

JAMSTEC Ocean Mapping Activities and Data Contribution

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

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

Mathematical Seafloor Geomorphology

Advancing Our Understandings
for the Earth :

- Recent activities
- Deep learning approaches
- Data contribution
- Collaboration

JAMSTEC



Vessels/Manned Submersible

GT: Gross tonnage

R/V HAKUOMARU

GT 3,991 t



Multipurpose research vessel with long-term cruise

R/V MIRAI

GT 8,687 t



Large vessel able to perform observation over wide areas

R/V YOKOSUKA

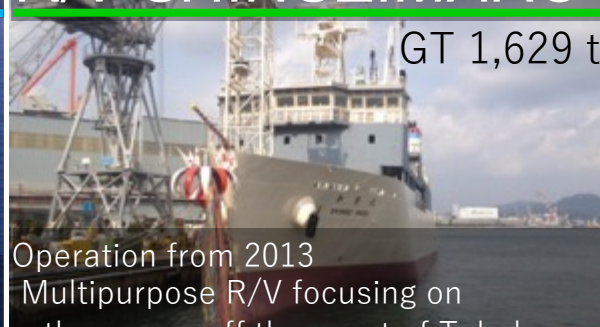
GT 4,439 t



Support vessel for "SHINKAI6500"

R/V SHINSEIMARU

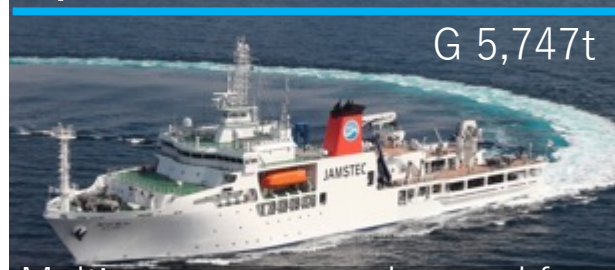
GT 1,629 t



Operation from 2013
Multipurpose R/V focusing on the survey off the coast of Tohoku region

R/V KAIMEI

G 5,747t



Multipurpose research vessel for wide-area seabed research

Deep Submergence Vehicle

Shinkai6500



World-class manned submersible

D/V CHIKYU

GT 56,752 t



Drilling vessel with world-class scientific drilling capacity

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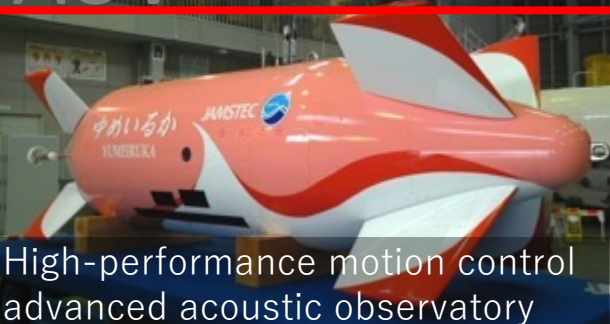
Unmanned Underwater Vehicles/Supercomputers

AUV URASHIMA



Large AUV capable of long-distance dives

AUV YUMEIRUKA



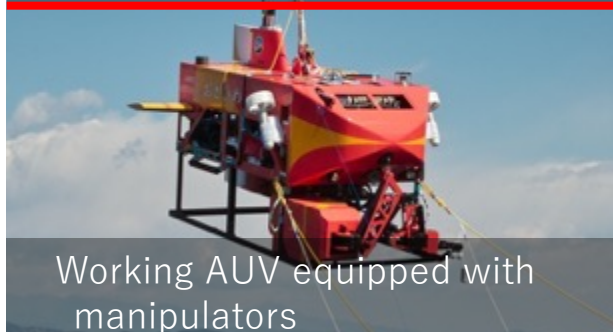
High-performance motion control
advanced acoustic observatory

