador	70 of 70	4 per year
Iceland	67 of 67	Not started
Mexico	108 of 108	10 per year. Currently use MLLW in the Pacific and Caribbean and MLW in the Gulf of Mexico.
Netherlands	49 of 49	Gradual conversion after 2005
New Zealand	167 of 167	Not yet started. In many cases do not have adequate tidal information.
Philippines	178 charts	Not yet decided. Requires upgrades to the tidal network.
Thailand	67 charts	Under consideration.

The following 11 countries are not converting to LAT/HAT:

Country	Charts	Comments
Chile	303	In General CD approximates to LAT. In those cases where there is a difference a legend will be included explaining the difference.
China	700	
Finland	75	Tide practically unobservable. Meteorological effects ± 0.6 m
Greece	186	Minimal tide. Meteorological conditions have the greatest effect. Lowest Low Water (LLW) observed over a 19 year period used for CD.
Italy	365	
Japan	705	
Portugal	218	(82 national waters and 136 Portuguese speaking African countries). The CD in Portuguese Official Nautical Charts is generally positioned below LAT, in order to compensate for meteorological and other local effects. CD is also used as the reference level for tide predictions. The difference between CD and LAT is provided in each chart, for the suitable scales. This difference generally varies from 0.0 to 0.3m, depending on the local characteristics. <i>HAT is used for vertical clearances.</i>

Slovenia	1	
Sweden	117	No significant difference between MAS and LAT in Baltic Sea. In the Kattegat and Skagerak the difference is approximately 0.2m.
Turkey	176	
USA	1000 approx	<p>NOAA will publish the differences between the national chart datum (MLLW) and LAT and between MHW and HAT for all tide stations that have approved harmonic constituents (currently 189 stations). These values will be published in the tide prediction tables beginning in 2005 and will also be available on the NOS web site.</p> <p>Procedure for computing LAT and HAT: NOAA will predict the hourly water level heights for each tide station for the 19-year period of 1983 – 2001, the US official National Tidal Datum Epoch (NTDE). The predictions will be based upon an Accepted Set of Harmonic Constants derived from a least squares harmonic analysis of a minimum of one-year of observed hourly heights. The harmonic constants of the Sa and Ssa seasonal constituents in the Accepted Set will be derived from an analysis of several years of observed monthly mean sea level. The tidal prediction will be computed based on the accepted NTDE datums of MLLW and MSL at each station. The elevation of LAT will be determined by selecting the highest hourly height over the 19-year prediction. The elevation of HAT will be determined by selecting the highest hourly height over the 19-year prediction. NOAA error budget estimates for the tides component contribution for hydrographic surveys take into account error sources of measurement, processing, datums and zoning. The estimated error in determination of LAT and HAT will be used in error budget estimates in the future.</p>

The following 6 countries indicated that they would simultaneously publish charts using existing datums and LAT/HAT or were considering it:

Country	Charts	Comments
Cuba	40	Table to show the relationship MLW to LAT
Iceland	Not yet known	Not yet known
Netherlands	Not known	Show relationship to LAT / HAT
Philippines		The matter is under consideration
Thailand		The matter is under consideration
Venezuela	35	Show links to LAT

The CL also sought Member States views on the inclusion of an epoch in a Tidal datum. The question posed was:

“Ideally a datum model should be given a precise name, including an epoch, as is common practice in Geodesy e.g. WGS 84. The use of LAT (2002) for example would avoid any possible future confusion. Would you support the inclusion of epochs in tidal datum models?”

The following 20 countries supported the inclusion of an epoch:

Country	Comment
Algeria	
Australia	Strongly support the inclusion of epochs.
Bahrain	
China	
Denmark	
Ecuador	
Finland	
Iceland	
Mexico	
Netherlands	
New Zealand	
Pakistan	
Philippines	
Portugal	
Slovenia	
Sweden	
Thailand	
Turkey	
UK	
USA	LAT and HAT should always be designated by the 19-year period used in the determination. For instance if the convention were to use the last year of the 19-year period, NOAA LAT and HAT would be LAT(2001) and HAT(2001) because the 1983-2001 National Tidal Datum Epoch is being used.

