Introduction of SynObs

Y. Fujii (JMA/MRI) and E. Remy (Moi)
(Co-chairs of SynObs and OceanPredict OS-Eval TT)

SynObs KOWS
15 Nov 2022
In Tsukuba

SynObs
UN Ocean Decade Project

Synergistic Observing Network for Ocean Prediction

Ocean Prediction Capacity of the Future
ForeSea

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

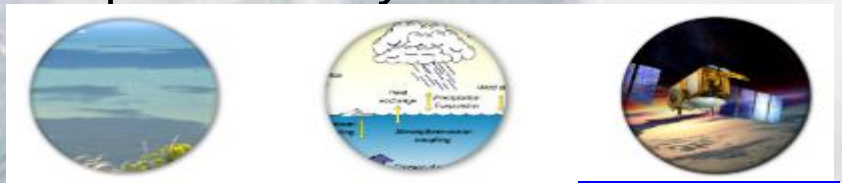
- Endorsed in June 2022 as an UN Ocean Decade project under the UN Decade Program ForeSea led by OceanPredict.
- Led by OceanPredict Observing System Evaluation Task Team
- Aim to identify optimum combination of in-situ and satellite data for ocean predictions in ocean observing network

Introduction of OceanPredict

☆ What is OceanPredict?

GODAE GLOBAL OCEAN DATA ASSIMILATION EXPERIMENT → GODAE OceanView → OceanPredict Advancing the science of ocean prediction

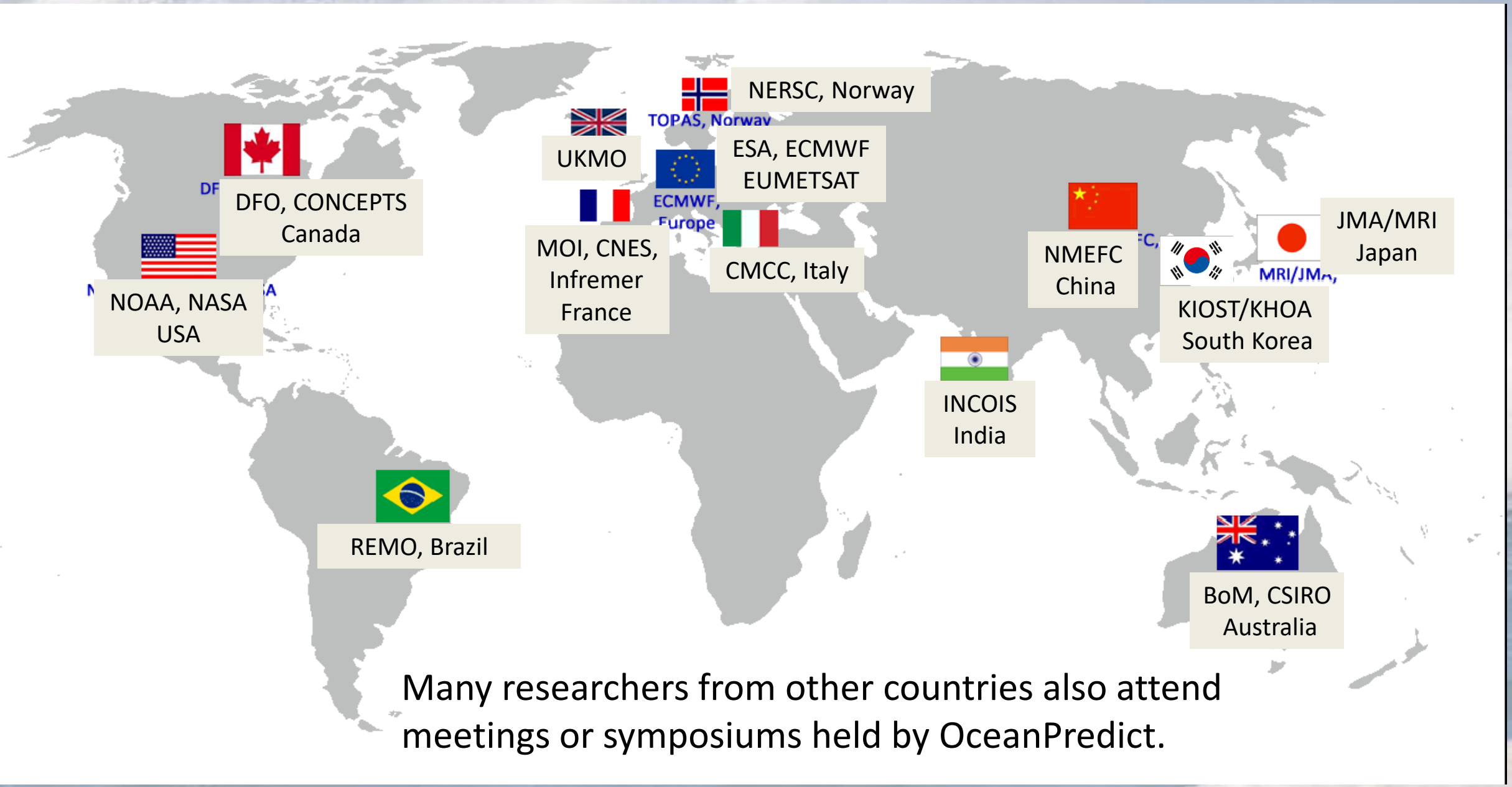
- ◆ GODAE（1998-2008）
  - ➢ Global Ocean Data Assimilation Experiment
  - ➢ Demonstration experiment of operational ocean data assimilation and prediction systems.
  - ➢ Support projects which generate observation data for assimilation (e.g., Argo and GHRSST)
  - ➢ An substantial ocean prediction community was established.
- ◆ GODAE Ocean View (2008-2019)
  - ➢ Continue to support the development of ocean data assimilation and prediction systems
- ◆ OceanPredict (2019-)
  - ➢ A bottom up community, supporting the ocean prediction studies in UNESCO-IOC.
  - ➢ Enhance the ocean prediction value chain from ocean observing system to end users through ocean predictions
  - ➢ International Symposiums, and Summer Schools
  - ➢ 6 Experts' Task Team related to ocean predictions, including the Observing Systems Evaluation Task Team (OS-Eval TT), and Coupled Prediction Task Team.



