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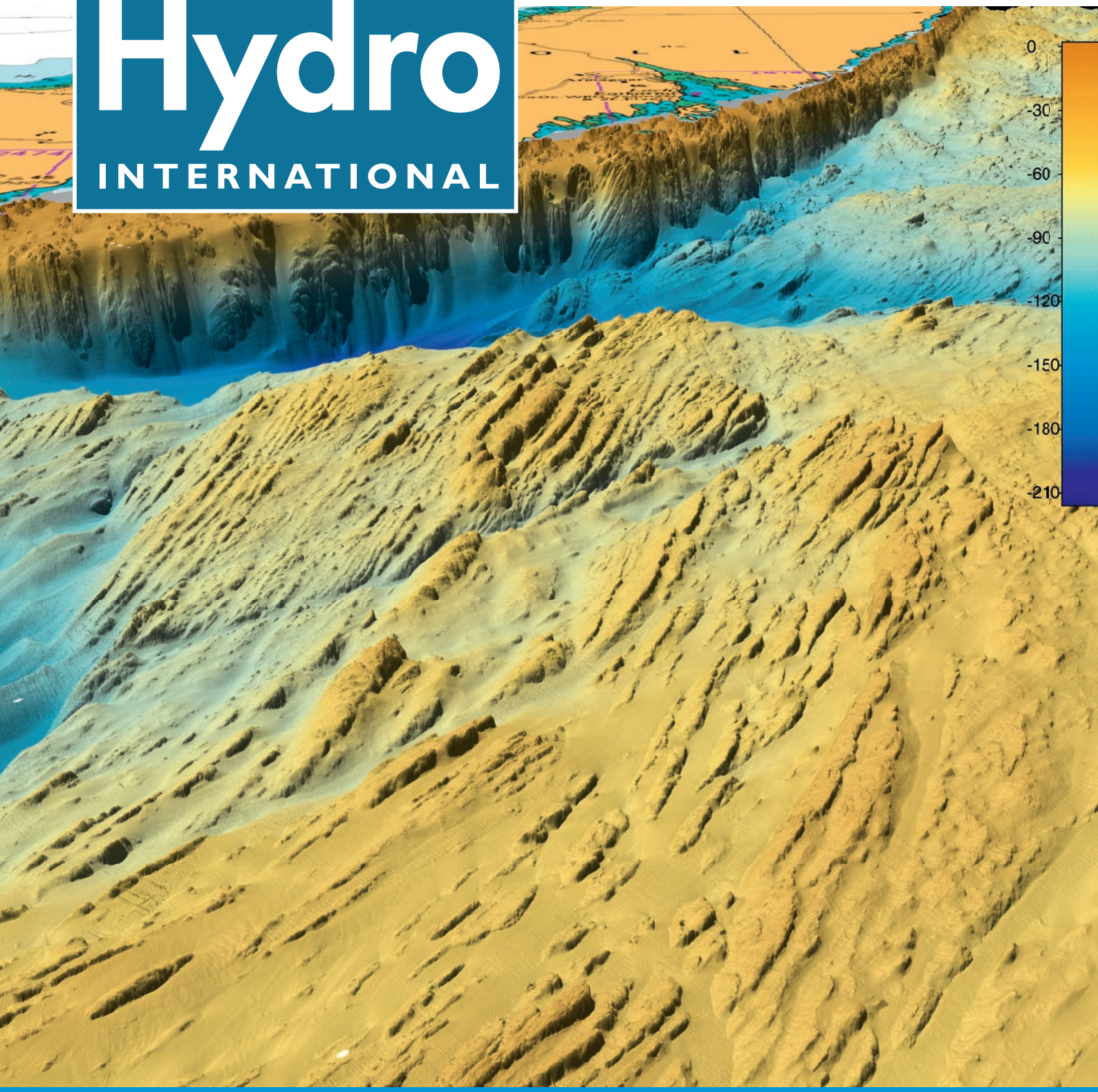

Characterisations of the Nigerian Shoreline

Making Use of Publicly Available Satellite Imagery

Human Element as Main Factor

Hydro International Interviews Markéta Pokorná

Echo Sounders versus Air Bubbles in Research Vessels

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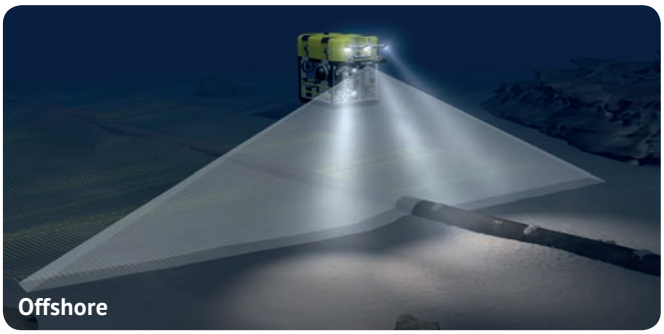
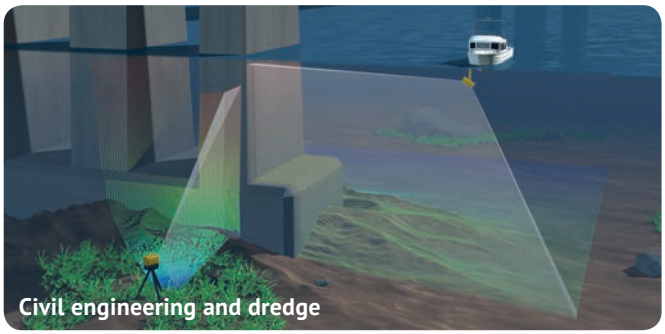

Offshore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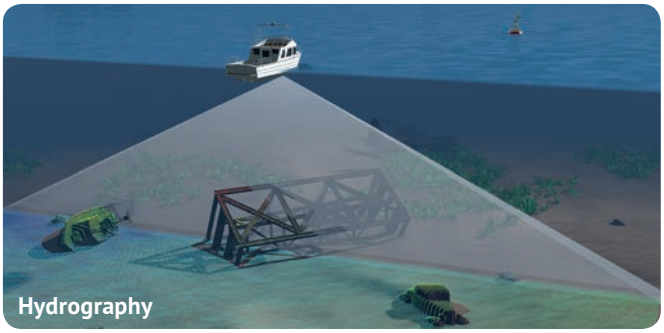
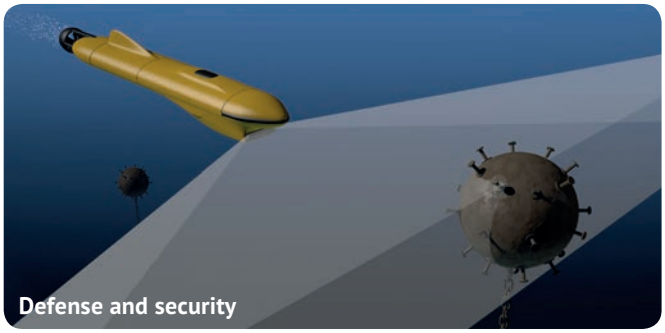

Hydrography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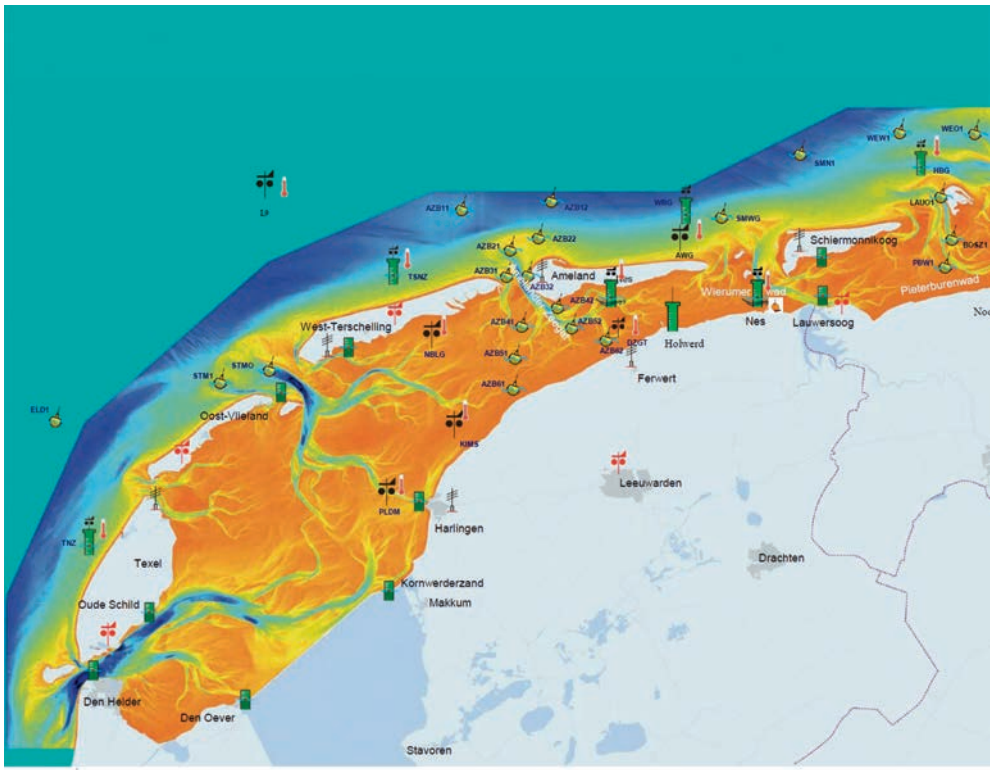

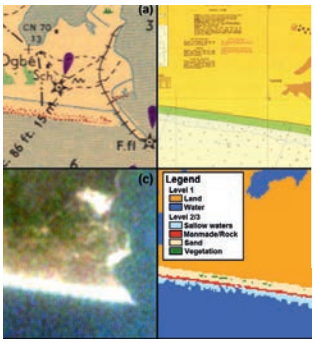

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Kongsberg EM2040D data captured by MMT UK showing the seabed across the Passage of Tiree, Scotland. This survey was a part of the Maritime & Coastguard Agency Civil Hydrography Programme to update nautical charts around the UK.

Hydro INTERNATIONAL

Hydro INTERNATIONAL is an independent international magazine published 8 times a year by Geomares Publishing. The magazine and related e-newsletter inform worldwide professional, industrial and governmental readers of the latest news and developments in the hydrographic, surveying, marine cartographic and geomatics world. Hydro INTERNATIONAL encompasses all aspects, activities and equipment related to the acquisition, processing, presentation, control and management of hydrographic and surveying-related activities.

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PHOTOGRAPHY: ARIE BRUINSMA (WWW.ARIEBRUINSMA.NL)

A Better Understanding

Durk Haarsma
durk.haarsma@geomares.nl

Nautical charts for navigation at sea are the oldest application of hydrography and still one of the most important ones. But navigation at sea is developing at a fast pace. The transition from paper charts to ECDIS is in full swing. The mandatory carriage of ECDIS makes that this year thousands of new vessels will be equipped with ECDIS. Also, training of mariners – navigation officers and other bridge personnel – in using ECDIS to navigate will grow substantially. The only factor that will slow down the ECDIS revolution slightly is the economic slowdown of the last few years, but all in all the revolution is inevitable and unstoppable. The maritime industry is undergoing a big change and this will have an effect on hydrography as well.

But what will these effects be, one could ask. Isn't the data delivered to be processed for paper charts the same as for electronic charts? Well, this might be true, but for one thing the perception of an electronic chart is different to that of a paper chart. This is a factor hydrographers will have to reckon with. To make it little clearer: hydrographers have to understand that users totally rely on technology without any further questions; especially younger, less experienced operators, who see information on a coloured display, backed up by a GPS overlay, tend to take its accuracy for granted. Such users may not realise that the source data could very well be quite old. It's up to the hydrographer to address this issue. The education of the digital user by the hydrographer is therefore a key point.

Furthermore, chart makers and users need better data. This means that hydrographers will have to embrace new techniques to create modern surveys more quickly; to name just two: satellite derived bathymetry and crowdsourcing are techniques that will conquer hydrography.

Lastly, those hydrographers active in chart making will need to have a growing understanding of what the users of their end products do. There are so many variables in the operation of ECDIS systems that they can no longer assume that navigators navigate in a standard way. The digital era is fundamentally changing the practice of navigation in a manner that cartographers will have to understand. They also need to understand what the manufacturers of ECDIS systems are doing and these two communities should cooperate even more closely to deliver a perfect combination of products for mariners.

We welcome two new members of our Editorial Advisory Board, who will also contribute to the column 'Insider's View' in each Hydro INTERNATIONAL issue: former UK Hydrographer Nick Lambert, and Capt Abri Kampfer, Hydrographer of the South African Navy. You may be looking forward to their first columns soon.

Let me end this first editorial of 2014 by wishing all readers of Hydro INTERNATIONAL a healthy and successful New Year. Have a great 2014!

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IMarEST Supports UKHO with Professional Development

The United Kingdom Hydrographic Office (UKHO) has joined the Institute of Marine Engineering, Science and Technology (IMarEST) as a Corporate Marine Partner. Its involvement with the initiative has had an immediate effect. This new partnership has already seen over 400 UKHO people enrolled as IMarEST members. Membership supports their Career Level Framework (CLF) and enhances the professional and technical development of UKHO staff.
http://tw.gs/RcvcD4

IAATO and IHO Collaborate to Chart Antarctic Waters

An IAATO sailing yacht has demonstrated that private and commercial vessels on expeditions in Antarctica can perform official hydrographic surveys and produce much-needed navigational charts for the region. Results were presented at the 13th Conference of the Hydrographic Commission on Antarctica (HCA) in Cadiz, Spain, from 3 to 5 December 2013, hosted by the Spanish Navy.
http://tw.gs/RcvcCW

Apply for Ship Time and Equipment on European Research Vessels

Within the European project EUROFLEETS2, scientists working within any field of marine science have until Thursday 27 March 2014 (16:00 CET) to apply for ship time on one of the 13 participating European research vessels and for the use of marine equipment. The Flemish research vessel *Simon Stevin* is one of the vessels taking part in this project as a way of contributing to international marine research. This exchange gives researchers the opportunity to carry out sampling work in more distant regions.
http://tw.gs/RcvcDx

The Belgian research vessel Simon Stevin.

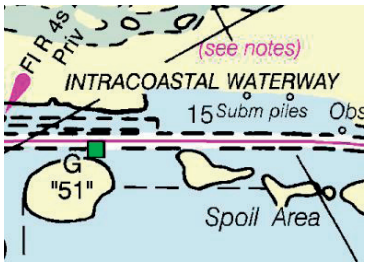
Surveying a Greek Underwater Archaeological Site

Researchers from Plymouth University (UK) recently conducted a marine geoarchaeological survey off Methoni, Greece. The survey results from the side-scan survey presented digital sonograph records and georeferenced mosaics of the submerged prehistoric settlement ruins, the ancient harbour and its submerged breakwater, as well as records of historic shipwrecks, cannons and artefacts over the site.
http://tw.gs/Rcvddv

An overview of the surveyed area.

