1st SynObs ST Meeting

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★ Agenda

- ✓ Briefly Confirm the outline of SynObs written in the proposal (5 min)

- ✓ Discuss about possible activity and their prioritization (40 min)

- ✓ Discuss how we contribute to UN Decade (15 min)

Synergistic Observing network for Ocean Prediction (SynObs)
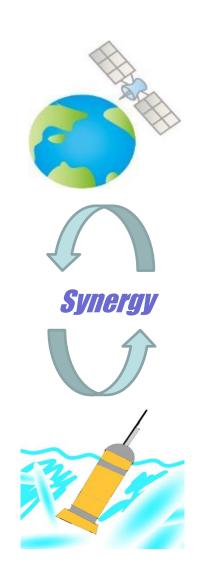## (From July 2022 to June 2026)

◆ **Objective**

SynObs will seek the way to extract maximum benefits from the combination among various observation platforms, typically between satellite and in situ observation data, or between coastal and open ocean platforms, in ocean/coastal predictions.

◆ **Strategy**

SynObs aims to identify the optimal combination of different ocean observation platforms through observing system design/evaluation, and to develop assimilation methods with which we can draw synergistic effects from the combination.
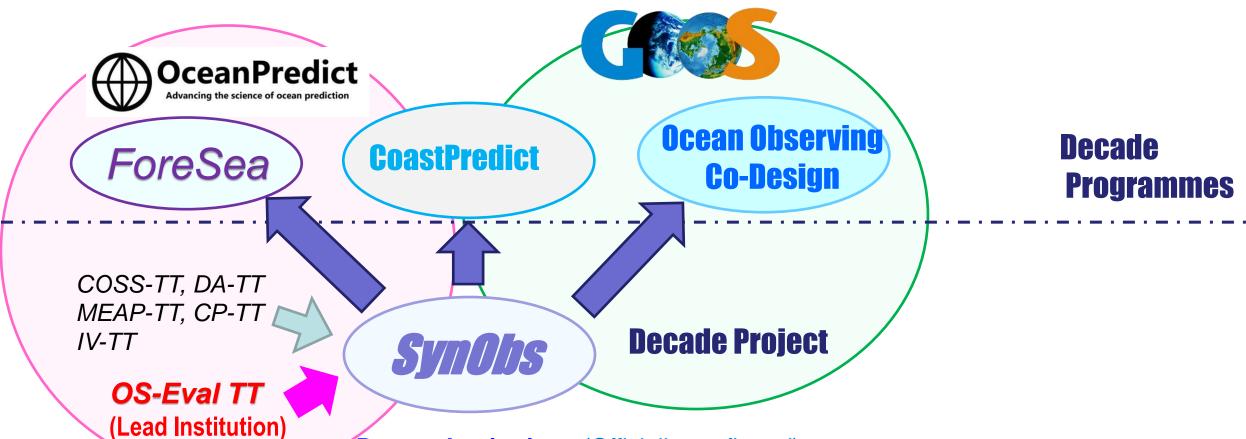
◆ **Scope**

Targets of **SynObs** include open-ocean (global, tropical, mid-latitude, polar areas), coastal, and biogeochemical (BGC) observing systems

Synergy

SynObs: A common comprehensive project

OceanPredict
Advancing the science of ocean prediction

ForeSea

CoastPredict

Ocean Observing Co-Design

Decade Programmes

COSS-TT, DA-TT MEAP-TT, CP-TT IV-TT

OS-Eval TT
(Lead Institution)

SynObs

Decade Project

Partner Institutions (Officially confirmed):
JMA/MRI (contact point, Japan), Mercator Ocean International (France)
Met Office (UK), NOAA Quantative Observing System Assessment Program (USA)
ECMWF, CNR ISMAT (Italy), NERSC (Norway), Ocean Data Network (Denmark)
CNRS (France), UFBA (Brazil)

Combination of observations targeted in SynObs

1. Satellite altimeters, satellite ocean current observations (SKIM) and Argo floats
   - For WBC, eddies ⇒ OST-ST, SWOT community, Argo ST
2. Argo floats, Tropical Moorings, and satellite altimeters in the tropical regions.
   - For equatorial waves, ENSO, extreme climates ⇒ TPOS, Argo ST
3. Satellite SSS, Moorings, Argo floats, and sea surface atmospheric parameters
   - For Fresh water budget(?) ⇒ ESA, NASA(?)
4. Satellite SST, Moorings, Argo floats, and sea surface atmospheric parameters
   - For coupled data assimilation ⇒ CP-TT, WWRP/WCRP-S2S
5. Satellite ocean colour observations and in-situ (Argo) observations
   - For BGC applications ⇒ MEAP-TT
6. Observations of sea ice concentrations and sea ice thickness
   - For the polar regions ⇒ Arctic Observation Community (Greg Smith?), Sat Agencies?
7. Coastal ocean radars and sensors, gliders, drones, satellite remote sensing, and Argo floats
   - COSS-TT, CoastPredict