Coastal Shelf Sea TT | Coupled Prediction TT | Data Assimilation TT

Validation Intercomp. TT | Marine Ecosystem AP TT | ObsSys Evaluation TT

☆ OceanPredict Network (Official Partners)

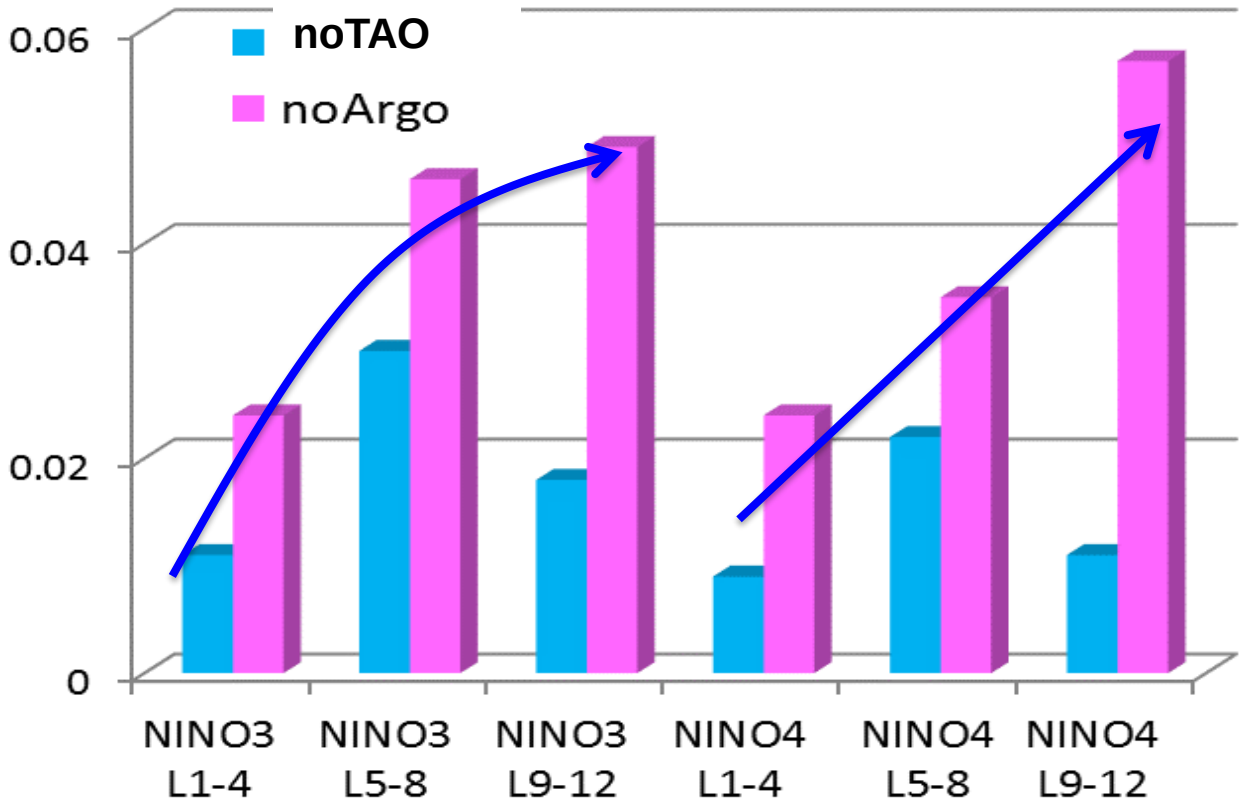


Many researchers from other countries also attend meetings or symposiums held by OceanPredict.

☆ OS-Eval activity in OceanPredict

- To date, OceanPredict OS-Eval TT has made several achievements on the observing system evaluation based on the variety of ocean prediction systems.
- These achievements encourage OS-Eval TT to propose SynObs as an UN Decade Project.
- For example, the evaluation results of the impacts of TAO/TRITON buoys and Argo floats in the tropical Pacific support the assessment of the tropical Pacific observing system and proposing the TPOS2020 design. (e.g., Fujii et al. 2014)

Reduction of ACC for NINO3/NINO4 SST Forecasts when Argo/TAO are withhold (Old JMA system)



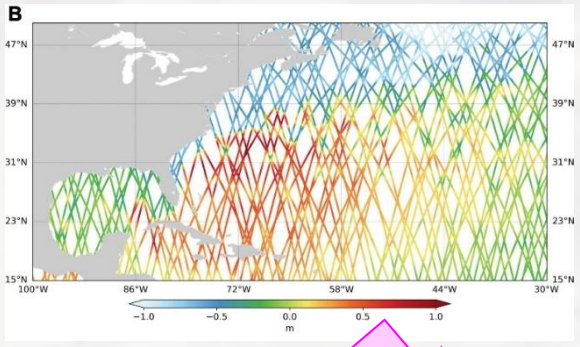
L1-4 indicate the forecasts for 1-4-month lead time.

- This figure indicates that both Argo and TAO have positive impacts on ENSO forecast.
- Argo has larger impacts. The Argo impact is greater on the longer lead-time forecast.

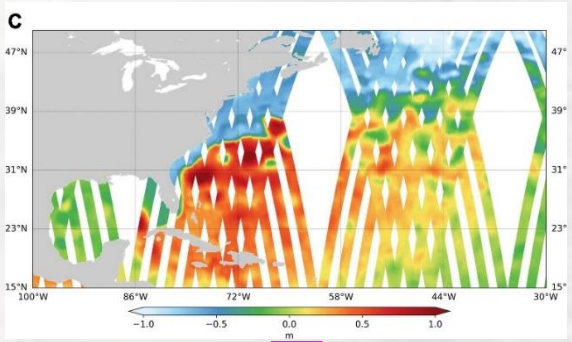
☆ Evaluation of swath altimetry in the OceanPredict Community