'Magenta Line' to be Improved on Intracoastal Waterway Nautical Charts

The US Office of Coast Survey will update future editions of nautical charts of the Intracoastal Waterway to include an improved 'magenta line' that has historically aided navigation down the East Coast and around the Gulf Coast. The magenta line's function will be changed from the perceived 'recommended route', established more than 100 years ago, to an advisory directional route that helps prevent boaters from going astray in the maze of channels which make up the route.
http://tw.gs/RcvcC1



The magenta line will be back after updating, this time with a clear purpose.

QINSy

The modular design, user friendly user interface, comprehensive help and support of international standards and exchange formats, mean QINSy is equally well suited to less complex bathymetric surveys as it is to highly complex multi-vessel and multi-sensor offshore construction projects.

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Coastal mapping
Environmental
Exploration
Geological
Habitat mapping
Hydrographic
Academic
Offshore
Marine construction
Marine Data Management

No. 3267

Support for Saudi Hydrographic Data Project

OceanWise, UK, has collaborated with Caris BV, The Netherlands, to support the General Commission for Survey (GCS), Kingdom of Saudi Arabia (KSA). The support is helping KSA to further develop its capability and capacity as it embarks on a programme to produce electronic navigation charts (ENCs) of its national waters, as well as supporting wider uses of hydrographic data, as part of the Kingdom's National Spatial Data Infrastructure (NSDI).
http://tw.gs/RcvcD2

N-Sea Acquires Subsea Business

The acquisition of the subsea business of Stork Technical Services in Aberdeen, UK, by the Netherlands-based N-Sea is a next step in the growth strategy of both companies and emphasises N-Sea's strategy of becoming a leading survey and IMR company.
http://tw.gs/RcvcDz

Most Shared

Most shared during the last month from www.hydro-international.com

1. Surveying a Greek Underwater Archaeological Site - http://tw.gs/Rcvddv
2. 3D Sonar Map Reveals Details of Civil War Wreck - http://tw.gs/Rcvdd2
3. Sea Trials for Long Endurance Marine Unmanned Surface Vehicle - http://tw.gs/RcvddX
4. SHOM Data Available as Open Data Online - http://tw.gs/Rcvdev
5. ALB Evaluation for NOAA Charting Requirements - http://tw.gs/Rcvdea

Changes in Hydroid's Key Leadership Positions

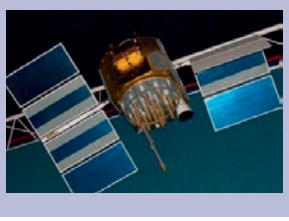
Hydroid, Inc., USA, has announced changes in its leadership team. Christopher von Alt, one of the company's founders and primary forces in its growth since its inception in 2001, has elected to resign from his position as president, effective 1 January 2014. Hydroid's board of directors has selected Duane Fotheringham, Hydroid's current vice president of operations, as his successor. Graham Lester has been appointed as vice president of sales & marketing.
http://tw.gs/Rcvda1

Fugro Signs Joint Venture Foundation Agreement With SOCAR

Fugro has reached agreement with the State Oil Company of the Azerbaijan Republic (SOCAR) to form a new joint venture for the performance of bathymetric, geophysical and geotechnical surveys, the provision of autonomous underwater vehicles (AUVs) and remotely operated vehicles (ROVs), diving services and general positioning support, both onshore and offshore, throughout the Republic of Azerbaijan.
http://tw.gs/Rcvdaw

American Bill Causes Setback for Russian GPS Alternative

The US President, Barack Obama, has signed a bill prohibiting Russia from constructing any stations in the country that could improve the precision of GLONASS, the Russian alternative to GPS. This was announced by the leading newspaper, *The New York Times*. Russia has been working on improvements to GLONASS for some time so that it can compete effectively with the American GPS.
http://tw.gs/RcvcDX



Dr Jonathan Beaudoin Joins QPS Development Team

The product development team of QPS, Canada, has been extended with the appointment of Dr Jonathan Beaudoin. Having participated in nearly 40 mapping cruises in which he used most modern multibeam mapping systems, Jonathan brings valued field experience and domain knowledge to the QPS team.
http://tw.gs/RcvcDW

More news
www.hydro-international.com/news/news.php

Human Element as Main Factor in Hydrography

Hydro International Interviews Markéta Pokorná from HafenCity University

HafenCity University in Hamburg is one of the most thriving European Universities with a Specialisation in Hydrography. Professor Markéta Pokorná has been named professor of hydrography and practical geodesy on a temporary basis for two years after the unfortunate and unexpected death of her respected predecessor Volker Böder. Markéta Pokorná, originally from the Czech Republic and educated as geodesist and cartographer at the Czech Technical University in Prague, has her own views on hydrography. Hydro International talked to Professor Pokorná in Hamburg, where she explains her responsibilities at HafenCity University. "I took over the community of hydrography students and lectures. I started the communication with companies to find out which projects will have priority over the coming weeks and months."

Durk Haarsma, publishing director, Hydro International

How difficult is it to take over from a figure as well-known as Professor Böder?

I only met Professor Böder once in Hannover in December 2007 after the Geodetic Colloquium. I was introduced to him and mentioned that I would be interested in teaching hydrography and we exchanged business cards. I found out about his death when I started working at Fugro OSAE. A student told me about the second advertisement for the position at the HCU. She gave me an impulse and a few months later I was chosen as his successor. I am still discovering new issues every day, hearing what students, companies and colleagues discussed and initiated with Professor Böder. It takes a careful approach to see how we can continue where he left off. I am trying to connect the past with the here and now and even with the future.

How big is Hydrography in Hamburg these days?

Over the last five years, the growth rate for Hydrography was up to 80% per year. And the expected growth rates for the coming years are expected to be similar. Starting with 5 students in 2008, we have now 17 Master's students from 10 different countries. 90% of our students come from outside Germany. We have students from Africa, Asia

and America, but also from other European countries like the UK. The tuition fee is low in Germany. Hamburg is one of the most attractive cities in Germany. The brand new university buildings are in the new quarter of HafenCity, close to the city center and with great synergy with other faculties and a direct view of the Elbe River.

Over the past years, HafenCity University has gained quite some fame throughout the hydrographic world. How would you explain this?
We are located close to the water, we have close contact with the port authority and state institutions, and we cooperate with universities and institutes in Bremen, Bremerhaven, Kiel and Hamburg. The maritime industry is closeby and we try to develop close cooperation with some of these organisations.

The HCU appointed a professor of Hydrography and Practical Geodesy, together with an innovative way of thinking of the University. Geomatics, with its specialisations (GIT: Geoinformation Technology, GMT: Geodetic Measurement Technology, HYD: Specialisation in Hydrography), overlaps with other faculties within the HCU.

Urban planning and Geomatics share GIS development together, and the inclusion of 3D data and plans also belong here.

Civil Engineering and Geomatics develop concrete bodies together, and work on deformation measurements and reverse engineering. In addition, projects of free-form areas are topics in this interface.

Architecture and Geomatics are interested in the IS-state of areas, buildings, and above all, in the metropolises. For example, taking measurements in the harbour using laser scanning from a ship. Geomatics Specialisation – Hydrography is the only CAT- A Hydrographer course in Germany and one of a total of nine in Europe. It is a great opportunity and challenge for me to take over the responsibility for this fast developing faculty in Hamburg.

What are the challenges of modern hydrography?
In my opinion, the major challenges of modern hydrography are optimising and minimising our hardware for measurement devices and developing state of the art software for these devices and visualisations. ROV and AUV technology is not yet well established underwater and substantial efforts have to be made to reach results similar to those seen for example on the 'mobile phone' side. Our systems are large, expensive and not always flexible. Continuous underwater data exchange between our ships and ROVs or AUVs is not yet possible without a cable. We need fast, small, cheap and flexible systems to reach our goals in hydrography. Therefore, universities and industry have to work hand in hand to create new solutions. During a trip out on a ship I saw that sometimes technologies are not compatible, with discrepancies occurring between software and hardware. We need skilled personnel to cope with these challenges. Often there are just 'software' people and 'hardware' people, and nothing in between. For example, during the IP Erasmus Summer Camp in France, which was organised together with French ENSTA and Belgium's Ghent University, I was in a group of students testing a new sonar prototype. But setting up the measurement devices took seven days! This made me aware that we may have to train students more in the basics of electronics and informatics. Hydrography should no longer be treated as a silo specialism.

How important is the cooperation between the university and industry for you?
This cooperation with industry is very important. It is one of my top priorities to establish extensive partnerships. As mentioned earlier, for hydrography measurement devices, methods and software to evolve, we have to ensure that there is close cooperation between university research and industry. I am also trying to show my students the importance of working together with industry, for instance in projects with economic aspects. It is important for the students to experience their future workplace at a very early phase and to establish contacts with industry. We try to include presentations by external specialists in our education. Recently, we have been able to welcome specialists on RTK corrections, geological core, and ADCP. I am sure that students are interested in actually obtaining information from the practical work.

The hydrographer on board will be part of a network of surveyors

What other priorities have you identified as important to emphasise in your term of office?
The other two main priorities are obviously good teaching, and research in the field of ROVs and AUVs. The first one is self-evident. The second, research in ROVs and AUVs, is simply due to the fact that unmanned vehicles are becoming an increasingly

Prof. Markéta Pokorná, PhD was born in 1980 and studied at the Czech Technical University, Geodesy and Cartography (2004), in Prague, where she also defended her PhD thesis (2012) concerning the determination of sea ice thickness in the Weddell Sea. Her academic career included many international periods of study at the University of Hannover, at the Institute of Alfred Wegener, at the University of New Brunswick, and at the University of Hamburg. Since 2013 she has been working at HafenCity University in Hamburg, where she obtained the position of temporary professor in Hydrography and Practical Geodesy. In addition to experience in Academia, she gained experiences in industry: from 2012-2013 she worked as hydrographer in the Barents Sea and was pilot of an underwater crawler for cable tracking in the German Bight at Fugro OSAE. Besides many expeditions, she spent one year in Antarctica (2011) where she was responsible for the geophysical observatory.

hot topic in hydrography and I would like the HCU to play a role in that development area.

Which set of skills is, in your view, most important for a modern hydrographer?
An excellent modern hydrographer in my eyes is somebody who can solve various problems, starting from work with board equipment, a laser scanner, sub-bottom profiler, magnetometer, side-scan sonar, but also electro techniques, data processing (point cloud compression) to seafloor topographic modelling and visualisation. A skilled hydrographer interacts with other colleagues, is able to communicate well and discuss problems on the daily basis. She/he is also aware of safety issues.

And what personal qualities shape the ideal modern hydrographer?
The ideal modern hydrographer should be a team player who is stress-resistant, able to live in harsh or at least uncomfortable conditions, creative and able to cope with situations that are not standardised in a handbook, communicative, patient, attentive, proud of the profession and a sense for humour would be a pleasant plus. He/she must be a curious, technical- and solution-oriented globetrotter interested in working together with different people from different countries and cultures on ships with varying levels of luxury which can sometimes mean a high level of adaptation to the surrounding.

Universities and industry have to work hand in hand to create new solutions

You also emphasise the human element as an important factor in hydrography. Can you explain this?
The human element is a factor that influences work in general and hydrographic surveys in particular. On board, small groups of people work in isolation, with all kinds of human interaction having an impact on the group and therefore also on the outcome and success of the work of the group. To work in such an area social intelligence and patience are extremely important and helpful assets. People who work in such areas must be well-established characters with both feet firmly on the ground.

Do you see an end to the traditional surveyor on board of a ship, with them being replaced by aerial bathymetry, both airborne or satellite?
I do not believe that this will change in the near future. Bathymetric Lidar and satellite altimetry can work complementary to sonar mapping. They do the rough work for us, but we still have to finish the fine tuning (higher accuracy) on board. It means that ships as a carrier (platform) will continue to be the most common working place for hydrographers. I do think that the position of hydrographers will change. The work of the hydrographer on board will become more interconnected with other specialties, for instance aerial bathymetry, drones, crawlers, robots, underwater positioning responders and others. The hydrographer on board will be part of a network of surveyors, more so than is currently the case. The measurements will be faster and the ship trips shorter.

What do you want to have achieved when your term ends in two years?
I would really like to have a state of the art teaching vessel here in Hamburg, which can go out onto the Elbe, but also to coastal areas in the North Sea and the Baltic and to offshore wind farms for research or educational rides. I would also like to establish and develop good working relations with industry, for instance to carry out research on prototypes of new products. This is a new university and I would like to connect academics to the outside wolrd, in keeping with the vision of this university. My aim is that everyone involved with hydrography across the world knows our university and is aware of our key projects. I would like to have more highly educated students in hydrography than we have today. I would like to launch preparatory courses for new students with different professional backgrounds. We are well on the way to becoming one of the most interesting universities for hydrography in Europe.

Echo Sounders versus Air Bubbles in Research Vessels

Lessons from Experience

Within echo sounding circles it is well known that air bubbles may have a negative effect on echo sounding systems. This article briefly presents the German way of dealing with air bubbles from sweep-down and cavitation processes as well as our experiences with the last three large research vessels (RVs *Polarstern, Meteor* and *Maria S. Merian*). The practical experience resulted in the development of an optimised new hull form for the replacement of RV *Sonne*. The new ship is now under construction at a German shipyard and will be delivered in autumn 2014.

Klaus von Bröckel, GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany.

THE BASIS OF ALL ECHO sounding systems is the directed transmittance of sound into the water at different frequencies and the recording of its reflection through suitable receivers. The reflection (echo) occurs at boundary layers e.g. within the water column, at sediment surfaces or fishes. Even boundary layers within the sediment can be recorded in this way. Naturally, any air or other gas bubble within the water possesses a rather sharp sound-reflecting boundary layer too. So, as long as there is only water through which the sound is travelling, everything is fine and records are worth reading. But as soon as air or any other gas (e.g. methane) in the form of small and large bubbles (size range might be between less than 1mm to more than several cm) gets in the way of the sound, it is stopped and/or redirected. No or only bad echo sounding records are the result. Hereinafter, all 'gas bubbles' are referred to as 'air bubbles' for easier reading.

