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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)

INTERNATIONAL HYDROGRAPHIC ORGANIZATION

# General Bathymetric Chart of the Oceans (GEBCO)

## Twenty-sixth Meeting of the GEBCO Guiding Committee
**1st-2nd October 2009**

**at**

## Service Hydrographique et Océanographique de la Marine (SHOM), Brest, France

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## 1. OPENING OF THE MEETING

*1.* The Twenty-sixth Meeting of the joint IOC-IHO General Bathymetric Chart of the Oceans Guiding Committee (GC XXVI) was held at the Service Hydrographique et Océanographique de la Marine (SHOM), Brest, France on 1st-2nd October 2009. The meeting started at 08.45.

*2.* Those present, in addition to Dave Monahan (IHO), the Chairman, were Bob Anderson, Juan Brown, Etienne Cailliau (IHO), Robin Falconer (IOC), Chris Fox (IHO), Bruce Goleby, Hugo Gorziglia, John Hall, Martin Jakobsson (IOC), Colin Jacobs, Shao Hua Lin, Karen Marks, George Newton, Kunio Yashima (IHO), John von Rosenberg, Hans-Werner Schenke (IOC), Walter Smith, Shin Tani, Steve Shipman, Hyo Hyun Sung (IHO), Lisa Taylor, Paola Travaglini, Dmitri Travin, Nataliya Turko (IOC), Fabienne Vallée (Science Park Brest Iroise; item 12), Pauline Weatherall, Bob Whitmarsh (Permanent Secretary) and Rochelle Wigley. The meeting was assisted by a team led by Mr Henri Dolou, SHOM.

*3.* Apologies for absence were received from Guiding Committee members Lic Jose Frias (IOC) and Cdr Paolo Lusiani (IHO).

*4.* M. Gilles Bessero, Directeur Général of SHOM, welcomed the Committee to SHOM and said it was an honour to host the GEBCO meeting. He emphasised the importance of the Committee's deliberations and their relevance within the recently restructured IHO which had included the setting up of the new IRCC. He also noted the impetus for the Committee, with its new terms of reference, to work with the Regional Hydrographic Commissions to face the challenges in oceanic and shallow-water bathymetry. Finally he paid tribute to Ing gén Roubertou, a former Deputy Director of SHOM and member of the Guiding Committee from 1974-1988, one-time Vice-Chairman of GEBCO and later Chairman of the Editorial Board of the IBCEA, who had died on 22 April 2009.

*5.* The Chairman, Mr Dave Monahan, invited attendees to introduce themselves.

*6.* The Agenda (Annex 1) was adopted. Dr Fox said that he hoped the discussions would include the structure of future meetings.

## 2. TSCOM REPORT

*7.* Dr Smith, Chairman of TSCOM, gave a brief report. He began by noting that over 30 people had attended the TSCOM discussions. The Science Day had been a great success with over 80 registrants. In his opinion there had been a quantum leap in numbers attending and the quality of the contributions.

*8.* Dr Smith continued that TSCOM had carried on the process of updating products that had been started in 2007. Two *ad hoc* Working Groups had been formed, one on Metadata and one on a Cookbook to formulate the best practice in ocean mapping. He was concerned at the size of the TSCOM meeting and the difficulties of working with such a large group. He said that he too wished there to be a discussion as to how to structure future meetings.

*9.* Dr Falconer asked what the Working Groups had achieved the previous day.

*10.* Dr Jakobsson replied that he had been in a group that had discussed the interpolation and extrapolation of grids based on sparse data. It had been decided to test at least four algorithms on a continental shelf/margin area where multibeam surveys could provide ground truth. The group also

planned to evaluate ideas on how to develop a high resolution grid from a set of overlapping grids. They would eventually produce a written report. Dr Smith responded that he hoped this group would present its results at Science Day 2010 [Action: Dr Jakobsson].

*11.* In the absence of Mr Pharaoh, Dr Goleby reported on the group that had discussed standards and the storage of bathymetric data. They were trying to develop a model, with the assistance of TSCOM, that would meet ISO standards. The group had also discussed vocabularies. They too planned a written report. Dr Smith responded that he would like to see a tutorial on metadata at Science Day 2010 [Action: Mr Pharaoh].

*12.* Dr Falconer said that he had also been involved in a brief meeting on structuring future meetings. The question was whether TSCOM should meet in series with other groups, or at the same time, or even in the same location. The question also arose as to whether the Guiding Committee should tell TSCOM what it wanted or *vice versa*.

*13.* Dr Fox commented that he thought the Science Day had been excellent. However he noted that TSCOM had spent 10-12 hours on general discussion whereas the working groups had met for only an hour. He thought the situation should be reversed with more technical discussion.

## 3. SCUFN REPORT

*14.* Dr Schenke presented a report (Annex 2) of SCUFN's 22nd meeting which had been held in Brest the previous week between 22 and 25 September. He thanked the rapporteurs of the meeting. He said that 9 out of 11 potential participants had come to Brest. He noted three new members, Ms Ana Angelica Alberoni from Brazil, Cdr Muhammad Bashir from Pakistan and Dr Vaughan Stagpoole from New Zealand. Three members had been absent Cdr Muhammad Bashir (visa problem), Lic. Walter Reynoso (lack of funds) and Lic. Jose Frias (job change). Ms Taylor had been elected Vice-Chairman. He noted that SCUFN was now complete with 12 members and he said he was confident that the Sub-Committee now had access to an excellent network of international contacts in science and hydrography.

*15.* Dr Schenke added that 11 observers had attended including Trent Palmer, the Secretary of ACUF. He was pleased to note that there was a continuous exchange of feature names between SCUFN and ACUF and that ACUF's and SCUFN's naming criteria were converging e.g. not naming a feature after a living person.

*16.* Dr Schenke stated that the Sub-Committee was preparing translations of IHO/IOC publication B-6 'Standardisation of undersea feature names' in French, Japanese, Korean, Russian and Spanish.

*17.* Finally Dr Schenke noted that, in spite of being formal IOC members of the Sub-Committee, some members were unable to attend because of a lack of travel support. He foresaw this as a future problem especially for members from developing countries. Mr Travin claimed that the Sub-Committee's new Terms of Reference/Rules of Procedure set out that the sponsoring government or institution should provide travel support, whereas in fact they make no such reference. [He appeared to wish to refer to IOC's Guidelines for the Structure and Responsibilities of the Subsidiary Bodies of the Commission which do appear to put the onus for travel and subsistence costs on to member states.]

*18.* Dr Fox asked how many new features were approved each year and to what extent naming conventions were harmonised with other organisation besides ACUF, e.g. NGA? Dr Schenke replied that technology was helping SCUFN to increase its throughput and that it was looking into considering new names before the meeting took place. He added that although SCUFN's naming

rules differed in some respects from other organisations the naming conventions were gradually converging.

*19.* Captain Gorziglia said he wanted to make several points. First, the IHB could not approved the text of its publications, such as B-6, in languages other than English and French. Second, the IHB lost money when they booked a flight for a Sub-Committee member who subsequently failed to apply for a visa in time. Third, he thought that SCUFN should develop more streamlined procedures. It was frustrating for a nominee to submit a proposal 30-60 days before a meeting only for the proposal to be rejected at the meeting on a minor technicality. Such minor problems should be dealt with before the meeting to allow time for a re-submission. Dr Schenke concurred with these points.

*20.* Dr Jakobsson asked what should happen if a feature was misplaced. The answer was to propose new coordinates.

*21.* Dr Smith asked whether the Sub-Committee considered that satellite altimetry could be used to define a feature when bathymetry was lacking. The answer was Yes. He continued that not all features in manuscripts were given the correct generic terminology e.g. a seamount should have relief of at least 1000m. Dr Schenke replied that all naming groups used the same height criterion for identifying seamounts.

*22.* Ing gén Cailliau asked what happened to rejected and pending proposals. Dr Schenke accepted that some pending cases were very old and needed to be cleared out.

*23.* Finally Mr Newton strongly recommended that the rejection/approval procedure should be streamlined because now that many UNCLOS submissions had been made there was likely to be an increase in naming proposals.

## 4. NIPPON FOUNDATION/GEBCO TRAINING PROJECT REPORT

*24.* Dr Falconer reminded the Committee of the background to the project which began in August 2004 at the University of New Hampshire, USA. Presently the project was overseen by a Management Committee chaired by himself and consisting of Hugo Montoro, Taisei Morishita and Rochelle Wigley (NF Scholars), Dr Jakobsson, Mr Jacobs, Mr Anderson, Prof Monahan (Project Manager) and Prof. Whitmarsh (Secretary).

*25.* Proposed: Dr Fox. Carried unanimously
**The Nippon Foundation/GEBCO Training Project Management Committee is ratified for the coming year.**

*26.* Dr Falconer recalled that the original proposal to the Nippon Foundation had proposed unsuccessfully to include work packages and PhD/postdoctoral funding. However both the Year 5 (2008-09) and Year 6 (2009-10) proposals had referred to these aspects again.

*27.* He continued that he and Prof Monahan, with Mr Tani and Mr Morishita, had met Mr Unno of the NF in Tokyo in August 2009. Mr Unno had said that the NF was very encouraged by GEBCO's efforts at capacity building and wanted GEBCO to produce a new proposal by December 2009. Unusually, Mr Unno had wished to see a draft of the proposal, that would eventually go to the NF Board for decision, and had provided some helpful feedback.

*28.* The final version of the proposal would be sent to the Guiding Committee. It had three aspects,

to continue the teaching programme at UNH. Although the possibility of transferring the programme to another site had been considered this was not seen to be either necessary or desirable. However it was agreed that the course curriculum should be reviewed [Action: Dr Falconer and PMC].

29. to enable the scholars to develop and grow in their careers as bathymetrists. This might be by attending GEBCO meetings in alternate years, enabling them to take training courses, encouraging them to obtain MSc or PhD degrees or assisting them to train others in bathymetry,

30. to expand GEBCO's influence in the world, for example, by supporting regional activities or by developing solutions to technical problems such as how to nest grids of data.

31. The NF response had been that it was in favour of continuing the teaching programme.

32. The NF had also intimated that the second and third aspects might be supported by a lump sum grant over five years subject to a better understanding of how GEBCO operates. The NF was looking to see a more formal organisation within GEBCO with a management board or committee that might contain 2-3 scholars, members from the NF, Japan and the Guiding Committee as well as an independent member. If these aspects were to be funded then there would have to be formal financial arrangements with a system that is transparent and can be audited. It was accepted that in future there would be a need to work with multiple currencies which might strain the current arrangements. The NF implied that it would not be necessary to have a new structure in place by early 2010 but it did want to see costed options for the new way of working.

33. Finally, Mr Unno had indicated that the NF would like to see GEBCO more active in outreach activities that highlighted the excitement of ocean bathymetry.

34. Proposed: Ms Taylor. Carried unanimously.
**The Guiding Committee is willing to delegate the preparation of the proposal to the Nippon Foundation for 2010-11 to the NF/GEBCO Project Management Committee.**

35. Captain Gorziglia commented that whenever the new proposal had been approved he would happy to circulate it to Member States [Action: Chairman/Project Manager].

36. Ms Taylor commented that with reference to the second aspect of the proposal she would like to see someone appointed annually to liaise between committees and groups involved in bathymetry with a view to improving networking opportunities. Dr Falconer agreed [Action Dr Falconer].

## 5. IOC REPORT

37. Mr Travin recalled that new Terms of Reference/Rules of Procedure for the GEBCO Guiding Committee and its two main Sub-Committees had been adopted in 2008. This had led the IOC Secretariat to seek confirmation of existing members of the Guiding Committee. Only Russia and Germany had responded and there had been no response from New Zealand, Mexico or Sweden. It followed therefore that three IOC members of the Committee were now 'not in a legal position'. He suggested that these three individual committee members should now initiate action themselves to confirm their positions [Action: Dr Falconer, Lic Frias, Dr Jakobsson].

38. Mr Travin reported that in June 2009 the IOC General Assembly had recognised the importance of GEBCO for tsunami modelling and the development of ocean science and had invited GEBCO to focus on coastal bathymetry. Unfortunately the official report of the Assembly was not yet available but he undertook to send a copy to the Permanent Secretary when it became available [Action: Mr Travin/ Dr Fonseca].

39. Mr Travin continued that because very limited funds were available to IOC it wanted to concentrate its efforts on capacity building in those countries affected by the Boxing Day 2004 tsunami. So far, IOC had trained over 120 people in skills related to tsunami modelling and prediction.

40. Regarding the International Bathymetric Charts he admitted that most were dormant and no longer operational. Three IBC Chairmen, who had made significant contributions, had recently died viz. Dr Werner Bettac (IBCWIO), Prof. Carlo Morelli (IBCM) and Ing gén André Roubertou (IBCEA). He continued that IOC was now working to reactivate the IBCs and he asked the Guiding Committee Chairman to write a letter to the IOC Executive Secretary requesting that regional projects would be reactivated, in spite of the fact that the Executive Council and General Assembly had no more funds to support this (only US$18,000 had been allocated to support seven regional projects), and would work more closely with GEBCO. He urged the Committee to garner support by contacting their national representatives.

41. The Chairman responded that membership of the Guiding Committee was not within the Committee's remit and GEBCO would continue to work assuming that the current membership was valid.

42. Mr Travin responded by saying that since Dr Frias now appeared to be unavailable he would advise IOC member states that there was a vacancy on the Guiding Committee [Action: Mr Travin/Dr Fonseca].

43. Dr Fox asked whether GEBCO had been sent a copy of the letter saying that IOC wanted GEBCO to concentrate its efforts more in shallow water. Mr Travin replied that many member states wanted to acquire more shallow water data and the Italian government had funded such a project in countries affected by the Boxing Day tsunami but it was recognised that deep-water bathymetry was important too. He said that IOC needed help from subsidiary bodies such as GEBCO to raise funds; Russia, USA and Italy had helped in the past but no longer. Dr Fox asked whether the US funds had been specifically for GEBCO. Mr Travin replied No. The Chairman ended the discussion by saying that Chairman GEBCO would write a supportive letter to the Executive Secretary IOC [Action: Chairman].