The following 8 countries did NOT support the inclusion of an epoch:

Country	Comment
Argentina	
Cuba	
France	It is of no interest to the navigator and the matter is too complex for him.
Italy	
Japan	We would not support the inclusion of an epoch in a tidal datum model, because, it is scientifically proved that a tidal datum model does not change if it is based on a sufficient period of tidal observation, which is 19 years. This means that with using the model, LAT and HAT will not change semi-permanently. Therefore, it is not necessary to include an epoch in the name of the model in addition.
South Africa	
Spain	
Venezuela	

Chile Norway and Greece did not provide a response to this question.

Vertical Datum Management Notes
IHO-TC Meeting, Lisbon, October 2004
Charles O'Reilly (Canada)

Premises

- hydrographic datums will always require adjustments due to crustal motion and sea level change.
- climate changes may well accelerate time scales of datum adjustments
- data storage assigned to these datums is exponentially increasing e.g. multibeam, Lidar, etc.
- datum adjustments often result in unintended and extensive reprocessing of hydrographic datasets, including source bathymetry, long-term water level time series, statistics, etc.

Preamble

The relationship of land and marine datums can be very complex, often leading to confusion when merging coastal zone data. The evolution of new terrestrial and hydrographic datums will compound an already difficult situation.

The field of hydrography has traditionally not considered long-term datum adjustments.

At present, hydrographic vertical datums adjustments are made on a chart by chart often on a port-by-port basis. Chart production schedules trigger datum adjustments, dictating an ad-hoc methodology.

Dynamic ENCS and real time water levels will require explicit datum transform knowledge in a readily available Information Technology (IT) context. Complex datum relationships need to be articulated in the digital world.

A temporally invariant seamless engineering reference frame (ellipsoid / ITRF) is required.

Datum transforms are necessary to take advantage of new technologies such as kinematic DGP.

Datum Nomenclature:

- **Product Datum** - a datum used for purposes of chart construction. Recoverable to within (cms).
- **Source Datum** - a survey datum used in the collection of field data. It may be coincident with an official current or historic Chart Datum, but is frozen in time and is not ambulatory in nature. It is recoverable to within cms and should be considered arbitrary.
- **Target Datum** - a tidal datum at which a product datum is targeted. **It is important to realize that Product Datums can be several decimetres off of their local Target Datum.** Target Datums are determined (and time monitored) by a network of Permanent Water Level gauges, along with sufficient temporary gauge observations. Product Datum names should be held distinct from, but related to their corresponding target datum names.

Outstanding Issues:

Vertical datum adjustments are often not apparent to users (both traditional and non-traditional). This is especially true for coastal engineering applications and emerging coastal zone management e.g. storm surge flood forecasting.

Cartographic standards need to be modified to introduce new nomenclature for chart titles.

Education and training (hydrographic management, mariners, IT community, etc).

Requirements

- migration strategies
- national datum adjustments, rather than localized ad-hoc adjustments
- Vertical Datum Naming Convention

- standard sign convention i.e. **“from”** source datum and the **“to”** destination datum. In the Vertical Datum Convention 3.1, a positive value means the **“From”** datum is physically below the **“To”** datum. In this case, the transform value is additive to the elevations assigned to the “from” datum.
- harmonization of international vertical datums (LAT/HAT)

Strategies will likely include:

- introduction of datum naming convention, starting with existing datums
- computation of corrective factors to new datum targets, using appropriate standards of acceptability (not looking for perfection)
- migration strategies to allow vertical datum adjustments to occur on-the-fly, while nautical publications use old and new datums simultaneously. This follows the lead of horizontal datum adjustments, which have successfully occurred in the navigational community.
- vertical datum transition periods lasting many years, perhaps decades
- assigning multiple Chart Datums to tidal stations
- creation of 3D datum surfaces which interpolate between tidal stations
- Tide Tables providing columns with corrective factors for simultaneous datums
- although national datum models are preferred, migration may still have to occur on a chart by chart basis.
- switching vector charts, while raster and paper charts play catch-up upon re-compilation

The IHO-TC is in a position to provide advice and leadership

VERTICAL REFERENCE FRAMEWORK

1. European Combined Geodetic Network (ECGN) Working Group.

Steve Shipman, PAH attended an ECGN Meeting held at the Bundesamt für Kartographie und Geodäsie (BKG) in Frankfurt on 4/5 September 2003

Background: The International Association for Geodesy (IAG) Sub-commission for Geodetic Networks in Europe (EUREF), which has as its principal task, the provision of European-wide solutions of a spatial reference system for geo-referencing data has, since 1995, also had the task of realizing and maintaining European vertical reference systems. This has included the establishment of the ‘United European Levelling Network’ (UENL [95/98]) and the ‘European Vertical Reference Network’ (EUVN). The latter has brought together: GPS, levelling, tide-gauge and gravity observations. In 2002 EUREF and the International Geoid and Gravity Commission (IGGC) jointly set up the European Combined Geodetic Network (ECGN) with the intention of realizing an integrated kinematic reference system for Europe. The first meeting of the ECGN working group took place at the Federal Agency for Cartography and Geodesy in Frankfurt, Germany from 4 – 5 September 2003. Whilst this group is very much focused on Europe it is considered, along with other regional programmes, to be an essential pre-cursor to a ‘Worldwide Height System’.