Two quite different sources of air bubbles exist: (1) Obvious are the bubbles from the water surface. With increasing wind and wave action more and more air is mixed into the uppermost water layers. By observing the water surface, whitish water with enclosed bubbles can be seen. Also, as ship movements accelerate, these bubbles are transported along the sides and finally underneath the hull with the installed echo sounding transducers. This process is called 'bubble sweep-down'. (2) More hidden are the bubbles from cavitation processes hereinafter called 'cavitation bubbles'. Actually, as the science behind this phenomenon is obscure and not fully understood, the following description is more a theory, than a proven fact. 'Cavitation bubbles' come into existence when small and even very small vortices exist, e.g. at sharp edges or weld joints. The water may show different pressures on a small scale within these vortices. The capability of water to dissolve air depends on its actual pressure (this phenomenon is well known from pressure cookers). So, if the pressure changes abruptly at these edges, air may be released in the form of bubbles. Especially, when seawater is air saturated or even air supersaturated, bubbles 'spring' into existence. This is shown schematically in Figure 1. This phenomenon is well-known from ship propellers where it is normally avoided by a 'cavitation-free' design.

In general, any given problem has several and sometimes quite different solutions. These differences may reach into the field of philosophy. Why should it be different when dealing with the problem of 'echo sounders versus air bubbles'? The philosophy in Germany concerning the installation of echo sounding transducers is to keep them as close to the bottom as possible. Thus, the optimal solution would be a flat hull and a flush installation. Actually, in most German research vessels echo sounding transducers are installed as far as possible to the front and within a box keel (height between 50 and 70cm) enlargement.

Lessons Learnt from RV *Polarstern*

Polarstern is an ice-breaking research and supply vessel (length: 118m, width: max. 25m, draught: max. 11.2m). Launched in 1982, she mainly works within the Antarctic and the Arctic and also supplies the German Antarctic station. One of the most impressive features of the ship is the ratio of underwater length and width. In a dry dock she looks like a huge duck. From ice-tank model tests it was predicted that no ice whatsoever will reach underneath the ship. Practice killed theory and after just the first cruise into Antarctica the ship's bottom looked like an old washboard with huge dents in the steel plates between the rips. Although rather large pieces of ice made their way down

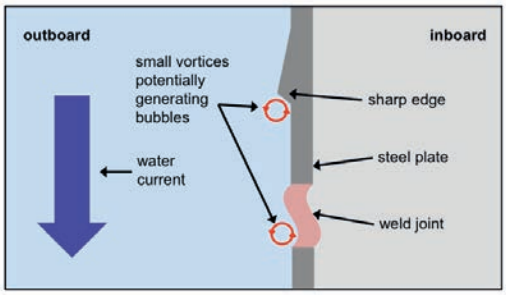


Figure 1: Generation of cavitation bubbles - a theoretical and schematic view.

Figure 2: Eddies on sides of bulbous bows.

Figure 3: The two bows of RV *Meteor*, before and after conversion.

underneath the ship, during normal cruising no air bubbles interfered with the echo sounding systems. The systems were installed within a box keel of about 70cm in height.

So, lessons learnt: (1) do not trust all aspects of tank model tests and (2) if a ship is deep enough or even unusually deep, no bubbles will normally reach underneath the bottom.

Lessons Learnt from RV *Meteor*

Meteor (length: 97.5m, width: max. 16.5m, draught: max. 5.6m) is a globally operating RV. She came into service in 1986 as one of the most modern RVs at the time. She has been working mainly within the Atlantic Ocean and its marginal seas, the East Pacific and the Indian Ocean. During the planning phase, attention was paid: (1) to developing a hull form that would prevent any air bubbles reaching underneath the hull and disturbing the function of the echo sounding systems, (2) towards an optimal hull form regarding energy consumption at maximum as well as normal travel speeds, (3) to limiting draught to about 5 metres, so the ship would be able to carry the German flag even into small and shallow harbours. Numerous tank tests were carried out to make sure all these different tasks were fulfilled. The bubble sweep-down tank tests gave satisfying results. The resulting hull form was characterised by a huge bulbous bow. The big surprise during the first sea trials: echo sounding systems worked poorly or not at all. It became clear, that lots of surface air was trapped within large eddies on both sides of the bulbous bow and swept down the ship's sides. Figure 2 shows this phenomenon for a 'normal' container vessel on its way through Kiel Canal. Installation of cameras below the ship clearly revealed carpets of air bubbles being swept underneath the ship. Naturally, the bulbous bow had to be cut off and replaced by a different one. Figure 3 shows the bows before and after conversion. Furthermore, echo sounding transducers were placed within a lateral extension of the box keel (height about 50cm) as seen in Figure 4. The new bow and the new installation resulted in a slightly reduced speed but also in echo sounding devices that worked.

So, lessons learnt: (1) do not trust all aspects of tank model tests, (2) bulbous bows do not fit with echo sounding systems and (3) integrating echo sounding transducers into an enlarged box keel away from the hull bottom is a solution that works.

Lessons Learnt from RV *Maria S. Merian*

Maria S. Merian (length: 94.8m, width: max. 19.2m, draught: max. 6.5m) began service in 2006. She was designed according to the experiences of *Meteor*. From the very beginning there were no questions about a bulbous bow as the ship was intended to be an ice-margin vessel. She had to be able to manoeuvre between ice-flows and to break ice. So, an ice-bow was required. Again all tank tests promised no air bubbles would ever reach the bottom. Surprisingly, the first sea trials revealed that all echo sounding systems refused to give decent results. As camera systems were installed underneath the bottom, again they presented huge carpets of bubbles passing by. As there was no bulbous bow, the source of the bubbles had to be within the bow itself, namely as 'cavitation

The ship's bottom looked like an old washboard

Figure 4: Enlarged box keel of RV *Meteor* (side view and installed echo sounding transducers).

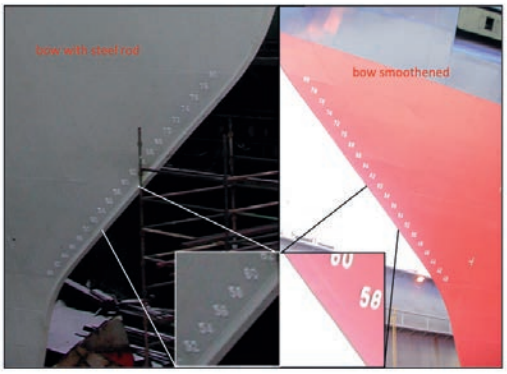


Figure 5: Ice-bow of RV *Maria S. Merian* with steel rod with sharp edges before and after grinding.

bubbles'. The typical icebreaker bow had a large rectangular iron rod fixed in the front to make the first ice-contact. This rod featured sharp edges on both sides. Other edges and unevenness, but less sharp, existed at the depth numbers and other markings. Especially, the edges of the iron rod at the bow supposedly produced cavitation bubbles during cruising. Not everybody involved was convinced. But there was no other logical reason and/or possibility for the echo sounding system failures. So, the sharp edges of the iron rod were cut off and ground down. Furthermore, the whole front part of the bow was smoothened. The situation before and after can be seen in Figure 5. The next sea trials with similar sea conditions and ship movements as before produced good echo sounding results.

So, lessons learnt: when constructing a research vessel's bow, avoid any sharp edges and unevenness where small vortices could build up and produce cavitation bubbles.

General Conclusions on Air Bubbles

(1) bubble sweep-down:
- bulbous bow should be avoided
- echo sounding systems should be positioned as far to the bow as possible
- echo sounding systems can be installed in an enlarged box keel

(2) cavitation bubbles:
- their production and appearance is actually not yet fully understood and thus less predictable (e.g. the installation on RV *Meteor* of a retractable bow thruster with edges directly underneath the bottom did not produce cavitation bubbles)
- nevertheless, any sharp edges at the bow part should be avoided; it should be as smooth as possible
- furthermore, creation of cavitation bubbles can also produce noise at different frequencies, which may interfere with any acoustic devices.

Do not trust all aspects of tank model tests

Hull Design for RV *Sonne*

The 'old' RV *Sonne* with a hull age of nearly 46 years is to be replaced. The new *Sonne* will be a deep-sea research vessel (length: 116m, width: max. 20.6m, draught: max. 6.6m) thought mainly to operate in the Pacific Ocean and its adjacent areas. The largest echo sounding array had to be considered (0.5° x 1°beam-opening, transducers length and width about 16 and 8m respectively). Naturally, all the experiences from former research vessels had to be taken into consideration. Furthermore, the results of a discussion that took place in 2010 during a workshop on 'Optimisation of Research Vessel Design for Acoustic Sensors' at the 23rd International Research Ship Operators Meeting were kept in mind. At the time, a hull form was emphasised that would channel surface born air bubbles from bubble sweep-down far along the sides. They would then only reach the bottom behind the installed transducers. This led to the development of a new hull form (see Figure 6). The hull exhibits a 'dent' along each side to channel the surface-originated air-water mixture far behind the installed transducers. Below this dent, all transducers, huge and small ones, are arranged within a kind of integrated gondola. The avoidance of cavitation bubbles is assured by smoothing the whole front part of the bow. This applied mainly to welding joints.

To date, only 'normal' tank tests and computer simulations could be carried out. Both showed bubble sweep-down behind the last crossbeam of the multibeam array (see Figure 7). And although tank test results should be regarded with some caution as noted above, they are still the tool most used for predicting hull performances.

Naturally, the first sea tests to be held early 2014 are eagerly awaited, to see

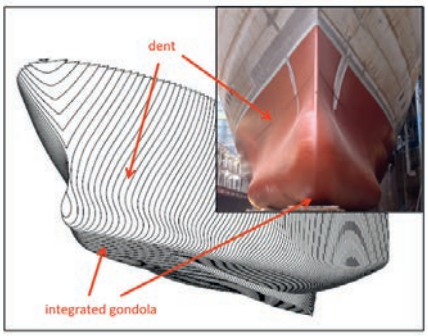


Figure 6: Newly developed hull of RV *Sonne*, theory (drawing) and practice (front bow).

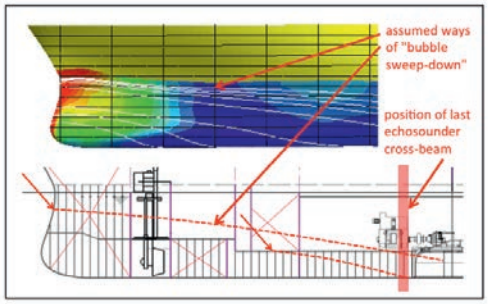


Figure 7: Predicted bubble sweep-down by tank test and computer simulations.

whether practice will be consistent with theory this time.

Acknowledgements
The experiences and advice of numerous persons contributed to the design and construction of the RV *Sonne*. Many thanks to them, in particular to the technicians and scientists of the Scientific-Technical Advisory Committee, the Federal Waterways Engineering and Research Institute (Hamburg) and the Meyer Shipyard (Papenburg). This project was founded through a BMBF-project 03F0653I (Federal Ministry for Education and Research).

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The WTI Field Measurement Programme

Data for Numerical Models to Predict Water Levels and Wave Conditions in Extreme Storms

Numerical models are used to predict water levels, wave heights and wind fields under extreme storm conditions. This paper aims to give a short overview of the measurements of three field sites in The Netherlands.

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VALIDATION MATERIAL FOR these numerical models is obtained in a long-running dedicated so-called WTI field measurement programme being carried out in three areas in the Netherlands (see Figure 1):

- Dutch Wadden Sea site: an area enclosed by a series of barrier islands and the Dutch mainland coast with complex bathymetric features.
- Petten dike site: a site with a bathymetric profile typical for the open Dutch coast, starting offshore (> 20m deep) and gently sloping, including some sand banks, towards the dike.
- Lake IJssel site: a large (20 x 60km^2) and relatively shallow (~4m deep) lake.

Background and Goal of the Measurements

In the assessment of the Dutch primary water defences against flooding, knowledge of the wind field, water levels and wave conditions under extreme storm conditions is required. Numerical models are used for this purpose: HARMONIE (wind), WAQUA (water levels) and SWAN (waves). A field measurement programme, initiated in 2003, aims to provide validation data for these models. Obviously, the main interest is in obtaining data under storm conditions; if the models perform satisfactorily under these conditions, we trust their performance under extreme storm conditions more.

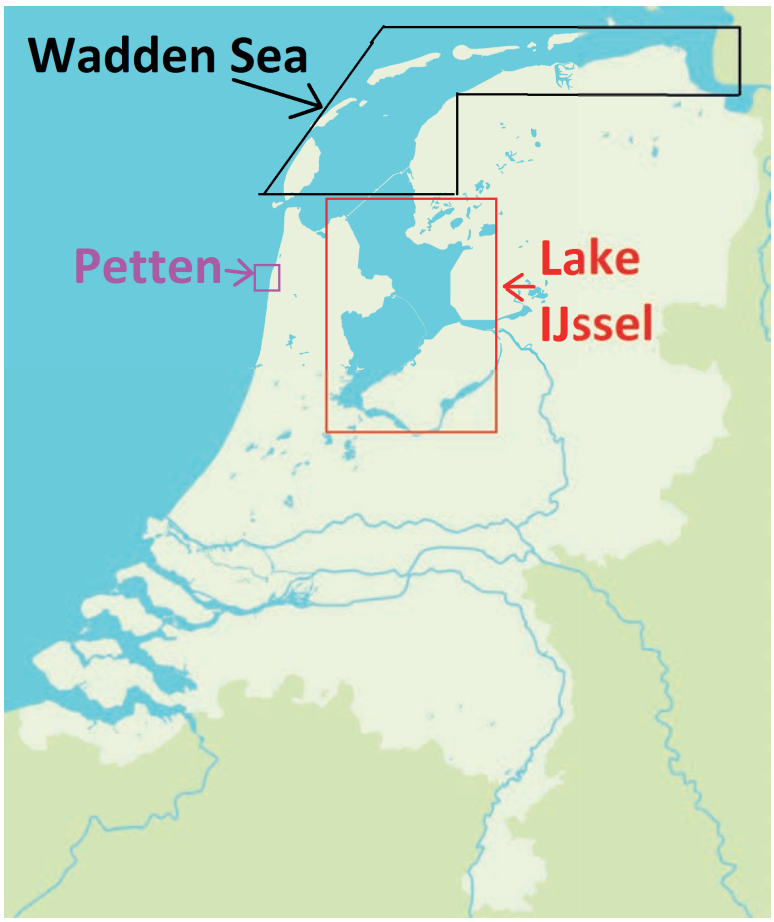

Figure 1: Three WTI measurement sites in The Netherlands.