AUV JINBEI



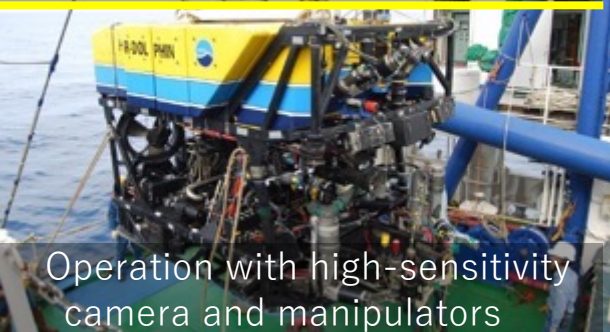
High cruising capability
Equipped with chemical sensors

AUV OTOHIME



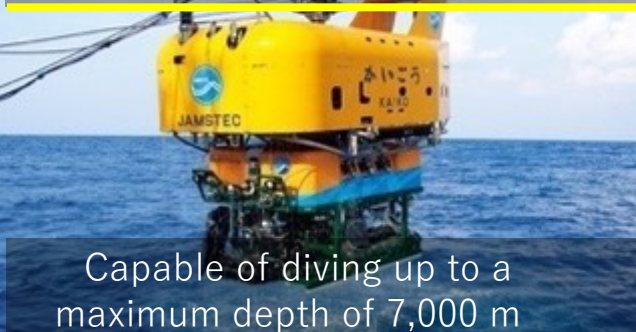
Working AUV equipped with
manipulators

ROV HYPER-DOLPHIN



Operation with high-sensitivity
camera and manipulators

ROV KAIKO 7000 II



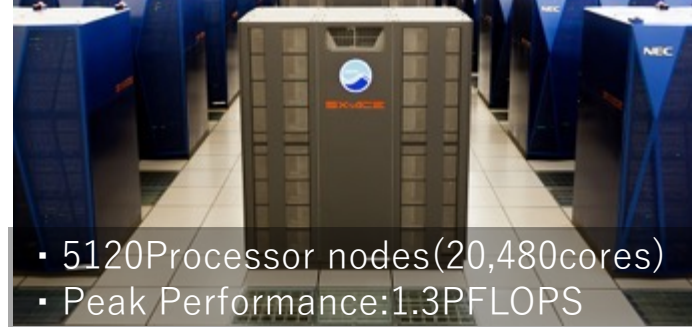
Capable of diving up to a
maximum depth of 7,000 m

ROV KAIKO Mk-IV



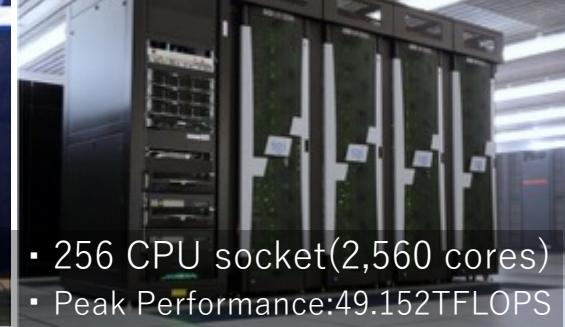
ROV for heavy-duty work
launched in 2013

