

Satellite-Derived Bathymetry:

Industry update for the Southwest Pacific Hydrographic Commission (SWPHC19)

Dr. Magnus Wettle

EOMAP Germany | Australia | United States | Abu Dhabi www.eomap.com



EOMAP

Mapping and monitoring aquatic environments worldwide

Satellite remote sensing – Earth Observation

Two main product suites:

- bathymetry and seafloor mapping
- water quality monitoring

Innovative, proprietary algorithms

Operational processing systems

Software: enabling capabilities

First and leading commercial provider of SDB

Spin-off German Aerospace Center, 20+ years R&D



The SDB journey so far

- 1980s-2000's: R&D
- 2005: First commercial SDB project: (environmental management)
- 2012: NOAA and UKHO evaluate SDB
- 2013: Used by marine professionals (e.g. SHELL)
- 2014: Pilot project with AHO
- 2015: UK Hydrographic Office puts EOMAP SDB in chart
- 2019: NZ Hydrographic Authority puts EOMAP SDB in charts
- 2019: IHO S-44 updated for SDB
- 2020: 2 hydrographic agencies with commercial SDB software
- 2021 AHO signs extended contract for EOMAP software services
- 2021 IHO HSWG establishes SDBPT, chaired by EOMAP COO
- 2022 UKHO selects EOMAP as primary SDB provider for next 3-5 years
- Uptake accelerating: >100 projects in >25 countries in last 2 years





PRESS RELEASE



Seabed 2030 SDB project



FOR IMMEDIATE RELEASE

Tropical seafloor secrets discovered as mission to map world's entire seabed gains momentum

London, 16 February 2022 - Satellite technology has been used to chart shallow areas of the Cook Islands' seafloor in never-before-seen detail by scientists at the National Institute of Water and Atmospheric Research (NIWA) and Toltū Te Whenua Land Information New Zealand (LINZ) working with the satellite data analytics company, EOMAP GmbH. The work was carried out as part of The Nippon Foundation-GEBCO Seabed 2030 Project – a collaborative project aiming to bring together all available bathymetric data to produce the definitive map of the world ocean floor.

The discovery coincides with the One Ocean Summit, held in France, which saw UNESCO call on the international community to strengthen efforts in pursuit of mapping the remainder of the ocean floor – 20.6 per cent has been mapped to date.

The chart of Suwarrow and Pukapuka in the Cook Islands builds upon decades-old surveys, with more accurate positioning and wider coverage, including information on harder to reach areas such as shallow lagoons.



Image shows the Pukapuka Atoll satellite derived bathymetry overlaying pre-existing data in the GEBCO Grid. Credit: NIWA

Kevin Mackay, a Researcher of Marine Geology at NIWA, also heads Seabed 2030's <u>South and West Pacific Ocean Data Centre</u> – one of the project's four Regional Centres, each responsible for data gathering and mapping in their territory.



Image shows the Pukapuka Atoll satellite derived bathymetry overlaying pre-existing data in the GEBCO Grid. Credit: NIWA



Seabed 2030 Satellite-Derived Bathymetry project

Approx 1,200 sq km of shallow waters bathymetry delivered for eastern Micronesia, using multispectral satellite image SDB and verified against Satellite Lidar Bathymetry (SLB).





SEABED

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Seabed 2030 Satellite-Derived Bathymetry project SEABED 20



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detect more.

THE NIPPON FOUNDATION-GEBCO

SDB to fill survey data gaps in polar regions



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SDB to fill survey data gaps in polar regions



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detect more.

Vanuatu Archipelago: Climate Change Resilience (2021)

Climate Information Services for Resilient Development in Vanuatu

- Vanuatu extremely vulnerable to climate change
- Standardise science-based climate information
- Underpins awareness and longterm policy planning around climate change
- Hydrodynamic, wave, and biogeochemical models amongst others



Climate Information Services for Resilient Development in Vanuatu



Climate Information and Services (CIS) provides people and organisations with timely, tailored climate-related information and tools that they can use to reduce the impacts of climate change including on lives; livelihods and property, CIS supports better policy, planning, and decision making across sectors, at national and community scales for both long and short-term timeframes.