OSSE in Mercator Ocean

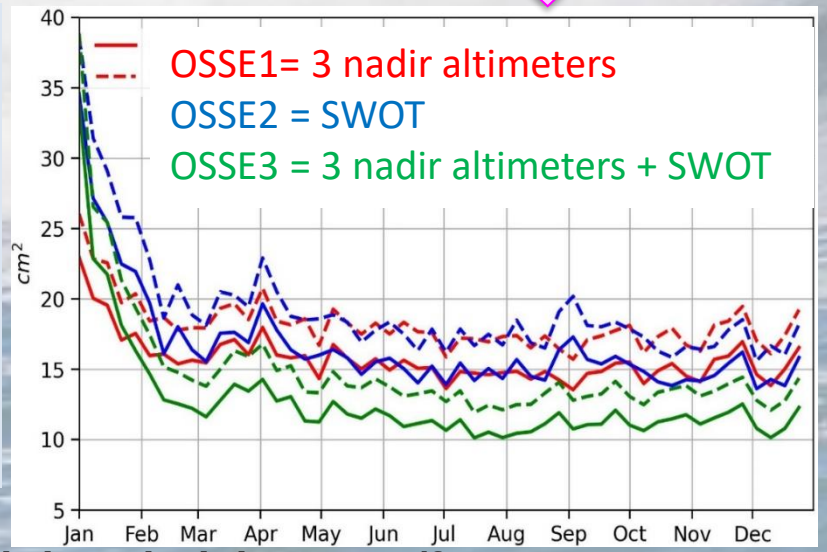
3 Nadir Altimeters



SWOT



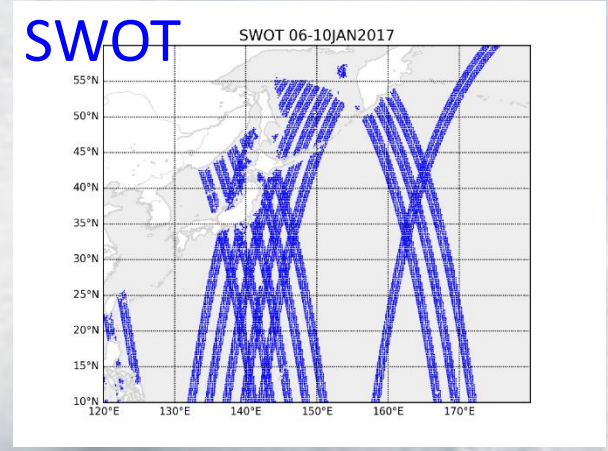
Temporal evolution of SSH error variance (in cm²) for 7-day analysis (plain lines) and forecast (dash lines)



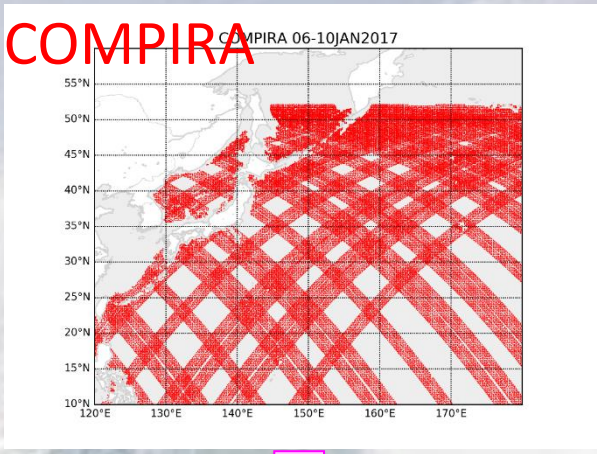
See Tchoang ey al. (2021), doi:10.3389/fmars.2021.687414, and Mounir et al. (2021), doi:10.3389/fmars.2021.691955