Earth Simulator



- 5120 Processor nodes (20,480 cores)
- Peak Performance: 1.3 PFLOPS

UV2000

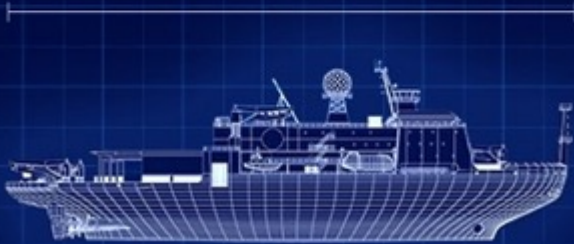


- 256 CPU socket (2,560 cores)
- Peak Performance: 49.152 TFLOPS

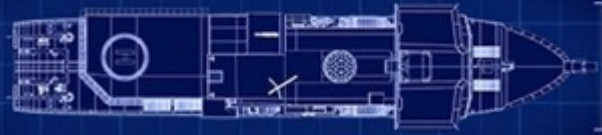
Arctic Research Vessel

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**

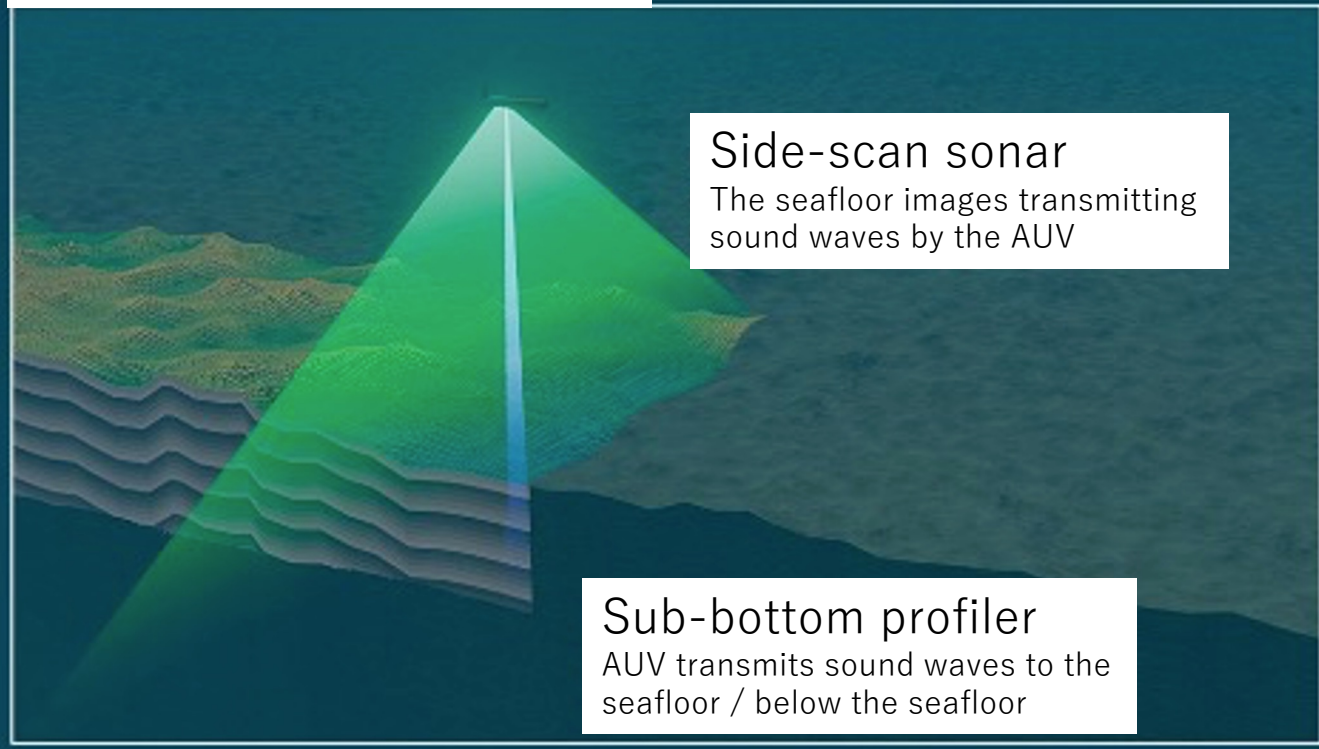


Completion
(planned) **FY 2026**





Ultra-deepwater exploration

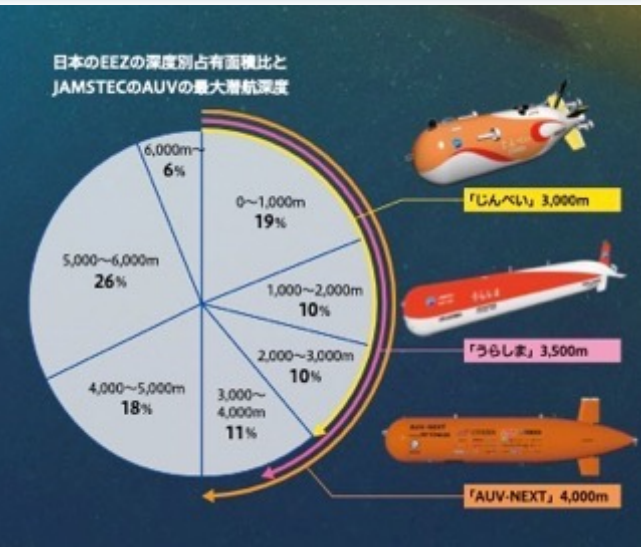
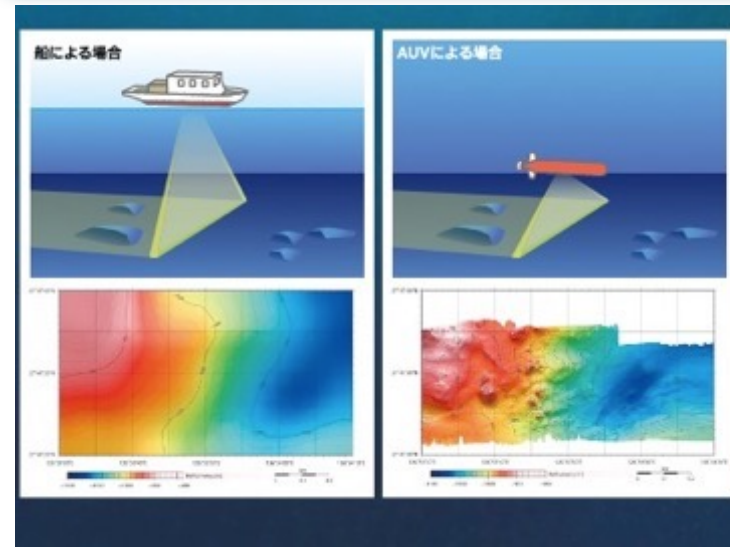
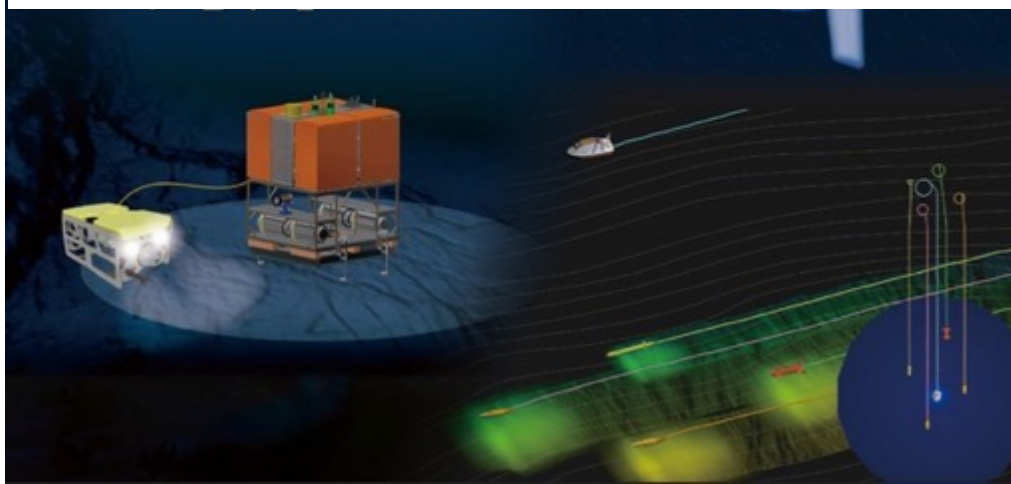