The **Climate Information Services for Resiliend Development In Vanuatu (ISSRDP) Project** responds to proteins identified in the Vanuatu Framework for Climate Services and the Vanuatu Meteorology and GEO-Hazards partiment (VMGD) Strategic Development Plan, developed through a national consultation and design process. Without timely and tailored information about the impacts of climate change development sectors, governments and communities like rick mascele poses and development due to drough the waves: conforce Endoring meteory of the sectors and sectors and the other meteors and the other meteors.







Vanuatu Archipelago: Climate Change Resilience (2021)

- SDB using Sentinel-2 (10m) for feasible shallow waters over entire area (~710km²)
 - I Multi-temporal approach
 - ^I Water depth to -23m (MSL)
- Multi-source bathymetry grid for entire area (~209,000km²)
 - SDB + ENC data interpolation (ANUDEM)
 - $\ensuremath{\,^{||}}$ 50 and 250m grids for entire area
 - 10 and 20m grids for 0-200m depth
 - ^I Water depth to -7732m (MSL)









Vanuatu Archipelago: Climate Change Resilience (2021)











Open Data: small technology company

In support of GEBCO/Seabed 2030: letter of bathymetric data contribution with SDB product delivery (reduced resolution)

(Engaging with AusSeabed for SDB data AOI and metadata)

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ECMAP Grant & CaxE, Schoolnel 4, 82229 Seekid, Germany	detec	
Attr. Amo Nym SuperCompany Itd Gondwana J.Berlin Singapore	Dr. Knut Hartmann EOMAP GmbH & Co. KC Schlosbolf 4 82229 Seefeld Germany	SEABED 2030
	+49 8153-99861 13 haitmann @eomap.de eomap.com	Appendix 1: Seeking support for The Nippon Foundation-GEBCO Sea Project
	Seefeld, G18, 1/5/2022	To support sustainable development, to make informed policy decisions, to manage nat and to pursue scientific research of the ocean, the world needs access to modern, deta bathymetric information of the world's oceans.
SUBJECT: Seeking support for The Nippon Foundation-GEBCO Sea Dear Armo Nym,	bed 2030 Project	The Nippon Foundation-GEBCO Seabed 2030 Project is a collaborative project between Foundation and GEBCO to inspire the complete mapping of the world's ocean by 2030 compile all bathymetric data into the freely-available GEBCO Ocean Map.
EOMAP is supporting and in strong favour of the Nippon Foundar and we encourage you to contribute to the ambitious goals of th oceans and manage marine hazards. Please take few minutes of which will provide you with details of the project and its goals. Ap	tion-GEBCO Seabed 2030 Project is project to sustainably manage or your time and read the appendix 1 apendix 2 provides a signature forn	The General Bathymetric Chart of the Ocam (GBEO) operates under the joint association terms atom in Hydrographic Organization (IHO) and the Intergovernmental Ocamograph Commission (IHO) of UMESO. The Seabed 2020 Protect builds on more than 100 years history in global seafloor mapping and has a vision that by 2020, the world's oceans are and the freely-available GBEO Ocean htsp is a complete may of the global local locans htsp.
to confirm your data contribution to Seabed 2030. Please return project. Sincerely yours, EOMAP GmbH & Co.KG SATOP GmbH	this document to contribute to the	Completing a modern map of the sea floor will be a turning point in our understanding processes and resorces, providing a major steer charge in our ability to sustainably ma oceans and manage marine hazards. By providing the definitive map of ocean bathwere 2010 fs. maintige a major contribution to the UIN bcade focean science for Sustainable Development (201-2030) and activering the UIN statianable Development Goal 14 Life Water).
Dr. Клис Hartmann. EOMAP GmbH & Co. KG		To achieve the Seabed 2030 vision, all existing data must be identified, contributed and into the GEBCO Ocean Map. Seabed 2030 will then identify areas without data which w directed mapping campaign to map the gaps and complete the GEBCO Ocean Map.
Appendix 1: Seeking support for The Nippon Foundation-Gi Appendix 2: Data support form	BCO Seabed 2030 Project	The key to realizing the Seabed 2010 vision is building global coordination between gip public, scademia and indury. To this end, J am writing to request your entry's support participation in the ineutolocitomy global instative. We recognite that some of these mary be considered commercially sensitive and to that end. Seabed 2010 would be pli- decimized data to lower resolutions that collected. However, the seabed 2010 would be pli- decimized data to lower resolutions that collected. However, the seabed 2010 would be pli- decimized data to lower resolutions that that collected. However, the seabed 2010 would be pli- decimized data to lower resolutions that that collected. However, the seabed 2010 would be pli- decimized data to lower resolutions that where the data are used to construct the water that resolutions are deterined as a resolutions that the collected. However, the seabed 2010 would be plice to the seabed data and the seabed data and the seabed data and the seabed cost of the seabed data and the seabed data and the seabed data and the seabed cost of the seabed data and the seabed data and the seabed data and the seabed cost of the seabed data and the seabed data and the seabed data and the seabed cost of the seabed data and the seabed data and the seabed data and the seabed cost of the seabed data and the seabed data and the seabed data and the seabed data and the seabed cost of the seabed data and the seabed da
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		Through your contribution of bathymetric data to Seabed 2030, your company would b global collaboration that provides a 'once in a lifetime' opportunity to create a new fou
		2/3