44. Captain Gorziglia suggested that GEBCO should attend the IOC Executive Council and the IOC General Assembly so that participants were less motivated to pass an unfavourable motion. He noted that there had been no GEBCO presence at the 2009 meetings. The Chairman responded that on the contrary in the recent past GEBCO had been represented at different times by Mr Tani, Prof. Whitmarsh and himself. He did not recall having received an invitation to attend the 2009 meetings.

45. Mr Travin suggested that a lack of communication generated many misunderstandings. He cited one example where applicants from a number of Indian Ocean countries had applied to join the NF/GEBCO Training Project and had been rejected. In one case of an Indian candidate this was in spite of a specific letter of recommendation from the IOC Executive Secretary [this letter was in fact never received by the Manager of the NF/GEBCO Training Project]. He regretted that IOC was not always aware of activities within the Training Project.

## 6. IHO REPORT

46. Captain Gorziglia recalled that three IHB staff supported GEBCO; Ing en Chef Huet, Mr Pharaoh and Cdr Shipman (or himself). Regarding shallow-water bathymetry he noted that all 14 Regional

Hydrographic Commissions acknowledged the need for shallow-water data. He added that the Member States felt they were not kept adequately informed of GEBCO's activities and that the annual Summary Report was insufficient. He reminded the Chairman that he himself was a member of the IHO Inter Regional Coordination Committee.

*47.* Captain Gorziglia continued that the new Terms of Reference/Rules of Procedure should not restrict GEBCO's activities but were there to help. He looked forward to working more closely with GEBCO but said he didn't want to increase the bureaucracy. He stressed that the IHB has funds to support communications. He regretted that the GEBCO Guiding Committee had not provided any information, except in the last few days, about its interaction with Google Earth, progress with the GEBCO grid or discussions with the Nippon Foundation. Similarly he hoped that the Regional Hydrographic Commissions would communicate with GEBCO. Captain Gorziglia said he preferred to see a single point of GEBCO contact with Google Ocean. He also recommended that GEBCO products were approved by the Guiding Committee before being made generally available.

*48.* Next he turned to the Nippon Foundation/GEBCO Training Project where the IHB had done its best to find suitable applicants. He stated that the IHB wished to know about the 'postgraduate diplomas and work packages' and added that Member States wished to know about any changes to the project.

*49.* He continued that the IHB regularly reviewed all its publications which were mostly free of charge. He enquired about the status of GEBCO's 6th Edition chart because the 5th Edition still appears in the IHB Catalogue. In addition 200-300 copies of the 'History of GEBCO' book were still on sale at a price of €20. What should happen to them?

*50.* Finally, he noted that in 2006-07 GEBCO had submitted ideas for a Work Programme. The Guiding Committee had requested €10,000 which had remained untouched. He reminded the Committee that at the end of the current 5-year programme a report would be needed on how the funds had been used.

*51.* Dr Falconer thanked Captain Gorziglia for his useful comments and noted that most of them would be addressed later in the Agenda.

*52.* Dr Fox asked what had happened about the IHB's contact with Google since GEBCO had not been kept informed of this exchange. Captain Gorziglia replied that Google had wanted a big public launch of Google Ocean involving HSH Prince Albert to which he had not replied. At that point communications had dried up.

## 7. IHO DCDB REPORT

*53.* Ms Taylor delivered her report, details of which can be found in Annex 3. The report consisted of three parts, a report of the International Hydrographic Organization Data Center for Digital Bathymetry, a Report of the World Data Center for Geophysics and Marine Geology, Boulder and a report on IHO DCDB Activities in Support of IOC/GEBCO.

*54.* Over the reporting period, the IHO DCDB received 2.2 terabytes of deep-water multibeam bathymetric data from 307 surveys almost two-thirds of which came from US sources. The Multibeam Bathymetric Database now provides 3.4 terabytes of data from 1,497 cruises. The IHO DCDB developed a 'pipeline' with LDEO for transferring data and metadata to the archive that will serve as the model for the upcoming National Science Foundation (NSF) Rolling Deck to Repository (R2R) Project.

*55.* The IHO DCDB continues to enhance the Geophysical Data System – Next Generation (GEODAS-NG) software management system. Originally developed to manage marine geophysical trackline data, GEODAS-NG is now a universal software data management tool, which can handle a variety of data formats and types including single-beam, multibeam, trackline, hydrographic survey, and gridded bathymetric and topographic data.

*56.* The World Data Center has been actively involved in a number of tsunami-related activities, supporting both research and mitigation efforts. NGDC released an Earth Magnetic Anomaly Grid (EMAG2) compiled from satellite, ship and airborne magnetic measurements during a 2-year international collaborative effort in February 2009.

*57.* Although the British Oceanographic Data Center (BODC) had assumed ownership and hosting of the GEBCO web pages IHO DCDB continues to update the mail lists in cooperation with BODC and to maintain the GEBCO Folk List Server to facilitate communication between members of the GEBCO personality list at gebco_folk@mailman.ngdc.noaa.gov.

*58.* The IHO DCDB, in collaboration with the British Oceanographic Data Center (BODC), the International Hydrographic Bureau (IHB) and the GEBCO Sub-committee on Undersea Feature Names (SCUFN), has migrated the GEBCO Gazetteer into a geospatially enabled relational database. Ms Taylor carried out a live demonstration of this database of undersea feature names which provides a lot of flexibility and allows live editing of the content.

*59.* Mr Travin thanked the NGDC for its contribution to tsunami studies and said that their data had helped in the training programmes run by IOC.

*60.* Further discussion of this topic is presented in paragraph 3.3 of the TSCOM Minutes.

## 8. IRCC MEETING

*61.* The Chairman noted that the first IRCC meeting had been held in June 2008 immediately after the Extraordinary Hydrographic Conference. Cdr Lusiani had attended on GEBCO's behalf and presented an oral report (a written report from the Chairman (Annex 4) had been presented later). Cdr Lusiani regretted that he had been unable to be present in Brest. Captain Gorziglia reported that the Chairman of each Regional Hydrographic Commission, as well as Cdr Lusiani for GEBCO, had made a presentation. An important decision had been the adoption of a new definition of 'hydrography'; it now included not just oceans but lakes and rivers. It was confirmed that the definition still included deep-water bathymetry.

*62.* Capt Gorziglia noted that the Chairman IRCC, M. Bessero, had tabled a Working Paper (Annex 5) in which he made specific suggestions regarding ways to improve relations between the IHO and GEBCO. These comprised GEBCO reporting annually to each RHC Chair on the situation in the relevant region, getting the RHC Chairs to report to GEBCO after each RHC meeting on recent or planned bathymetric campaigns and any requirements for non-navigational bathymetric products, and considering or encouraging the adaptation of on-going or new IBC projects to match the areas of a single RHC.

*63.* In the following discussion it was made clear that there was unlikely ever to be a match between the RHC areas, chosen using one set of criteria, and the IBC areas, chosen on the basis of other criteria.

*64.* Dr Falconer pointed out that if all 14 RHCs met once a year it would be impossible for GEBCO to attend so many meetings. He asked whether one person could produce an annual summary of GEBCO's activities for all the RHCs. Ms Taylor suggested that in addition GEBCO could

occasionally be represented at specific RHC meetings. Mr Jacobs said that it would be more appropriate to involve BODC since they updated the digital grid. Ms Taylor thought that the IHO DCDB should be involved as well.

*65.* Mr Travin said this appeared to be yet another communication problem. He preferred that GEBCO should be invited to each RHC meeting as a matter of course and IOC would try to help with travel funds because it had an interest in obtaining shallow-water data acquired by Hydrographic Offices. Finally, he suggested that a special attempt was made to advertise GEBCO at the next IOC Executive Council meeting in 2010 [Action: Chairman].

*66.* Dr Brown commented that he was concerned about the resources that would be needed to report to all 14 RHCs. He thought that this was best done annually at the IRCC meeting.

## 9. GOOGLE OCEAN

*67.* Dr Smith introduced this item. He noted that Google Ocean had been used by 500 million people which demonstrated that it was not a tool for science or hydrography but was a highly successful tool for outreach. It had brought the GEBCO name before a huge number of people. He stressed that many people had worked very hard before the Google Ocean launch in February 2009 to ensure that the bathymetry was good but even so it did not look very pretty. The reason for this was that he had not allowed Google to fill gaps in soundings with a uniform texture because he wanted to show the public, and especially young people, that much remained to be done in ocean mapping. He added that he had talked to Jenifer Foulkes of Google over many months. During that time she had been put in charge of bathymetry so that now GEBCO had a single point of high-level contact within the company.

*68.* He closed by suggesting that GEBCO initiate an oral history project with pop-up icons over particular undersea features with commentaries by former GEBCO activists such as Gleb Udintsev.

*69.* Captain Gorziglia asked who in GEBCO was the single point of contact with Google Ocean and Dr Falconer wanted to know how GEBCO interacted with the group at LDEO. Dr Smith intimated that presently a lot of people were involved and he hoped to improve coordination. He noted that Google liked to 'drop in' high-resolution surveys into the current grid whereas GEBCO wished to update the whole grid with such data. Discussions were ongoing about this. Dr Fox remarked that Dr Carbotte's group at LDEO was much more advanced in its ability to nest grids but she was happy to work with GEBCO. He thought that Chairman GEBCO should be the point of contact with Google. Dr Brown noted that the problem was to decide how to get an updated grid to Google on at least an annual basis; he thought that Ms Weatherall was the best person to do this. The Chairman said that officially he was the point of contact but for technical matters it was Pauline Weatherall. Dr Marks responded by pointing out that Dr Smith had been key to the discussions with Google and he should not be excluded in future. The Chairman concurred and proposed that Dr Smith should be the principal point of contact. Dr Smith responded that he was happy to continue while noting that at the technical level GEBCO had been interacting with Google very successfully. Mr Anderson pointed out that, in her discussions with TSCOM, Ms Foulkes had requested that, to complement Jamie Adams in Google, there be a single point of contact for technical matters within the whole seafloor mapping community which would include LDEO, BODC, NGDC and others.

*70.* After some further discussion the Chairman concluded that Dr Smith should continue to be GEBCO's formal point of contact with Google 'because it worked' and that Dr Smith should be kept informed of any other communications with Google about bathymetry.

## 10. REGIONAL UNDERSEA MAPPING

*71.* Dr Fox introduced the concept of a possible new sub-committee to work on regional undersea mapping. He said that this idea had arisen during a discussion in Maryland in 2009 between Dr Falconer, Dr Fox, Dr Jakobsson, Prof Monahan, Mr Pharoah, Mr Rankin, and Dr Walter Smith. A small working group consisting of Dr Falconer, Dr Fox, Prof Monahan, Dr Jakobsson and Ms Taylor had then developed the draft Terms of Reference in the intervening months before the Guiding Committee meeting. The idea was not for GEBCO to start regional mapping itself but to ensure that GEBCO was well linked to whatever regional mapping was going on. The group also envisaged obtaining help from regional experts to edit new datasets and to form the equivalent of an editorial board which could quality assess new data.

*72.* Dr Fox referred to the tabled draft Rules of Procedure which had been designed to follow those of TSCOM. The proposed membership would consist of one person from each regional mapping effort. The group had been unaware of the structure of the IHO's RHCs at the time and that might eventually have to be taken into account. It was explained that the objective was to draw regional mapping efforts into GEBCO not only to avoid duplication but also to attempt to revitalise the International Bathymetric Charts.

*73.* Mr Yashima remarked that he had only just received the Terms of Reference document and would need more time to study it. He suggested that establishing another Sub-Committee might be too much and he pointed out that the IBCs already have Editorial Boards. It might be better simply to reactivate these Boards although he understood that there was a need to better link the activities of IOC and IHO. He said he was against the proposal.

*74.* Dr Jakobsson emphasised that there was no intention to take over the editorial function of the IBCs but simply to bring the IBCs into GEBCO and inspire them to be more active.

*75.* Ing gén Cailliau pointed out that the words in the draft document '… the Sub-Committee shall establish …' was unfortunate phrasing. Martin Jakobsson concurred that 'the Sub-Committee shall encourage …' was preferable; it was meant to include small regional efforts such as by GEBCO scholars. Captain Gorziglia agreed; he recalled that a similar structure had been proposed in Portovenere in 2004 and was happy to see it being reinvented because GEBCO needed a regional component. He warned that resources were too few to run such an activity in parallel with the IBCs.

*76.* Dr Hall commented that he liked the proposal very much. He had been going to Mediterranean RHC and IBC meetings for 26 years and this was the first time he had been presented with an opportunity to combine efforts.

*77.* Prof. Lin said she was concerned that the proposed sub-committee might lead to duplication. She said that care was needed to give Member States time to talk to their constituencies. She said she preferred to think about the question and put off a decision. Dr Turko concurred. She preferred that the proposal was presented at the next IRCC meeting after which a decision could be made by the Guiding Committee. Mr Travin said that the co-existence of both CGOM and the proposed sub-committee should be avoided although he appreciated the efficiency of having a single body. Time was needed to gain acceptance of the idea and eventually it would need the approval of the IOC Executive Council and Assembly.

*78.* Dr Jakobsson responded that he was impatient to move ahead because he didn't see regional data going into GEBCO at present. He recalled that the IBCAO had been started in 1997 and within 2 years had put together a digital grid. The bureaucracy had been attended to later.