Side-scan sonar
The seafloor images transmitting sound waves by the AUV

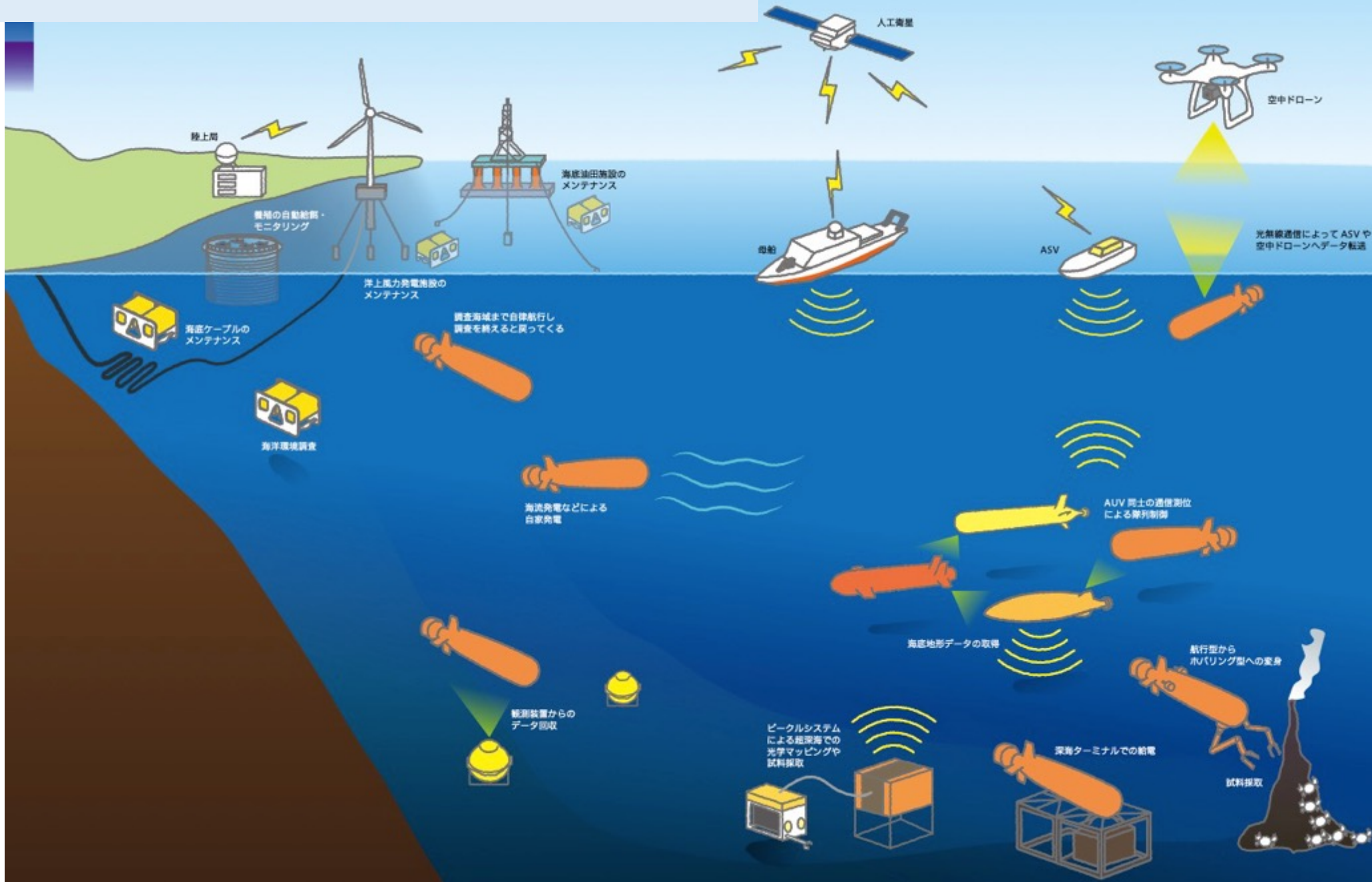
Sub-bottom profiler
AUV transmits sound waves to the seafloor / below the seafloor