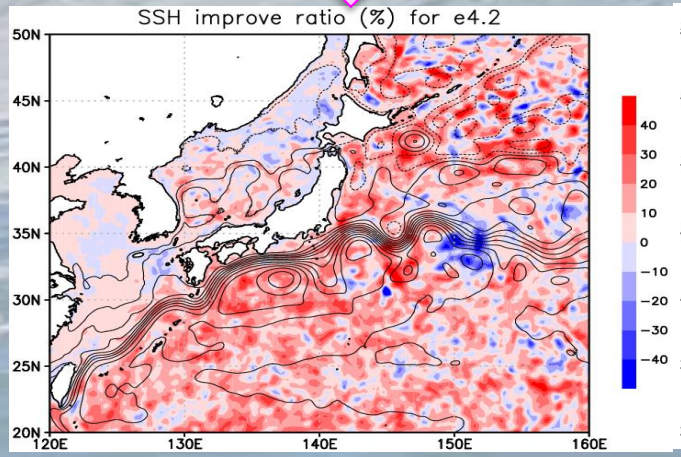
OSSE in MRI-JMA

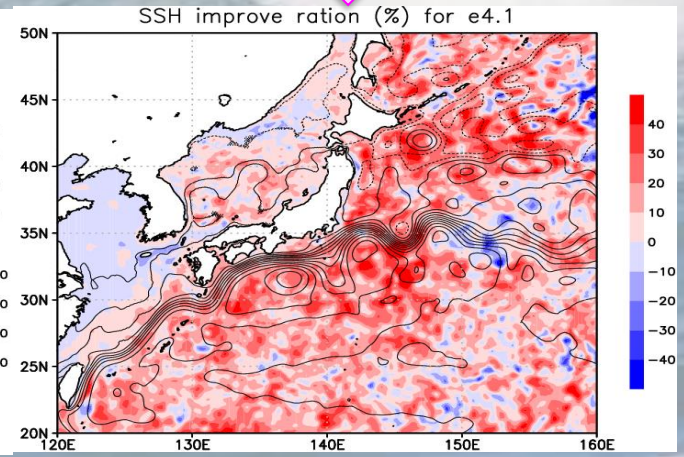
SWOT



COMPIRA



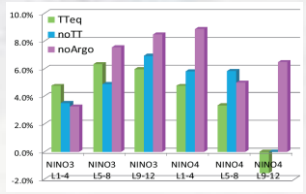


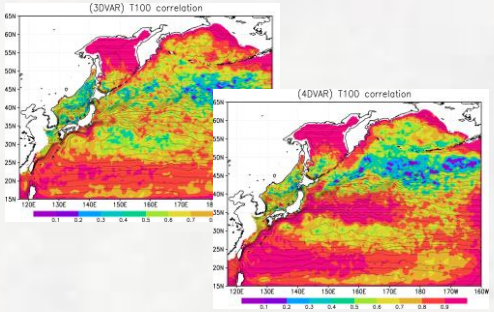


OSSE in JMA/MRI

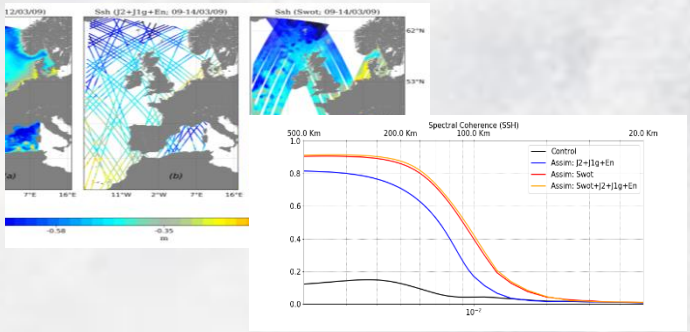
★ OceanObs'19 CWP on OS-Eval

TPOS and Argo

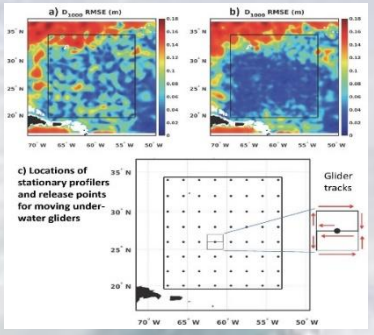




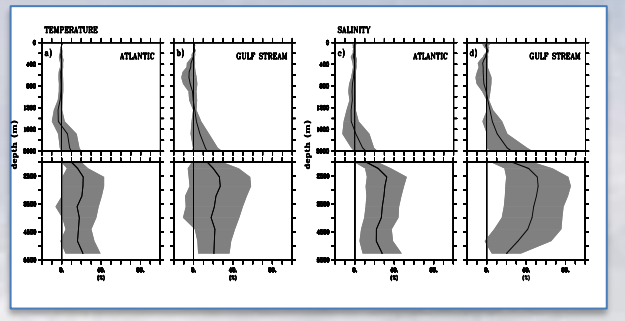
SWOT



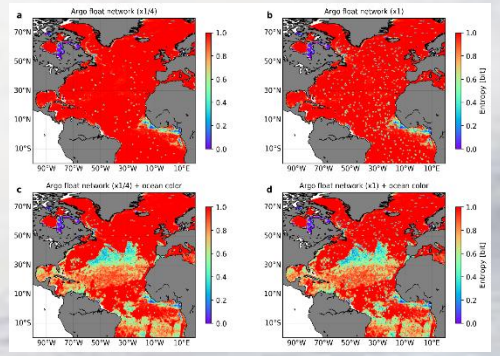
Coastal Obs System



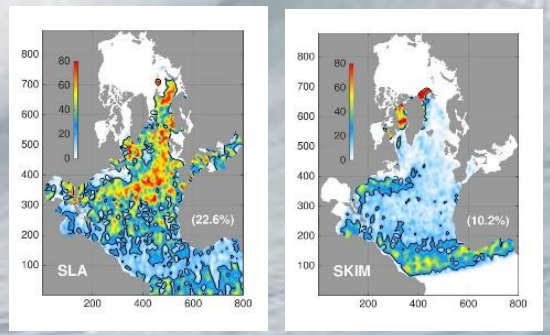
Atlant-OS



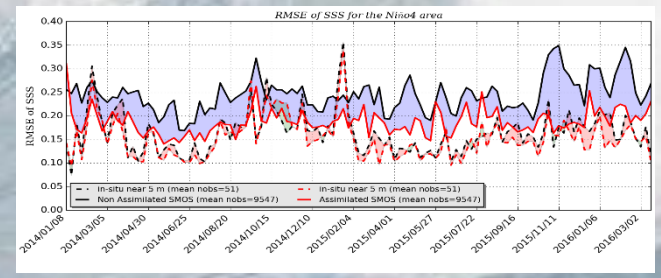
BGC Argo



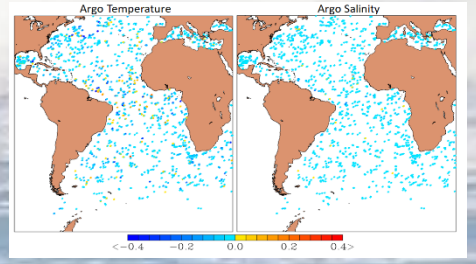
SKIM

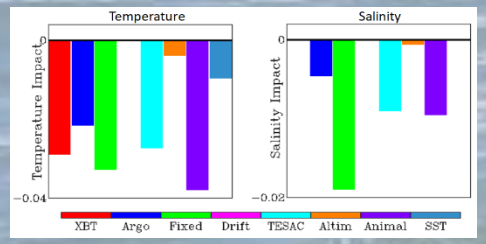