*79.* Dr Fox proposed that a sub-committee on regional undersea mapping be set up to act as a communications interface with the IBCs and other regional mapping groups and chaired by a member of the Guiding Committee. Ms Taylor concurred saying that lack of communications was holding up GEBCO from being effective. Dr Jakobsson noted that GEBCO was not accessing all available regional data today and this was basically a communications problem which could be solved by setting up the proposed sub-committee. Mr Travin countered that the Guiding Committee should examine the proposal and make a decision either the following day or by correspondence. Mr Tani too was uncertain about the new sub-committee not least because of the logistical problems of three different sub-committees meeting in one week probably, at least partly, in parallel. He asked what would be the relationship with CGOM. Dr Hall was sympathetic to Mr Tani's view and suggested that much more work could be done by email. Dr Schenke said that he tended to agree. He was concerned, following his own experience of IBCSO interacting with SCAR, at the potential workload if the proposed sub-committee had to interact with both the IRCC and the RHCs. He wondered whether TSCOM could expand its mandate to include regional programmes.

*80.* Captain Gorziglia thought that the proposed sub-committee was the way to revitalise the dormant IBCs provided the IBC chairmen were involved. Ing gén Cailliau noted that the new Rules of Procedure of the Guiding Committee enabled it to create *ad hoc* groups. He proposed that the new group should be set up forthwith and the Rules of Procedure of the group should be considered at a later date.

*81.* Dr Fox apologised for the late production of the draft Rules of Procedure of the proposed sub-committee. He responded to some of the concerns expressed by saying that the committee would not have to meet for a week but the chairman would have to report to the Guiding Committee once a year. He acknowledged that it was possible for TSCOM to take on the role of the proposed sub-committee but good communications were key to success. Dr Jakobsson concurred that the GEBCO meetings were tending to be too drawn out and stressed that a solution had to be found for how to operate in future.

*82.* After a break, the Chairman concluded that the principle of a new Working Group on Regional Undersea Mapping had been accepted and would take the form of an 'interim sub-committee' to be known as ISCRUM. Mr Yashima objected that he did not agree with the principle of the new group and he wanted to make a decision later by correspondence. Prof. Lin said that more time was required to consider the proposed Terms of Reference. The Chairman overruled these objections by saying that he sensed that the majority wanted to get on with setting up ISCRUM and noting that 'interim' means 'not cast in stone'; it would be possible to re-address the Terms of Reference later.

*83.* Captain Gorziglia noted that it was up to the Guiding Committee to decide what to do but finally, if a Sub-Committee was set up, it would need the approval of IOC and IHO. He wondered what would be the Terms of Reference of the interim group. Dr Fox noted that often such groups were set up before their Terms of Reference had been agreed and this could be done in the present case. The Chairman agreed and said that several iterations of the Terms of Reference might be required. It could be decided later when, or even if, ISCRUM needed to become an official Sub-Committee of GEBCO.

*84.* Dr Fox proposed that Dr Jakobsson should lead ISCRUM. Dr Jakobsson said he would be glad to lead ISCRUM assuming it would hold a one-day meeting at the next GEBCO annual meeting in which regional groups would be involved [Action: Dr Jakobsson].

*85.* The Chairman concluded the discussion by saying that ISCRUM's first task would be to get in touch with the RHCs and to develop the draft Terms of Reference. It would be up to Dr Jakobsson

to propose a Vice-Chairman of ISCRUM to the Guiding Committee for approval [Action: Dr Jakobsson].

## 11. WORLD MAP

*86.* Dr Jakobsson reviewed the status of the World Map. He reminded the Committee that 5000 copies of the map, at 35 million scale and with undersea feature names, had been printed and almost all had been distributed. He said that the map should be updated and improved; it was time for a new version. The positive aspects of the map had been that it successfully assisted outreach, there was a big demand and that it had involved some NF scholars in its production. On the other hand the colours had been too dark and there had been significant handling and shipping problems to do with the map's size.

*87.* He continued that he was happy to involve more NF scholars in the new map if that was wished. He expected that the new map would be at a slightly smaller scale and consequently smaller in size. He said that he had costed the new map which might be cheaper to print in Japan although the freight costs would be higher. It might even be cheaper to print the maps in multiple locations. He envisaged that small numbers could be shipped in tubes but for 100-200 copies he envisaged using special cardboard boxes. He had also included the costs of warehousing and shipping.

*88.* Dr Schenke responded that he would like to see the next map at a larger scale and spread over multiple sheets because so many institutions had made use of, and displayed, the 5th Edition. He asked what was the largest size that could be printed. Mr Jacobs recalled that there had been an action on him to investigate this point. At the SCUFN meeting in South Korea in 2008 the Koreans from NORI had been interested in printing a 10 million scale map. He said he could re-investigate this option.

*89.* The Chairman responded that this subject needed more discussion because the work involved could be deceptively large. Dr Falconer agreed, pointing out that it would not be a matter of just a print run of a few thousand maps because there would be 18 sheets to print. Dr Turko suggested printing maps at a smaller scale. In any event she said that the sheets would need to be scientifically reviewed. Dr Jakobsson responded that he would be happy to print the world map at 40-45 million scale. Captain Gorziglia said that world maps were needed from the size of a postcard up to metres on a side. He said that if GEBCO withdrew the now very old 5$^{th}$ Edition and replaced it with a newer map, that was updated regularly, the Hydrographic Offices and Member States would be very happy. Dr Brown cautioned that this could be a big operation that might need professional help. He said that BODC would try and update the grid regularly, possibly every 3-6 months. Ms Taylor suggested that a compromise might be possible, for example, some copies of the maps could be distributed in tubes while others could be available as pdf files over the internet. Dr Jakobsson concluded that he will create pdf files of the maps.

*90.* Captain Gorziglia asked who would decide whether to publish a 6$^{th}$ Edition. The Chairman said that this was a decision for those working on the World Map. Dr Brown noted that, in his lab, if the 6$^{th}$ Edition corresponded to a full-scale map it would be source of distraction from upgrading the grid.

*91.* Finally Mr Tani asked about the price of the new World Map. Captain Gorziglia said that it might be possible to find a Member State Hydrographic Office that would produce it. Dr Jakobsson reminded attendees that GEBCO was totally in debt to Dr Hall and his associates who had funded the production of the first edition of the World Map.

## 12. OUTREACH

*92.* In the absence of Cdr Lusiani the Chairman noted the progress that had been made since the last meeting. He was pleased to see the Wikipedia entry for 'GEBCO' and he noted that the GEBCO web site was improving all the time. He invited the Committee to suggest further activities.

*93.* Dr Schenke noted Expo2010 in Shanghai and asked whether GEBCO would have an exhibit there or in Korea which would be the site of the following Expo. He said that his institution, AWI, was planning to exhibit a 9m model of the IBCAO in the Marine Pavilion of Expo2010.

*94.* Ms Vallée, invitee from Science Park Brest Iroise, introduced information she had tabled. She wanted to set up an organisation, including the research community, to take part in Expo2010. She stressed that the Expo would open in 6 months time and that she was looking for events that would take place for a fixed period some time between May and October 2010. The space would be free and she considered that this would be a great opportunity for GEBCO. She said she was already working with Océanopolis in Brest and involved in setting up a 'network of networks' which included museums and aquaria. She sought input from the research community on subjects such as energy and climate change. She proposed a GEBCO meeting, a Science Day or a Conference and Workshop. Funding might be obtained from sponsors.

*95.* Suggestions from the Committee included displays on tsunami modelling, GEBCO flyers and the World Map (possibly printed in China). Dr Smith supported printing the World Map but felt that seeing the oceans on a sphere would have an even bigger impact. Ms Travaglini suggested that GEBCO's Outreach WG should work with Dr Schenke on ideas.

*96.* Other items concerning outreach were discussed. Dr Fox noted that he had an opportunity to advertise GEBCO at the 6th Plenary of GEO on 18-23 October 2009 in Washington, DC. Dr Falconer mentioned that Yannick Beaudoin from UNEP, who had earlier attended TSCOM, was happy to work with GEBCO in future. Ms Weatherall made a plea for any outreach material to be sent to her for putting up on the GEBCO web site. Dr Smith reminded the Committee that Google wanted 'stories to tell' in Google Ocean.

## 13. GLOBE

*97.* Mr Anderson reported on progress made with creating a globe based on the World Map [Annex 6]. He said that he had approached ten globe makers few of whom expressed any interest. Finally he had contacted Greaves & Thomas, UK, who make custom globes, and Dong-Xin, a company based in Hong Kong.

*98.* Greaves & Thomas made a sample using GEBCO bathymetry and Blue marble topography by pasting paper gores onto a globe but there were problems matching the adjacent gores. The price was reasonable, with a big reduction for wholesale production, and delivery was cheap in Europe. Globes could be up to 60 inches in diameter although 1 metre (39 inches) seemed preferable.

*99.* Dong-Xin use a proprietary process that involves ink jet printing directly onto a sphere. After some initial setbacks they produced a 62 cm sphere which arrived just before the meeting ended. Many Committee members were impressed with the standard of finish although some alignment problems were evident in the bathymetry. Dr Jakobsson said he was very impressed and recommended buying it.

*100.* Mr Anderson suggested that, before making a final decision, latitude and longitude lines and some feature names should be added. Further, there was a need to assess the market for such a globe. He added that the company might sell the globe themselves accompanied by some explanatory text in

a brochure. Finally there was a need to determine the eventual size of the globe which would strongly influence the price.

*101.* The Chairman concluded that an editorial decision was needed and this could be obtained by circulating the Guiding Committee for their opinions. He noted that GEBCO was not in the distribution business, this would have to be left to commercial companies. Mr Anderson said that he was happy to progress the project provided that GEBCO covered any costs [Action: Mr Anderson and Chairman].

## 14. POLAR HOVERCRAFT

*102.* Dr Hall described the project using his hovercraft, R/H *Sabvabaa*, in the Arctic. The 4-berth craft, a Griffon 2000TD MkIII, is 40ft long, weighs 5 tonnes, can carry a 2200 kg payload (and demonstrably 1300 kg more) and has a top speed of 43.2 knots. The hovercraft was built in Southampton, UK and is now based in Svalbard University.

*103.* The craft has been used over Arctic ice on 12 occasions and has travelled over 1000 miles over ice. In 2009 the hovercraft worked in the region of Alpha Ridge and north Greenland in an area where short cores contain glass spherules perhaps indicative of an asteroid impact. The craft carries a 20 cub.ins airgun and sparker and a 6-channel streamer and it can also core, dredge and measure ice thickness, currents (ADCP) and sea-water properties (CTD).

*104.* Dr Hall concluded by noting that there are plans to carry the hovercraft on board the drill ship *Aurora Borealis*. He is seeking logistical support from other countries to enable the hovercraft to work for up to 6 months a year.

*105.* Further details from this presentation can be found at www.gebco.net/about_us/gebco_science_day/.

## 15. STATUS OF WORLD GRID

*106.* Dr Smith reminded the Committee that GEBCO presently managed two world grids, as had been agreed in Portovenere in 2004. The first was the 1 arc.min grid introduced in 2003 which had been partly updated since then. Where it hadn't been updated it still relied on digitised 5th Edition contours. The second grid is a 30 arc.sec grid (also known as GEBCO_08) based on merging soundings and satellite altimetry 'depths'. Originally it had been hoped that the two grids would converge but it became clear that updating two grids was too much work. Therefore TSCOM had agreed that the first grid should be 'frozen' and all efforts should be directed at the second grid. This approach had been agreed by the Guiding Committee in 2007.

*107.* Dr Fox pleaded that TSCOM should put up a technical explanation on the GEBCO web site of what was going on. Ms Weatherall responded that she fully agreed but this was already in hand because Mr Jacobs was developing the text. Mr Jacobs said the text would explain the outline procedures and the history of the grid [Action: Mr Jacobs]. Dr Smith added that TSCOM had also established a Cookbook Working Group which will contribute to the explanation. He elaborated that the 30 arc.sec grid contained metadata for every pixel (whether the pixel contained data or not and, if so, the nature of the source); every pixel with sounding data contained information about the cruise that collected the data although this information was not yet publicly available. He continued that TSCOM's vision was that eventually such data should be added to Google so that it would be possible to show where data were missing and, where present, who collected it.

*108.* Dr Schenke praised this approach and asked whether TSCOM used multibeam data in the 30 arc.sec grid or just centre beam data. Dr Smith replied that originally only centre beam data had been used but that now the full swath was included although sometimes it is not 'clean' at the edges. Dr Jakobsson noted that this would be very helpful for ISCRUM provided there was a clear description of how the data had been processed and what was the vision behind TSCOM's plans. Dr Smith assured Dr Jakobsson that this would happen.

## 16. COPYRIGHT ISSUES AND USE OF DATA

*109.* Ms Weatherall reported that she received lots of requests for various GEBCO products. Some came from very large companies, e.g. Nokia which wanted to display bathymetry on its mobile phones. She said that she needed guidance on a charging policy.

*110.* Dr Schenke elaborated on the Nokia request. He said that a Nokia group in Berlin were developing a special product with a deadline of end of November 2009. He had had a long phone call with the head of the group who unfortunately had been unable to attend the Science Day. Nokia essentially were interested in products for three types of market, the internet, mobile phone users (over 300 million) and contracts with third parties (leisure, sports etc.). Nokia could support the scientific and technical work of GEBCO via a lump sum donation. Dr Schenke considered this to be a great opportunity for GEBCO's outreach activities and income generation.

*111.* Dr Smith said he thought that GEBCO products should be free but that a wealthy company such as Nokia should be encouraged to make a contribution to GEBCO. He felt that if GEBCO charged the company it would make use of free products instead which were offered by others. Dr Fox agreed that the products should be free and asked if there was a mechanism for accepting money. Dr Jakobsson concurred but said that GEBCO needed to maintain its freedom. Dr Brown argued that the real problem was the need for a quick decision. This needed time and effort but was worth the effort in such cases.

*112.* Mr Anderson noted that in his discussions with two globe manufacturers both had raised the copyright issue. Advice was needed on how to proceed. Dr Brown noted that BODC has had the same experience and treats all companies the same way. Dr Fox noted that GEBCO badly needed a written policy. Captain Gorziglia agreed; he said that IHO would expect three elements in such cases. Any GEBCO policy would need to be agreed by the parent organisations, all products should be free of charge and logos should include not only GEBCO but also IOC and IHO. Dr Brown stated that at BODC any user had to sign a licence, it was made clear that the bathymetry was 'not for navigation', and the only legal authority was the UK NERC. Captain Gorziglia remarked that, in GEBCO's case, if IOC and IHO were included in such arrangements that would be fine.