6 Blue Earth 171 (2023)

Marine Robotics R&D

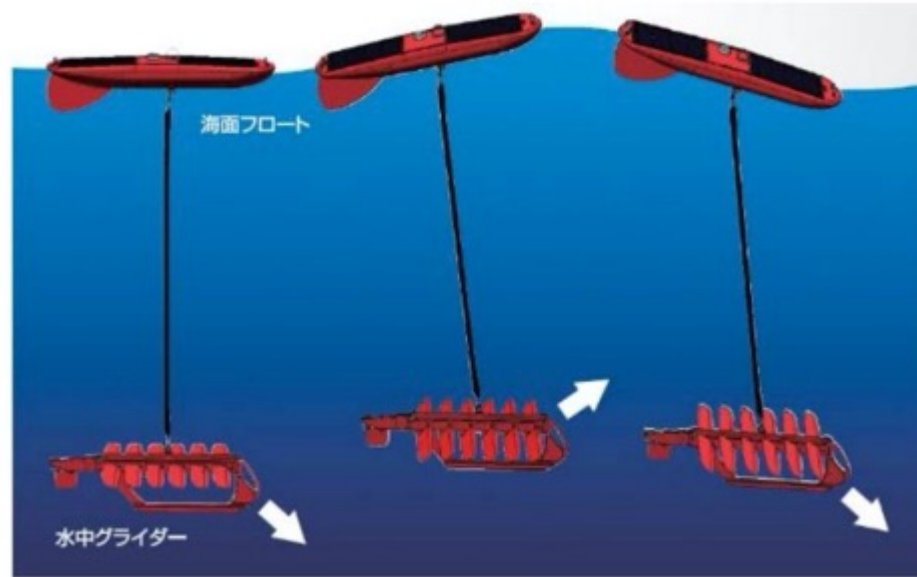
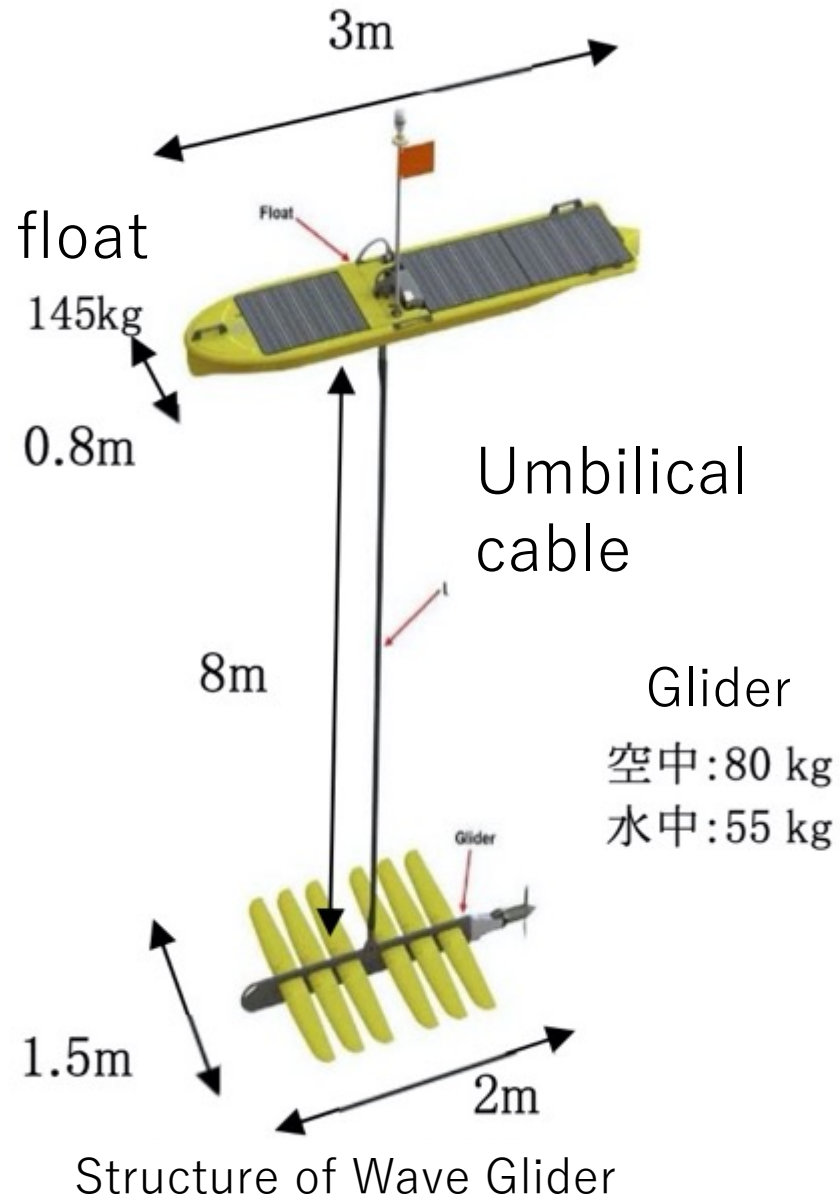