SMOS-NINO2015



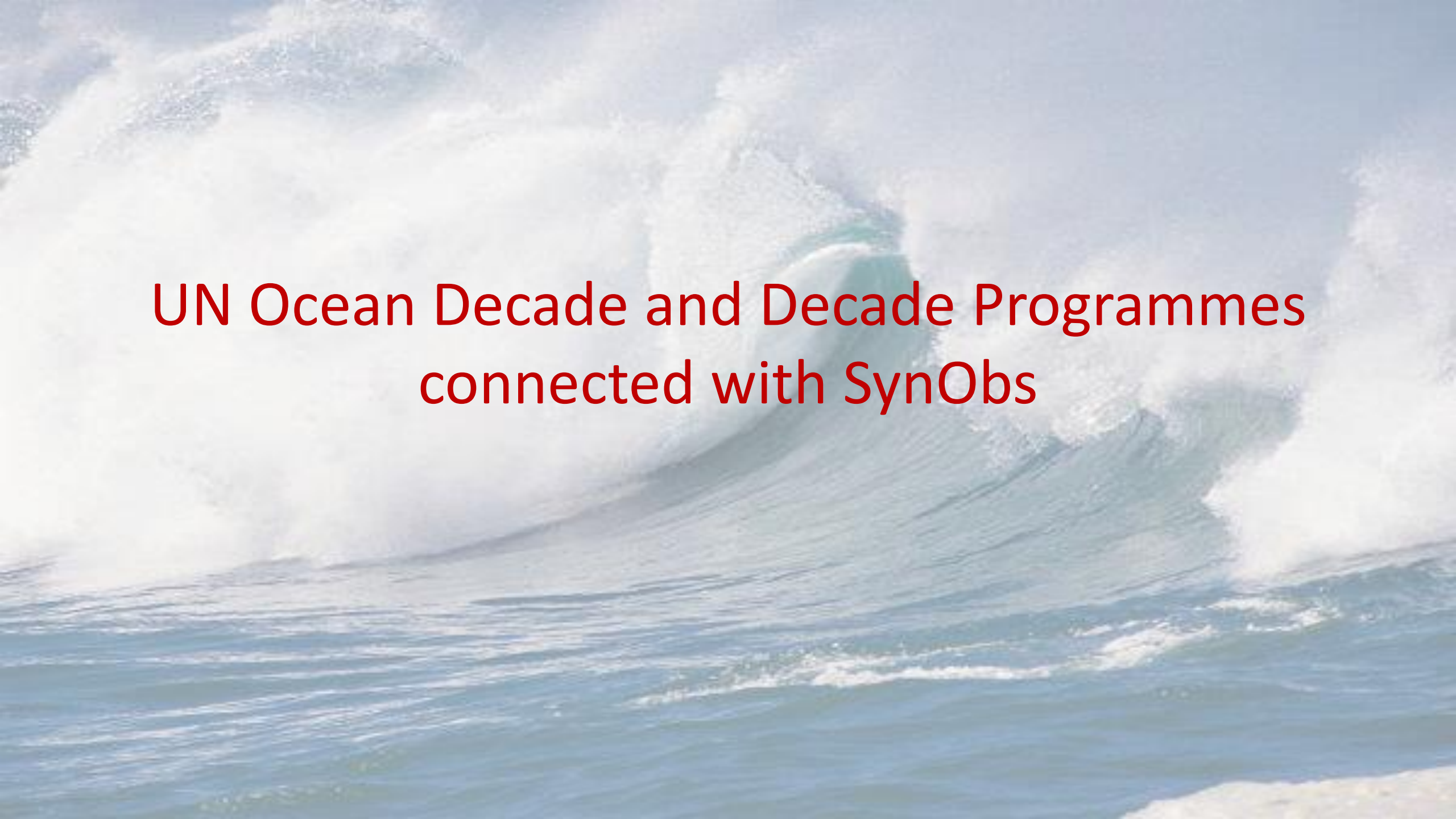
Adjoint Sensitivity





Fujii et al., Front. mar. Sci. 2019. DOI: 10.3389/fmars.2019.00417

GODAE and GODAE OceanView provided special issues on their activities on "Oceanography" at 2009 and "Journal of Operational Oceanography" at 2014.



UN Ocean Decade and Decade Programmes connected with SynObs

☆ UN Decade of Ocean Science (2021-2030)

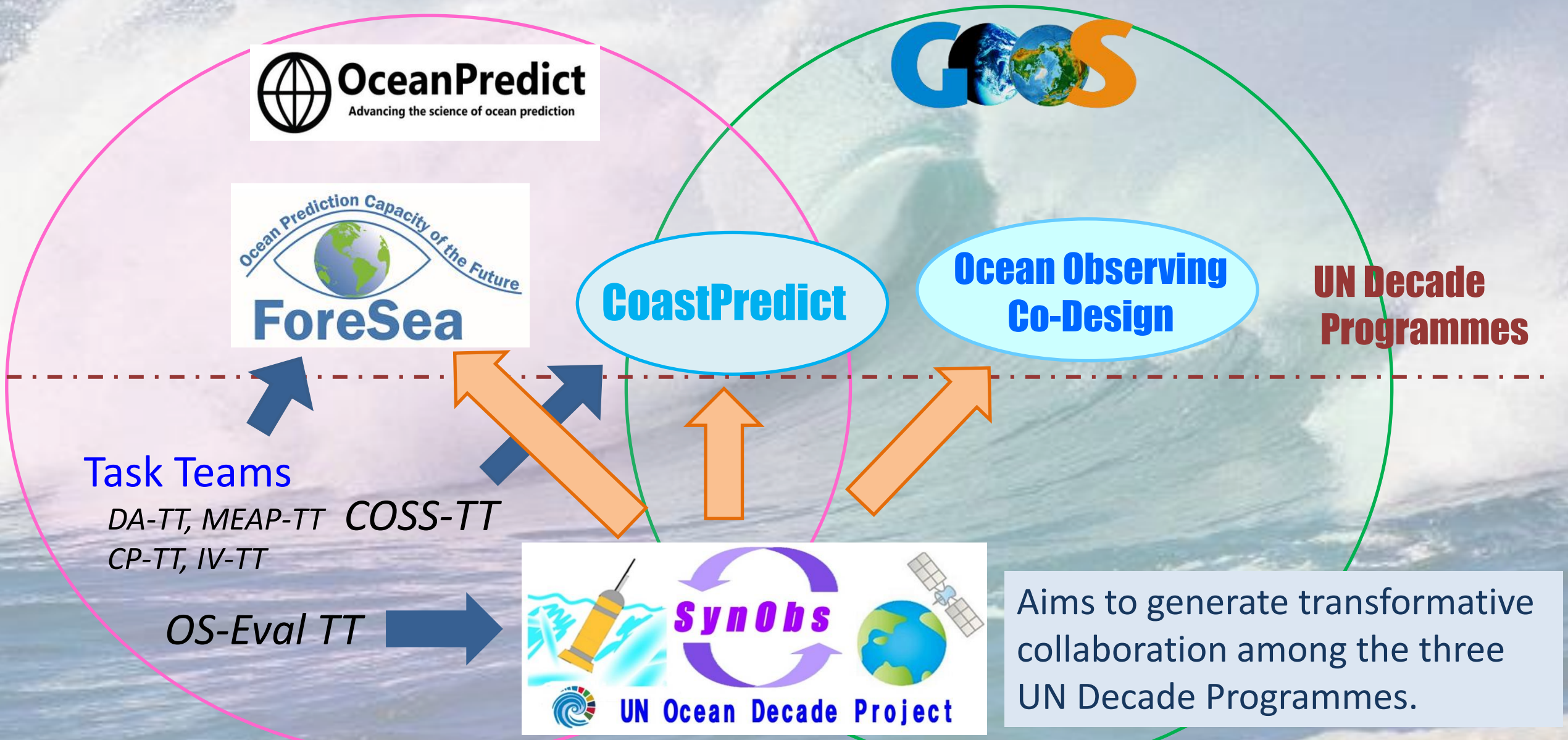
- Designated by **the United Nations** based on the recommendation of UNESCO-IOC in order to mobilize all the knowledge and technologies from ocean sciences to achieve the Sustainable Development Goals (**SDGs**)