*113.* Dr Smith said he was concerned that GEBCO needed to take legal advice. Dr Brown countered that BODC had a working system. He warned that 'copyright' was probably the wrong word to use because copyright was only effective if NERC took someone to court. Ms Taylor suggested using the phrase 'terms of use'.

*114.* Captain Gorziglia suggested that GEBCO should come up with a form of words granting non-exclusive use of its bathymetric products in such a way that the data were given to Nokia with no strings attached provided they gave something in return.

*115.* Prof. Lin noted that IOC also has a data policy.

*116.* Dr Smith repeated his concern. He said that phrases such 'terms of use' and 'copyright' have different meanings to lawyers in different countries. These are strict legal terms and it was pointless to debate them in this forum. He suggested that the solution was a small group to consider the

problem. Dr Brown considered this a waste of time. He felt that if there was a working system it should not be tampered with.

*117.* There was a lack of consensus on how to proceed. Finally Dr Falconer proposed that a small group consisting of the Chairman, Vice-Chairman and Dr Brown draft a policy which could be sent to IOC and IHO later for approval. This was agreed by a majority of the Committee [Action: Chairman, Vice-Chairman, Dr Brown].

## 17. FUTURE ACCOUNTING ARRANGEMENTS

*118.* Dr Falconer noted that the Permanent Secretary, who also acted as GEBCO's Treasurer, had intimated that he wished to resign at the end of 2010. Thus there would need to be a discussion about how GEBCO's funds were to be handled after that date.

## 18. ELECTION OF CHAIRMAN, VICE-CHAIRMAN

*119.* Dr Falconer was elected unanimously as the new Chairman to replace Prof Monahan, who was retiring, and Dr Fox was elected unanimously as the Vice-Chairman to replace Dr Falconer.

*120.* Dr Falconer stated that he didn't plan to be Chairman for a full 5-year term.

## 19. DATES AND PLACES OF MEETINGS IN 2010 AND 2011

*121.* The Secretary informed the Committee that informal offers to host the 2010 meeting had been received from Peru (Cdr Montoro) and Monaco (IHB). Dr Falconer added that Dr Stagpoole might also be willing to host a meeting in New Zealand. Mr Jacobs supported the invitation from Peru because it would send a message that GEBCO supported its NF scholars. Dr Smith agreed; failure to accept the invitation would send a bad message.

*122.* Ms Taylor revealed that SCUFN had discussed venues and decided that a 2-week meeting was too long. They had decided that parallel sessions were required to shorten the meeting and reduce the cost. They had agreed that running meetings concurrently in the same venue was valuable. Dr Fox said that it was wasteful to have essentially duplicate reports, for example, from the Bathymetric Editor and the Digital Atlas Manager. It was more efficient for them to give their reports once in a joint session. Dr Jakobsson strongly endorsed this approach. Captain Gorziglia said that in his experience successful meetings were those where the group had worked between meetings. So, for example, maybe SCUFN could make many decisions between meetings. If relevant reports were prepared before meetings then it would be much easier to come to quick decisions at the meetings themselves. Ms Taylor concurred. SCUFN had already agreed to work so as to review most proposals before they met but she noted that some topics do not lend themselves to email discussion. Mr Yashima agreed that two weeks was too long for the GEBCO meetings.

*123.* Dr Smith said he sought advice on how to balance the conflicting requirements to open up GEBCO to the wider community, by holding a Science Day, and chairing a large TSCOM meeting that, with the attendance of many observers, was frequently unwieldy. Dr Jakobsson strongly supported the Science Day concept and said that it should not overlap with any other meeting.

*124.* The Chairman concluded by noting that there seemed to be consensus to meet in Peru in 2010. The Secretary asked everyone to inform him of any constraints people had regarding the timing of that meeting [Action: All].

## 20. ANY OTHER BUSINESS

*125.* 20.1 Cdr Shipman noted that IHO's document B-7 'GEBCO Guidelines', dated 2003, was woefully out of date. He referred to a detailed tabled document (Annex 7) which was a first attempt to revise it and to indicate the division of labour in re-drafting different sections. He invited the Guiding Committee to consider this draft document. He said that he was happy to collect responses. He also said that the IHB was embarrassed to continue displaying the current document on the IHO web site and proposed to withdraw it with a note that it was under revision.

*126.* There was general agreement that the current version of B-7 should be withdrawn and that a note about the revision should be posted on the IHO web site. It was agreed that TSCOM, with ISCRUM, Should work with Cdr Shipman on the revision [Action: Chair TSCOM, Dr Jakobsson for ISCRUM]. Captain Gorziglia said he would like to see the new version by the next GEBCO meeting.

*127.* 20.2 Ing gén Cailliau referred to a note tabled by M-F. Lalancette-Lequentrec, J-Y. Royer, M. Maia and L. Géli (Annex 8) that proposed that the Guiding Committee should write a letter to endorse a new satellite altimetry mission dedicated to the mapping of a high-resolution geoid.

*128.* Dr Fox replied that this suggestion might be overtaken by events because the Jason 3 mission was on track to be launched. Dr Smith elaborated that Jason 3 would be in a fixed, 10-day repeat orbit designed to carry out oceanographic work. Thus it was not ideal for seafloor mapping. He said he was not sure what form of words any letter might contain however he supported, as did others, Ing gén Cailliau's suggestion. It was agreed that 'The Committee supports the idea of sending a letter in support of a new satellite altimetry mission' to be drafted by French colleagues [Action: Ing gén Cailliau].

## 21. CLOSURE OF THE MEETING

*129.* The Chairman thanked everyone present for travelling to Brest. Finally he thanked SHOM, the meeting hosts, for their hospitality, organisation and, above all, the food.

*130.* Dr Falconer noted that Prof Monahan, the retiring Chairman, had been active in GEBCO since getting involved in the preparation of the 5$^{th}$ Edition charts. He thanked Prof Monahan for all his efforts since becoming Chairman in 2003, a period that had seen a lot of change.

# ANNEX 1

**Twenty-sixth Meeting of the GEBCO Guiding Committee at
Service Hydrographique et Océanographique de la Marine (SHOM)
in Brest, France
1st – 2nd October, 2009**

# AGENDA

1. **WELCOME (Cailliau)**
2. **TSCOM REPORT (Smith)**
3. **SCUFN REPORT (Schenke)**
4. **NF/GEBCO TRAINING PROJECT MNGMGT COMM REPORT (Falconer)**
5. **IOC REPORT (Travin)**
6. **IHO REPORT (Gorziglia)**
7. **IHO DCDB REPORT (Taylor)**
8. **IHO/IRCC-1 MEETING (Lusiani)**
9. **GOOGLE OCEAN (Smith)**
10. **REGIONAL UNDERSEA MAPPING (Fox, Jakobsson)**
11. **WORLD MAP (Jakobsson)**
12. **OUTREACH WORKING GROUP REPORT (Lusiani)**
13. **GLOBE (Anderson)**
14. **POLAR HOVERCRAFT (Hall)**
15. **STATUS OF WORLD GRID (Smith)**
16. **BATHYMETRIC EDITOR'S REPORT (Jacobs)**
17. **DIGITAL ATLAS MANAGER'S REPORT (Weatherall)**
18. **COPYRIGHT ISSSUES AND USE OF DATA (Weatherall)**
19. **REVIEW OF COMMITTEE/SUB-COMMITTEE MEMBERSHIP (Monahan)**
20. **FUTURE ACCOUNTING ARRANGEMENTS (Falconer)**
21. **ELECTION OF CHAIRMAN, VICE-CHAIRMAN (Monahan)**
22. **DATES AND PLACES OF MEETINGS IN 2010 AND 2011 (Secretary)**

# ANNEX 2

# SCUFN-XXII Report to GEBCO XXVI Guiding Committee[1]

## 1. Attendance.

Ten Sub-Committee members out of 12 attended.

| | |
|---|---|
| Dr. Hans Werner SCHENKE, Germany | IOC (Chair) |
| Ing. en Chef Michel HUET, IHB | Secretary |
| Mrs. Lisa A. TAYLOR, USA (Vice-Chair) | IHO |
| Cdr. Harvinder AVTAR, India | IHO |
| Cpt. Ana Angelica ALBERONI, Brazil (new member) | IHO |
| Dr. Yasuhiko OHARA, Japan | IHO |
| Lic. Walter REYNOSO Peralta, Argentina | IHO |
| Cdr. Muhammad BASHIR, Pakistan (new member) | IHO |
| Dr. Vaughan STAGPOOLE, New Zealand (new mbr) | IOC |
| Lic. José Luis FRIAS Salazar, Mexico | IOC |
| Dr. Hyun-Chul HAN, Rep. of Korea | IOC |
| Mr. Norman Z. CHERKIS, USA | IOC |
| Dr. Ksenia DOBROLYOBOVA, Russia | IOC |

## 2. Election of new SCUFN Members:

| | |
|---|---|
| Capt. Ana Angelica ALBERONI, Brazil | IHO |
| Cdr. Muhammad BASHIR, Pakistan | IHO |
| Dr. Vaughan STAGPOOLE, NZ | IOC |

## 3. Election of a SCUFN Vice-Chair:

Ms. Lisa A. TAYLOR, NGDC, USA IHO

## 4. Other participants were,

Mr. Trent Palmer, Secretary ACUF, US BGN

with observers:
Ms. Darma Bennett, USA
Prof. Hyo Hyun SUNG, Korea
Mr. Brede GUNDERSEN, Norway
Ing Général Etienne CAILLIAU, France
Ing en Chef Henri DOLOU, SHOM, France
Mr. Young Tae LIM KHOA, Korea
Ms. In Young PARK, KHOA, Korea
Mr. Shigeru KASUGA, JHOD, Japan
Dr. Kunio YASHIMA, JHOD, Japan
Mr. Jin Jiye (PRC) China
Prof. Lin Shao Hua, China

[1] Based on a Powerpoint presentation. No formal report was submitted.

## 5. Database Gazetteer

The Gazetteer is now Geospatially Enabled. It is available in GIS friendly formats such as Shapefiles, Keyhole Markup Language (Google Earth) and Web Feature Services. It features enhanced management capability, easy real-time updates and on-line definition of geometry and extent. There is easy to use software for submitting on-line name proposals.

## 6. Remaining items from previous meetings

SCUFN XXI (Jeju Island, May 2008)

Actions from the previous meeting: 35
Actions during the intersessional period 2008-2009 by SCUFN members:
completed: 29
pending: 6

New undersea feature names were submitted by Japan, Brazil, Korea and IBCSEP.

## 7. Liaison with ACUF and US Board on Geographical Names

Harmonization of GEBCO and ACUF Gazetteers Thanks to ACUF for enforcing their rules, in order to harmonize the work and products of the two committees.

ACUF: two proposals are relevant to SCUFN
- Fred Spiess Seamount accepted
- Spiess Seamount Chain accepted

## 8. Summary

- 52 undersea feature name proposals were considered/discussed
- 13 proposals were rejected
- 2 were put in reserve
- 37 proposals were finally discussed and accepted

## 9. Other Business

- The sub-committee discussed the need to communicate effectively between meetings and agreed using a list server.

- It was again expressed that proposals which are to be considered at SCUFN meetings must be submitted.
  - 30 days before meetings in digital form
  - 60 days before meetings in analog form

- That future SCUFN Meeting will need 4 to 5 days

- Meeting parallel to other GEBCO SC

- Data Flow from proposer to IHO DCDB

# ANNEX 3

**International Hydrographic Organization**
**Data Center for Digital Bathymetry**
**World Data Center for Geophysics and Marine Geology at Boulder**
**And**
**United States Department of Commerce**
**National Oceanic and Atmospheric Administration**
**National Environmental Satellite, Data, and Information Service**
**National Geophysical Data Center**

## Report to the
## Guiding Committee
## of the General Bathymetric Chart of the Oceans (GEBCO)

**September 2009**
**Service Hydrographique et Océanographique de la Marine**
**Brest, France**

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# I. REPORT OF THE INTERNATIONAL HYDROGRAPHIC ORGANIZATION DATA CENTER FOR DIGITAL BATHYMETRY

## I-A. Bathymetric Data Holdings and Global Database Management

Since the May 2008 Meeting of the General Bathymetric Chart of the Oceans (GEBCO) the International Hydrographic Organization Data Center for Digital Bathymetry (IHO DCDB) has responded to 30 international requests for marine geology and geophysics data and 241 total sales requests from 9 countries, all of which are International Hydrographic Organization (IHO) Member States. These numbers are slightly higher than the numbers reported in last year's report. Hard copy posters used by educators and bathymetric maps used by fisherman continue to be the bulk of products shipped by the IHO DCDB, as most of our digital data are online free of charge.

The IHO DCDB released Version 5.0.13 of the global Marine Trackline Geophysics dataset in August of 2009 on DVD. The new release contains an additional 566,000 nautical miles of bathymetry, magnetics, and gravity from 186 cruises added since Version 5.0.11, released in April 2008. Also provided on the DVD is Geophysical Data System (GEODAS) search and retrieval software, which runs under Microsoft Windows®. IHO DCDB's global Marine Trackline Geophysics database now includes 50.1 million soundings from 4,851 cruises. This DVD is available online at http://www.ngdc.noaa.gov/mgg/fliers/03mgg02.html.

Over the reporting period, the IHO DCDB received 2.2 terabytes of deep-water multibeam bathymetric data from 307 surveys. Significant contributions included surveys from Scripps Institution of Oceanography (88), Lamont-Doherty Earth Observatory (62), Woods Hole Oceanographic Institution (27), the Geological Survey of Ireland (31), NOAA (12), the United States Geological Survey (2), and the University of New Hampshire (1). The Multibeam Bathymetric Database now provides 3.4 terabytes of data from 1,497 cruises.

