2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Ocean Prediction Capacity of the Future ForeSea

SynObs: a UN Decade project on Synergistic Observing Network for Ocean Prediction

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Partner Institutions:

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)

Synergistic Observing Network for Ocean Prediction (**SynObs**)

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

UN Ocean Decade Project Under ForeSea

(Led by OceanPredict OS-Eval TT)

Ocean Prediction Capacity of the Future ForeSea

Officially Endorsed on June 8th

◆ 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, in ocean/coastal predictions.

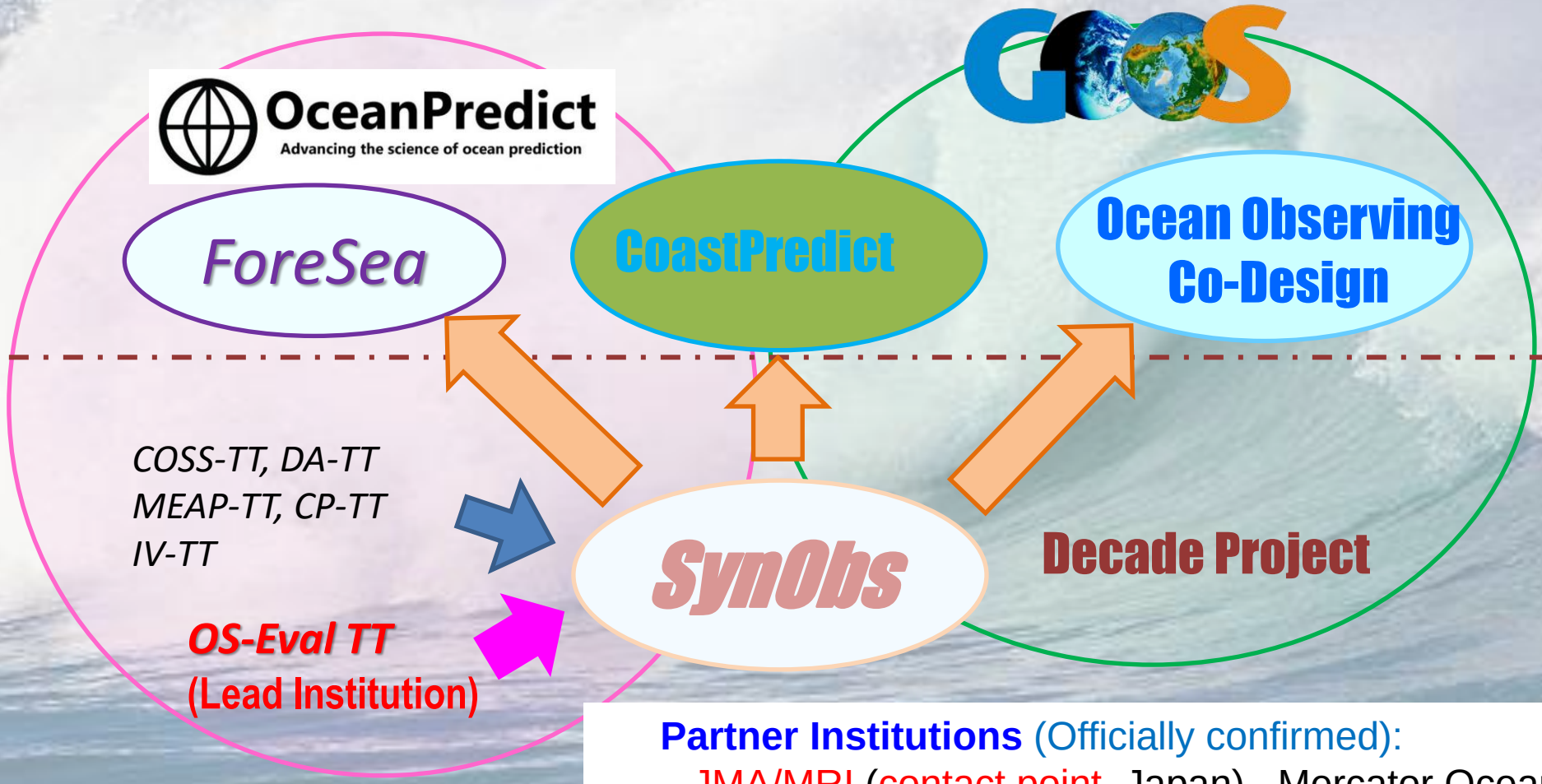
◆ Strategy

SynObs aims to identify the optimal combination of different ocean observation platforms through observing system design/evaluation, and to develop assimilation methods for maximum synergy among different observations.