I hope the targets combinations can be changed considering the interests of participants and requests from other communities

★ Expected Activities in SynObs

1. Collaboration for evaluation and design

- ➢ Provide Nature runs
- ➢ Multi-System OSE and OSSE
- ➢ Establish a best practice method or a model case

2. Supporting DA scheme development

- ➢ Summarize required development for extracting synergy from the targeted combinations
- ➢ Observation campaigns

3. Providing information from ocean prediction systems in real time

- ➢ Regular reporting on information of QC, innovations, increments, etc.
- ➢ Explore the methods to evaluate observing system status in real-time operation

4. OS-Eval showcase and reporting

- ➢ Collect OS-Eval examples and introduce them (Showcase)
- ➢ Generate a report on observation requirements and design

⭐ 1. Collaboration for evaluation and design

Provide Nature Runs

➢ Global ocean-alone nature run for Targets 1, 2, 3? (2022-2023?)

➢ Existing simulations or newly generate? Does sea ice can be included (for Target 6)?

➢ How about A-O coupled nature run (for Target 4) and BGC nature run (Target 5)?

➢ Is it difficult to prepare a nature run for each coastal area by collaboration? (Target 7)

Multi-System OSE and OSSE

➢ We may start the multi-system OSE&OSSE for evaluating impacts of altimetry with in-situ data on open-ocean and coastal predictions (for Targets 1, 7)   (maybe 2023-2024)

➢ Establish a best practice method or a model case through this activity

➢ I would like to include the on-going OSE activities for the Argo salinity drift. (Can it be connected to the Target 3? Maybe we focus on the heat and salt content in long-term reanalyses in Target 3.)

➢ We will extent the multi-system activities to other targets.

⭐ 2. Supporting DA scheme development

Summarize required development for extracting synergy from the targeted combinations(?)

➢ Discuss in a workshop?

➢ Provide a summary in a web page?

➢ We should involve relating observational communities.

➢ 2022-2023?

Observation campaign

➢ Collocate observation of atmospheric hyper spectral sounder and Argo: Some pilot experiment may be feasible. (2023-?) (for Target 4)

➢ Are there any possible pilot project for supporting DA developments?

★ 3. Providing information from ocean prediction systems in real time

Regular reporting (web page?) on information of QC, innovations, increments, etc.

- ➢ Extension from the table of observation use
- ➢ Collaborate with IV-TT? But the web page must be able to be accessed from broad community.
- ➢ Design (2022-2023?), Construction (2023-2024?)

Explore the methods to evaluate observing system status in real-time operation

- ➢ Explore and develop the methods (e.g., DFS and FSOI or multi-system ensemble) (2022-2024)
- ➢ Establish a regular reporting framework (2025-2026)