The IHO DCDB continues to offer online access to its multibeam bathymetric data holdings using an interactive mapping tool with query capabilities at http://map.ngdc.noaa.gov/website/mgg/multibeam/. In addition, The IHO DCDB has provided an interactive website, which allows the user to generate color relief maps - with contours, if desired, and grids of the data using NOAA's Pacific Marine Environmental Laboratory (PMEL) AutoChart, Generic Mapping Tools (GMT), and MB-System software. The maps and grids output formats are in Postscript and GMT, respectively, and users have the option to download the source data. Most of these datasets have associated Federal Geographic Data Committee (FGDC) metadata files, viewable online through a link in the survey listing of a search or downloaded with the full resolution data. The IHO DCDB developed a pipeline with LDEO for transferring data and metadata to the archive that will serve as the model for the upcoming National Science Foundation (NSF) Rolling Deck to Repository (R2R) Project.

The IHO DCDB's United States single-beam, multi-beam, and sidescan sonar coastal databases have migrated to a spatially enabled Oracle Relational Database Management System (RDBMS). This migration aids data managers in maintaining data consistency across other National Ocean Service (NOS) databases and increases overall data quality and ability to search the data. Over the reporting period, the database grew by 215 surveys, including 164,370 soundings. The database contains over 84 million soundings and features from 7,049 surveys, providing valuable input to bathymetric base maps, Geographic Information Systems (GIS), geophysical exploration, coastal engineering studies, and seafloor habitat mapping. This database is the primary data source for the IHO DCDB's Coastal Relief Model and tsunami inundation digital elevation model development. The IHO DCDB archived and made publicly available 1,200 new Bathymetric Attributed Grid (BAG) files. For more information about the BAG format and the Open Navigation Surface

Working Group (ONSWG), please visit http://www.opennavsurf.org. The IHO DCDB now provides an online conversion tool to translate the binary BAG file to XYZ, which provides the public greater access to NOS surveys.

The IHO DCDB continues to archive digital sidescan sonar data and cleaned, mosaicked imagery as part of NOS survey operations. The IHO DCDB offers these mosaic images for download over the Internet and continues work to develop products derived from these data. Current NOS sidescan sonar holdings exceed 15 terabytes; the sheer volume of the data is providing Information Technology (IT) challenges in the areas of data archive, access, and product generation.

NOS hydrographic survey data is accessible to the public through an interactive map service maintained at http://map.ngdc.noaa.gov/website/mgg/nos_hydro/. The NOS Hydrographic Survey Data Map Service is a data discovery and download tool that allows the user to quickly and easily make spatial or textual searches for surveys of interest, then download survey-related data products. The IHO DCDB is now archiving numerous types of digital survey data files of survey data, including Extensible Markup Language (XML) metadata documents files, survey plots, sounding data in American Standard Code for Information Interchange (ASCII) XYZ and the Hydrographic Surveys Data Exchange Format (HYD93), sidescan sonar mosaics, shaded-relief images, and gridded data in text and BAG file formats.

Over 9,300 NOS Descriptive Reports containing detailed survey metadata are currently available, as well as over 23,400 final smooth sheet images scanned from original plots of the survey area using corrected hydrographic data. The map service enables the IHO DCDB to deliver these products, including high-resolution multibeam and sidescan sonar data, over one interactive, web-based system. The site gained in popularity over the last year, receiving an average of 47,000 hits per quarter.

## I-B. GEODAS Software Development

The IHO DCDB continues to enhance the Geophysical Data System – Next Generation (GEODAS-NG) software management system. Originally developed to manage marine geophysical trackline data, GEODAS-NG is now a universal software data management tool, which can handle a variety of data formats and types including single-beam, multibeam, trackline, hydrographic survey, and gridded bathymetric and topographic data. The software serves users both as a desktop application on various IHO DCDB DVD products, and as an online search, display, and retrieval system. The IHO DCDB is in the process of moving the GEODAS-NG system, as well as the Aeromag database to a RDBMS based system. The IHO DCDB has successfully migrated all GEODAS data, metadata, and navigation information to Oracle relational databases. Initial online user access is through geospatially enabled Arc Internet Map Services (ArcIMS) developed by Environmental Systems Research Institute (ESRI).

The GEODAS Grid Translator page at http://www.ngdc.noaa.gov/mgg/gdas/gd_designagrid.html offers translation of GEODAS gridded databases to several formats using various grid parameter options. Online users can create and download custom grids of IHO DCDB gridded datasets: ETOPO2v2, Coastal Relief Model, and Great Lakes Bathymetry.

# II. REPORT OF THE WORLD DATA CENTER FOR GEOPHYSICS AND MARINE GEOLOGY, BOULDER

The National Geophysical Data Center (NGDC), in its capacity as the World Data Center for Geophysics and Marine Geology (WDC-GMG), Boulder, promotes excellence in archiving, managing, and exchanging data obtained from measurements of the seafloor. NGDC works with national and international groups on many projects outside the scope of the International Hydrographic Organization Data Center for Digital Bathymetry (IHO DCDB), GEBCO, and the Intergovernmental Oceanographic Commission (IOC) Regional Mapping Projects. Although the WDC-GMG, Boulder, manages all types of data from the ocean floor, including descriptions and analyses of seafloor samples, deep sea drilling data, underway geophysical measurements, and derived gridded data sets, this report will only describe activities regarding bathymetry.

## II-A. Tsunami Research and Training Activities

The data center has been actively involved in a number of tsunami-related activities, supporting both research and mitigation efforts.

### II-A-1. Elevation Modeling for the NOAA Tsunami Forecasting and Warning System

NOAA has primary responsibility for providing tsunami warnings and information to United States coastal communities, operates the Pacific Tsunami Warning System, and has a worldwide leadership role in tsunami observations and research. Detailed bathymetry is crucial to forecasting the potential effects of a tsunami and for the protection of life and property. NGDC is building high-resolution digital elevation models (DEMs) for select United States coastal regions to support tsunami forecasting and modeling efforts at the NOAA Center for Tsunami Research, Pacific Marine Environmental Laboratory (PMEL). These combined bathymetric–topographic DEMs are part of the tsunami forecast system Short-term Inundation Forecasting for Tsunamis (SIFT) currently being developed by PMEL for the NOAA Tsunami Warning Centers, and are used in the Method of Splitting Tsunami (MOST) model developed by PMEL to simulate tsunami generation, propagation, and inundation.

Bathymetric, topographic, and shoreline data used in DEM compilation are obtained from various sources, including IHO DCDB, NOAA's NOS, the USGS, the United States Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), and other federal, state, and local government agencies, academic institutions, and private companies. Reference datums used by the DEMs are the vertical tidal datum of Mean High Water (MHW) and horizontal datum of World Geodetic System 1984 (WGS84). Cell sizes for the DEMs range from 1/3 arc-second (~10 meters) to 3 arc-seconds (~90 meters). The DEMs are available to the public via NGDC's Tsunami Inundation Gridding Project web site at http://www.ngdc.noaa.gov/mgg/inundation/. Web site visitors may view planned DEMs, and download completed DEMs with corresponding metadata and documentation. Between May 2008 and August 2009, NGDC completed 17 coastal DEMs, all of which are available to the public online. Since the start of the project in 2006, NGDC has developed 46 DEMs covering all of Puerto Rico and portions of the United States' East, West, Gulf, Hawaiian, and Alaskan coasts, as well as several Pacific Islands.

### II-A-2. Elevation Modeling Supporting NTHMP Tsunami Inundation Modeling

The National Tsunami Hazard Mitigation Program (NTHMP) is a coordinated national effort between United States Coastal States, NOAA, and other Federal agencies to assess tsunami threat, prepare community response, issue timely and effective warnings, and mitigate damage. To support this program, NGDC is developing high-resolution digital elevation models (DEMs) of identified at-risk United States coastal communities for use in State tsunami inundation modeling

efforts. Appropriate State partners specify DEM requirements (e.g., cell size, spatial coverage, vertical datum.) Bathymetric, topographic, and shoreline data used in DEM compilation are obtained from various sources, including the IHO DCDB, the United States Geological Survey (USGS), the United States Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), and other federal, state, and local government agencies, academic institutions, and private companies.

In 2009, NGDC developed 10 nested, integrated bathymetric-topographic DEMs to support the State of Alaska's coastal inundation modeling efforts. DEM cell sizes stepped from 8 arc-second regional DEMs, to 8/3 arc-second local DEMs to high-resolution (8/15 arc-second) community DEMs. Communities covered by the DEMs included Whittier and Cordova in Prince William Sound, Yakutat and Akutan. DEMs specifications included positive (East) longitude, exact cell overlap between nested grids, and mean higher high water (MHHW) vertical datum. In 2010, NGDC will build additional DEMs to support Alaska, California, and Washington State tsunami inundation modeling efforts.

## II-A-3. Online Catalog of Historic and Prehistoric Tsunami Events

The Global Historic Tsunami Event and Runup database allows users to search, display, and download data on-line via web forms, interactive ArcIMS maps, and Keyhole Markup Language (KML), which is an XML-based language schema for expressing geographic annotation and visualization on Google Earth. This database contains information on the data and location of the tsunami source and runups, as well as deaths, damages, and monetary impact. Tsunami history provides clues to what might happen in the future, including frequency of occurrence and maximum wave heights. However, instrumental and written records commonly span too little time to reveal the full range of a region's tsunami hazard, so NGDC added a global database of citations on tsunami deposits to the archive. The citation database provides additional data on historical events and extends the record of tsunamis backward in time, in some cases to prehistoric or paleotsunami deposits preserved in the geologic record. There are currently over 800 citations describing deposits from all over the world and over 300 are associated and linked to a specific historic tsunami event. The service is an important component of worldwide efforts to mitigate against tsunami threat and is available at http://www.ngdc.noaa.gov/hazard/tsu.shtml.

## II-B. World Magnetic Model Crustal Anomaly Analysis

NGDC released an Earth Magnetic Anomaly Grid (EMAG2) compiled from satellite, ship, and airborne magnetic measurements during a 2-year international collaborative effort in February 2009. Magnetic anomaly maps provide insights into the subsurface structure and composition of the earth's crust. They are widely used in the geological sciences and in resource exploration. Furthermore, the global magnetic map is useful in science education to illustrate plate tectonics, crustal interaction with the deep mantle, and other aspects of Earth evolution. Distinct patterns and magnetic signatures on magnetic anomaly maps attributed to the formation (seafloor spreading) and destruction (subduction zones) of oceanic crust, the formation of continental crust by accretion of terranes to cratonic areas, and large-scale volcanism. NGDC contributed EMAG2 to the Magnetic Anomaly Map of the World (http://ccgm.free.fr/index_gb.html), improving the current grid resolution to 2 arc-minute from 3 arc-minute grid resolution of the previous version, EMAG3.

In this revision, additional grid and trackline data over land and oceans have been included. Moreover, NGDC improved interpolation between sparse tracklines in the oceans by using directional gridding and extrapolation using an oceanic crustal age model. The longest wavelengths (>330 kilometers) were replaced with the latest Challenging Mini-Satellite Payload (CHAMP) satellite magnetic field model 6 (MF6). The EMAG2 publication details improvements in data processing. The digital grid, images, and various derived products, including the KMZ file enabling visualization in Google Earth are available on the EMAG2 homepage at http://geomag.org/models/emag2.html and permanently archived at http://earthref.org/cgi-bin.cgi?s=erda.cgi?n=9700.

## II-C. United States–Canada Cooperation on New Bathymetry for the Great Lakes

NGDC/WDC partnered with NOAA's Office of Oceanic and Atmospheric Research (OAR) Great Lakes Environmental Research Laboratory (GLERL) and the Canadian Hydrographic Service (CHS) in a long-term international cooperative effort to produce bathymetric contours for Lakes Ontario, Michigan, Erie, St. Claire, and Huron. NGDC maintains web pages for Great Lakes bathymetry at http://www.ngdc.noaa.gov/mgg/greatlakes/. These pages provide direct links to related external organizations, and an online, interactive map service featuring the Great Lakes. The map includes a coastline for the Great Lakes as well as bathymetric contours for Lakes Ontario, Michigan, Erie, St. Claire, and Huron. The Great Lakes websites received an average of 33,238 hits per month and 5.16 gigabytes a month of data downloaded during this reporting period.

## II-D. United States–Japan Cooperative Program in Natural Resources

NGDC presented a report and presentation on activities of NGDC/WDC related to sea bottom surveys at the 36th annual United States-Japan Cooperative Program in Natural Resources (UJNR) Sea-Bottom Surveys Panel Meeting held in Tokyo, Japan, on January 20-22, 2009. This panel continues to be one of the principal mechanisms by which Japan and NGDC exchange technologies and marine geophysical data, including bathymetry.

## II-E. World Data Center for Geophysics and Marine Geology, Boulder, Online Activities

The web pages of the World Data Center for Geophysics and Marine Geology (WDC-GMG), Boulder, collocated with those of the NGDC's Marine Geology and Geophysics Division, averaged 3.3 million hits per month, during the period from June 2008 through August 2009, down from 4 million during the last reporting period of August 2008 through May 2009. Users downloaded an average of 5.87 terabytes of data each month, a significant increase over the 2.79 terabytes per month of the last reporting period. The WDC-GMG website is at http://www.ngdc.noaa.gov/mgg/wdc/wdcgmg.html.

## II-F. NOAA National Ocean Service Bathymetric Fishing Maps

The NOS Bathymetric Fishing Maps continue to be a popular product. Over the reporting period, the online map service averaged 64,458 hits per quarter, slightly lower than last year's numbers; however, users downloaded 6.5 terabytes of data. The web page features an ArcIMS interface with links to preview map images. Map layers include state boundaries, shaded relief, all maps, or map types individually as bathymetry, fishing, preliminary, and topography/bathymetry. All full resolution map images are available online in Portable Document Format (PDF) format. Customers can order paper copies of the maps and scanned images on Compact Disk (CD). For more information, please visit the Web site http://www.ngdc.noaa.gov/mgg/bathymetry/maps/nos_intro.html.