◆ Scope

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

SynObs: A common comprehensive project



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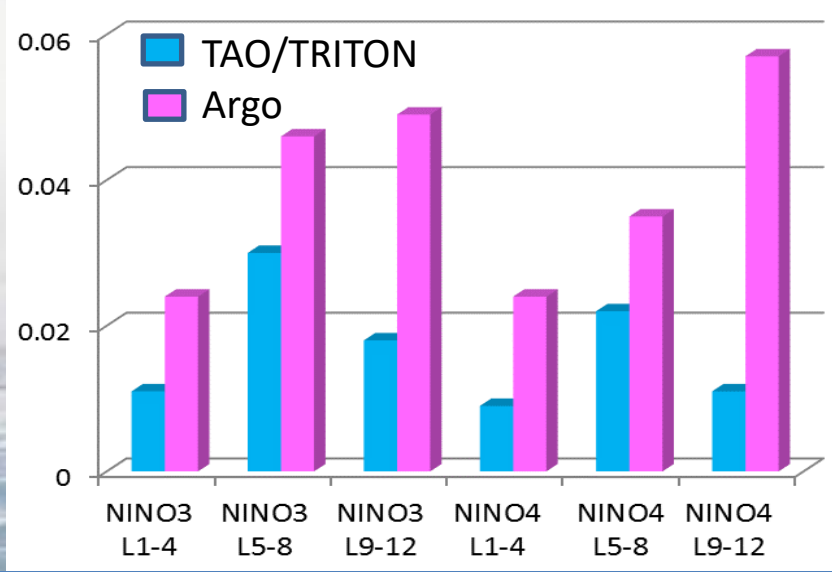
★ Expected Activities in SynObs

1. OS-Eval showcase and reporting
   - Collect OS-Eval examples and introduce them (Showcase)
   - Generate a report on observation requirements and design
2. Collaboration for evaluation and design
   - Flagship (Core) multi-system OSE
   - Several Extensions (S2S OSE, OSSE, etc.) of the flagship OSE
   - Facilitating communication for OS-Eval collaborations
3. Providing information from ocean prediction systems on regular basis
   - Regular reporting on information of QC, innovations, increments, etc.
   - Explore the methods to evaluate observing system status in real-time operation
4. Supporting DA scheme development
   - Support DA-TT seminar series
   - Discussion on required development of DA technology and models
   - Observation campaigns for the development

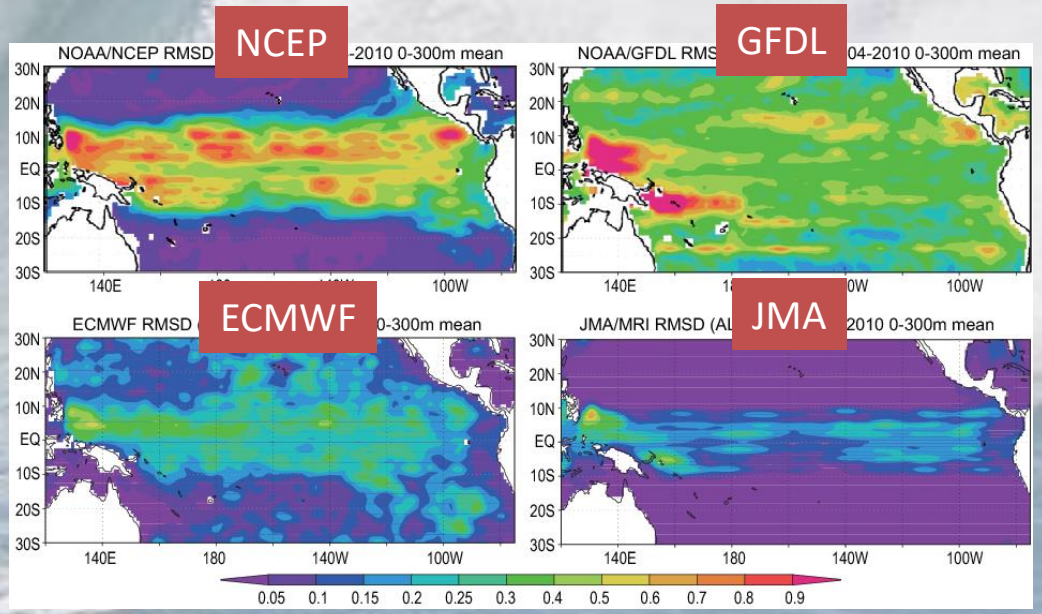
Example 1: Evaluate the existing network