1st Meeting: The meeting took place in the splendid ‘Villa Mumm’ at the BKG, originally built in 1902 for the Mumm Champagne Family. The primary task on the first day was to review and agree on the standards to be met for Space Observations, (GPS, GLONASS, *GALILEO* and Laser), Gravity Observations (Super-conducting and Absolute), Levelling, Tide-gauges and other observations.

It was agreed that tide-gauge observations must satisfy the general recommendations of the International Oceanographic Commission (IOC) in order to fulfil the standards of the international sea-level centres, networks and services such as the Permanent Service for Mean Sea Level (PSMSL), European Sea Level Service (ESEAS) and the Global Sea Level Observing System (GLOSS). Special attention has to be applied to the regular fixing of the tide-gauge to ensure the necessary long-term stability and reliability of the measurements. Height differences between the tide-gauge contact point, tide-gauge benchmark, GPS benchmark and possibly other benchmarks should be established at least annually. It was further recommended that all participating tide-gauge stations should be part of the GPS Tide-Gauge Benchmark Monitoring Pilot Project (TIGA-PP). Having agreed on the standards, agreement was then reached on the criteria for assessing proposals for participation in the project.

The second day was spent reviewing those proposals already received (71 in number). Assistance and advice would be provided to those countries / stations which did not currently meet the required standards. There is no cut-off date for participation and stations could join the network as and when they fulfilled the criteria. Members of the WG would actively seek participation from further stations in Belgium, Croatia, France, Hungary, Iceland, Ireland, Netherlands, Romania, Scotland, Slovakia, Slovenia and Turkey where it was considered that there was an insufficient density of stations. The remainder of Day 2 was spent looking at the requirement for a ‘Meta

Data' database and how the second call for participation, to look at processing and analysing the data, might be handled.

2nd Meeting: The meeting took place at the European Centre for Geodynamics and Seismology (ECGS), Luxembourg on 17 and 18 May 2004. PAH was unable to attend this meeting due to other commitments. Progress since the first meeting was reviewed and preparations for the 2nd Call for participation in the project discussed. The minutes of the meeting and other useful information can be found at:
<http://gibs.bkg.bund.de/ecgn/index.html>

2. IAG Inter-Commission Project (ICP1.2) on Vertical Reference Frames

The IAG have created a new Project shared between Commissions 1 and 2 to look at the development of a unified global reference frame. Dr Johannes Ihde, who also chairs the ECGN, chairs this project. The first meeting is scheduled for 31 August 2004 in Porto in the sidelines of GGSM2004. PAH is unable to attend this meeting. Details of ICP1.2 can be accessed from the ECGN web site, see section 1 above.

3. FIG Commission 4 (Hydrography)

Commission 4 met in Athens in May 2004 as part of the FIG working week. A separate meeting of Commission 4's WG 4.2 on Vertical Reference Frames was held (at 0730 in the morning such was the busy schedule!). This discussed the way ahead on the paper that had been produced by Ruth Adams (UKHO) and Ahmed El-Rabbany of Ryerson University. Minutes of this meeting and other useful documents are available from <http://www.fig.net/figtree/commission4/index.htm> . A workshop was held on Tuesday 25 May and the 3rd session from 1600-1730 was devoted to Vertical Reference Frames and Marine Construction/Dredging. The presenters of the two papers on Marine Construction / Dredging did not appear leaving plenty of time for a very lively discussion on the presentations on Vertical Reference Frames from Ruth Adams and Steve Shipman; indeed the discussion had to be adjourned to the bar when the room was required by another group at 1800. One of the major benefits of this workshop was that it brought together hydrographers and geodesists and emphasised the fact that they tend to speak two different languages!