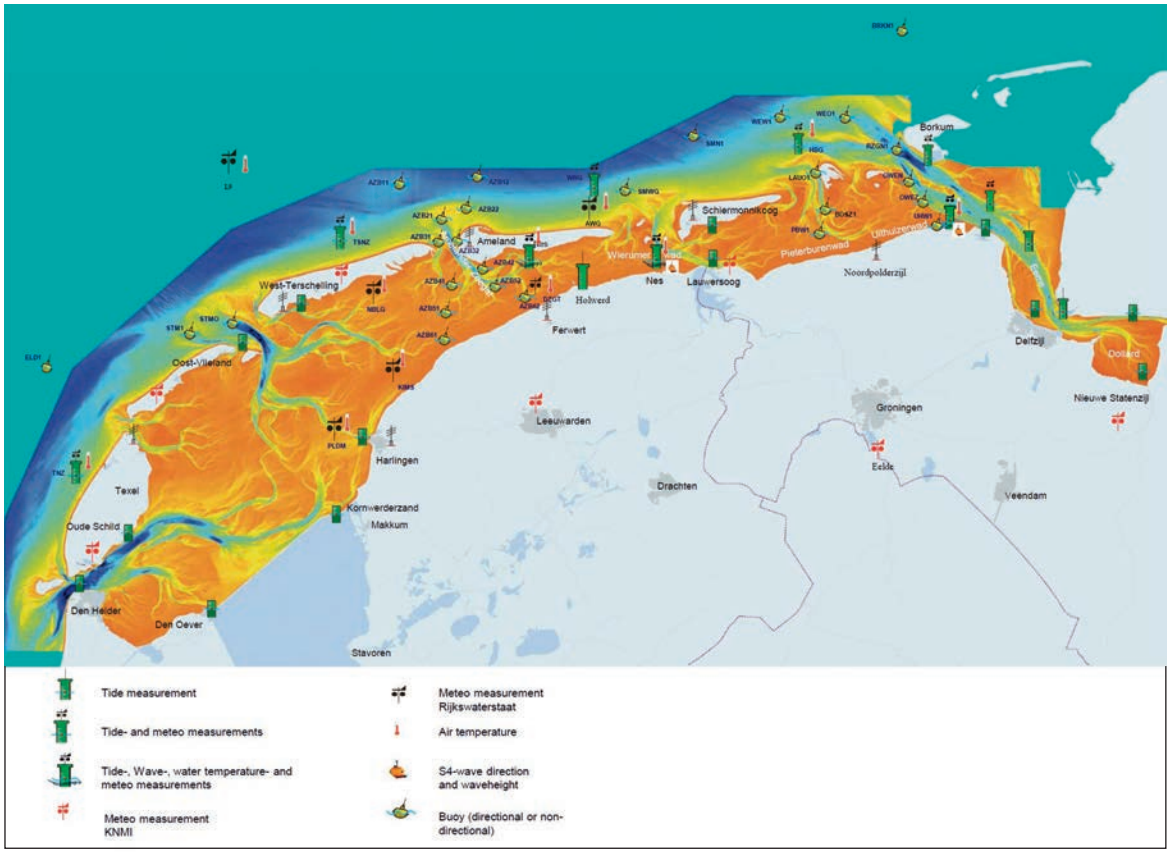

Figure 2: Measurement configuration in the Dutch Wadden Sea.

This field measurement programme was set up by Rijkswaterstaat (a division of the Dutch Ministry of Infrastructure and Environment) within the framework of the WTI program (National Flood Defence Assessment Tools), formerly called the SBW program (Strength and Loading of Water defences).

Measuring Strategy and Techniques

To start with, we would like to make a couple of remarks that pertain to all three sites. Firstly, water levels were already monitored at a large number of stations. Therefore, no additional water level stations were erected within the WTI field measurement programme. Secondly, accurate and up-to-date information about the bottom topography is necessary. Since shipborne depth sounding and airborne laser altimetry campaigns are very accurate, but also time consuming and costly, a lot of effort has been devoted to optimising these campaigns.

Wadden Sea Site

In the Wadden Sea area, see Figure 2, the emphasis of the measurements (since 2003) has been on following the waves from the deep North Sea via the tidal inlets between the islands to the shallow parts near the dikes. The measurement strategy has been discussed in Zijderveld and Peters (2008). Presently, the wave measuring configuration in the Wadden Sea consists of about 25 directional and non-directional wave rider buoys.

Shipborne depth sounding and airborne laser altimetry are accurate but time consuming

These buoys are spread out within as well as outside the Wadden Sea area giving good spatial coverage within several parts in the Wadden Sea. Buoys are used because they can be deployed and moved around easily. In the Ameland tidal inlet, three ADCPs are deployed to obtain current-vector profiles over the water column.

In 2008, three new long-term measuring poles situated on dikes became operational: Nes (south of Ameland), Wierumerwad (at Frisian coast) and Uithuizerwad (at Groningen coast). The poles measure waves, wind, water level and current. Furthermore, four wind poles were installed at Pollendam, Kimstergat, Dantziggat and Noorderbalgen. In addition, wind sensors were placed on several already existing poles belonging to LMW (National Water Monitoring Network). These wind measurement extensions were justified by the fact that the existing (predominantly land-based) stations gave insufficient spatial coverage in the areas of interest, and were also not representative enough to measure the wind field over open water.

Another interesting aspect is that a SeaDarQ processor unit has been connected to the microwave marine traffic surveillance radar on the Ameland lighthouse since 2009, showing promising results in displaying wave patterns, current fields and bottom features, see Gautier et al. (2012). Such remote sensing techniques are envisaged to give spatial wave and current field

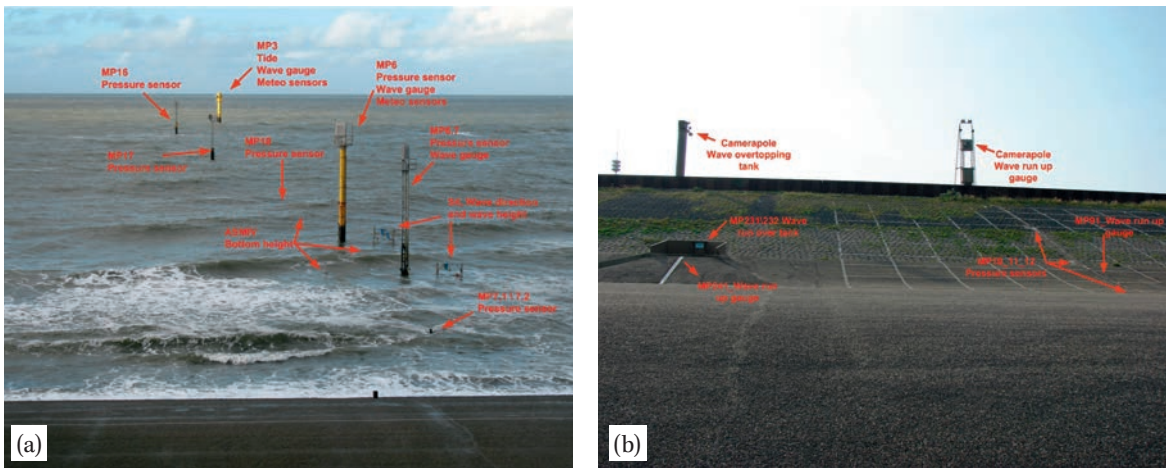

Figure 3: Measurement configuration in the Petten transect (a) and on the dike (b).

data in this and other specific areas of the Wadden Sea.

Petten Dike Site

The measurement campaign (since 1995) at Petten was devoted to measuring wave conditions at a site typical for the open Holland coastline. This was accomplished by placing a number of measuring stations (poles and buoys) in a transect (see Figure 3a) more or less perpendicular to the dike. The poles were equipped with a suite of sensors (radar level sensors, step gauges, current meters, wind sensors, S4s) to measure a large number of important hydraulic and meteorological parameters. Note that the two offshore buoys are too far (3 and 8km) from the coast to be visible in Figure 3a. The Petten site was also equipped to measure wave run-up and (since 2007) wave overtopping on the sea dike by using several dedicated sensors installed in or on the Petten sea dike itself, see Figure 3b.

The Petten site was equipped to measure wave run-up and wave overtopping

Unfortunately, the Petten site has ceased to exist since May 2013 because a major beach nourishment scheme will be carried out soon.

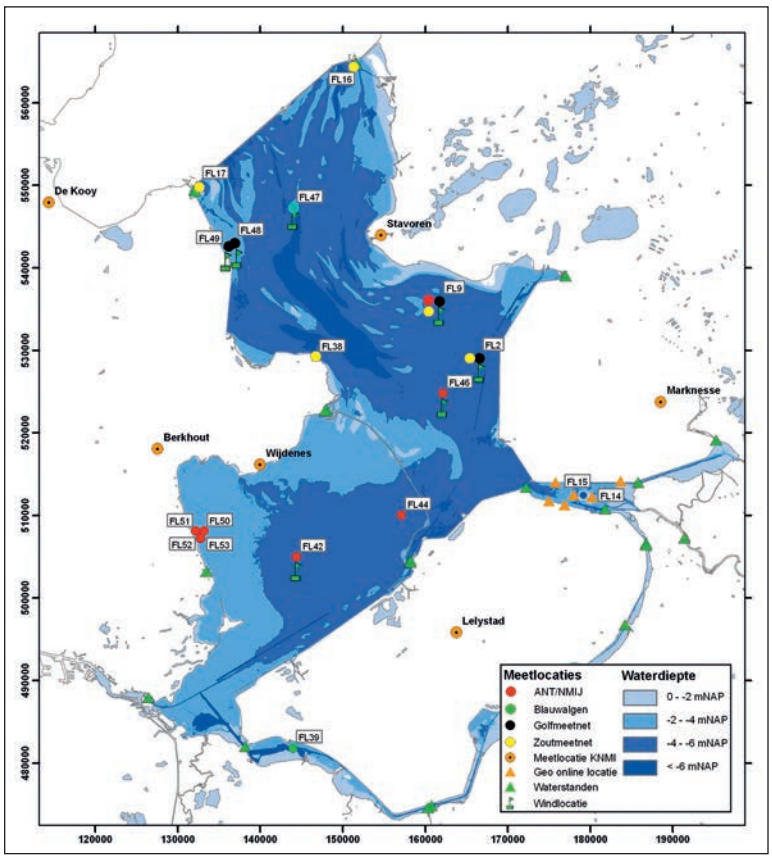

Figure 4: Measurement configuration in Lake IJssel and Lake Marken for aspects like ecological features, waves, salinity, weather, tides and wind.

Lake IJssel Site

Since 1997, measurement poles have been deployed in the large Lake IJssel and Lake Marken, both inland lakes, to measure waves, wind and water levels, see Figure 4. Recently, the measurement site has been extended by combining the WTI poles with poles installed for ecological projects. Several of the poles also have an operational purpose (like FL02 and FL09 for ship guidance).

Data Management

All the data (from poles and buoys) is transmitted by radio links in real-time to a few land-based receiving stations and from there to a few central computer stations where the data is processed. The data is checked for possible outliers and staggers using automatic validation algorithms. For validating the wave parameters, use is made of the so-called WAVIX neural network. In case of data loss, the operational measuring and information

divisions of Rijkswaterstaat are contacted requesting the repair of malfunctioning equipment (measuring sensors and/or data communication links) as soon as possible. Thus, downtime of instruments is minimised. After the monitoring and validation steps the validated data is stored in the Rijkswaterstaat national data base DONAR. This thoroughly backed-up data base guarantees the integrity of all the measurement data.

Radar is promising in displaying wave patterns, current fields and bottom features

Future Developments

It is expected that the wave measurement programme in the Wadden Sea will include more measurement locations in the Eems-Dollard estuary. This area is subject to high water levels in severe Northern storms, as observed on 1 November 2006.

In the long term the entire WTI measurement campaign will be transformed into a monitoring campaign, to fulfil the information needs of several stakeholders. One of the stakeholders is the Dutch Storm Surge Warning Department (SVSD) that is responsible for accurate storm surge warnings for the coastal areas.

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Characterisation of the Nigerian Shoreline

Making Use of Publicly Available Satellite Imagery

Current methods of shoreline mapping include aerial and high-resolution satellite imagery and ground-based surveying, all of which require considerable investment of human and material resources. Mapping and continuous updating of the shoreline for developing countries, such as Nigeria, is a challenge. Most of the information on the Nigerian shoreline is based on 'surveys of opportunity' performed by various government agencies over a wide time span. Additional surveys conducted by the multi-national oil and gas companies exploring in the region are typically not available for use by government agencies. In cases where the data are available, the variety in methods used for shoreline mapping can result in inconsistencies.

Olumide Fadahunsi, Nigerian Navy Hydrographic Office Lagos, Nigeria; CCOM/UNH, USA

Shachak Pe'eri, CCOM/UNH, USA

Andrew Armstrong, NOAA OCS/JHC, USA

THE GOAL OF THIS STUDY WAS to develop a procedure for mapping and characterising shorelines using publicly-available satellite imagery in a GIS environment. Spectral analysis and image processing algorithms were used to define the land/water boundary and characterise the coastal area around the shoreline. The satellite-derived shorelines were compared to well-charted shorelines for adequacy and consistency evaluation. The satellite-derived shorelines were also compared to shorelines from historical maps to identify any changes between the datasets.

Shoreline Position and Character

The Nigerian shoreline lies in the West Coast of Africa (Figure 1) and is part of the Gulf of Guinea. The Nigerian shoreline is typically classified into one of the four major coastal groups: barrier island coast, mud coast, Niger Delta coast and the strand coast. The character of the shoreline can be used as an indicator for coastal management. In addition to the geological characterisation, the International Hydrographic Organization (IHO) provides a description of shoreline characteristics and the corresponding symbols and features used on a nautical chart. The shoreline position is marked on the chart at a selected vertical datum, typically a tidal datum. The shoreline character symbols and features vary between charting organisations, but can generally be divided into three main cartographic groups: natural, manmade and undefined.

In Nigeria, the current navigational charts are produced by the United Kingdom Hydrographic Office (UKHO) (Figure 1). Three Admiralty Charts at a scale of 1:350,000 cover the whole Nigerian coastline and only a few key locations (e.g., Lagos and Escravos) are covered by charts at scales larger than 1:80,000. The horizontal datum of the UKHO Admiralty charts is WGS 84 (original realisation), and a Transverse Mercator map projection is used. The vertical datum to which soundings are referenced is the Lowest Astronomical Tide (LAT), while heights and the shoreline are referenced to the Mean High Water Springs (MHWS).

Free and publicly available data is the solution

Shoreline Mapping and Characterisation Procedure

The mapping and characterisation of shorelines using multi-spectral satellite imagery was performed in a GIS environment. Key steps in the procedure include: pre-processing, land/water separation (shoreline delineation), water subset analysis (man-made features and bathymetry) and land subset analysis (vegetation and exposed land). Landsat 7 imagery was used for mapping the position and character of the shoreline. The major consideration in selecting Landsat imagery was the availability of suitable multispectral datasets at no cost for many coastal areas around the world.