# III. REPORT OF IHO DCDB ACTIVITIES IN SUPPORT OF IOC/GEBCO

## III-A. GEBCO Reviewers' Reports

### III-A-1. ETOPO1

IHO DCDB has developed the ETOPO1 Global Relief Model, a 1-arc-minute model of Earth's surface which integrates land topography and ocean bathymetry. ETOPO1 incorporates bathymetry north of 65° N and Greenland topography from International Bathymetric Chart of the Arctic Ocean (IBCAO) version 2.0, as well as numerous global and regional data sets. It is available in "Ice Surface" (top of Antarctic and Greenland ice sheets) and "Bedrock" (base of the ice sheets) versions. ETOPO1 is available in multiple file formats, and users may extract specified regions using the 'Create Custom Grids' tool. Historic ETOPO2v2 and ETOPO5 global relief grids are deprecated but still available.

IHO DCDB has also created a color, shaded-relief image of Earth from ETOPO1 Ice Surface. The image is downloadable as geo-referenced TIFF or KMZ files and available for NOAA's Science On a Sphere®. The image was created with Generic Mapping Tools (GMT) using three color palettes; blues for ocean depths and above sea-level lakes, greens and browns for dry land areas, and shades of white for the Antarctic and Greenland ice sheets and other glaciers greater than 100 $km^2$ using the Global Land Ice Measurements from Space (GLIMS) Glacier Database at the National Snow and Ice Data Center (NSIDC).

## III-B. Related Activities Supporting IOC/GEBCO Programs and Projects

### III-B-1. GEBCO Online Activities

#### III-B-1-a. GEBCO Web Pages

The British Oceanographic Data Center (BODC) assumed ownership and hosting of the GEBCO web pages. IHO DCDB continues to update the mail lists in cooperation with BODC.

#### III-B-1-b. IOC Regional Bathymetric Chart Web Pages

The following table shows the web activity over this reporting period for the International Bathymetric Chart web sites hosted by IHO DCDB.

| Web Activity for Regional Mapping Project Sites | |
|---|---|
| **IBC** | **Average Hits/Month** |
| IBCAO | 17,014 |
| IBCCA | 5,625 |
| IBCM | 3,492 |
| IBCEA | 1,801 |
| IBCWIO | 11,005 |

### III-B-1-c. GEBCO List Servers

IHO DCDB continues to maintain the GEBCO Folk List Server to facilitate communication between members of the GEBCO personality list at gebco_folk@mailman.ngdc.noaa.gov. IHO DCDB welcomes comments from the GEBCO community on how we can improve or enhance these services. IHO DCDB also maintains the following GEBCO list servers:

- International Bathymetric Chart of the Arctic Ocean (IBCAO)
- International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA)
- International Bathymetric Chart of the Eastern Atlantic Ocean (IBCEA)
- International Bathymetric Chart of the Mediterranean (IBCM)
- International Bathymetric Chart of the South East Pacific (IBCSEP)
- International Bathymetric Chart of the Southern Ocean (IBCSO)
- International Bathymetric Chart of the Western Indian Ocean (IBCWIO)
- Technical Sub-Committee on Ocean Mapping (TSCOM)
- GEBCO Guiding Committee

### III-B-2. Coastal Relief Model Development

IHO DCDB has developed the Southern Alaska Coastal Relief Model, a 24 arc-second digital elevation model ranging from 170° to 230° E and 48.5° to 66.5° N. It integrates land topography and ocean bathymetry to represent Earth's surface, and spans the Gulf of Alaska, Bering Sea, Aleutian Islands, and Alaska's largest communities: Anchorage, Fairbanks, and Juneau. IHO DCDB built the relief model from a variety of source datasets acquired from IHO DCDB, USGS, NASA, and other United States and international agencies (CRM; http://www.ngdc.noaa.gov/mgg/coastal/s_alaska.html). Additionally, IHO DCDB created a color, shaded-relief image of the Southern Alaska CRM, which is downloadable as a geo-referenced TIFF, created with the Generic Mapping Tools (GMT) and Persistence of Vision Raytracer (POV-Ray).

IHO DCDB is also initiating the development of the first of the next-generation CRMs, which will span Southern California, scheduled for completion by March 2010. The CRM will have a resolution of 1 arc-second (~30 m), expanded seafloor coverage to the United States Exclusive Economic Zone (EEZ) boundary, a common vertical datum (NAVD88), and incorporate the latest hydrographic and multibeam swath sonar surveys and land elevation data. IHO DCDB will also create an NAVD88-to-MHW conversion grid for development of a MHW version to support tsunami inundation modeling. IHO DCDB will use NOAA's VDatum tool (http://nauticalcharts.noaa.gov/csdl/vdatum.htm) for conversion of bathymetric measurements to NAVD88 and creation of the conversion grid. IHO DCDB will be collaborating with other NOAA offices, the National Geospatial-Intelligence Agency, the U.S. Navy, universities, and state and local agencies in California to complete this effort. IHO DCDB expects to update the other nine existing 3arc-second CRM volumes over the next five years.

### III-B-3. Geospatially Enabling the GEBCO Gazetteer of Undersea Feature Names

The IHO DCDB, in collaboration with the British Oceanographic Data Center (BODC), the International Hydrographic Bureau (IHB) and the GEBCO Sub-committee on Undersea Feature Names (SCUFN), has migrated the GEBCO Gazetteer into a geospatially enabled relational database. In addition, the IHO DCDB has developed both an administrative and a public interface to the Gazetteer. The advantages to this are numerous including GIS compatibility, real-time updates and modifications, enhanced database management capability, and spatial display and editing during SCUFN meetings.

The IHB will continue to maintain the Gazetteer remotely online using the new administrative interface. Future enhancements will include display in Google Earth, an online undersea feature name proposal form, and polar projections.

## III-B-4. United States Extended Continental Shelf

The United States Extended Continental Shelf (ECS) Task Force delegated to NGDC, the responsibility for establishing and maintaining a central repository of data and metadata for ECS scientific information that is accessible, robust, and effectively promotes ECS analysis and interpretation. Additionally, NGDC will take the lead in constructing and maintaining the data system, linking it where appropriate with other existing databases, and working with other Task Force agencies in developing standards and protocols for database and metadata as part of the overall system for preserving the critical analyses and decisions made in support of the United States continental shelf delimitation.

Major accomplishments during the past year include the development of common metadata templates for marine seismic reflection and multibeam bathymetric data and providing NGDC staff support for three cruises. Common metadata supports discovery, understanding and long-term archival of data that will contribute to the outer continental shelf analysis. Scientists and data experts from several United States federal agencies and United States academic science data centers joined together to agree on common vocabularies, documentation rules, best practices and crosswalks to federal and international metadata standards. NGDC has completed and tested the template for the seismic reflection data, which is ready for final distribution. The template for multibeam data is near completion and testing will begin soon. NGDC provided scientific staff on cruises to the Mendocino Ridge aboard NOAA Ship *Okeanus Explorer*, the Arctic aboard USCGC *Healy*, and the Gulf of Alaska aboard the oceanographic research vessel R/V *Marcus G. Langseth.*

NGDC has worked with the Nations Environment Programme's (UNEP) Global Resource Information Database (GRID) and the United States Department of State to identify data coverage for developing states that have ratified with deadlines in 2009. UNEP/GRID has obtained seismic data from NGDC to provide aid to Costa Rica, Gambia, various Pacific Island States, and Uruguay. Bangladesh, Cuba, Trinidad and Tobago, and Vietnam contacted NGDC directly to identify data coverage for their regions.

# Appendix A. Single Beam Bathymetric Data

**Sources of single beam bathymetric data and number of cruises contributed to the IHO DCDB during this reporting period:**

| Institution | Nº Cruises |
|---|---|
| New Zealand,<br>Institute of Geological and Nuclear Sciences (GNS Science) | 69 |
| Federative Republic of Brazil,<br>Navy Hydrographic Center (CHM),<br>Directorate of Hydrography and Navigation (DHN) | 4 |
| United Kingdom of Great Britain and Northern Ireland,<br>Natural Environment Research Council (NERC),<br>British Antarctic Survey (BAS) | 1 |
| **Total** | **74** |

# Appendix B. Marine Geology and Geophysics Data Requests

**Number of IHO DCDB Marine Geology and Geophysics data requests fulfilled by country during this reporting period:**

| Country | Nº Requests |
|---|---|
| Canada | 12 |
| Kingdom of Denmark | 1 |
| Federal Republic of Germany | 2 |
| Hong Kong Special Administrative Region | 2 |
| Republic of India | 1 |
| Japan | 1 |
| Republic of South Africa | 2 |
| Republic of China (Taiwan) | 2 |
| United Kingdom of Great Britain and Northern Ireland | 7 |
| **Total** | **30** |

# Appendix C. Multibeam Bathymetry Database

**Number of cruises with multibeam bathymetry added to the Multibeam Bathymetry Database this reporting period:**

| Institution | Nº Cruises |
|---|---|
| Lamont-Doherty Earth Observatory (LDEO) | 62 |
| United States Geological Survey (USGS) | 2 |
| National Oceanic and Atmospheric Administration (NOAA) | 12 |
| Geological Survey of Ireland (GSI) | 31 |
| Scripps Institution of Oceanography (SIO) | 88 |
| University of New Hampshire (UNH)<br>Center for Coastal and Ocean Mapping (CCOM)<br>Joint Hydrographic Center (JHC) | 4 |
| Woods Hole Oceanographic Institution (WHOI) | 27 |
| **Total** | **226** |

# Appendix D. Multibeam Bathymetric Cruises Received

**Number of cruises with multibeam bathymetry received during this reporting period:**

| Institution | Nº Cruises |
|---|---|
| USA | 195 |
| Non-US | 31 |
| **Total** | **226** |

# ANNEX 4

## *The General Bathymetric Chart of the Oceans (GEBCO)*

Report to the first meeting of the new IHO Inter Regional Co-ordination Committee (IRCC), Monaco, 5 June 2008

Dave Monahan,
Canadian Hydrographic Service

## Introduction

The General Bathymetric Chart of the Oceans (GEBCO), is the only international organization with a mandate to map the floors of the oceans of the entire world. Its primary products are bathymetric maps of the world ocean, in paper and digital versions, a digital grid of depths covering the world and a Gazetteer of undersea feature names.

GEBCO benefits from the participation of many contributors. Depth data collected by Hydrographic Offices and other government agencies, by universities and by industry, is shared with GEBCO, where it is archived, compiled and quality controlled before being used to update bathymetry maps and grids. The process is a continuous one, with updating being frequent.

## Relationship with IHO and IOC

Producing maps of the world ocean is very different from producing hydrographic charts of navigation areas. Depth measurements are scarce and come form a variety of instruments, platforms and organizations. Only a small percentage of the seafloor has been completely examined and in some areas of the world ocean acoustic sounding tracks are over 100km apart, GEBCO produces bathymetric maps of the world ocean floor by assembling and collating depth data measured from surface ships and submarines together with gravity data collected by satellite, then interpreting these different types of data together to produce maps and grids. Producing bathymetry maps of deep water depends heavily on interpolation and interpretation.

Consequently the GEBCO program requires not only hydrographers but also scientists and engineers.

Organizationally, to support these professionals, GEBCO has formal links to the scientific and hydrographic communities through the Intergovernmental Oceanographic Commission (IOC of UNESCO) and the International Hydrographic Organization (IHO), respectively. The two are represented by an equal number of members on the GEBCO Guiding Committee.

Much more important than any formal links to International organizations is the informal and very effective network of GEBCO participants and the professional colleagues and organizations that they have access to. GEBCO participants are

employed in national laboratories, university research and teaching departments, navies and coast guards, and private industry.

## Products

GEBCO's most recent paper production is a new bathymetric map of the world, suitable for general audiences as well as specialists. Digitally, the regular grid of depth data covering the entire ocean is regularly updated and downloadable from the GEBCO website. The grid will soon be replaced with one using a finer spacing between grid nodes.

GEBCO also evaluates and authorizes new undersea feature names, which are published in a Gazetteer by the International Hydrographic Organization. Feature names are a fundamental part of being able to describe the seafloor

## Capacity Building

To build capacity to create bathymetry maps in countries generally lacking such human resources, in 2004 GEBCO united with the Nippon Foundation to form the Nippon Foundation GEBCO Training Project. In this program, graduate-level scientists and hydrographers spend one full year at the Center for Coastal and Ocean Mapping /Joint Hydrographic Center at the University of New Hampshire, USA, where they are trained in the production of bathymetry maps. The course consists of graduate level classes, practical laboratory exercises, a month long field course, and assignments to another mapping organization and to a mapping cruise. Twenty four students have completed the course, six are currently enrolled and another six will commence studies in August. HOs have participated by sending valuable staff members as students (of the 36 students, 25 are staff of national HOs) and by occasionally hosting students during their work assignments.

## Future directions

A. Full integration of the Nippon Foundation program graduates into the GEBCO network.

It is hoped that the graduates will participate fully in GEBCO, becoming members of committees and Working Groups, and eventually taking over the responsibilities of senior GEBCO members.

Graduates will be supported to produce a map of the seafloor near their home country. Doing so will frequently require working with neighboring countries to demonstrate techniques learned during the teaching program and to obtain data in adjacent areas. The fully trained Nippon Foundation Scholars will be able to extend and apply their knowledge through teaching, demonstrating and explaining the importance of bathymetric mapping. Each area to be mapped would be overseen by a GEBCO Project Group that includes scientists and hydrographers from local states.

B Google Earth

Bathymetry appeared on Google Earth in January. It included credits to GEBCO, and to several other organizations. Although GEBCO had had some meetings with Google about bathymetry, the bathymetry that appeared on GE was in fact a poorly executed mix from several sources. Negotiations with Google are continuing with the aim of having GEBCO, and its updates, as the source of bathymetry in Google Earth. Millions of people who had never seen bathymetric maps, now have.

