Editorial

Welcome to the first issue of the 30th volume of The International Hydrographic Review (IHR).

What a success! Over 1 billion crowdsourcing depth data points, collected by hundreds of vessels using standard navigation equipment during routine maritime operations, are stored in the IHO Data Center for Digital Bathymetry (DCDB). The DCDB is hosted by the U.S. National Oceanographic and Atmospheric Administration (NOAA) on behalf of the IHO Member States. In addition to data from the IHO Crowdsourced Bathymetry (CSB) initiative, the DCDB archives and shares ocean depth soundings collected since 1990 by hydrographic, oceanographic and industrial vessels using multibeam and single beam sonars during surveys or transits.

Each of these 1,008,164,463 CSB depth soundings (as of April 2024) has the potential to fill data gaps and to contribute to a safer navigation at sea. But it is not only for this purpose. The hydrographic data required is no longer limited to water depths along shipping routes. Rather, the derived spatio-temporally resolved seabed topography plays a crucial role in the acquisition, processing and analysis of other expert data, e.g. ocean profile data in oceanography and habitat mapping in marine geology. Hydrographic data are therefore essential for e.g. assessing the impact of climate change on ocean circulation, mapping mussel habitats, predicting coastal erosion and identifying suitable areas for offshore renewable energy infrastructure.

Knowledge of our waters in general, and CSB data in particular, can help take informed decisions and is therefore key to protecting and sustainably using our oceans. The fact that our hydrographic community, as well as the neighbouring disciplines of oceanography and geodesy, are rising to the challenge of providing data that were previously non-existent or very sparse is also reflected in the number of related papers in this issue – five on crowdsourcing and four on ocean exploration. Let us begin with the first…

In honour of IHR's centenary in 2023, Prof Dr Alex David Rogers has been invited to contribute to the special Jubilee Issue with a keynote article on the exploration of deep-sea biodiversity. As this was not possible in the Jubilee year, we are publishing the manuscript now. This is not such a big worry, as Alex David Rogers & Eva Ramirez-Llodra's article also fits perfectly into the thematic focus of this issue. Their contribution provides an excellent summary of the activities to discover the diversity of species in the deep sea over the last hundred years, and shows that as human impact increases, knowledge of the distribution of life must be constantly improved through further *deep-sea exploration of marine ecosystems* (pp. 10–37).

The second article in this issue is also an invited contribution. Manuela Ammann from the University of Applied Sciences Northwestern Switzerland is the current winner of the IFHS Student Award for her Master's thesis on *robotic photogrammetric underwater inspections* (pp. 38–44).

The following three of the five peer-reviewed scientific articles also address the task of filling data gaps. What is exciting is that they do so from three different disciplines, in very different ways, for different tasks. First, Bruce Enki Oscar Thomas et al. present a novel *cargo ship-based Global Navigation Satellite System (GNSS) network* in the Pacific Ocean that analyses sea surface heights in real time *for tsunami detection*, thereby adding accurate tsunami observations to an existing geodetic data gap (pp. 46–63). In the following article, Mathieu Rondeau et al. use the Canadian Hydrographic Service's (CHS) *Community Hydrography Program* as an

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example of how *to go from a volunteer ping to a bathymetric community map* in the span of a few weeks (pp. 64–77). In a third article, Matthias Hinz et al. present a workflow for fully automated *AI-based boulder detection* in sonar data, which has the potential to efficiently provide accurate, reliable and unbiased knowledge about the presence of boulders on the seabed for a variety of applications such as marine geological and biological habitat mapping (pp. 78–98).

Another two peer-reviewed scientific articles focus on *improving the energy efficiency of a ship using tidal current information* (Jinyoung Yang & Do-Seong Byun, pp. 100–110) and *exploring the possibility of adding Discrete Global Grid Systems (DGGS) support to the S-100 Universal Hydrographic Data Model* (Kimberly Mason & Jens Schröder-Fürstenberg, pp. 112–123).

I am pleased to announce that for the first time in this issue we are publishing selected papers from HYDRO, the annual hydrographic conference of the International Federation of Hydrographic Societies (IFHS). First of all, Aldo Monaca, President of the Organizing Committee of HYDRO 2023, will give you his greetings (pp. 125–126). This is followed by two conference papers on exploring our oceans, with the aim of providing the knowledge to use them sustainably and to protect them: Tanja Dufek et al. use *deep-towed multibeam echosounder data to locate active hydrothermal vents* that are thought to be metal-rich sulphide deposits on the seafloor (pp. 128–134). Hannah Brocke et al. are also helping to *fill data gaps by creating automated maps of seabed health to provide nature-based solutions* for policy decisions, support investment in the blue economy, and encourage the development of markets for blue carbon and biodiversity credits (pp. 136–142). Matthew Woodlief will conclude with his conference paper on *unlock insights from hydrographic data with GeoAI* (pp. 144–149).

Due to the rapid technological development in the field of hydroacoustic data acquisition and processing, CSB can make a valuable contribution to filling the gaps, provided that the associated uncertainty constraints are understood and adequately addressed. In this new issue of the IHR you will find two notes / technical reports on the subject of CSB: Jennifer Jencks & Belen Jimenez Baron present *CSB as part of the modern hydrographic toolbox* (pp. 150–160) and Hains et al. examine CSB data quality and legal concerns (pp. 162–170).

Two further notes / technical reports deal with *Science Monitoring and Reliable Technology (SMART)* to monitor the ocean using submarine cables (Matías Sifón, pp. 172–177) and the *Baltic Sea e-Nav project, a partnership for the future of marine navigation* to unlock the full potential of the S-100 paradigm shift towards e-navigation (Benjamin Hell et al., pp. 178–181).

The current issue concludes with valuable information from the IFHS on *empowering hydrographic professionals* (Lekkerkerk et al., pp. 182–187), from the International Federation of Surveyors (FIG) presenting its forthcoming *four-year work plan for Commission 4 – Hydrography* (M. D. Eranda K. Gunathilaka et al., pp. 188–192) and a *review of the book „The deepest map – The high-stakes race to chart the world's oceans"* by Laura Tretheway (Douglas Paul Brunt, pp. 194–195).

On behalf of the Editorial Board, I hope you enjoy reading this new edition of IHR!

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Chief Editor, IHR