SAC SHIPMAN

Professional Assistant Hydrography

I understand you will have the next IHO Tidal Committee meeting in Portugal in October 2004. We have asked Dr Leonor Martins to represent GLOSS.

I would like to draw your attention to the full GLOSS GE8 report which is available from http://ioc.unesco.org/goos/docs/GOOS_141_GLOSS-8draft.pdf. The proceedings from the Technical Workshop in association with the GLOSS GE8 meeting is about to be finalised and I hope we can have a web-version ready before the Tidal Committee meeting.

In terms of message from GLOSS to the IHO Tidal Committee then I would like to mention that GLOSS still appreciates the help from IHO and hopes for enhanced collaboration from the hydrographic community in terms of (i) upgrade and renovation of national tide gauge networks; (ii) data submission from the GLOSS Core Network to the GLOSS data centres [i.e. delayed mode (low frequency and high frequency) data; and fast data (i.e. real time data); and (iii) historical sea level data provision (including data archaeology and digitisation of "records on paper").

(The article <http://www.pol.ac.uk/psmsl/reports.gloss/general/ihb2002.pdf> from the IHO Newsletter still holds).

I would also like to mention that

- 1) The IOC Assembly (June 2003) endorsed the GLOSS Group of Experts Adequacy Report (<http://unesdoc.unesco.org/images/0013/001302/130292e.pdf>).
- 2) The Assembly urged Member States to give effect to each recommendation of the GLOSS Group of Experts Adequacy Report without delay, in view of the urgency for data for programmes such as GODAE and GOOS, and in particular, to take the necessary immediate measures (i) to upgrade all GLOSS stations to the extent possible for real-time data delivery by 2004; and (ii) in this context to provide resources for technical assistance and capacity-building for developing nations.

Finally I would like to mention that IOC has recently been awarded a \$2.3 million grant from the Government of Flanders (Belgium) for the third phase of the Ocean Data Information Network for Africa (ODINAFRICA; <http://ioc.unesco.org/odinafrica/>), which will take place from 2004-2008. About \$ 740,000 will go towards enhancing the coastal observation system and particularly the GLOSS tide gauge network in Africa. Any direct or indirect support and endorsement the IHO Tidal Committee and IHO can provide to this project will be helpful.

Regards

Thorkild

Thorkild Aarup, Ph.D., Programme Specialist
GOOS Project Office
Intergovernmental Oceanographic Commission
UNESCO
1, rue Miollis
75732 Paris Cedex 15
France
Tel: + 33 (0) 145 684019
Fax: + 33 (0) 145 685812
e-mail: t.aarup@unesco.org

See GOOS web site at <http://ioc.unesco.org/goos>

STRATEGIC PLANNING WORKING GROUP

In April 2002 the XVIth International Hydrographic Conference resolved that there should be a thorough review of the Basic Documents of the IHO and of its structure and procedures, in order to determine whether a more flexible, efficient Organization could be constructed. It tasked the SPWG to undertake this review and to make appropriate recommendations to an Extraordinary Conference in April 2005.

The SPWG worked for more than two years and finalized its recommendations to the Extraordinary International Hydrographic Conference, by proposing amendments to the Convention and the Regulations. These proposals have already been circulated to Member States for comments.

The proposed new structure for the IHO is designed to maintain the strengths of the Organization, eliminate the weaknesses, achieve the Vision, Mission and Objectives and be more effective and cost-effective. The SPWG proposes the following :

- a. An Assembly, comprising all Member States, meeting every three years, being the principal organ of the IHO and being strategically focused.
- b. A Council, meeting annually, being a smaller and more dynamic group and focusing on the continuous operation of the IHO. It will comprise 30 Member States – or 25% of all MS, whichever number is greater- 66% of the seats for representatives of the RHCs and 33% of the seats for the states with greatest hydrographic interest (measured by tonnage).
- c. A Finance Committee. Open to all Member States, meeting in conjunction with the Assembly and being responsible for presenting the IHO's budget and administrative and financial policies for approval by the Assembly.
- d. Subsidiary Organs. Committees open to all Member States, meeting annually. A Hydrographic Services and Standards Committee (HSSC), being a technical committee responsible for the development of international standards for the quality and formats of hydrographic data and information and the greatest possible uniformity. An Inter-Regional Coordination Committee (IRCC), being responsible for generating and monitoring the work to be carried out by the RHCs promoting Capacity Building and co-operating with regional organizations concerned with the use of hydrographic information.
- e. RHCs continuing as at present.
- f. Legal Advisory Group. Comprising Legal experts from any or all MS.
- g. A Secretariat comprising a Secretary-General, Directors and Professional Assistants. The Secretary-General will be the chief administrative officer of the Organization, head of the Secretariat and be responsible for its efficient operation. Elected by the Assembly for a period of 6 years and re-election at a subsequent Assembly for a further 3 years. Directors are elected by the Assembly in the same way as the S-G. They report to the S-G and provide support to the Organs of the IHO. The Professional Assistants are selected by the S-G, providing support to the S-G, Directors and organs of the IHO.