- Aim to realize the following 7 Oceans we want
  1. A clean ocean
  2. A healthy and resilient ocean
  3. A productive ocean
  4. A predicted ocean
  5. A safe ocean
  6. An accessible ocean
  7. An Inspiring and engaging ocean

- Endorse many Decade actions, including Decade Programs and Decade Projects, and support those actions to obtain funding.
- Web page: https://www.oceandecade.org/

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

OceanPredict Contribution to UN Decade



Aims to generate transformative collaboration among the three UN Decade Programmes.

Ocean Prediction Capacity of the Future

ForeSea

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

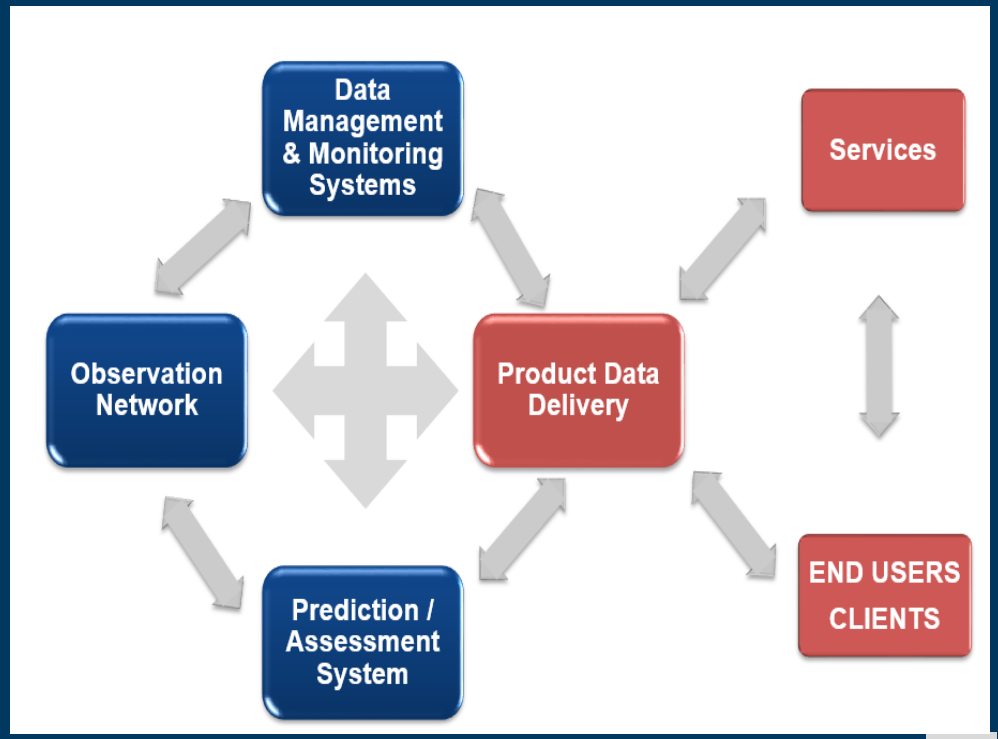
Vision: ***S***trong international coordination and community building of the ocean prediction capacity for the future.

Overarching goals

- Improve the science, capacity, efficacy, use, and impact of ocean prediction systems.
- Build a seamless ocean information value chain, from observations to end users, for economic and societal benefit.

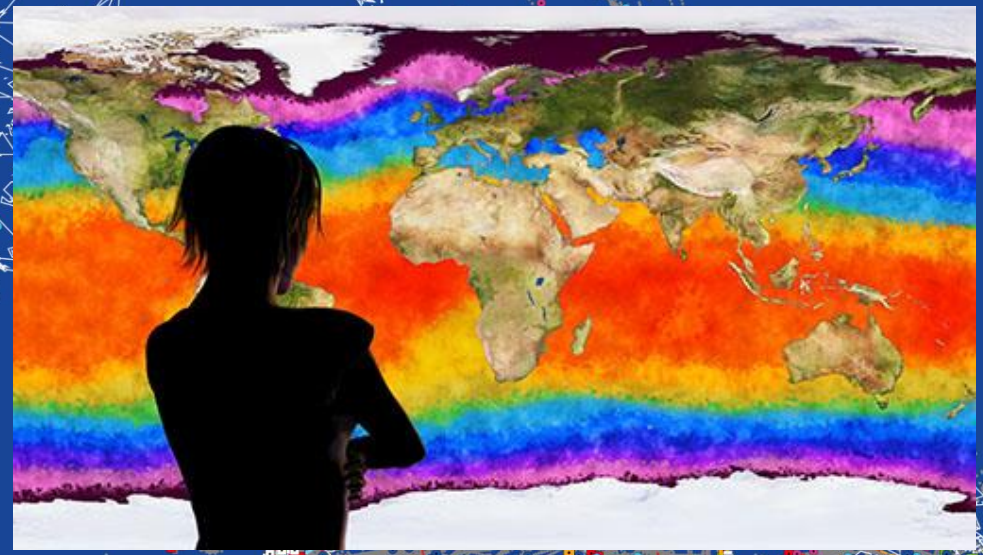
These transformative goals aim to make ocean prediction science more impactful and relevant.