Three Nigerian sites were selected based on their coastal characteristics, national priority for mapping and availability in nautical charts and topographic maps. The Lagos study site is a barrier coast type shoreline

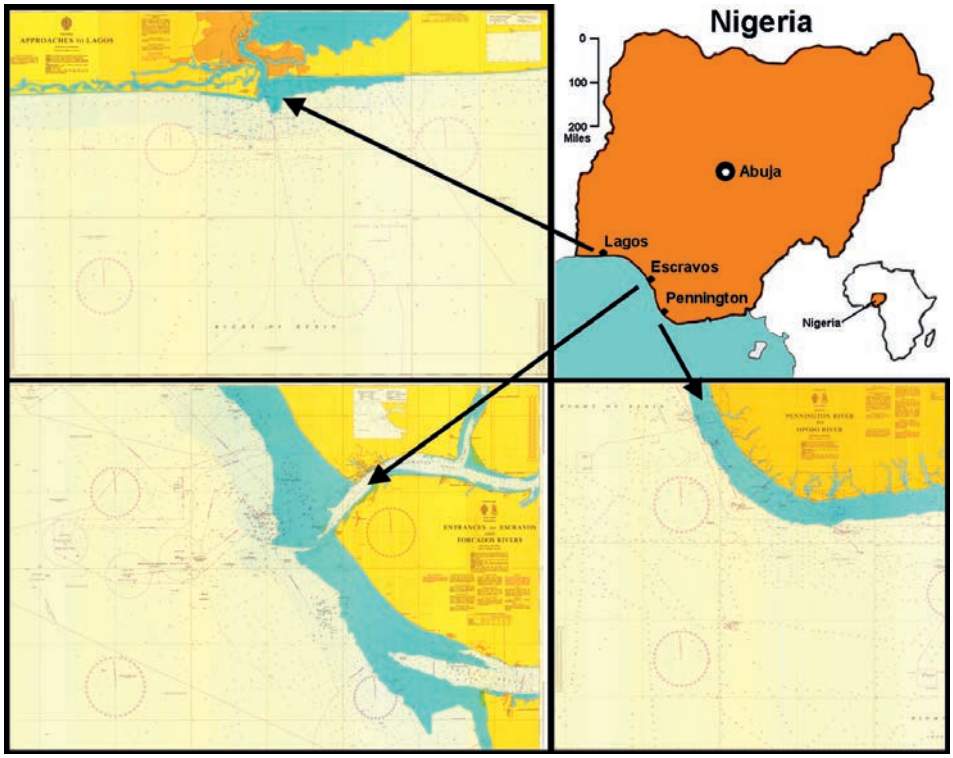

Figure 1: (top right) Outline map of Nigeria, (top left) Admiralty Chart of Lagos, (bottom right) Admiralty Chart of Escravos, and (bottom left) Admiralty Chart of Pennington (charts shown with permission of UKHO).

with man-made features on both sides of the Lagos inlet. The Lagos study site has sparse vegetation, typically shrubs and short grass. Escravos and Pennington are located in a Niger Delta coast type shoreline: a densely vegetated area composed mainly of mangrove and tall shrubs. The vegetation in both sites does not extend to the low water line except within the channel where the water is usually calmer. Man-made features (moles and oil rigs) are also present in the Escravos study site.

To assess the suitability of the methods developed in this study, the procedure was first conducted using a calibration site located along the northeast coast of Massachusetts in the United States, between Merrimack River and Cape Ann. The criteria for selecting this site included the availability of remote sensing survey data that can be used as reference datasets. The site also contained shoreline characters similar to the Nigerian study sites, in addition to rocky outcrops. Although the data for the calibration site is from a NOAA chart, the chart symbols are similar to those of the UKHO charts of the Nigerian sites. The procedure included a decision tree (Figure 2) that: a) classified the images into land and water (level 1), b) characterised the dry land into exposed, vegetated and man-made classes (level 2), c) calculated bathymetry for the submersed areas (level 2), and d) assigned an attribute to different segments along the shoreline character (level 3).

Comparison Results

The satellite shoreline position results for the US calibration site showed a good agreement with the MHW shoreline depicted on NOAA charts. NOAA archive tidal stage information indicated that the Landsat image was acquired at a high stage of tide. Next, a qualitative cartographic comparison over the Nigerian study area was conducted. In Lagos Channel, visual agreement in shoreline position was observed between the satellite-derived shoreline and the charted MHWS shoreline. In the Escravos study site, cartographic comparison also shows good agreement between the charted shoreline and the satellite-derived shoreline along most of the coast. It is important to note that MHWS and LAT shorelines in the Escravos study site are almost coincident over their entire length. This can be attributed to the relatively steep beach slope in the area and the 1:60,000 scale of the chart used in the comparison. In the Pennington study area, only a single MHWS shoreline is depicted on

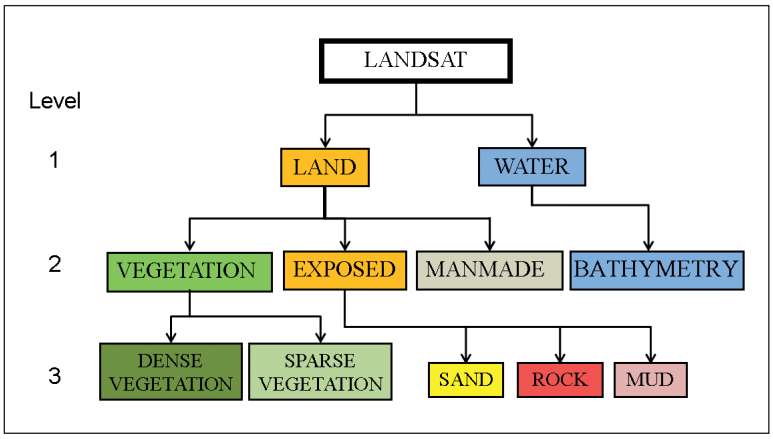

Figure 2: Decision tree hierarchy of the layers generated in the shoreline characterisation procedure.

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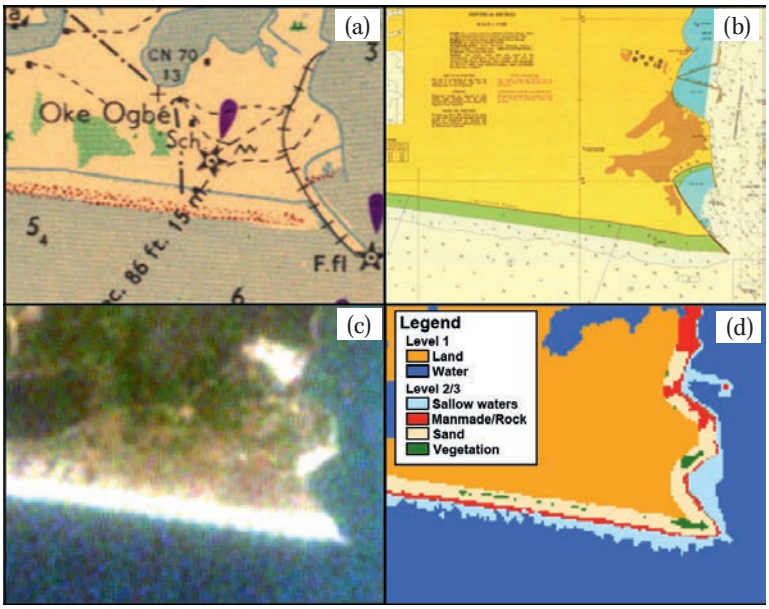

Figure 3: Lagos study site: (a) historical map, (b) UKHO chart, (c) Landsat 7 image, and (d) thematic map of the coastal characters.

the chart because of the chart scale (1: 350,000). The Landsat shoreline agreed well with the charted shoreline.

A thematic comparison was also made between the Landsat-derived shoreline and other sources. High-resolution satellite imagery (IKONOS) was used to validate that the separation of vegetated areas from exposed areas was successful using Landsat over the US calibration site and Escravos. The Landsat imagery provided more details on the shoreline character than the available charts and maps (Figure 3). It was possible to separate the vegetation and exposed shoreline into more classes, however, the symbols on the charts were not detailed enough to validate the results. In addition, a submerged mole was identified using satellite derived bathymetry and validated using the reference (Figure 4).

Based on consideration of the nominal georeferencing accuracy and resolution of the Landsat 7 imagery, the lack of tide information, and the method of shoreline extraction, the estimated positional uncertainty of the shoreline in all three Nigerian sites (Lagos and Pennington) is ~150-200 m at 95% confidence level. Cloud cover in some of sites limited the comparison areas. Ground truth is required to evaluate the results and determine the threshold between various land covers and vegetation types.

Characteristics of the shoreline are an indicator for coastal management

Conclusions

The characteristics of a shoreline are indicative of potential changes that can occur in the position of that shoreline, as well as coastal development. Unfortunately, many developing countries are not able to map their shorelines on a frequent basis due to limited resources. This procedure offers a solution to this challenge using free and publicly available data. Although, the shoreline characterisation procedure was developed based on datasets from study sites along Nigerian coastline, the procedure is suitable for mapping coastal areas in other developing regions. Investigation of more study sites with ground truth data as a controlled reference will provide a more robust procedure that can include various land covers and vegetation types.

Acknowledgements

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Further Reading

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International Hydrographic Organization (IHO), 2012, Publication S – 4, Regulations of the IHO for International (INT) Charts and Chart Specifications of the IHO, Edition 4.3, Monaco.

The Authors

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Andrew Armstrong is the NOAA co-director of the NOAA/University of New Hampshire Joint Hydrographic Center. Along with his UNH counterpart, he manages the research, mapping and educational programmes of the centre.

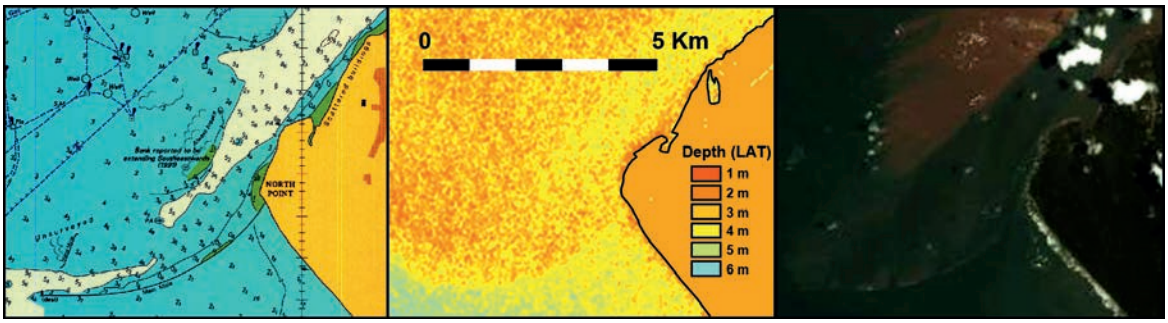

Figure 4: Indirect mapping of a submerged mole in the Escravos site: (left) UKHO Chart, (centre) satellite-derived bathymetry from Landsat imagery, (right) Ikonos reference imagery.

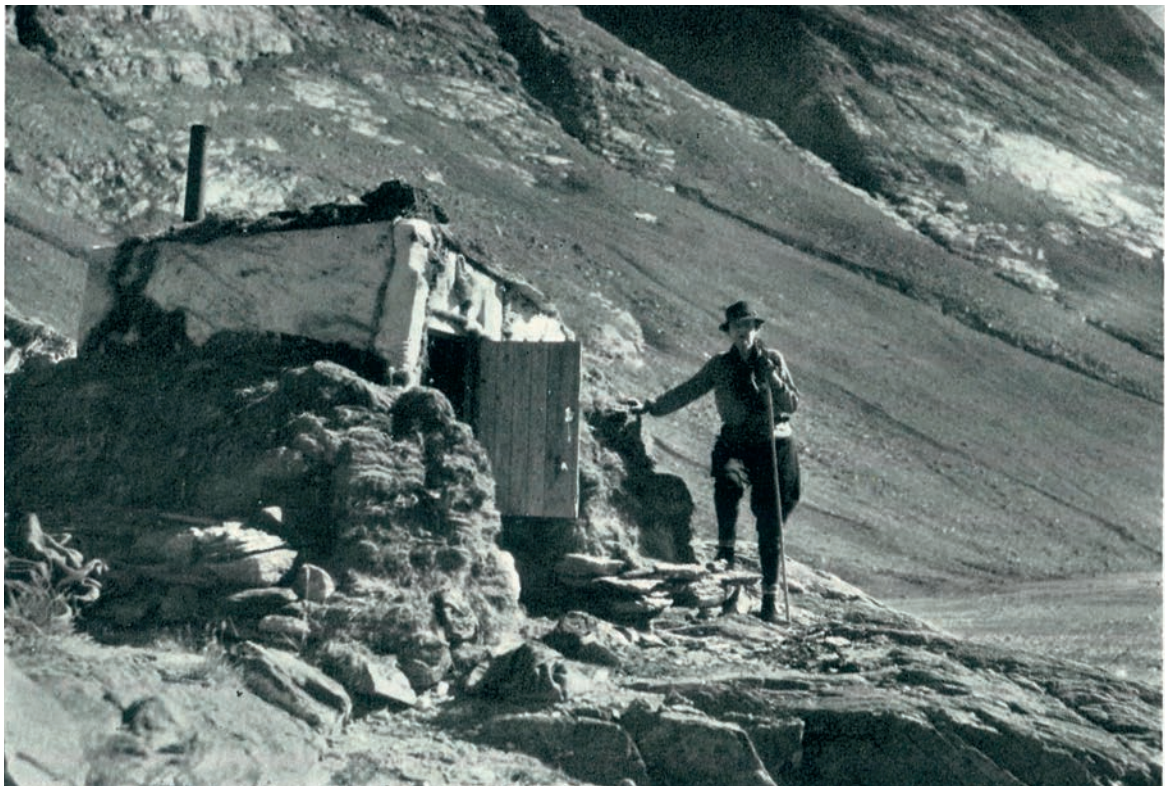

Figure 1: Louise A. Boyd in Greenland.

Large of Spirit

A Great Woman Explorer: Louise A. Boyd

Albert E. Theberge Jr., Contributing editor, Hydro INTERNATIONAL

Sprinkled throughout the world's oceans are thousands of named seafloor features. Many of the major features have received names that associate them with some other geographic feature such as Mid-Atlantic Ridge, East Pacific Rise, or Aleutian Trench. Many of the smaller features have received names commemorating scientists, explorers, bathymetrists, hydrographers, research or survey vessels, and even crew members of those vessels. Of the names of these lesser features, hundreds are named for men who made contributions to knowledge of the sea. However, a review of both the official names of the IHO GEBCO Subcommittee on Undersea Feature Names (SCUFN) and that of the United States Board on Geographic Names Advisory Committee on Undersea Features finds less than twenty names that can be unambiguously associated with women, and of those, only a handful that contributed to knowledge of the oceans. The only examples of the latter that this author is aware of are Louis A. Boyd Bank, Tharp Fracture Zone (named for Marie Tharp of physiographic mapping fame), Mammerickx Seamount (named for Scripps Institution of Oceanography bathymetrist Jacqueline Mammerickx), Valerie Guyot (named for Valerie Craig, wife and professional partner of Harmon Craig, Scripps geochemist and chemical oceanographer), Klenova Seamount (named for pioneering Soviet marine geologist Maria Klenova), and Betty Seamount (named for Elizabeth Shor, historian of the Scripps Institution of Oceanography.)