## Proposals To Improve Overall Inter Regional Coordination

### Support for IBCs

In some areas of the world, regional mapping projects are undertaken, usually with IOC support and sometimes with IHO support. The maps resulting from these projects are valuable in their own right, meeting the needs of users for seafloor maps. HOs within the map area can play a strong role as leaders and organizers, data providers, and cartographic experts. They can coordinate with each other the production and data flow, and going as far as to provide the geospatial infrastructure for the project. IBCs can be projects on which RHCs can focus and produce a tangible result demonstrable to others.

### Support for sending data to IHO Data Center for Digital Bathymetry (IHO DCDB)

HOs that have access to depths deeper than normal navigation depths can greatly assist GEBCO mapping the entire ocean by ensuring that the deep data is passed to the IHO DCDB. Data that HOs collect themselves is routinely passed to the Data Center, and this valuable data can in some cases by amplified by encouraging other organizations within the HO's sphere of influence to do the same.

### UNCLOS

Many HOs are involved with their State's preparation of juridical Continental Shelf mapping under Article 76 of UNCLOS. In some cases, neighboring Coastal States are cooperating in data collection. The data being collected, primarily over Continental Slopes, is usually the newest and most detailed in the area. Once the Coastal State's submission to the UN has been dealt with to its satisfaction, HOs can contribute greatly to mapping the world ocean by having the Article 76 data sent to the IHO DCDB.

From: IHO Inter-Regional Coordination Committee

# ANNEX 5

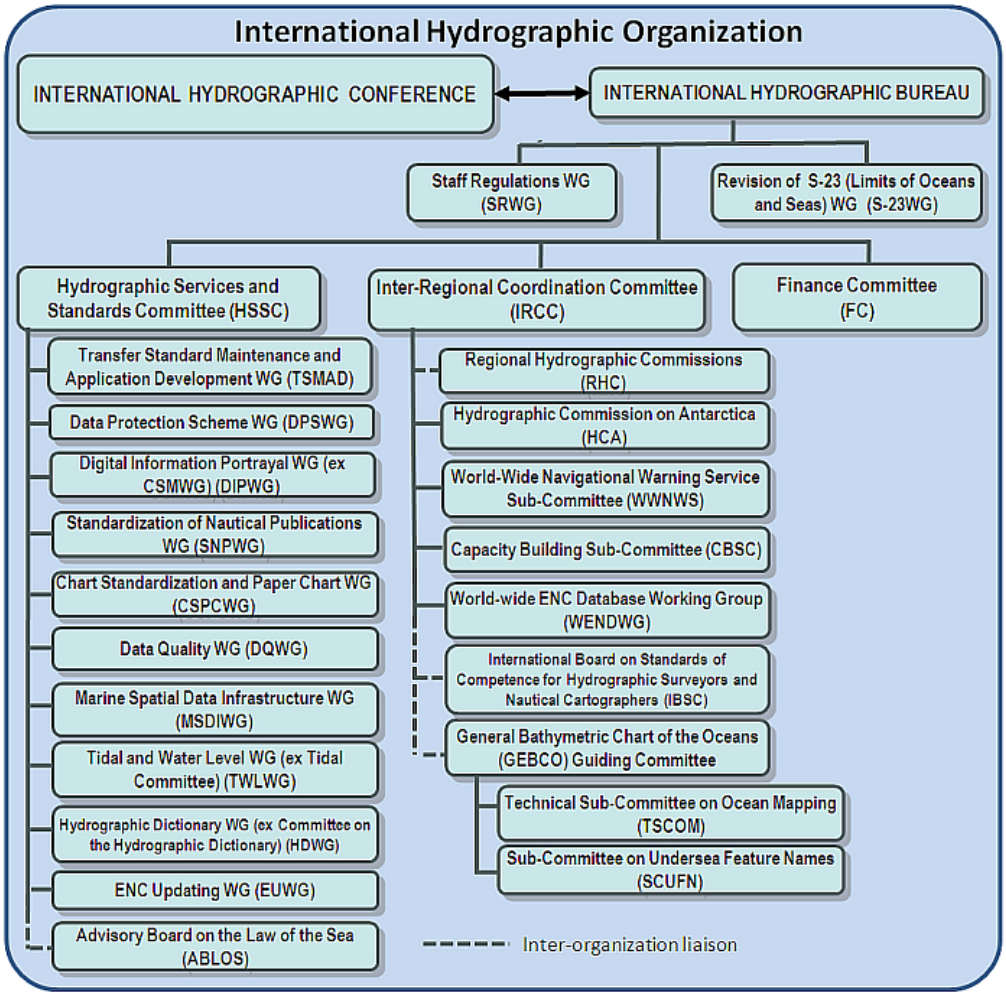
## IOC-IHO GEBCO Guiding Committee XXVI
## WORKING PAPER
## The IHO implication in GEBCO: the way forward

### Background

The XVII[th] International Hydrographic Conference (IHC) in 2007 approved the restructuring of IHO committees and other groups in order to improve the efficiency of the organization. The new structure which came into force on 1[st] January 2009 is based on two main committees:

- the Hydrographic Services and Standards Committee (HSSC) acting as the technical steering committee of the IHO;
- the Inter-Regional Coordination Committee (IRCC) in charge of the promotion and coordination of those activities that might benefit from a regional approach.

Each committee coordinates the activities of the relevant organs (IHO sub-committees or working groups and IHO contribution to inter-organizational bodies) according to the diagram below.



The IRCC scope includes the IHO-IOC GEBCO Guiding Committee (GGC) and therefore the Chair of GGC is a member of the IRCC.

Following the report on GEBCO presented at its first meeting in June 2009[1] the IRCC agreed that there was some merit in looking at ways to improve the relations between the IHO and GEBCO. This working paper reviews briefly the situation and suggests some ideas to consolidate the implication of the IHO in the GEBCO project.

**The present situation**

The IHO is convinced of the importance of the GEBCO project and committed to fostering its development. The related activities fall mainly[2] under the following strategic direction of the new IHO Strategic Plan approved by the 4th Extraordinary IHC in June 2009:

***"Facilitate global coverage and use of official hydrographic data, products and services***
*The IHO will strive to achieve global coverage and availability of high quality official hydrographic data, information, products and services necessary for safety of navigation at sea and for non-navigational uses, e.g. by means of the developing spatial data infrastructure, …"*

It is worth noting that the new definition of hydrography approved by the 4th Extraordinary IHC confirms the interest of IHO for non navigational applications:
*"Hydrography is the branch of applied science which deals with the measurement and description of the physical features of oceans, seas, coastal areas, lakes and rivers, as well as with the prediction of their change over time, for the primary purpose of safety of navigation* ***and in support of all other marine activities, including economic development, security and defence, scientific research, and environmental protection****."*

From the IHO perspective the Terms of Reference and Rules of Procedure for the GGC and its sub-committees that came into force on 1st January 2009[3] provide the appropriate framework. Yet, although element 3.7 "Ocean Mapping Program" of the IHO work program 2008-2012[4] contains the relevant tasks, ***it should be recognized that it does not translate into agreeing measurable objectives, planning the specific activities and allocating the associated resources necessary to implement these tasks in a consistent and traceable manner***.

In its written report provided after the 1st IRCC meeting the GGC identifies two directions to improve inter-regional coordination:

- **support for IBC projects** through the relevant Regional Hydrographic Commissions (RHC);

[1] A verbal report was offered by Commander Paolo Lusiani (Italy), an IHO member of the GGC and representing the GGC, a written report was provided later by the GGC Chair.
[2] The aspects dealing with capacity building relate to another strategic direction; they are handled by the IHO sub-committee on capacity building and are not considered here.
[3] See IHO CL 24/2008 and 59/2008.
[4] See http://www.iho.shom.fr/msonly/work_prog/WP_2008_2012_APPROVED.pdf.

- **support for encouraging IHO MS to pass data to the IHO Data Centre for Digital Bathymetry (DCDB)**.

The appropriate instruments already exist in the IHO resolutions approved by Member States:

- Administrative Resolution T1.3 on the establishment of RHC identify GEBCO and IBC's activities as a specific item in the structure to be used for National Reports tabled at RHC Conferences;
- GEBCO and IBC activities are also identified as an item for RHCs which have adopted a standing agenda;

- Technical Resolution A5.3 about the centralization of oceanic soundings aims at ensuring that all available data are forwarded to the IHO DCDB[5].

To further their effective implementation, the following ideas are offered for consideration by the GGC:

- address systematically to the RHC Chairs before [each][6] RHC Conference a report on the situation in their Region from the GEBCO perspective identifying specific shortcomings and issues to be considered to improve data coverage and quality (including the issue of extension to shallow waters);

- invite RHC Chairs to report after [each] RHC Conference on recent or planned bathymetric campaigns in their region and more generally on the RHC contribution to GEBCO;

- invite RHC Chairs to identify and express any specific requirement in their region for improved bathymetric products for non navigational purposes;

- whenever possible, consider/encourage the adaptation of on going and new IBC projects so that they fall under the aegis of a single RHC and that the IHO contribution to each project may be efficiently discussed and monitored within a single RHC.

As regards the working relation between the IRCC and the GGC, the GGC is kindly invited to note that IRCC has agreed not to require any additional reports from IRCC bodies. IRCC bodies just need to include in their standard meeting reports a section on issues to be considered by the IRCC and send a copy to the IRCC secretary.

[5] The revised version of TR A5.3 proposed by the GGC was approved by IHO MS in 2008 (see IHO CL 62/2008 and 85/2008).
[6] The periodicity may be adapted for those RHCs which meet annually.

# ANNEX 6

## Globes for GEBCO

Robert Anderson, scientific adviser to GEBCO
October 2009

1. At the request of David Monahan (Chairman of GEBCO Guiding Committee), about six months ago I initiated an effort to determine how custom world globes might be obtained, featuring the GEBCO world bathymetric data base in the design.

2. I contacted numerous globe manufacturers to determine whether they had interest in production of custom globes, and to get some idea of associated costs:

In the U.S. I had discussions with Replogle Globes; Cram Globes; Earthball Globes; and Columbia Plastics Corporation. Neither Replogle or Cram have any interest in producing custom globes. Columbia Plastics, which specializes in large (1 meter and larger) acrylic globes, estimated the initial cost to produce a custom globe at "tens of thousands" of dollars. Earthball, which produces inflatable globes, offered to produce a custom globe, but only upon receiving an order for several thousand (and they frankly told me that their globes are not suitable for more than a few days use).

I contacted Columbus Verlag of Berlin, who showed little interest in producing custom globes.

I determined that Scanglobes, in Scandinavia, is actually just a branch of Replogle Globes in the U.S. (no interest in custom work.)

I contacted a globe company in Italy (forgot the name) who had no interest.

Productive discussions were held with the Chinese company DongXin Globes, and the British company Greaves and Thomas. After much discussion, both companies offered to produce sample globes for me to present at the GEBCO meetings in Brest, France in September/October 2009. I managed to stop by Greaves and Thomas while en route to the GEBCO meeting to pick up the sample 12" globe from them. While the Chinese company did not charge us for the production of the globe, the express shipping cost to get it to the meeting was very expensive. A description of the two sample globes follows.

3. Greaves and Thomas produce globes by the standard globe-making technique of pasting paper gores onto a sphere, and sealing the finish with a coat of varnish. They make globes in various sizes, from about 10 cm diameter to nearly 2 meters diameter. All the globes they offer, except for the 12" (standard desktop size) are made of plaster of paris spheres. These they produce themselves, laying up plaster hemispheres in female molds, with burlap or jute embedded in the plaster to give it strength. The hemispheres are joined with additional plaster, and the resulting sphere used as the base for a globe. For the 12" diameter globes, Greaves and Thomas purchase acrylic spheres from an Italian globe manufacturer, prepare them by painting with an opaque sizing material, then use them as the bases for desktop globes. Interestingly, Greaves and Thomas already knew about GEBCO. One of their workmen had discovered the GEBCO gridded data base and contacted Pauline Weatherall to find out if he could use it as the design for a globe. He