A 2.5 DATUMS AND BENCH MARKS

- 1.- It is resolved that elevations on shore, including those of lights, should be referred to a HW datum or Mean Sea Level (MSL). The datum used should be clearly stated on all charts.
 - 2.-
 - a) It is resolved that the datum for tide predictions shall be the same as chart datum (datum for sounding reduction). It is further resolved that the Lowest Astronomical Tide (LAT), or as closely equivalent to this level as is practically acceptable to Hydrographic Offices, be adopted as chart datum where tides have an appreciable effect on the water level. Alternatively the differences between LAT and national chart datums may be specified on nautical documents. If low water levels in a specific area frequently deviate from LAT, chart datum may be adapted accordingly.
 - b) It is resolved that Highest Astronomical Tide (HAT) be adopted as the datum for vertical clearances where tides have an appreciable effect on the water level. Alternatively the differences between HAT and national datums for vertical clearances may be specified on nautical documents. If high water levels in a specific area frequently deviate from HAT, the datum for vertical clearances may be adapted accordingly. It is further resolved that a HW datum be used for vertical clearances in non-tidal waters.
- Notes:
- i. LAT (HAT) is defined as the lowest (highest) tide level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions. It is recommended that LAT and HAT be calculated either over a minimum period of 19 years using harmonic constants derived from a minimum of one year's observations or by other proven methods known to give reliable results. Tide levels should, if feasible, reflect the estimated error values obtained during the determination of these levels.
 - ii. In non-tidal waters, in order to allow the development of regional solutions, it is recommended that a range of low/high water definitions of the lower/upper 94-100 percentile be adopted.
- 3.- It is resolved that chart datums (datums for sounding reduction), the datums of tide prediction and other tidal datums shall always be connected with the general land survey datum, and, in addition, with a prominent and permanent fixed mark in the neighbourhood.
 - 4.- It is resolved that ellipsoidal height determination should be made at vertical reference marks used for tidal observations, in order to support the production of seamless data sets; i.e. to allow the translation between data sets with differing vertical datums. It is further resolved that such observations should relate to a geocentric reference system, preferably the World Geodetic System 1984 (WGS84).

G 2.1 TRANSLATION OF HEADINGS, etc.

1.- It is recommended, principally for those Tide Tables which are not published in Roman characters, that the headings of divisions and columns include a translation in English, French or Spanish, in order to increase the international usefulness of the publication.

TERMS OF REFERENCE
for the
TIDAL COMMITTEE

Objective:

To provide technical advice and promote coordination on tidal issues within the IHO.

1. Terms of Reference

- 1.1 To make recommendations concerning any tidal and related matters requiring discussion, development and coordination within the IHO.
- 1.2 To cooperate with other IHO bodies where tidal matters are concerned.
- 1.3 To advise on questions related to vertical datums.
- 1.4 To advise on issues concerning the exchange and distribution of tidal and related data.
- 1.5 To advise on questions related to tidal observations, analysis and predictions.

2. Rules of Procedure

- 2.1 The Committee is composed of Representatives of Member States and a representative of the International Hydrographic Bureau.
- 2.2 Member States Representatives, or the Committee as a whole, may invite observers to participate in its deliberations during and between committee meetings. Observers are not entitled to vote.
- 2.3 The Committee will conduct its business mainly by correspondence. Meetings will usually be held at intervals of about 18 months.
- 2.4 The Chairperson and Vice Chairperson are elected by the Committee from its membership at the first meeting after each ordinary session of the International Hydrographic Conference.
- 2.5 The Chairperson is to submit a report each year for inclusion in the IHO Annual Report.
- 2.6 The Chairperson is to submit a report prior to each ordinary International Hydrographic Conference covering the Committee's affairs since the previous Conference.
- 2.7 Recommendations of the Committee will be submitted to the IHO Member States for adoption through the Directing Committee.