EOMAR

Contribute to the sustainable development and stewardship of our ocean 3. Be recognized by GEBCO as a contributor to Seabed 2030 through the Partners page of the Seabed 2030 website

EOMA

- 4. In some jurisdictions, recognize potential tax benefits from charitable contributions of hathymetric data
- Access to a larger, higher resolution GEBCO bathymetric dataset to support your company's future business interests and activities
- In addition to providing the information or data mentioned above, your company could furthe support Seabed 2030 in three ways:
- 1. Continue to share information about the spatial extents of your bathymetric data holdings and contribute or make commitments to contribute these data going forward
- 2. Where you own or charter vessels to support your offshore activities, acquire and contribute crowdsourced bathymetry data during transits to Seabed 2030 Help spread the word, by letting others in your network know about Seabed 2030 and how
- they can participate.

Should you have questions or wish to discuss details related to your company's participation, please contact Seabed 2030 or Dr. Knut Hartmann (hartmann@eomap.de)

Your sincerely,

Jamie McMichael-Philling Seabed 2030 Director

Further Information:

- · General Bathymetric Chart of the Ocean (GEBCO) https://www.gebco.net/
- The Ninnon Foundation GEBCO Seahed 2030 Project http://www.seahed2030.org UN Decade of Ocean Science for Sustainable Development - https://en.unesco.org/ocean-decade

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Letter of bathymetric data contribution

Seabed 2030



Open Data: small technology company

EOMAP

Running lean: profits to R&D and increased resources > forefront of SDB development and adoption since 2005

Driven by Government agencies and NGOs negotiate e.g. creative commons licence – everybody wins





SDB Capacity Building

Workshop with IHO (June 2021):

Concepts, theory, use cases and hands-on practicals

By IHO invite only

<u>3rd International SDB Day (Feb. 2021)</u>

2 day conference





SDB Standards and Best Practice

1. SDB Best Practice Project Team (SDBPT)

- International Working Group
- Official member and supporting body of IHO HSWG
- SDB Standards and Best Practice
- · 30+ members
- Kick-off in April 2021

2. Engaging with best intent but sporadically with AusSeabed (e.g. fit-for-purpose user guide)







Global SDB CAL/VAL opportunity: IceSAT-2, space-borne LIDAR







Data derived using EOMAP's Satellite Lidar Bathymetry toolbox and based on IceSAT-2 ATLAS data.



Data derived from EOMAP's physics based Watcor-X Satellite-Derived Bathymetry software. No calibration, no manual interpretation and no configuration.

Not a panacea:

- 1) Raw photon returns (point clouds) challenging to convert to depth
- 2) Noise and errors (not equivalent to airborne LIDAR)
- 3) Transects (10+ kilometres apart), not spatial image
- 4) Cumbersome data volumes



SDB software for different needs

	software installation	calibration data	features
WATCOR-X	local	independent	transparent, accuracy assessment, sophisticated
LiteCOR-X	local	required	fast, easy
eoLytics-SDB	online*	required	fast, easy
eoLytics-SDB _{wc}	online**	independent	transparent, accuracy assessment, sophisticated

eoLytics-SWIFT, -WQ, -ICESAT	online*	-	Image finder, water quality analysis, ICESAT toolkit
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Reconnaisance Surveying of uncharted navigational hazards: Mawson Station, Antarctica





Thank you

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