THE FIRST OF THE ABOVE features was the very first deep sea feature named after a woman explorer or scientist. It was named after Louise Arner Boyd (1887-1972), a remarkable woman who led a remarkable life. Her story began in 1877 with the discovery of a gold bonanza in the town of Bodie, California. Her father made a fortune here in subsequent years and, by the time of her birth in 1887, her family was living in an exclusive community north of San Francisco. Because of the death of her two brothers in the early 1900s, Louise became the sole heir to the family's USD3,000,000 fortune (approximately USD36,000,000 in 2013) upon the death of her parents in 1919 and 1920 respectively. Having an adventurous spirit, Louise soon tired

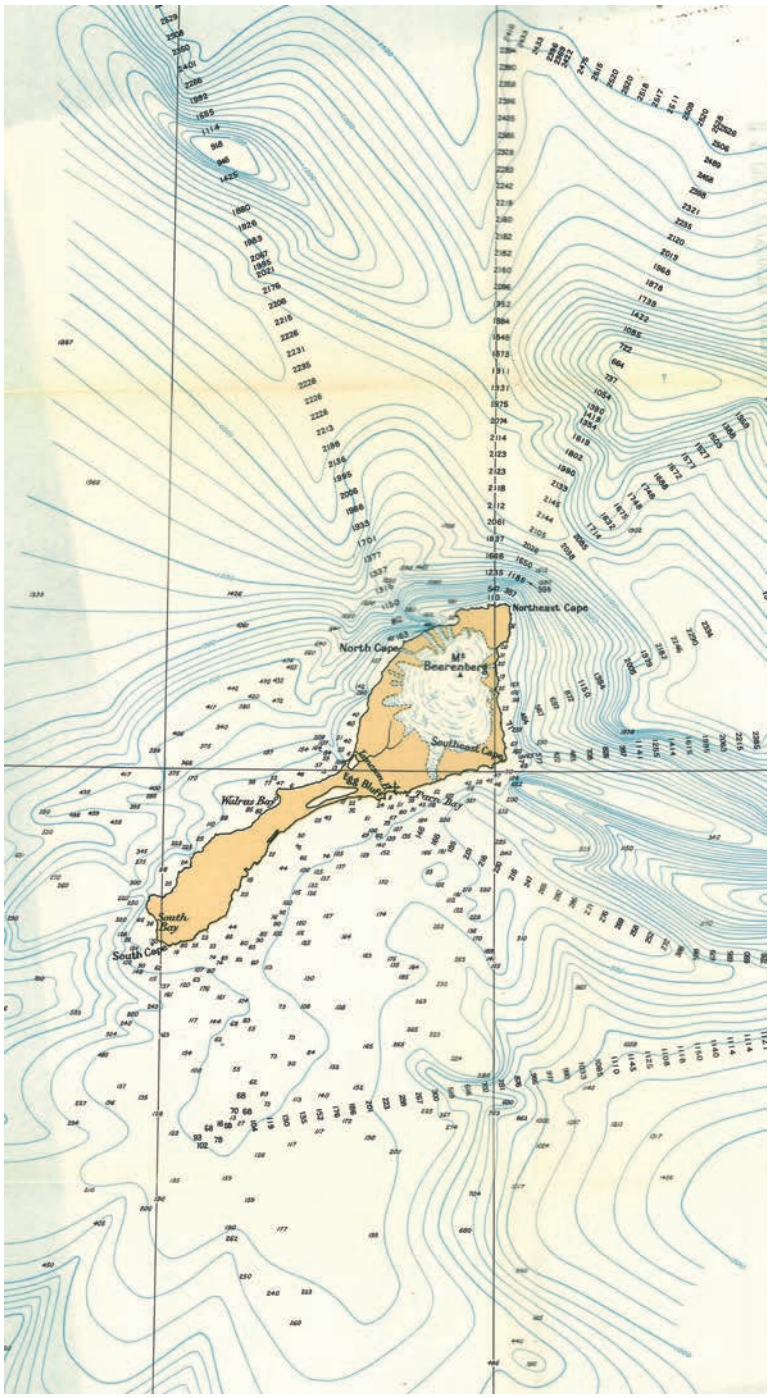

Figure 2: Jan Mayen Island

of the life of a socialite. In 1924, she had her introduction to the far north as a tourist on a small Norwegian passenger ship that visited Spitsbergen. Following that excursion, she resolved to return to the Arctic.

Beginning in 1926, Miss Boyd, as she was often referred to, began chartering small tough Norwegian vessels that were used in the sealing and whaling trade. The first of these vessels was the *Hobby*, a sealing vessel. This 1926 trip was a trophy hunting expedition and led to her being called the 'Arctic Diana' after she shot 11 polar bears. Later she was called 'The Queen of the Arctic.' She even had a limerick written in her honour that began: "There was a young lady named Boyd, Whom polar bears tried to avoid….".

Her 1928 expedition coincided with the news that the dirigible of Arctic explorer Umberto Nobile had crashed somewhere in the Arctic. This accident led the great Norwegian explorer Roald Amundsen to launch an aerial search for the crash site of the Nobile expedition. Amundsen was subsequently lost, never to be found. However, his disappearance prompted Boyd to put her chartered vessel under the direction of the Norwegian government in helping with search efforts for Amundsen. During this search, the *Hobby* traversed over 10,000 miles and proceeded as far as 81 03 North Latitude, north of Franz Josef Land. In spite of the failure to find Amundsen or any trace of his aircraft, this was a transforming experience for Boyd and she devoted the rest of her life and much of her fortune to the scientific study of the Arctic. In her 1948 American Geographical Society publication, *The Coast of Northeast Greenland with Hydrographic Studies in the Greenland Sea*, she related, "Four times have I had the satisfaction of organising and conducting expeditions that successfully negotiated the belt of ice that guards the East Greenland coast and of bringing back in photographs, maps, collections, and written records, what I hope are worthwhile contributions to knowledge of that alluring region of fjords and glaciers and lofty, ice-capped mountains - its majestic scenery, its plant and animal life, its geology and physiography, and the ice in all its many and frequently changing summer aspects." The four times she referred to were expeditions in 1931, 1933, 1937 and 1938.

Although much of the work on these expeditions was terrestrial in nature, concerning the 1937 and 1938 expeditions, "Greater emphasis was … put on the hydrographic work than had been the case on any of my previous expeditions, and a hydrographer, who was to be in charge of the sounding programme, current studies, and tide-gauge recording, was therefore added to my staff." For all four of her science expeditions, Louise Boyd chartered the small Norwegian sealer *Veslekari*, or 'Little Kari' in Norwegian. This vessel was little, only 125 feet long with 27-foot beam and 14-foot draft.

The hydrographer that accompanied the expedition was James M. LeRoy, a former officer of the United States Coast and Geodetic Survey. He oversaw all hydrographic activities. Of particular interest was overseeing a deepwater sounding instrument and recorder produced by Hughes and Son of London. This instrument

subsequently became known as the Hughes Veslekari Type Echo Sounder and was used in many deepwater surveys conducted by other organisations. This machine was purchased by Miss Boyd in 1937 when the sounding instrument used in the earlier expeditions failed. The Hughes machine was rated to 1400 fathoms but, in fact, recorded to a maximum observed depth of 2053 fathoms from where a strong return was received. On 22 June 1937, shortly after installing the new sounding machine and while conducting trials of it offshore from Narvik, Norway, to the great surprise of all on board "… the sounder readings suddenly rose from normal sea floor depths to some 320 fathoms. The importance of keeping the sounder operating on a journey such as ours was thus further established, for it was soon evident that we had found a previously unrecorded ocean bank." To further delineate the bank, a buoy was anchored on its summit and lines run radially outward from it. The buoy position was determined by astronomic observations. A check sounding was made with a wireline sounding machine that registered 589 metres while the Hughes machine read 585 metres. During the remainder of the 1937 field season, the *Veslekari* proceeded to Jan Mayen Island where it conducted surveys and then engaged in exploring the northeast coast of Greenland. After returning to Norway, a short expedition was made to Spitsbergen in September to carry sounding work into the far Arctic. Some relatively high-accuracy hydrographic surveys were performed in 1937 in some of the fjords of Greenland with hand lead and wireline machine during the summer explorations as well. These surveys were controlled by measuring baselines, establishing local triangulation networks, building signals, and positioning the survey boat by three-point sextant fixes.

The 1938 expedition was notable for having a 'portable' Hughes shallow-water acoustic sounding machine as well as the Hughes Veslekari instrument. This particular instrument was installed on a *Veslekari* motor dory and was able to record depths to 230 fathoms. For the time, it was also unique as its speed could be increased by a factor of six and record either in fathoms or feet. This machine was used for some reconnaissance surveys in a few Greenland fjords in 1938. The sounding vessel in these surveys was located by estimating direction and distance to the shoreline as shown on an existing map.

The body of work accomplished by Louise Boyd and the expeditions she financed is impressive. She was not a passive observer of the activities but expedition photographer, collector of specimens for the accompanying scientists, and even took turns while at sea standing watch monitoring the sounding instrument. She enlisted the assistance of the best scientific and engineering personnel to accompany her on these expeditions. Geology professor Richard Flint from Yale University, Yale graduate student A. Lincoln Washburn, assistant geologist, (a champion skier as well as academic who went on to become first director of the Arctic Institute of North America), and Henry J. Oosting, professor of botany and ecology at Duke University, were all members of this expedition. In contouring and interpreting soundings, Boyd enlisted the assistance of Harry Hess of Princeton University. Hess is recognised as one of the 'founding fathers' of the Theory of Plate Tectonics.

Today, climatologists and glaciologists use Boyd's Greenland work as baseline information. She was an innovator and used the best of equipment in her explorations. She was a social pioneer in leading the way to expand the role of women in the physical sciences and was the first woman (at least to this author's knowledge) to lead major oceanographic and geographic expeditions. Because of her knowledge of the Arctic, she was recruited by the US government to conduct secret research on radio transmission in the high Arctic in 1941. She chartered at her own expense and sailed on the legendary Arctic exploration vessel *Effie M. Morrissey* under Captain Bob Bartlett during this expedition. World War II curtailed her explorations, but she

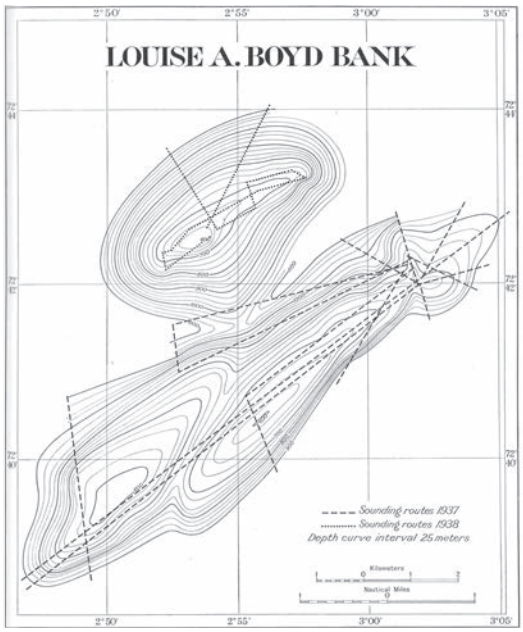

Figure 3: Louise Boyd Bank.

was not quite finished. In 1955, at the age of 68, she chartered an airplane and became the first woman to fly over the North Pole.

Oddly, she was able to transition easily to the life of a socialite whenever she returned to her home in northern California and was a community leader for both the city of San Rafael and Marin County. She was equally at home in an evening gown at social gatherings or in the garb of an Arctic explorer. She was described by one observer as "large of spirit." Indeed she was. She never married but left a legacy of Arctic knowledge that is still valuable today as well as her mark on the waters she sailed. She died penniless in 1972, having exhausted her fortune in the service of humanity and expanding our Arctic horizons.

Acknowledgements: Thanks are offered to the American Geographical Society that generously allowed use of its imagery to illustrate this article.

Further Reading

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Figure 1: Deploying Sonobot in the Baltic Ocean for bathymetric measurements.

Reliability and Supervised Autonomy

Evologics

Francisco Bustamante
senior operations manager, Evologics

Founded in the year 2000 in Berlin, Germany, EvoLogics is a private company currently focused on underwater acoustic communication and positioning solutions, development of new sonar technologies, and integration of sensor systems in autonomous platforms.

THE MISSION OF THE COMPANY is to develop innovative technologies for aerospace, maritime and offshore industries through interdisciplinary co-operation between engineering and life sciences. To further this mission, EvoLogics works both independently and in partnership with other research institutions and companies. These include the Technical University in Berlin, University of Bremen and the Institute for Baltic Research, as well as other institutions and companies such as Sea & Sun Technologies GmbH and Enitech.

Leap forward

In the beginning, the research and development activities included a broad range of areas, from fluid dynamics to mechanical structures with built-in intelligence. Nowadays, EvoLogics is very active in the area of underwater communication, positioning and navigation. Derived from original studies on the physics of communication among dolphins, EvoLogics' patented S2C (Sweep-Spread Carrier) technology represents a leap forward for reliable hydro-acoustics.

Sweeps

The main challenge for underwater communication is the multipath propagation of the signals. This in turn results in an overlap of signals on the receiver side. The trick is to be able to reliably and quickly separate the incoming signals from each other. In contrast to other approaches such as frequency hopping, EvoLogics employs a continuous frequency change or 'sweeps', carrying more information while still being able to separate the signals quickly from one another. Developing reliable hydro-acoustic communications and positioning is a necessary step for future products.

Supervised Autonomy

Current areas of development include mobile platforms for sensors in order to be able to collect data autonomously and efficiently. Reliable

Figure 2: Rudolph Bannasch, managing director of Evologics, presents Sonobot at Ocean Business 2013.

Figure 3: LBL node being installed for the Bailkal neutrino telescope.

Figure 4: Installing a USBL in a vessel for AUV tracking.

hydroacoustics enable underwater navigation in the same way that GPS has enabled our cars to display maps that guide us to our destination. At the same time, having the option to communicate with the vehicle opens up the possibility for supervised autonomy: a combination of the on-board systems that can react and navigate based on the data with the option to track the mission from a distance and intervene if necessary. These technologies can be deployed in a combination of vehicles at the same time, both on the surface, as a relay between the underwater vehicles and satellite communications, and underwater for ROVs and AUVs alike. Multiple AUVs and gliders can co-ordinate a mission to survey a larger area simultaneously, for example.