Near future realized through Marine Robotics



- 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.

Wave Glider



Wave propulsion mechanism



Sail Drone

Bluebottle



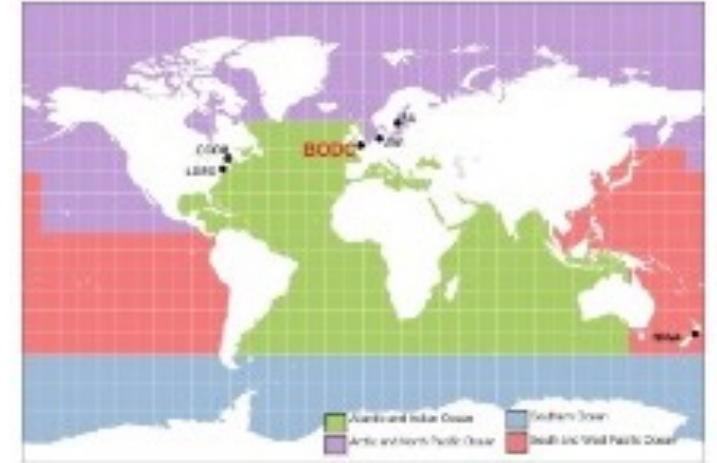
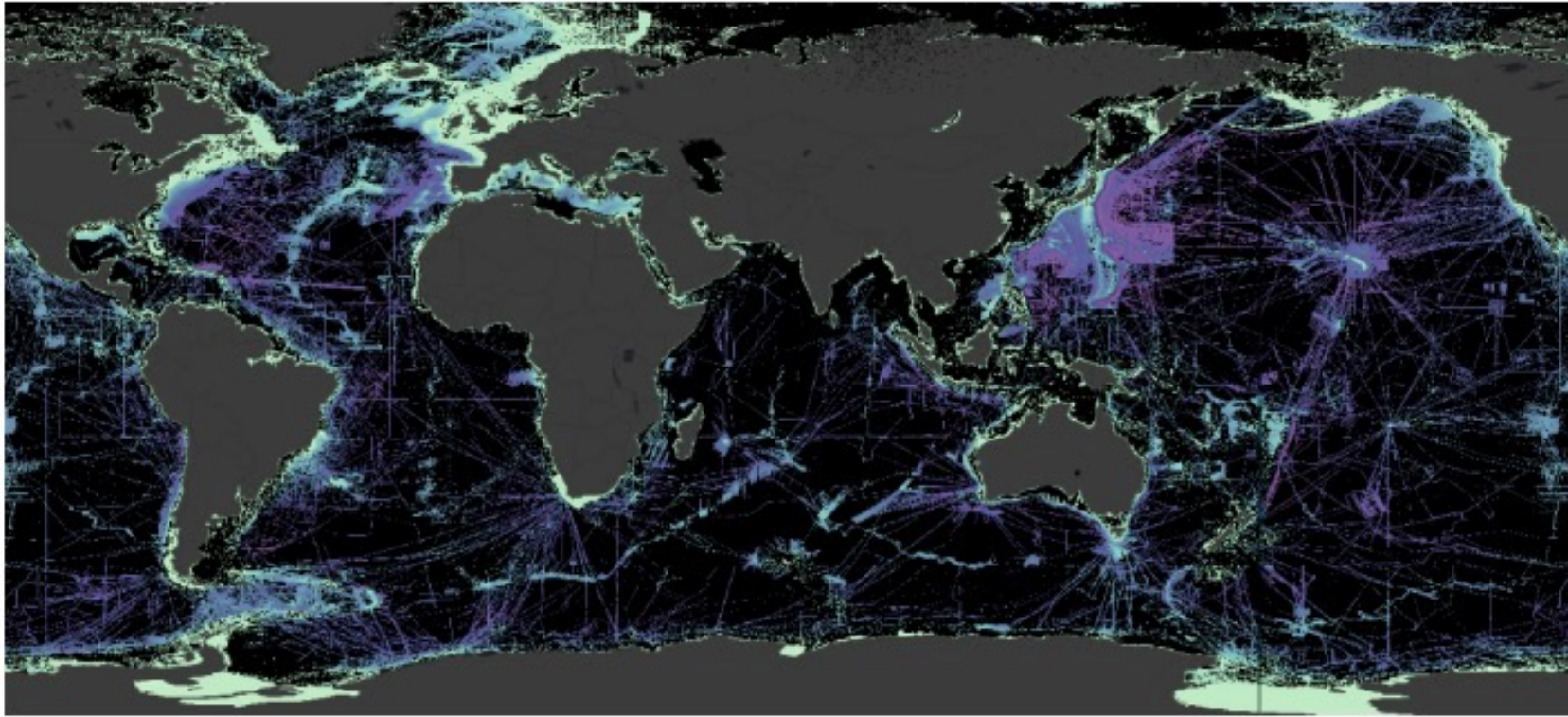
Drone