Ocean Information Value Chain



Ocean Observing Co-Design

by The Global Ocean Observing System



Aim to develop a more user-focused co-design process to evolve a truly fit for purpose, integrated, responsive ocean observing system

➢ Exemplar Project

- Improving Carbon data
- Advance Cyclone forecasting
- Sustaining development and conservation of living marine resources
- Improving Storm surge predictions
- Monitor Marine Heatwave impacts on biodiversity and economies
- Observing key current systems

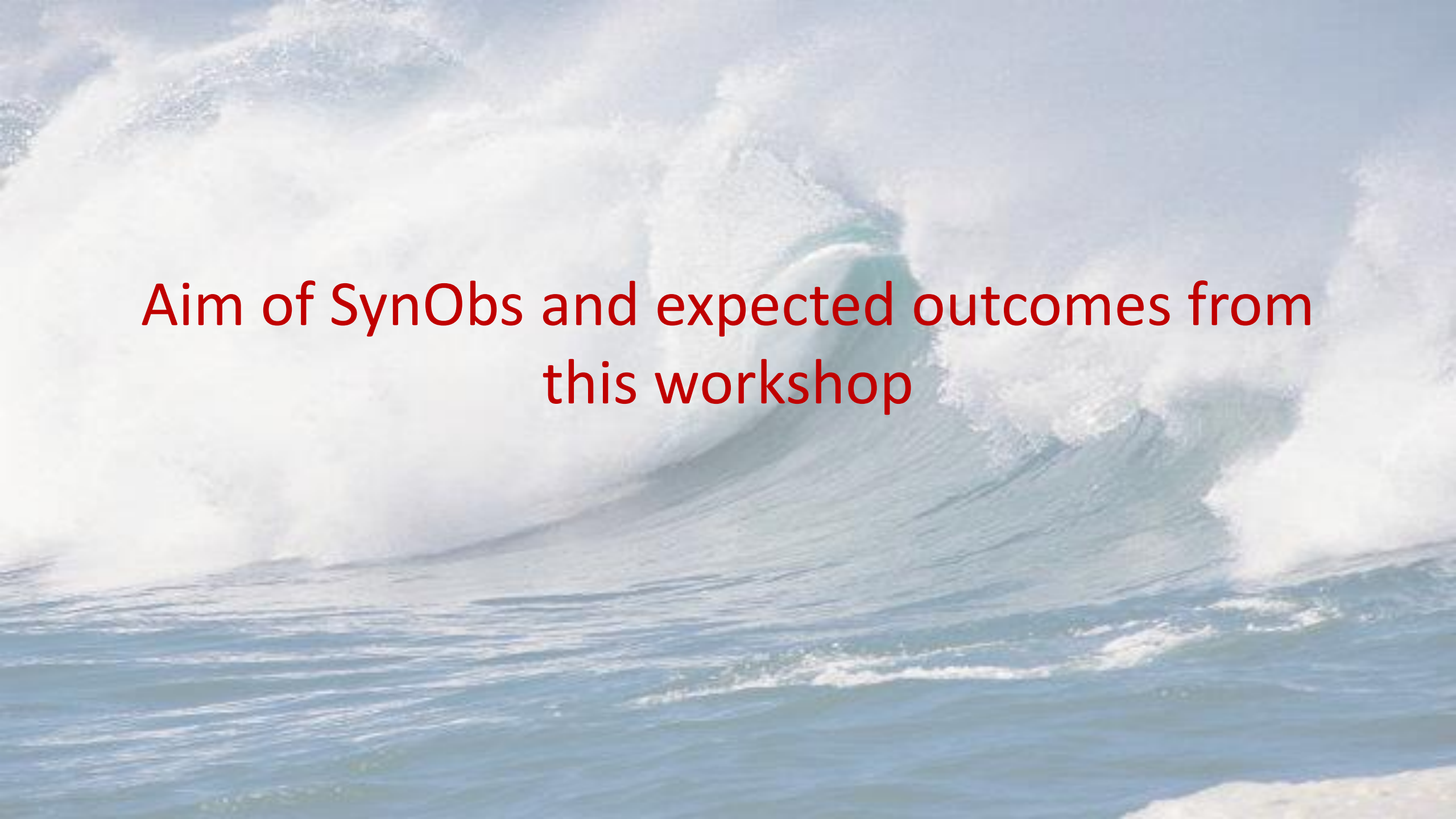
CoastPredict

with The Global Ocean Observing System

Aim to redefine the science of observing and predicting the Global Coastal Ocean to help the Ocean Decade succeed in its aims and give us the ocean we need for the future we want.

➢ Focus Areas

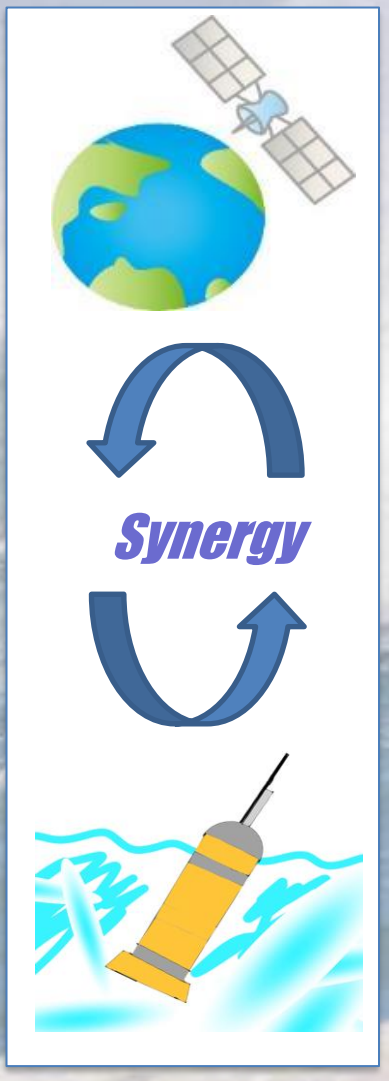
1. Integrated observing and modelling for short term coastal forecasting and early warnings.
2. Future coastal ocean climates, earth system observing and modeling
3. Solution for integrated coastal management
4. Coastal ocean and human health
5. Coastal information integrated in the open and free exchange international infrastructures
6. Equitable coastal ocean capacity



Aim of SynObs and expected outcomes from this workshop

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

An UN Ocean Decade Project (Submitted)



- 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.