Multiple AUVs and gliders can survey a larger area simultaneously

Customers for EvoLogics products can be found around the globe. From the beginning, universities and research institutions have been very keen to try out new developments. As the technology has matured, the client base has expanded to encompass survey companies and the offshore industry.

EvoLogics currently has 27 employees who are mostly focused on R&D for new products and on support. Sales for S2C technology have been growing steadily at between 20-30% per year over the last 6 years, and sales in 2013 impressively doubled compared to the previous year.

Positive Outlook

With new product introductions planned for 2014, new applications being developed and a growing demand for solutions that work in deep water for environmental monitoring, tsunami warning systems or to extract resources from the sea, the outlook for the years ahead is positive. One of the product launches planned for this year, together with JT Electric in the Faroe Islands, is the TrawlCamera Live: an underwater camera for trawl operations to monitor the fish catch in real time.

We are reaching new markets through new partners and representatives abroad. The team will continue to grow in order to translate more of the company's ideas into products and systems, and to keep pace with the increase in demand.

sales@evologics.de

www.evologics.de

Digital Hydrography on the Maritime Web

The annual multi-day event organised by the International Federation of Hydrographic Societies (IFHS) was this year somewhat less exuberant than the usual Hydro conferences. Last year we had Hydro12 in Rotterdam, next year we will have Hydro14 in Aberdeen. The gathering for 2013 took place in Southampton, UK, on 29 and 30 October 2013.

Figure 1: Standing from left to right: Ole Berg, Harry Gale, David Wheal and James Manson; kneeling from left to right: James Langley and Peter Kortenoeven.

Figure 2: The forum, from left to right: Nicolas Seube, Zakirul Bhuiyan, Richard Thain and Ashok Mahapatra.

THE UK HYDROGRAPHIC Society filled the gap between the years by organising this smaller version, in association with the IFHS and the International Hydrographic Organization (IHO). Smaller, but not necessarily less interesting. The number of delegates was around 65, with many participants having leading positions in government and industry. Although the conference did not have the objective of making decisions on future developments, the conference format allowed a most interesting exchange of views.

The event in the Southampton Solent University Conference Centre was sponsored by Esri, as principal sponsor, and by Caris, ITIC and QPS. The exhibition in the refreshment room also provided space for OceanWise and TeamSurv. At the end of the first day a drinks reception was organised, sponsored by ITIC and QPS.

The conference was divided into four sessions, each consisting of a keynote speech, two or three lectures and a one-hour forum discussion, inviting views from everyone present. The main conference theme was divided into four sub-themes: The user's perspective, Products – quality and presentation, Survey innovation and Training for all.

The User's Perspective

The keynote speech was 'A view from the bridge' by Capt Harry Gale, technical manager of the Nautical Institute in Southampton. Next Mr Ole Berg addressed e-navigation, the transition from the navigating navigator to the monitoring navigator. The lecture by Capt David Wheal was titled 'The question facing us is not how much work the human can do safely, but how little'. One of the main items of the subsequent discussion was how to make good use of the Zones of Confidence categorisation. Or should we perhaps not give the ZOC principle much emphasis but use the navigation surface instead.

Products – Quality and Presentation

A playful but interesting distinction made by Rear Adm Nick Lambert in his keynote speech 'The user's faith in technology' was between digital immigrants, born before 1990, and the youngsters of today as digital natives. The lectures of the session provided technical details, for example, how to achieve really quick ENC updates with frequent survey data in highly dynamic estuaries like the Humber. During the panel discussion various examples were given, whereby participants highlighted still existing misunderstandings and false perceptions of existing chart products and systems. Here, concerns where shared that future users might lack appropriate basic training and operational knowledge and might therefore put themselves and their ships at risk when using highly complex and demanding ECDIS systems.

Survey Innovation

The limitations and future developments of satellite multispectral imagery were discussed along with the possibility to develop bathymetric applications based on other satellite techniques, such as SAR. A framework for data quality assessment and usefulness of crowdsourcing was discussed and further clarifications were sought. The panel was also questioned on the perspective to see alternatives other than acoustic or laser techniques emerge in the future. The need to 'educate', rather than 'train' future surveyors so that they can adapt and foster innovation was stressed.

Training for All

Keynote speaker Mr Nicholas Seube is head of the leading French civil hydrography education at ENSTA in Brest and the newly elected chair of the International Board on the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers.

The standards provide a useful framework for the education of internationally operating surveyors. The other speakers in the session were Capt Zakirul Bhuyan with a critical view on ECDIS display management and Dr Richard Thain inviting a scheme of individual rather than institutional recognition. All participants of the ensuing panel discussion agreed that proper and extensive basic training of elementary navigation skills will remain a top prerequisite, no matter how 'clever' modern navigation systems may become. Furthermore, the need for participation in an extensive generic ECDIS course was deemed necessary.

The organisers of the mini-Hydro event were praised for the effective and efficient arrangements, as shown, for example, by the very well laid-out delegate handbook, Special Publication 60.

Source: Rob van Ree, Lecturer, Institute Willem Barentz, The Netherlands

1. www.hydroconferences.org/digitalhydro

International Hydrographic Organization

IHO-IAG Advisory Board on the Law of the Sea

The Advisory Board on the Law of the Sea (ABLOS) is an inter-organisational group of experts in geodesy, hydrography, law of the sea and related disciplines. It was formed as a result of the United Nations Convention on the Law of the Sea (UNCLOS), which was signed at Montego Bay, Jamaica, on 10 December 1982 and entered into force on 16 November 1994. The signing of UNCLOS marked the conclusion of the Third United Nations Conference on Law of the Sea, which had lasted from 1973 to 1982.

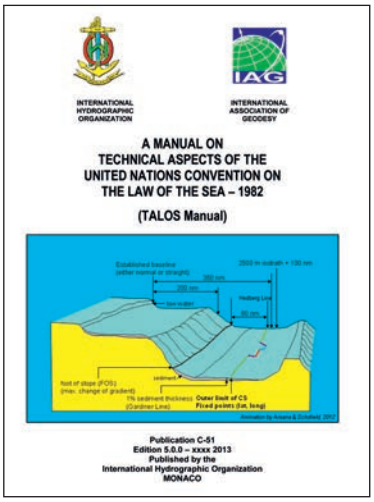
In 1984, an IHO Working Group was formed to prepare a special publication on the technical aspects of UNCLOS. In 1988, the first edition of the Manual on Technical Aspects of the United Nations Convention on the Law of the Sea 1982 (the TALOS manual) was published. It was, in effect, little more than a glossary of the technical terms contained in UNCLOS. In 1990, the Special Study Group on the Geodetic Aspects of the Law of the Sea (GALOS), established by the International Association of Geodesy, joined the IHO TALOS Working Group to strengthen the geodetic aspects of the manual. The second and third editions of the TALOS manual were then published in 1990 and 1993.

In 1994, the combined group adopted the name ABLOS with the tasks of reviewing State practice and jurisprudence on law of the sea matters and providing guidance on the hydrographic, geodetic and marine geo-scientific aspects of the law of the sea. It was also tasked to study, promote and encourage the development of appropriate techniques in geodetic and hydrographic aspects of the law of the sea.

The expertise available to the ABLOS was boosted in 1997 and 1998 when representatives from the UN Department of Administration of the Law of the Sea (DOALOS) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO joined the group. The IOC remained in the ABLOS from April 1997 until December 2006.

In late 2002, the ABLOS set up an editorial group to prepare a fourth edition of its TALOS manual. It was agreed that the fourth edition would be a digital publication and would be aimed at a non-specialist audience.

The successful fourth edition has recently been revised and the fifth edition of the manual is now undergoing its final stages of editorial review. It is expected to be released in early 2014. The revised edition contains significant revisions and incorporates diagrammatic animations for the first time. It continues to provide guidance on the technical aspects of the law of the sea with respect to geodesy, hydrography and geoscience. The TALOS manual is a key information resource for practitioners not trained in core subjects; for lawyers, diplomats, teachers and students. At the same time, it is an authoritative reference source providing specialist practitioners with definitive explanations in relation to UNCLOS rather than just in terms of abstract academic meanings.



Manual on Technical Aspects of the Law of the Sea.

In addition to the publication of the TALOS manual, the ABLOS conducts training courses and seminars as part of the IHO Capacity Building strategy. The most recent training was a two-day seminar held in conjunction with the 20th ABLOS meeting held in Muscat, Sultanate of Oman in late October 2013. The ABLOS is currently chaired by Professor Sunil Bisnath from the Geomatics Engineering Department of Earth and Space Science and Engineering of the University of York, Canada - sbisnath@yorku.ca

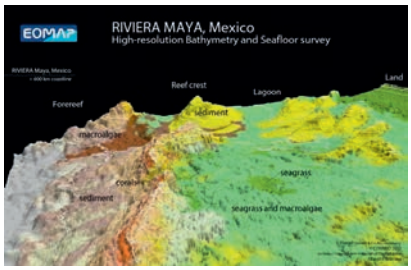
Copies of the TALOS manual and details of the ABLOS can be obtained from the IHO website.

Advisory Board on the Law of the Sea.

1. www.iho.int

High-resolution Seafloor and Bathymetry Survey of Riviera Maya

The Mexican National Commission for Knowledge and Use of Biodiversity (CONABIO) contracted EOMAP, Germany, to deliver high-resolution environmental information for the entire Maya shoreline using spatial technologies. In total more than 5,000km^2 of the marine environment, including ecosystems such as corals, seagrass and mangroves, were mapped in water depths down to 25m.
http://tw.gs/Rcvdf2



Habitat mapping of the Riviera Maya coastline.

Mini-sparker for University of Perpignan

The University of Perpignan, France, has acquired the new generation of SIG mini-sparker. The SIG Pulse S1 is a 35kg energy source with easy power adjustment: from 20 to 300 joules in small steps of 10 between 20 and 60 joules and in steps of 20 above that. This enables the energy to be tuned according to the geological environment.
http://tw.gs/Rcvdhx

Ocean Observation Based on Networked Sensor Systems

The Ocean Observatories Initiative (OOI, USA) will construct a networked infrastructure of science-driven sensor systems to measure the physical, chemical, geological and biological variables in the ocean and seafloor. Greater knowledge of these variables is vital for improved detection and forecasting of environmental changes and their effects on biodiversity, coastal ecosystems and climate.
http://tw.gs/RcvdgX

Mobile Mounting Bracket for SeaBeam 3030

L-3 Elac Nautik can now supply a mobile transducer mounting bracket for the SeaBeam 3030 multibeam system with a spatial resolution of 3° x 2°. Normally, 30kHz systems can only be installed for stationary applications. However, with this mounting bracket, L-3 ELAC Nautik offers the possibility to operate a 30kHz system in a mobile version.
http://tw.gs/RcvdhW

15 Z-Boats for Survey Fleet in Russia

The Federal Service for Hydrometeorology and Environmental Monitoring of Russia (Roshydromet) has embarked on a widespread programme of modernisation of its environmental instrumentation and infrastructure. Partly funded by the World Bank through a USD60 million loan, the project will result in an improvement in Roshydromet's ability to monitor surface-water hydrology and hydrography. As part of the project, an initial fleet of 15 Oceanscience Z-Boat 1800 remotely operated hydrographic survey boats has been delivered to Russia through Oceanscience's project partner, INFAX Inc.
http://tw.gs/Rcvdg5

Sea Trials for Long Endurance

ASV's latest vehicle, the C-Enduro, has begun sea trials in Portchester, UK. The trials, attended by the National Oceanography Centre (NOC) and Royal Navy personnel, saw the C-Enduro operate autonomously and follow various courses set out by ASV's control system. The highlight of the two-day event came when the vehicle followed a course spelling out 'ASV'.
http://tw.gs/Rcvdd3

The ASC C-Enduro during its sea trial.

HYPACK 2014 Automates and Simplifies

The software package HYPACK 2014 is to be introduced at the HYPACK Training Event in January 2014 and will be available for release in February 2014. The theme in HYPACK 2014 appears to be 'automate and simplify' and the major enhancements in HYPACK 2014 include a new shell look, automatic background searches, automatic MTX creation in Hypack Survey (image), a new magnetometer editing programme and a simplified workflow by merging HYSWEEP, HYPACK and sidescan software.
http://tw.gs/Rcvdh3

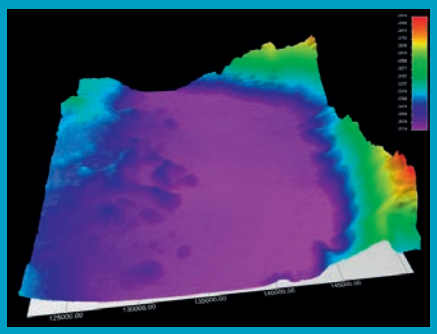
A screenshot of the new HYPACK software.

Luschi Purchases Hopper Dredger

Luschi, headquartered in Brazil, has added a 2,000m^3 hopper dredger Luschi IX to its fleet. The equipment (capacity 2,350 tons, and overall length 82.71m) is currently being updated and it is expected to be ready for dredging soon.
http://tw.gs/RcwbZv

SOA Selects ATLAS Multibeam Echosounder for Future Projects

The 3rd Institute of Oceanography of the State Oceanographic Administration (SOA) in Xiamen, China, have awarded Atlas Hydrographic a contract to supply an Atlas Hydrosweep multibeam echosounder. The system with depth range capability of more than 2,000m will be used for hydrographic surveying from mid-2014.
http://tw.gs/Rcvdgv



Atlas Hydrosweep multibeam survey data.

SHOM Data Available as Open Data Online

In mid-December 2013, a new version of the portal data.gouv.fr was launched during the meeting of the Interministerial Committee for the Modernisation of the Public Governance. From now on, SHOM data will be available as open data from the maritime geographic information portal data.shom.fr, which is indexed on data.gouv.fr.
http://tw.gs/Rcvdev

EIVA Training Programme

The dates for the EIVA software training courses of 2014 have been finalised, offering training courses at various locations throughout the world – and the highest number of locations and courses to date.
http://tw.gs/RcwbiV

Sailing Drone

The HyDrone RCV of Seafloor Systems is a hand-portable, remote controlled hydrographic survey platform. Working in conjunction with the HydroLite portable echosounder kit to conduct bathymetric surveys in ponds, lakes, rivers, and streams, the HyDrone RCV accomplishes the same results as much more expensive radio-controlled survey systems.
http://tw.gs/RcwbZZ

Seafloor Systems' HyDrone RCV

100th Gen 5 Multiplexer (MUX) Sale

Seatronics, UK, has secured its sale of the 100th industry-leading Gen 5 MUX: a milestone it has reached in two years. The Gen 5 MUX is a fibre multiplexer solution, designed and manufactured by RTS and sold through Seatronics' global network and used by ROV and subsea survey communities.
http://tw.gs/RcwbZX

Horizon's New DP2 Vessel Delivered

Horizon Survey and Geotechnical Companies (UAE) were able to welcome their new build DP2 Geotechnical Drill Ship, Quest Horizon. The 65m vessel was commissioned and designed specifically to support Horizon's geotechnical drilling projects. She can also be utilised for survey, ROV and light construction activities.
http://tw.gs/Rcwbi1

Quest Horizon

Install Academy Opens

After the successsful completion of the first two courses at Install Academy, the Italy-based company has announced its new courses scheduled from January 2014. Install has introduced this service to give a fast response to the offshore market that requires professionals for incoming projects.
http://tw.gs/Rcwba1

Report on ROVs in the Energy Industry 2014-2024

Visiongain, UK, forecasts strong spending growth on remotely operated vehicle (ROV) services and new builds of ROVs for use in the energy industry. Visiongain calculates that spending on ROVs will total USD2,496m in 2014. Europe is the only region that will see declining demand for ROV services as North Sea production and drilling activity declines. However, decommissioning and maintenance activity will support spending levels.
http://tw.gs/Rcx801

ROV services can look forward to growth in the energy industry.