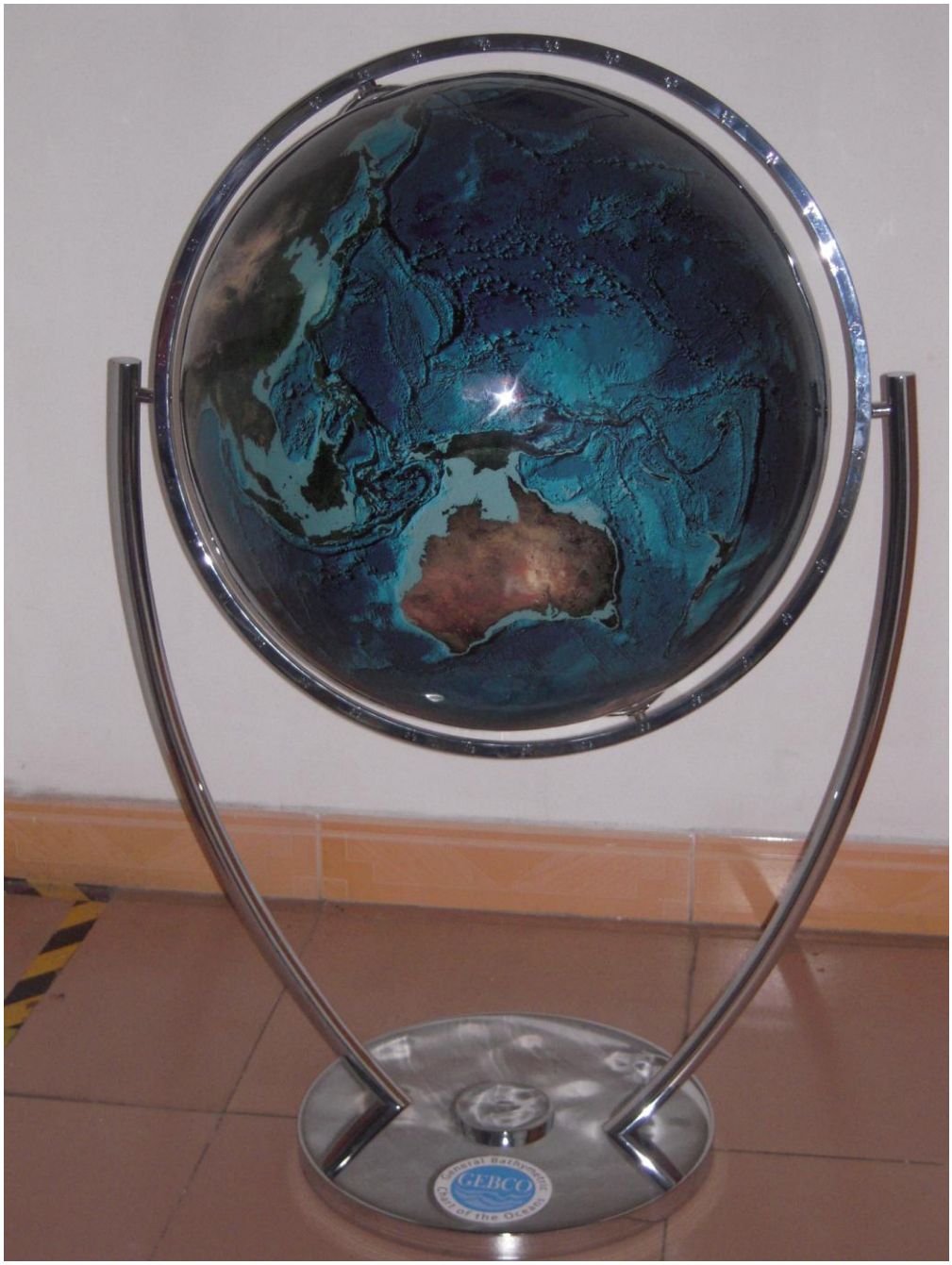
showed me that 16" diameter globe, and I was quite impressed. For the 12" diameter sample they produced for our meeting, Martin Jakobsson supplied them with an equirectangular projection that combined GEBCO bathymetry with Blue Marble terrestrial imagery. They actually produced four different globes, tweaking the colors to emphasize one part of the globe or another. As I write this short note, I have been in touch with Greaves and Thomas since the Brest meetings, and they continue to refine the design. I believe they will soon be ready to produce another sample.

The Greaves and Thomas desktop size globes retail for about 100 GBP. They will be willing to sell them to GEBCO for a wholesale price, probably about half the normal retail price. On top of that will need to be added the cost of whatever stand is used to hold the globe; and the shipping cost (not very expensive to ship to UK or western Europe, but quite expensive relative to the cost of the globe to ship them to US or Asia.)

4. DongXin produced a 62 cm globe sample for our meeting. They were also provided the GEBCO/Blue Marble map. The company claims a proprietary process for printing directly onto a sphere with high resolution inkjet printing. It is not clear exactly how this is done; close examination of the product reveals that, although the printing may be directly onto the sphere, the design is still laid out in gores, similar to what is done in standard globe manufacturing. The direct printing has not eliminated the usual problems of misregistration associated with pasting paper gores onto a sphere. Martin Jakobsson and I have been in touch with the company, and they assure us that they can improve on the printing, as well as improve on the general workmanship of the globes. We will work with them via email until they have assured us that the globe design has been improved; at that point, a visit to the company may be necessary to evaluate, first hand, the improved product. I think we must also discuss with the company how we might ensure quality control/quality assurance of any products from them, before they are shipped, because shipping from China is either very expensive (FedEx) or very complicated (sea shipping/customs clearance/inland shipping).

We have only very preliminary cost estimates from DongXin for the 62 cm globe. They are willing to accept orders for as few as a single globe. Price for a single globe, including FedEx delivery to the US or Western Europe, is about $3000 US. If demand is sufficient to justify a container size order (60 to 120 globes) the price could drop to under $2000 each, but would entail setting up of a distribution/shipping system.

5. I solicited comments from attendees at the GGC meeting in Brest regarding the globes. As a result of the comments I received, I intend to pursue further development of custom globes by both the Chinese and the British company. In addition, I received a comment relative to the usual GEBCO non-political stance (i.e., no country names or country boundaries on GEBCO maps). The comment was to the effect that many people who would like a globe featuring GEBCO bathymetry would actually like to see countries delineated and named. If you see an article in the news that a devastating tsunami has occurred, say, on the south coast of Indonesia you might want to examine your GEBCO globe to see where that is, relative to tectonic features on the seafloor. But your GEBCO globe does not tell you where Indonesia is; you must refer to another data source. Must you have two globes? Wouldn't it be simpler to have only one, which portrays both GEBCO bathymetry and political boundaries? Maybe there is a market for a (non-GEBCO) globe which incorporates GEBCO bathymetry.




**The DongXin 62 cm GEBCO globe**

**The Greaves & Thomas workshop, showing two GEBCO globes**

# ANNEX 7

Draft Review of "GEBCO - Guidelines for the General Bathymetric Chart of the Oceans, IHO Publication B-7 by the IHB

Steve Shipman, IHB

The Need

B-7 was last revised in 2003 since when revised ToR and RoP for GEBCO have been adopted by both IHO and IOC Member States and revised IHO Technical Resolutions A5.1; A5.2; and A5.3 have been adopted by IHO Member States. Consequently there is an urgent need to revise this publication to update it and to reflect the changes adopted elsewhere.

For consideration:

Title: GEBCO - Guidelines for the General Bathymetric Chart of the Oceans

*(B-7 already contains Annex 2 on the IBCs- Should B-7 be titled "Guidelines for Ocean Mapping" or should all reference to the IBCs be removed? – to be discussed with IOC and at the GGC meeting.)*

The structure of the current document is shown at Annex A. The following observations on this structure and the need for review are offered:

1. The Foreword requires updating – *(By the IHB once the other sections are complete.)*

2. Part 1 - It seems reasonable to have this at the beginning as it sets out the structure and organisation of GEBCO:

- Sections 1.1 and 1.2 describe GEBCO and its components. *(To be drafted by the GGC)*;
- Sections 1.3 to 1.6 cover the ToR, whilst this is a duplication of text already available on the GEBCO web site and the GEBCO section of the IHO web site, it would seem useful, for completeness, to keep this information in this document;
- Sections 1.3.1; 1.3.2; 1.4.1; and 1.4.2 *(IHB to insert the new ToR and RoP)*;
- Sections 1.3.3; 1.5.1; 1.5.2 and 1.6.1 *(To be drafted by the GGC)*;
- Section 1.7.1 *(To be drafted by the IHB, may need to await review of other text by the GGC)*;
- Section 1.7.2 *(To be drafted by the DCDB)*;
- Sections 1.8 and 1.9 *(To be drafted by IOC)*; and
- Annex A *(To be drafted by the DCDB)*.

3. Parts 2, 3, 4 and 5 seem to be very much related. These could possibly be merged to a certain extent and they require considerable rewriting. *(To be drafted by TSCOM)*.

- Part 2 - talks extensively of the "Volunteering Hydrographic Offices" is this still relevant / appropriate today? VHO's used to collect and compile soundings; this is now handled digitally by the DCDB. For consideration at the GGC Meeting in Brest.

- Section 2.4 relating IHO Publication B-4 *(To be drafted by the IHB - Tony Pharaoh)*.

4. Annex 1 gives the assembly diagram for the 5th Edition of the GEBCO Sheets – Is this still necessary?
*(If no 6th edition of the printed sheets is anticipated this should be deleted*.)

5. Annex 2 "Cartographic specifications for International Bathymetric Charts (IBC) Produced under IOC's Regional Ocean Mapping Projects. Is this appropriate if B-7 remains as the GEBCO Guidelines? See suggestion under the title above. Perhaps the new B-7 should have Part 1 – GEBCO and Part 2 – IBCs?
*(Opinion of IOC to be sought on this matter.)*

6. Annex 3 Acronyms and Abbreviations – always useful but needs checking and updating. *(GGC to compile following wide consultation.)*

7. A preliminary draft re-structuring is shown at Annex B.

GUIDELINES FOR THE GENERAL BATHYMETRIC CHART OF THE OCEANS
IHO PUBLICATION B-7 (Current Structure)

Foreword: description of B-7 and outline of contents

| Part 1 GEBCO Organizational Framework | Part 2 Bathymetric Data Management | Part 3 Digital Bathymetric Data Single Beam Echo Sounders | Part 4 Digital Bathymetric Data Multibeam echo Sounders | Part 5 Underway Geophysics Data | Annex 1 Assembly diagram for GEBCO Sheets (5th Edition) |
|---|---|---|---|---|---|
| 1.1 The GEBCO | 2.1 Role of HO VHOs | 3.1 Introduction | 4.1 Introduction | 5.1 Introduction | |
| 1.2 Organization & components of GEBCO | 2.1 Role of HO VHOs | 3.2 Guidelines for data organisation | 4.2 Guidelines for data organisation | 5.2 Storage of magnetic data within time series records | Annex 2 Cartographic specifications for International Bathymetric Charts (IBC) produced under IOC's Regional Ocean Mapping Projects |
| 1.3 The GGC | 2.3 Additional roles of IHO VHOs | 3.3 Echogram digitisation | 4.3 Data digitisation | 5.3 Storage of gravity data within time series records | Annex 3 Acronyms and abbreviations |
| 1.4 GEBCO Sub-committees | 2.4 IHO Publication B-4 Information concerning recent bathymetric data | 3.4 Contents of digital data files | 4.4 Contents of digital data files | 5.4 Data documentation | |
| 1.5 GEBCO Mapping | 2.5 Multi-beam data | 3.5 Data documentation | 4.5 Data documentation | | |
| 1.6 GDA | Annex A Accuracy categories for data digitised from ships' plotting sheets | Annex A Third edition echo-sounding correction tables | Annex A Nomenclature for various aspects of bathymetric data | | |
| 1.7 IHO<br>1.8 IOC<br>1.9 IOC CGOM | | | Annex B Supporting documentation for multibeam echo-sounding data | | |
| Annex A Operational procedures, systems and formats supporting the banking of bathymetric data at the DCDB | | | | | |

GUIDELINES FOR [THE GENERAL BATHYMETRIC CHART OF THE OCEANS] [OCEAN MAPPING]
IHO PUBLICATION B-7 (Draft Revised Structure)

**PLEASE NOTE THIS IS A VERY PRELIMINARY DRAFT AND WILL REQUIRE REVISION DEPENDING ON DECISION TAKEN DURING THE REVIEW**

Foreword: description of B-7 and outline of contents

| 1 General | 2 GEBCO | 3 IBCs | 4 Data Specifications | ? | Annex: Acronyms |
|---|---|---|---|---|---|
| 1.1 Ocean Mapping | 2.1 Structure | 3.1 Structure | | | |
| 1.2 IHO | 2.2 GGC | 3.2 CGOM | | | |
| 1.3 IOC | 2.3 GEBCO Sub-committees | ? | | | |
| | 2.4 GEBCO Mapping | ? | | | |
| | 2.5 GDA | ? | | | |

# ANNEX 8

Message to the GEBCO Guiding Committee from
the GRAL (gravity from altimetry) team[1]

Over the last three decades, satellite altimetry provided significant advances in our understanding of ocean dynamics and mapping the mean sea surface of the world's ocean. In solid Earth sciences, one of the most spectacular results was the production of a global gravity grid at 1 mile spacing, from which a global bathymetry grid was derived in combination with shipborne bathymetry soundings. The spatial resolution of these grids comes from the geodetic missions in 1985 and 1994 of Geosat and ERS1 altimetry satellites, which represent only 4% of the altimetric data collected since then. Despite extensive reprocessing of the raw data, satellite-derived gravity still fails to resolve wavelengths smaller than 25 km with an accuracy of 6 mgal in most oceanic areas, particularly on continental shelves and rough seafloor (in some favourable cases, these limits reach 16 km and 3 mgal). Since many investigations suffer from these limitations, we are promoting and looking for support for a new satellite-altimetry mission dedicated to the mapping of a high-resolution geoid, thus optimising the data coverage (drifting and high-inclination orbit) and benefitting from the increased accuracy of current altimetric radars (1 cm geoid or 1 mgal).

Such an initiative would certainly contribute to the GEBCO endeavour for accurate mapping of the world's ocean floor, since a high-resolution gravity field, and its derived bathymetry, proves very useful for detecting uncharted reliefs of the ocean floor or mapping areas with sparse soundings (e.g. Southern Ocean).

We respectfully ask the GEBCO Guiding Committee to consider writing a recommendation endorsing the general idea that a new satellite altimeter mission for marine geodesy designed for optimal spatial resolution should be undertaken at the earliest opportunity.

[1] M-F. Lalancette-Lequentrec (SHOM), J-Y. Royer and M. Maia (Univ. Brest & CRNS), L. Géli (Ifremer).

## ANNEX 9

# GEBCO PERSONALITY LIST

*(Last Revised 7 January 2010)*

## JOINT IOC-IHO GUIDING COMMITTEE FOR GEBCO

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| Lic. José Luis FRIAS Salazar | Dr Chris Fox (Vice-Chairman) |
| Prof. Martin Jakobsson | Commander Paolo Lusiani |
| Dr Hans-Werner Schenke (Chairman SCUFN) | Dr Kunio Yashima |
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Dr Walter Smith (ex-officio, Chairman TSCOM)

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Lt Cdr Hugo Montoro
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Dr Günter Giermann (Chairman of IOC/CGOM)

**The mailing addresses and other contact details of all the people listed above, plus those currently active in GEBCO, can be found on the GEBCO web site. An Alphabetical contact list of names, which is regularly updated, can be found at,**

**http://www.gebco.net/about_us/contact_us/**