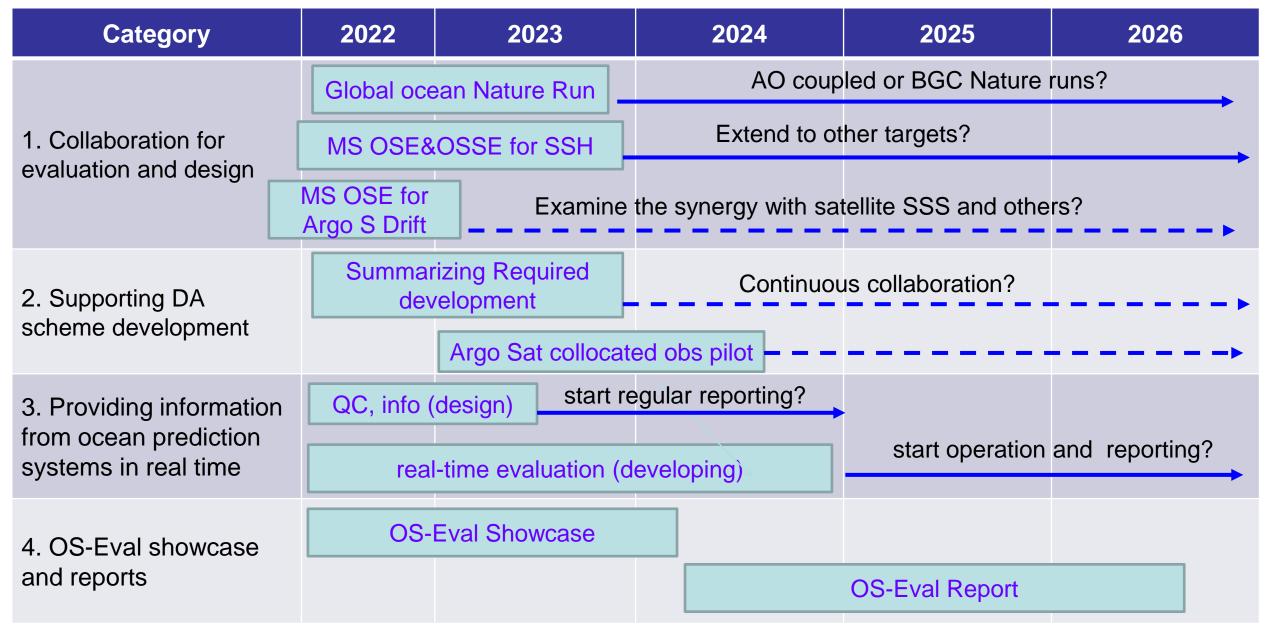# ★ 4. OS-Eval Showcase and reporting

OS-Eval Showcase

➤ Collect OS-Eval examples for all targeted observations and introduce them to the broad communities (particularly to observational communities) to show the potential of OS-Eval.

➤ Special Issue, web page, or Symposium?

➤ 2022-early 2024 (?)

OS-Eval Report

➤ Generate a report on the observation requirements and design based on various OS-Eval studies

➤ The report is generated for the sustaining and developing ocean observing networks. So it will be hopefully distribute to broad observational communities.

➤ 2024-early 2026 (?)

➤ Mayne we need to adjust the schedule with the timeline of Ocean Observing Co-Design.

Time Line of SynObs Activity

Category	2022	2023	2024	2025	2026
1. Collaboration for evaluation and design	Global ocean Nature Run		AO coupled or BGC Nature runs?		
	MS OSE&OSSE for SSH		Extend to other targets?		
	MS OSE for Argo S Drift		Examine the synergy with satellite SSS and others?		
2. Supporting DA scheme development		Summarizing Required development	Continuous collaboration?		
		Argo Sat collocated obs pilot			
3. Providing information from ocean prediction systems in real time	QC, info (design)		start regular reporting?		
	real-time evaluation (developing)			start operation and reporting?	
4. OS-Eval showcase and reports		OS-Eval Showcase			
			OS-Eval Report		

Contribution to CoastPredict

➢ SynObs will collaborate with Coastpredict Core Project 1 "Integrated coastal ocean observing and predicting (PredictOnTime)", WP5

WP3 Innovative Coastal Observing Systems
WP5 Data assimilation in the coastal ocean

Objectives: Develop new or strengthen data assimilation towards coastal EOV estimation and prediction; DA frameworks; Machine learning techniques

5.1 Assimilation of existing and new datasets for coastal forecasting

5.2 Machine learning methods in data assimilation

5.3 Coastal ocean analysis and reanalysis

5.4 OSSE (Observing Systems Simulation Experiments) and OSE (Observing System Experiments) for optimization of coastal observatories

Deliverables: Open and free data assimilation codes available; Best practices reports; data assimilation manuals;

➢ We will contribute through OSE&OSSH for the combination of SSH and coastal observing systems, summarizing required developments, OS-Eval showcase and report. Is it enough?

Contribution to Ocean Observing Co-Design

➤ Ocean Observing CoDesign plans to focus on some examplars.

➤ Currently suggested examplers

· Marine Heatwaves (MHW)

· Hurricanes and Tropical Storms

· Carbon Cycle

· Something related BGC

Are they suitable for OceanPredict systems or the targeted combinations of observation data in SynObs? (MHW can be related to Oceanpredict systems, but …)

I think something related to ocean current fields (e.g., drifting target prediction), ocean interior (e.g., heat and salt budget) should be added, as well as something related to S2S predictions (e.g., extreme climate, atmospheric HW)