

Digital Twins of the Ocean (DITTO)

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Digital Twins of the Ocean (DITTO)



An **accessible digital ocean** with open and equitable access to data, information, and technology and innovation.

- **DITTO MISSION:** Empower ocean professionals, citizen scientists, policymakers, and the general public alike to explore ocean knowledge, data, models and forecasts.
- **Digital Twins** will enable users to address **‘What if’ questions** based on shared data, models and knowledge.

Develop a comprehensive digital representation of the ocean.

ditto-oceandecade.org

DITTO & the UN Ocean Decade



“The science we need for the ocean we want”

OCEAN DECADE Challenge Questions

- *Facilitate* new partnerships, discoveries & benefits
- *Transform* business-as-usual science, technology, & policy

Challenge 8: Through multi-stakeholder collaboration, develop a comprehensive digital representation of the ocean, including a dynamic ocean map, which provides free and open access for exploring, discovering, and visualizing past, current, and future ocean conditions in a manner relevant to diverse stakeholders.



DITTO Steering Committee 2024-2027



Giovanni Coppini, Euro-Mediterranean CMCC Foundation, Italy



Urmas Lips (Tallinn University of Technology, Estonia)



Joanna Staneva (Helmholtz Zentrum HEREON, Germany)



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Sung Yong Kim Korea



Swadhin Behera (JAMSTEC, Japan)



Marina Tonani, Mercator Ocean International, France



Jon Blower (NOA, UK)



Alain Arnaud (Mercator, France)



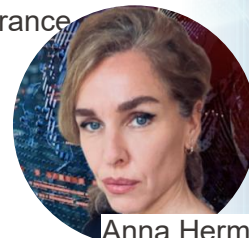
Di Wan, Fisheries & Oceans Canada / Pêches et Océans Canada



Deanesh Ramsewak, CMOS at UTT, Trinidad and Tobago



Irikomuni Zauisomue (University of Namibia)



Anna Hermen (Netherlands)



Joaquin Tintore (SOCIE and IMEDEA (CSIC-UIB Spain))

Digital Twins of the Ocean - DITTO



**Opportunities to connect
science to society**



<https://ditto-oceandecade.org>

Co-Chairs



Fei Chai



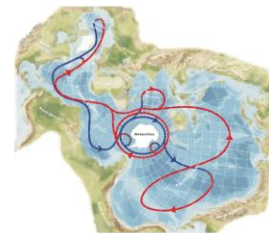
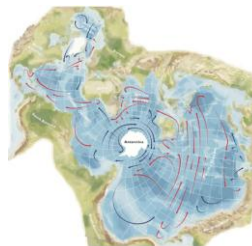
Joanna Staneva



Swadhin Behera



Marina Tonani



DITTO Working Groups & Affiliations



DITTO establishes and advances a digital framework to explore ocean-related development scenarios and develop a comprehensive digital representation of the ocean.

Use cases are established across all of the following Working Groups:

WG1: Sustainable Ocean Observations & Data Networks

WG2: Integrative Digital Twins Models

WG3: Interoperability Nexus and Future-Proof Architecture

WG4: Community Interfaces and Engagement

WG5: Capacity Building for the Digital Ocean

ATLANTIC
SENSE



eOSC

Blue-Cloud2026

Fishtwin



B1OH – Beyond One Ocean Health

HAIG FRAS MARINE PROTECTED AREA DIGITAL TWIN

THE CASPIAN SEA DIGITAL TWIN (CASSEADI)

PILOT DIGITAL TWINS FOR WATER POLLUTION IN AFRICA

INTEROPERABILITY ARCHITECTURE FOR A DIGITAL OCEAN

Status: DITTO as a global integrator

- Connecting scientists, stakeholders, and users,
- Bridging science, technology, policy, and society

Key added value:

- • Integration of data, models, and digital infrastructure
- • Co-design and cross-domain collaboration

Expected Impact:

- Supporting informed decision-making
- Foster international collaborations
- Enhancing ocean literacy
- Strengthening science–policy interface
- Integrating DTOs' community

DITTO connects communities, sectors, and users to enable actionable ocean knowledge



Next 5 Years: Addressing Digital Ecosystem Needs

The Mission: Creating a robust and extensible foundation of our planet's digital ocean ecosystem

OECD RECOMMENDATION CONCERNING ACCESS TO RESEARCH DATA
FROM PUBLIC FUNDING

AREAS OF POLICY GUIDANCE



EXPANDED SCOPE COVERS RESEARCH DATA, METADATA,
ALGORITHMS, WORKFLOWS, MODELS, AND SOFTWARE (INCLUDING CODE)

- 'democratize' the data world.
- establish 'trust' in use cases and open data.
- ensure widespread and equitable access.