- SynObs aims to evaluate the ocean observing network using ocean prediction systems to support their sustainment and further development
- Multi-system evaluation is performed to get more robust and reliable conclusion *(results are strongly system-dependent).*

Evaluation for ENSO forecasts.
Fujii et al., QJRMS, 2015



Impacts of TAO/TRITON and Argo in the JMA ENSO forecasting system



Multi-System Evaluation of TAO/TRITON impacts in 4 ocean reanalysis systems (0-300m average)

Example 2: Summarize and provide information

- SynObs will summarize the information on the observation data (usage, QC, impacts) which we get through ocean predictions. Those information will be provided to observation communities to suport the management of ocean observing systems

Table on usage of observations (for moorings) in Ocean Prediction Systems

https://oceanpredict.org/observations-use/

Center/ Institute	System Name	Ocean Temp.	Salinity	Velocity (Mech.)	Velocity (ADCP)	Surface Air Temp.	Surface Air Humid.	Surface Wind	Sea Level Pressure	Precip.	Rad.
BoM (CSIRO)	OceanMAPS	Level 5	Level 5		Level 1						
CHM-REMO	RODAS	Level 1	Level 1								
ECCC	GIOPS (global 1/4°)	Level 5	Level 5			Level 5	Level 5	Level 1	Level 5	Level 5	Level 1
	RIOPS (Pac-Arctic-NAtl 1/12°)	Level 5	Level 5								
ECMWF	OCEAN5 Global 1/4	Level 5	Level 5	Level 1	Level 1			Level 4	Level 4		

★ Expectations/Requests of OSE/OSSE to SynObs

- SynObs proposal defined 7 targeted combinations
  - Altimetry and satellite surface velocity with Argo
  - Tropical buoy array, Argo, and Altimetry
  - Satellite SSS and in-situ observations
  - Satellite SST/radiometer observations and near surface observations
  - Satellite ocean color and BGC Argo
  - Sea ice concentration and thickness
  - Coastal ocean and Open Ocean Observations
- SWOT: OSSE and post-launch OSE (launch targeted for November 2022) .
- Ocean Observing Co-Design expects SynObs to conduct OSE/OSSEs for some of their exemplars (Marine Heatwaves, Boundary Currents, Tropical Cyclones, Storm Surge, Carbon Cycle, Biodiversity).
- TPOS-SAC requested OSE/OSSE for new TPOS, and ECMWF, NCEP, and JMA started to discuss on a collaborative OSE for S2S forecasts.
- Argo Science Team aims to enhance the communication with modeling communities.
  - ➢ Multi-system OSE for salinity drifts are currently on-going (Suggested by P. Oke.)

★ Collaborative OSE activities in SynObs

Flagship (Core) multi-system OSEs

System: Reanalysis and

Ocean Prediction Systems

Targeted Observations:

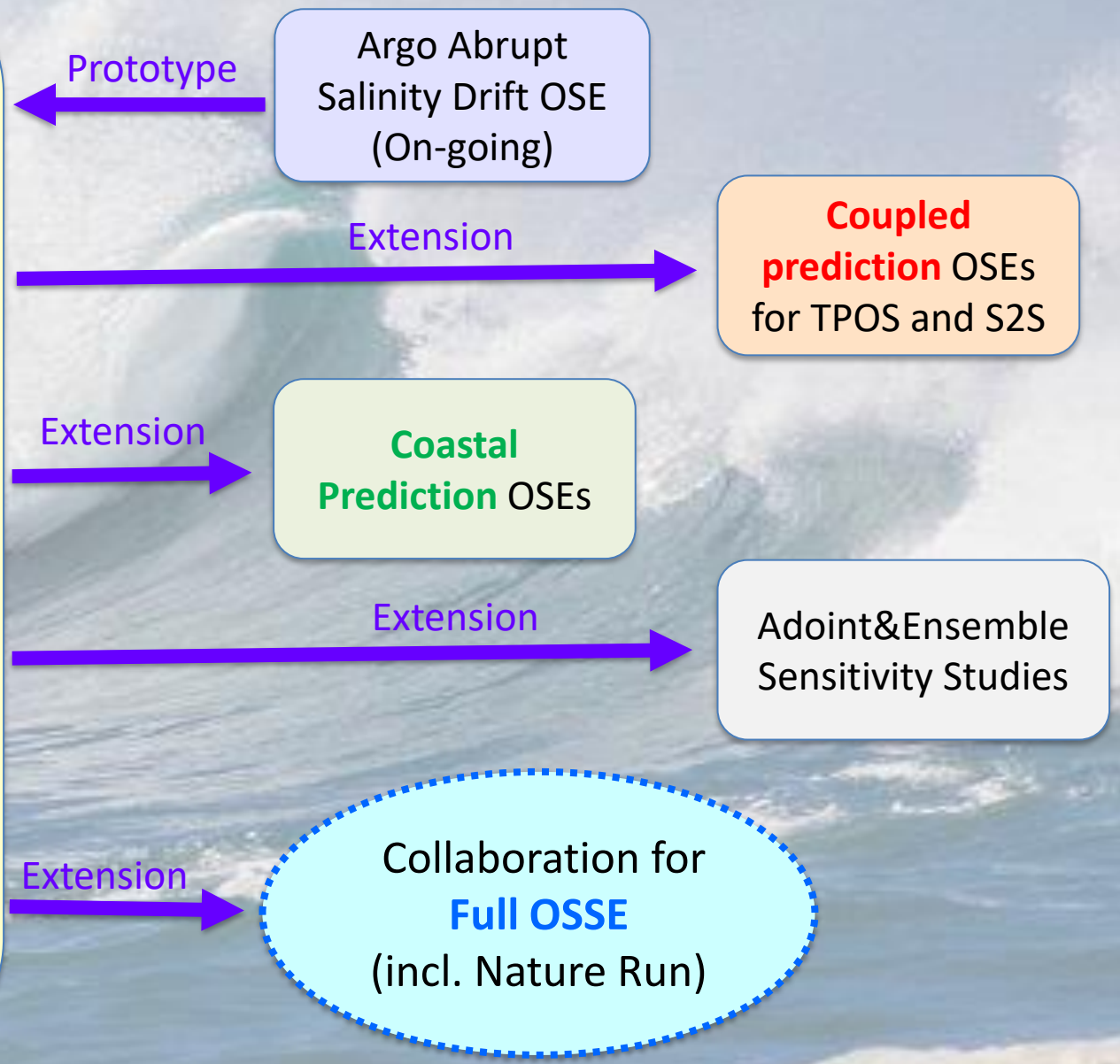
- ✓ SSH (Nadir+SWOT)
- ✓ In-situ (Argo, Trop. Buoys, etc.)
- ✓ consider their Synergy

Prediction Targets:

- ✓ 0-100m Temp. (MHWs)
- ✓ Near-surface currents (WBCs)
- ✓ Etc.

