JAMSTEC Ocean Mapping Activities and Data Contribution


http://www.jamstec.go.jp/msg/e/

Recent activities
• Deep learning approaches
• Data contribution
• Collaboration

No.5 SawPacRMC in Peru, 12-14 July 2023

Mathematical Seafloor Geomorphology
Advancing Our Understandings for the Earth:

Researcher Staff
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Tatsu Kuwatani (IMG)
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**Vessels/Manned Submersible**

**R/V HAKUHOMARU**
GT 3,991 t
Multipurpose research vessel with long-term cruise

**R/V YOKOSUKA**
GT 4,439 t
Support vessel for “SHINKAI6500”

**D/V CHIKYU**
GT 56,752 t
Drilling vessel with world-class scientific drilling capacity

**R/V MIRAI**
GT 8,687 t
Large vessel able to perform observation over wide areas

**R/V SHINSEIMARU**
GT 1,629 t
Operation from 2013
Multipurpose R/V focusing on the survey off the coast of Tohoku region

**R/V KAIMEI**
G 5,747 t
Multipurpose research vessel for wide-area seabed research

**Deep Submergence Vehicle** Shinkai6500
World-class manned submersible

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Unmanned Underwater Vehicles/Supercomputers

**URASHIMA**
Large AUV capable of long-distance dives

**YUMEIRUKA**
High-performance motion control advanced acoustic observatory

**JINBEI**
High cruising capability Equipped with chemical sensors

**OTOHIME**
Working AUV equipped with manipulators

**HYPER-DOLPHIN**
Operation with high-sensitivity camera and manipulators

**KAIKO 7000 II**
Capable of diving up to a maximum depth of 7,000 m

**KAIKO Mk-IV**
ROV for heavy-duty work launched in 2013

**Earth Simulator**
- 5120 Processor nodes (20,480 cores)
- Peak Performance: 1.3 PfLOPS

**UV2000**
- 256 CPU socket (2,560 cores)
- Peak Performance: 49.152 TFLOPS

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Arctic Research Vessel

**Vessel Profile**

- **Length**: 128 m
- **Beam**: 23 m
- **Gross tonnage**: 13000 t

- **Ice-breaking capacity**: capable of continuously breaking 1.2 m of flat, one-year ice at a speed of 3.0 knots

- **Accommodation**: 99

- **Completion (planned)**: FY 2026
Marine Robotics R&D

Ultra-deepwater exploration

Side-scan sonar
The seafloor images transmitting sound waves by the AUV

Sub-bottom profiler
AUV transmits sound waves to the seafloor / below the seafloor
Accelerating efficiency and automation of oceanographic observations

The recent AUVs allow long-term and continuous surveys and sampling, but they still require a human occupied research vessel and mother ship.

“Unmanned observation system” is our goal! without the need for crewed ship support.
Modular platform includes:
Powerful Computing Environment
Multiple Configurable Sensor Modules
Real-Time Communications
Solar Modules & Battery Packs
Monaco, 2 May 2023 – An additional 5.4 million square kilometres of new data – equating to an area twice the size of Argentina – has been added to the definitive map of the world’s ocean floor, with 24.9 per cent of the seabed now mapped.

The global effort behind mapping the world’s entire ocean floor before the end of the decade is being spearheaded by Seabed 2030 – a collaborative project between The Nippon Foundation and the General Bathymetric Chart of the Oceans (GEBCO), itself a joint programme of the IHO and the Intergovernmental Oceanographic Commission (IOC) of UNESCO.
Coverage of seafloor surveying is still only 24.9%!

GEBCO results measured against present day requirements:

1903-2017: From 0% to 6% minimum acceptable data coverage

2017-2021: From 6% to 21% minimum acceptable data coverage

2021-2023: From 21% to 24.9%!

2005: 100% 10m DEM coverage of all landmass

2021: 100% detailed topography coverage of Moon, Venus and Mars
<table>
<thead>
<tr>
<th>Action Item</th>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td><strong>International Affaire</strong></td>
<td>Oct 2022 and Jan 23</td>
<td>GEBCO MapTheGap</td>
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<td>Jan 2023 and Feb 23</td>
<td>Seabed2030 OneOceanSummit</td>
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<td></td>
<td>Jun 2023</td>
<td>CSBWG13</td>
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<td>TSCOM</td>
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<td></td>
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<td>GECBO_grid2023</td>
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<tr>
<td>Domestic networking</td>
<td>July 15 2021 ~ May 27 2022 ~ April 1 2023 ~</td>
<td>Email contact / online meeting Joint bathymetry research MOU signed</td>
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<tr>
<td>Under planning to Next DARWIN system</td>
<td>Within this year</td>
<td>Database construction</td>
</tr>
<tr>
<td>Publications Related papers</td>
<td>March 2021</td>
<td>Hidaka et al., Deep learning approaches, Geoinformatics, 32, 1, 2021.*</td>
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<td></td>
<td>Apr 2022</td>
<td>Yutani et al., Super-resolution and feature extraction, Sensors, 22, 9, 2022.</td>
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JAMSTEC Data Contribution for general public
as of 13 March 2023

- Cruises & Dives
  - 2,431 cruises
  - 7,857 dives

- Observation data (totally 99,644)
  - CTD : 239 cruises
  - XBT : 1,039 cruises
  - Submersible CTD : 2,760 cruises
  - ADCP + LADCP : 779 cruises

- Marine Geophysics data
  - Bathymetry : 1,295 cruises
  - Gravity : 914 cruises
  - Magnetics : 1,136 cruises

https://www.godac.jamstec.go.jp/darwin_tmp/explain/81/e/
Seabed 2030 Project management team

Activity
• Update JAMSTEC bathymetry data provided to manually,
• Vessels, fleet and vehicle sounding operation, data QAQC,
  new technology of AUVs, marine robotics.

Related papers now preparation / in planning
• Matsuoka and Murakami, Applied deep learning
• Kuwatani, Data-driven analysis, in preparation
• Kikawa, AGU 2023

Future activity
• Keep in contact with key persons in NIWA, FISHINC, CSBWG, and JCG
• Cruise MBES data updated and QAQC automatically operation

Please contact us at seabed2030@jamstec.go.jp