Key Gaps and Challenges

- **Fragmentation across the value chain**

→ observations, data, models, services not fully connected

- **Limited integration of AI into operational systems**

→ strong research, weak transition to operations

- **Interoperability & data challenges**

→ heterogeneous systems, lack of common standards

- **Insufficient validation & trust frameworks**

→ need for robust verification of hybrid systems

- **Gap between science and decision-making**

→ limited translation into actionable, policy-relevant information

- **Coordination challenge**

→ multiple initiatives, limited alignment across programmes



Key Gaps and Challenges

DITTO Context (UN Ocean Decade)

- Global **UN Ocean Decade** program
- Community-driven, **not centrally funded**
- Relies on:
 - partnerships
 - alignment of existing initiatives
 - shared infrastructure and vision

Challenge:

- **connecting programs, DTOs projects, use cases, activities, etc and sustaining coordination**

Opportunities

Strengthen links with:

- **GOOS** (observations)
- **WMO** (operational frameworks)
- **OceanPredict** (prediction systems)
- other Decade programs

Enable:

- stronger **program interaction**
- better **science–policy connection**
- Integration – between scales, disciplines, providers, users,
- multi-actor involvement
- foster collaboration

Alignment with OceanPredict (2026–2031)



- Direct contribution to key priorities:
 - data assimilation & forecasting systems
 - verification & benchmarking frameworks
 - AI/ML integration into operations
 - Integration of DITTO pillar for the **Use cases**
 - Contributions to WGs, Summits, Literacy
 - Dialogued for beyond 230 strategy
 - Co-design with users, involvement of industry
 - Foster international collaboration
- Supports OceanPredict objectives:
 - strengthening the **end-to-end value chain**
 - improving **global coordination and interoperability**
 - enhancing **impact for users and society**

DITTO can be seen as a framework that helps implement parts of the OceanPredict 5-year plan, especially where integration across the value chain is needed.

Detailed Agenda is shared

Of all the **39** cases to share:

- Africa, Asia, Europe, North America;
- More than 12 countries;
- Including contributors from:
 - Civil society: *OceanForesters*,...
 - Government: *DFO*,...
 - Private sector
 - Science



*(Figure above) Word cloud generated based on the abstracts of all applications.

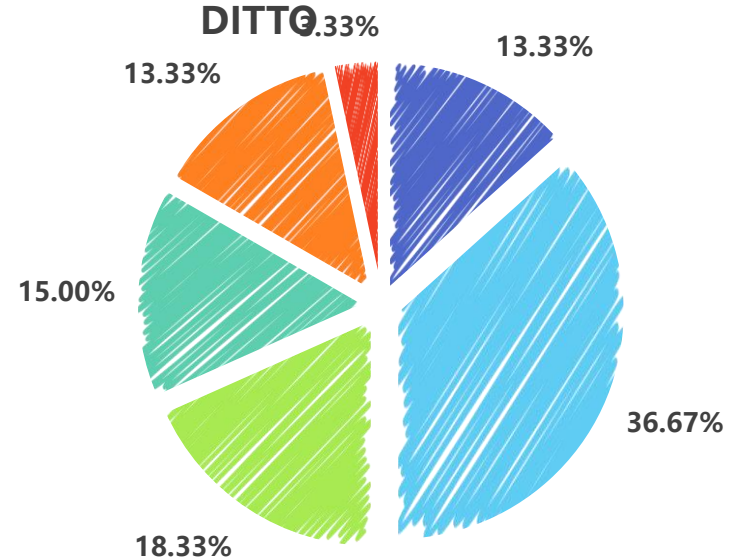


2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development



DITTO
Digital Twins of the Ocean

TOPICS PER WorkingGroup of



A banner for the DITTO Summit 2026. It features the text 'DITTO Summit 2026' in large white letters on a dark blue background. Below the text is a stylized illustration of people silhouettes standing on a path that leads towards a city skyline with tall buildings. In the foreground, there are stylized blue waves. The overall theme is digital twins and ocean technology.

DITTO Summit 2026

November 11-13, 2026
Venue: Workpia Yokohama



A Convention center in Yokohama's Minato-Mirai area, 4 min from Nihon-Ōdōri Station and 6 min from Motomachi-Chūkagai Station.

Digital Twins for a Changing Ocean

Connecting Data. Powering Predictions. Enabling Decisions.

Partnering to build the next generation of ocean intelligence infrastructure—powering the blue economy, advancing sustainable development, and enabling a smarter 21st-century society.

The UN Ocean Decade–endorsed Digital Twins of the Ocean (DITTO) programme will convene its flagship global event, the 2026 DITTO Summit, in Japan. Building on the in-person summits in [London \(2022\)](#) and [Xiamen \(2023\)](#), as well as the [online event in January 2026](#), the [2026 DITTO Summit in Japan](#) brings together developers, scientists, operational agencies, policymakers, and industry leaders to advance the science, technology, and application of ocean digital twins.

https://www.jamstec.go.jp/j/pr-event/ditto_summit2026/

Core Themes

Ocean Observation

The foundation of digital twins

Real-time, integrated ocean data from in situ and satellite systems.

Modelling & AI/ML

Intelligence driving prediction

Advanced models and AI for faster, more accurate forecasting.

Interfaces & Interoperability

Connecting data, models, and people

Open, accessible platforms for seamless integration and use.

Functional Digital Twins

From concept to capability

Operational, trusted systems with validation and governance.

Use Cases & Applications

Impact in action

From marine heatwaves to coastal resilience and blue economy solutions.

Cross-Disciplinary Integration

One Earth, connected systems

Linking ocean, atmosphere, and land for holistic insights.

- **Flagship global event** under the UN Decade of Ocean Science, uniting leaders across industry, government, academia, and technology
- **From data to decisions**—advancing actionable ocean intelligence through digital twins
- **Real-world impact** across climate services, maritime operations, and the blue economy
- **Driving innovation and partnerships** in AI, modelling, and ocean observing systems
- **Yokohama 2026** ->a milestone toward scalable, interoperable, and operational digital twins

Join Us



OceanPredict

Advancing the science of ocean prediction

OPST-12

Science Team Meeting

15 Apr 2026 – 17 Apr 2026, Montreal, Canada

Thank you!



DITTO

Digital Twins of the Ocean

DITTO GOVERNANCE