QR Codes Added to UKHO's Standard Nautical Charts

In an initiative to deliver the benefits of digital solutions to users of paper navigational charts, the United Kingdom Hydrographic Office (UKHO) has introduced QR codes to its portfolio of Standard Nautical Charts. By scanning the QR code, the user will be taken directly to the relevant page for the scanned chart on the UKHO's searchable Notes to Mariners database.
http://tw.gs/RcwaEY

More product news
www.hydro-international.com/news/productnews.php

Hydrographic Society Russia

On 1 November 2013, more than 50 people gathered on the ice breaker *Krasin* to participate in polar readings on the theme: *Severnaya Zemlya*: opening, research and the present. This was to celebrate the 100th anniversary of the scientific feat of Russian Hydrographic expedition of the Arctic Ocean (HEAO) on icebreaking steamships *Taimyr* and *Vaigach* under command of Boris Vilkitsky. The readings were organised at the initiative of HSR and under the direction of the museum 'Ice breaker *Krasin*' (St. Petersburg branch of the World Ocean Museum in Kaliningrad).

Among the participants were descendants of researchers: Irina Tikhomirova (grandniece of Boris Vilkitsky), Asya Schwarz (granddaughter of Nikolay Evguenov, senior navigator of *Tajmyr*), Vadim Novopashenny (grandson of Petr Novopashennyj, the commander of *Vaigach*), Alexey Zhokhov (relative of Alexey Zhohov, senior officer of *Tajmyr*), Maola Ushakova (the daughter of the researcher of Severnaya Zemlya from 1930-1932), Olga Petrova (granddaughter of admiral I.K. Grigorovich, the last imperial sea minister of Russia).

The participants were welcomed by HSR president, Nikolay Neronov, the oldest Russian polar explorer, V.V. Dremljug (95 years old), the Hero of Socialist Work, N.A. Kornilov, and the deputy director of the museum 'Ice breaker *Krasin*', Pavel Filin.

HSR Secretary, Valentin Smirnov, gave a presentation of the basic report 'Opening of *Severnaya Zemlya*: history, events, people, using plenty of slides'. HSR member, Irina Tikhomirova, gave an interesting talk on the Vilkitsky family, and showed a number of unique photos and documents from the family archive. Related to this, Olga Petrova talked about letters that the Boris Vilkitsky family sent to her grandfather, admiral I.K. Grigorovich. Scientific employee of the Russian State Arctic and Antarctic museum, Jury Vinogradov, gave a talk on the scientific and practical preparations of participants of the Hydrographic expedition in Arctic Ocean.
The head of the cartographic department of the Russian Academy of sciences library, O.A. Krasnikova, reviewed the unrealised research projects of the Imperor Nikolay II Land (now Severnaya Zemlya) in 1914-1928. Scientific employee of the Shirshov Institute of Oceanology, Maola Ushakova, gave a presentation on the work of her father and his comrades on Severnaya Zemlya in 1930-1932.
Honoured HSR member Viktor Rybin presented the report *Severnaya Zemlya and Imperor Nikolay II Land. Pro and contra*. He insisted on the necessity to return the initial historical

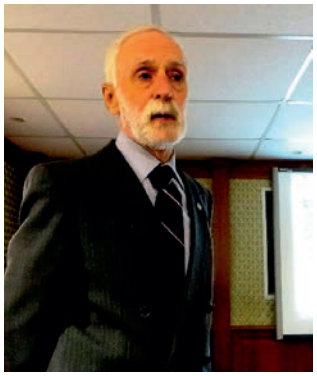


Figure 1: Honoured HSR member Viktor Rybin speaking.

Figure 2: Ice breaker *Krasin* - the St. Petersburg branch of the World Ocean Museum in Kaliningrad.

names of the archipelago - the 'Imperor Nikolay II Land' and the island 'Tsesarevitch Alexey' onto charts. To support this proposal he called upon everyone to sign a collective letter to the President of the Russian Federation.

The chief of the High-altitude Arctic expedition, V.T. Sokolov, talked about future research at the permanent ice base 'Cape Baranova'. Of general interest was the emotional story by the chief of the ice base 'Cape Baranova' from 1983-1996, V.V. Baranov, who talked about the activities of the scientific station on Severnaya Zemlya and the organisation of polar tourism.

At the end of the session, interested participants were able to view the exhibition created about the ice breaker, devoted to HEAO activity in 1910-1915.

At the same time, participants supporting Victor Rybin's proposal signed the letter to the President of Russia.

Hydrographic Society Benelux

Modern Techniques in Vintage Venue

The Hydrographic Society Benelux gathered for a well-attended meeting in the Nautical Museum (Scheepvaartmuseum) in Amsterdam for a workshop on vessel geometry and calibration. The meeting was busy with nearly 90 members participating.
Before the meeting, the members were able to visit the museum, which was renovated two years ago. The building is actually a former Navy warehouse and during the restoration characteristics were kept well. In the wings, dedicated exhibitions have been created for themes and children; the port of Amsterdam, a virtual journey on the sea, paintings, navigational instruments, models of yachts and artwork. Outside the museum, the former VOC sailing ship, the *Amsterdam,* can be accessed on the quay.

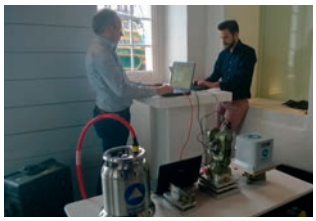


Figure 1: Demonstration of calibration equipment by Erich Gaickhorst (left) and Nicolàs de Hilster (right)

Figure 2: The attendees gathered during a lunch.

The programme was varied, starting with the museum director, Willem Bijleveld, introducing the museum and its building. This contribution was followed by a mega-presentation by Nicolàs de Hilster (Starmountain Survey & Consultancy) digging into the history of calibration and ships geometry. Together with Erich Gaickhorst (GeoVisie), he introduced a case story on the duplication of reference marks created on the weather deck of a vessel starting from a reference plate inside without lines of sight. They gave a live demonstration of their solution (Figure 1). Erich Gaickhorst then continued with an interesting story on the influence longitudinal flexibility and temperature deformation can have on the accuracy of the installations for ROV operations and positioning aspects.

After a short break, IJsbrand van der Bent (Ingenieursbureau Passe Partout) gave an insight into the dimensional control of construction works afloat from three points of view. Kees Boogaard from Rijkswaterstaat the presented the AMUST programme, which is a measuring application the organisation has developed in cooperation with the Technical University Delft.
An informal drink concluded the meeting where new contacts were made for the year around the corner.

The next workshop is scheduled for 19 March 2014, to take place in Antwerp, Belgium. This meeting is to include the General Assembly and the presentation of the award for the best thesis of 2013. Further details and registration will be available on the website of the Hydrographic Society Benelux: *www.hydrographicsocietybenelux.eu.*

Figure 3: The presenters of the workshop. From left to right: Erich Gaickhorst, Kees Boogaard, Nicolàs de Hilster, workshop chair Joost Boers, and IJsbrand van der Bent. Director of the Nautical Museum, Willem Bijleveld, is not on this picture.

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Hydro Agenda

FEBRUARY

Subsea Expo 2014
Aberdeen, UK
→ 05-07 February
For more information:
W: www.subseaexpo.com/

Underwater Intervention 2014
New Orleans, LA, USA
→ 11-13 February
For more information:
W: www.underwater-intervention.com/

MARCH

4th FPSO Vessel Conference
London, UK
05-06 March
For more information:
E: cwilliams@acieu.co.uk
W: www.wplgroup.com/aci/conferences/eu-mfp4.asp

VLIZ Young Marine Scientists' Day
Brugge, Belgium
→ 07 March
For more information:
W: www.vliz.be/en/event/2014-03-07-young-marine-scientists-day-2014

Oceanology International 2014 (OI2014)
London, UK
→ 11-13 March
For more information:
W: www.oceanologyinter-national.com

INAMARINE
Kemayoran, Jakarta - Indonesia
→ 13-15 March
For more information:
E: donna@gem-indonesia.com
W: www.inamarine-exhibition.net

Gastech 2014 Conference & Exhibition
South Korea
→ 24-27 March
For more information:
E: info@gastech.co.uk
W: www.gastechkorea.com

Offshore Technology conference Asia
Kuala Lumpur, Malaysia
→ 25-28 March
For more information:
W: www.otcasia.org/2014/

APRIL

OCEANS'14 MTS/IEEE Taipei
Taipei, Taiwan
→ 07-10 April
For more information:
W: www.oceans-14mtsieeetaipei.org

GeoMaritime
London, UK
→ 08-09 April
For more information:
W: www.geospatialmaritime.com/

International Convention Marine Renewable Energy
Cherbourg, France
→ 09-10 April
For more information:
W: www.thetis-emr.com/

ENC-GNSS 2014
Rotterdam, The Netherlands
→ 14-17 April
For more information:
W: www.enc-gnss2014.com

Canadian Hydrographic Conference (CHC)
St. John's, Canada
→ 15-17 April
For more information:
W: www.chc2014.ca

Underwater Acoustics & Advanced Courses in Acoustic Monitoring of Marine Wildlife & Oil Industry, Civil & Navy Underwater Acoustics
Bath, UK
→ 28 April-02 May
For more information:
E: sarah@seiche.eu.com
W: www.seiche.com

MAY

EIVA NaviSuite User Group
Skanderborg, Denmark
→ 06 May
For more information:
E: heh@eiva.com
W: http://bit.ly/1cSNnxv

AUVSI's Unmanned Systems
Orlando, USA
→ 12-15 May
For more information:
W: www.auvsishow.org/auvsi2014/public/enter.aspx

JUNE

CARIS 2014
Brest, France
→ 02-06 June
For more information:
W: www.caris.com/caris2014

Energy Ocean
Atlantic City, NJ, USA
→ 03-05 June
For more information:
E: kleighton@accessintel.com
W: www.energyocean.com/

GeoMaritime APAC
Singapore
→ 10-11 June
For more information:
W: www.geo-maritimeapac.com

ADCPs in Action 2014
Utrecht, The Netherlands
→ 11-12 June
For more information:
E: info@aquavision.nl
W: www.aquavision.nl

SEPTEMBER

Oceanology International China 2014
Shanghai, China
→ 03-05 September
For more information:
W: www.oichina.com.cn/en/

SMM 2014
Hamburg, Germany
→ 09-12 September
For more information:
W: http://smm-hamburg.com/

OCEANS'14 MTS/IEEE
St. John's, Newfoundland and Labrador, Canada
→ 14-19 September
For more information:
E: info@oceans14mtsieeest-johns.org
W: www.oceans14mtsieeest-johns.org

OCTOBER

Extraordinary International Hydrographic Conference (EIHC)
Monaco
→ 06-10 October
For more information:
W: www.iho.int

Sea Tech Week 2014
Brest, France
→ 13-17 October
For more information:
E: seatechweek@brest-metropole-oceane.fr
W: www.seatechweek-brest.org

Offshore Energy
Amsterdam, The Netherlands
→ 28-29 October
For more information:
E: oe@offshore-energy.biz
W: www.offshore-energy.biz

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Hydrographic Data and E-navigation

In his 'Insider's View' column in the September 2013 edition, the president of IHO, Robert Ward, highlighted the need for more efforts to improve the world's "global bathymetric dataset". This position is even more critical when looking at the emerging e-navigation concept and fits in well with the theme of World Hydrographic Day 2014: 'Hydrography – more than just charts'.

At the core of e-navigation are different data streams, communicated between the different stakeholders on shore and at sea. To gain the necessary situational awareness, a growing amount of data is being collected. This needs to be analysed and converted into meaningful information, which can increase situational awareness. Hydrographic data, especially in ENCs but also bathymetric data, is the essential foundation. Real-time data – such as traffic situations – or semi-real-time data, such as tidal information submitted at certain time intervals, will be added to the data pool. This growing amount of data, including on-board sensor data, will need to be automatically selected given the situation at hand. The systems will provide the navigator with all the information needed to gain the necessary awareness for good decision-making. In other areas, such as in terrestrial or air navigation, this is already implemented to a degree.

Various e-navigation test projects are underway to prepare for this data consolidation and integration. One of the issues to be solved is how to link the different data sources together. Hydrographic data is gathered and consolidated in a certain grid structure. As tide station data is being integrated to develop a more accurate depth contour at the time of navigation, the tide station needs to be linked into the gridded static hydrographic data. Here, the hydrographic offices and other hydrographic data experts need to work closely with other data providers and data service providers functioning as data clearing houses. Furthermore, the rules need to be defined regarding which data is being selected for presentation to the user. What is to be presented, when? Which data should have priority over other types, and how should static, pre-composed hydrographic data be adjusted using semi-real-time data to better represent reality? These are just a few questions to be answered in the early phases of the e-navigation journey.

Such integrated hydrographic data is not only useful on board, but also on shore to gain a better insight into the traffic situation and provide educated advice to the mariner from a VTS station. Shore-based users may have a very different view and other goals to achieve, but some base data will be the same. This will improve communication between the different stakeholders in the maritime world, and also increase the ability of shore-based experts to provide meaningful advice to navigators on-board vessels. Understanding and utilising hydrographic data – rather than just charts produced based on this data – is becoming more important for all players in the maritime field.

It has to be understood that in this concept, while integrating new datasets, the foundation is the hydrographic data layer. Without the availability, quality and reliability of this data layer, e-navigation is like a house without foundations. E-navigation is not possible without them. While it may appear that the work of hydrographic offices will become less important in the future, the opposite is actually true. The final products used by the mariner may not come from HOs since they may be composed from different sources, but the HO data is – and will continue to be – central.

Going back to my initial remark: a good "global bathymetric dataset" as requested by Robert Ward is the cornerstone of e-navigation.

Michael Bergmann, director Maritime Industry Affairs and Services, Jeppesen

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