PHANTOM 4 PRO V2.0



Modular platform includes:
Powerful Computing Environment
Multiple Configurable Sensor Modules
Real-Time Communications
Solar Modules & Battery Packs

HSH Prince Albert II of Monaco Announces a Quarter of the Ocean Now Mapped



NOAA_IHO-DCDB
AWI, LDEO, SU-CCOM/JHC, NIWA

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

Update since last June 2022

Action Item	Date	Activity
International Affaire	Oct 2022 Jan 2023 Jan 2023 Feb 2023 June 2023	GEBCO MapTheGap Seabed2030 OneOceanSummit CSBWG13 TSCOM GEBCO_grid2023
Domestic networking	July 15 2021 ~ May 27 2022 ~ April 1 2023 ~	Email contact / online meeting Joint bathymetry research MOU signed
Under planning to Next DARWIN system	Within this year	Database construction
Publications Related papers	March 2021 April 2022 June 2022 Dec 2022	Hidaka et al., Deep learning approaches, Geoinformatics, 32, 1, 2021.* (* Best paper award in 2022) Yutani et al., Super-resolution and feature extraction, Sensors, 22, 9, 2022. Kasaya et al., Mobile GIS DB, Geoinformatics, 33, 2, 2022. Asada & Kido , Underwater Acoustic positioning, Geoinformatics, 33, 2, 2022. Kaneko and Kasaya , Water column data analysis, Geoinformatics, 33, 4, 2022.

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
 - Magnetism : 1,136 cruises

2022/03/18 12:20 Public Information | DARWIN

DARWIN Data and Sample Research System
Public Information Whole Cruise Information in JAMSTEC

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DARWIN provides the following information and data. Clicking on a link of summary value in the table will display the search results.

Aggregation Date: 2022-03-18

Cruise Data	2,393
Dive Data	7,792
Observation Data	98,841
Publications	5,231

▼ Cruise Data 2,393

Ship Name	Number of Cruises [cruises] ▼▲
NATSUSHIMA	610
KAIYO	389
YOKOSUKA	475
MIRAI	248
KAIREI	437
CHIKYU	31
KAIMEI	76
SHINSEI MARU	91
HAKUHO MARU	36

▼ Dive Data 7,792

Submersible Name	Number of Dives [dives] ▼▲
KAIKO	739
SHINKAI 2000	1,347
DOLPHIN-3K	532
SHINKAI 6500	1,541

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