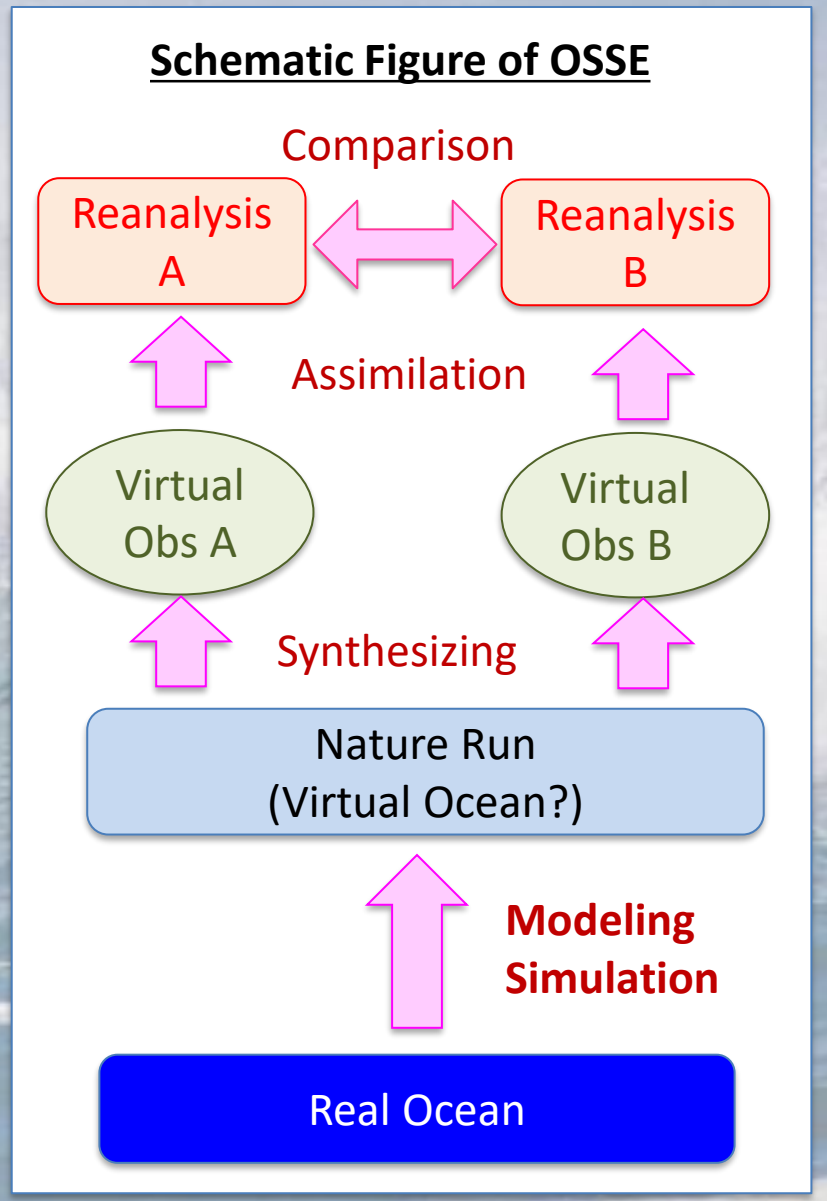
Period: 2015-2025?

➢ A protocol should be drafted in the near future.



☆ Possible collaboration for Nature Runs and multi-system OSSEs

- A high-quality Nature Runs is essential to make reliable observing system evaluation as done with OSSE.
- Providing a list of model simulation data which are available for a Nature Run ⇒ A tentative action
- Within OP, we discuss a possibility to collaborate with Digital Twin Ocean (DITTO) and Ocean Prediction Decade Collaboration Center (DCC) for provision of Nature Runs and multi-system OSSEs.
- OSSE is actually the most familiar application of the concept of the digital twin ocean, and a good tool for promote the collaboration among ocean modelers, DA scientists, application engineers.
- What kind of Nature Runs? Global Ocean? Coastal? BGC? Coupled?
- Funding?



Symposium toward Synergistic Observation Networks for Ocean and Earth System Predictions

15-18 Nov, 2022, Tsukuba Japan

- A Kick-off Meeting for SynObs
- Having presentations on the OS-Eval showcase, DA development, and earth system predictions, and discussion on the SynObs activity plan.
- It may be held as a completely online meeting according to COVID-19 status. We may also limit the number of people who can attend the on-site event.
- Registration and Abstract Submission is now open. The deadline is 15 July 2022.

SynObs

Contact

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Webpage for Information of SynObs

https://oceanpredict.org/foresea/synobs/