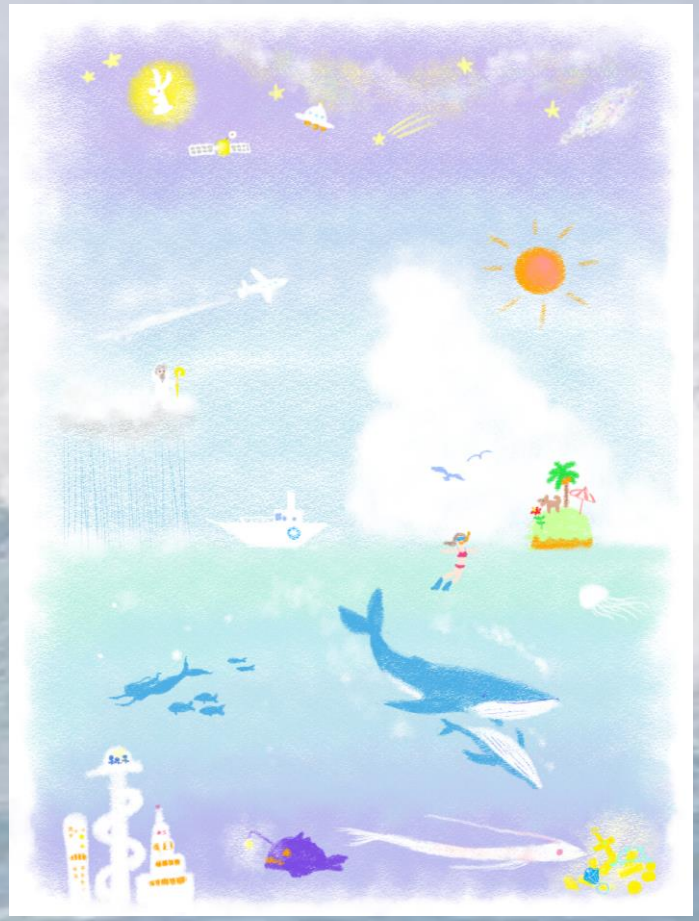
- Scope

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

☆ Expected activities of SynObs

1. Collaboration for evaluation and design

- Collaborative evaluation of the ocean observing systems through multi-system OSE/OSSE and other data assimilation techniques.
- The synergistic effects of swath and nadir altimeters (including SWOT), and in situ observations (e.g., Argo) is a main target of the evaluation
- Establish a best practice based on the collaboration above.



2. Supporting DA scheme development

- Share the information on the development of DA schemes
- Planning of observation campaigns for DA scheme development

3. Providing information from ocean prediction systems in real time

- Explore the methods to evaluate observing system status in real-time
- Establish a regular-reporting framework

4. OS-Eval showcase and reporting

- Introduce OS-Eval examples to demonstrate its effectiveness (Showcase)
- Contribute to reports on observation requirements and design

☆ What will be achieved in this workshop?

Many Presentations

- Showcase of OS-Eval Activity
- Information sharing on the DA development for more effective use of observation data
- Communication with observational communities (What observing system requires evaluation?)

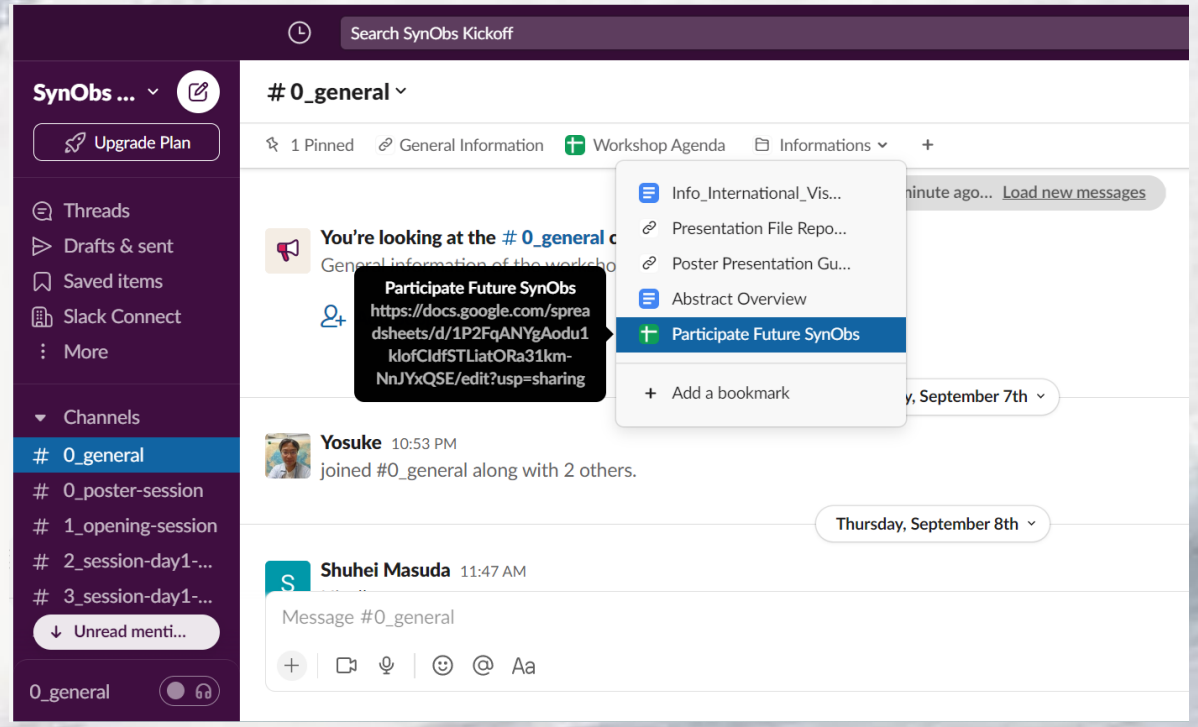
Opportunity of Discussion

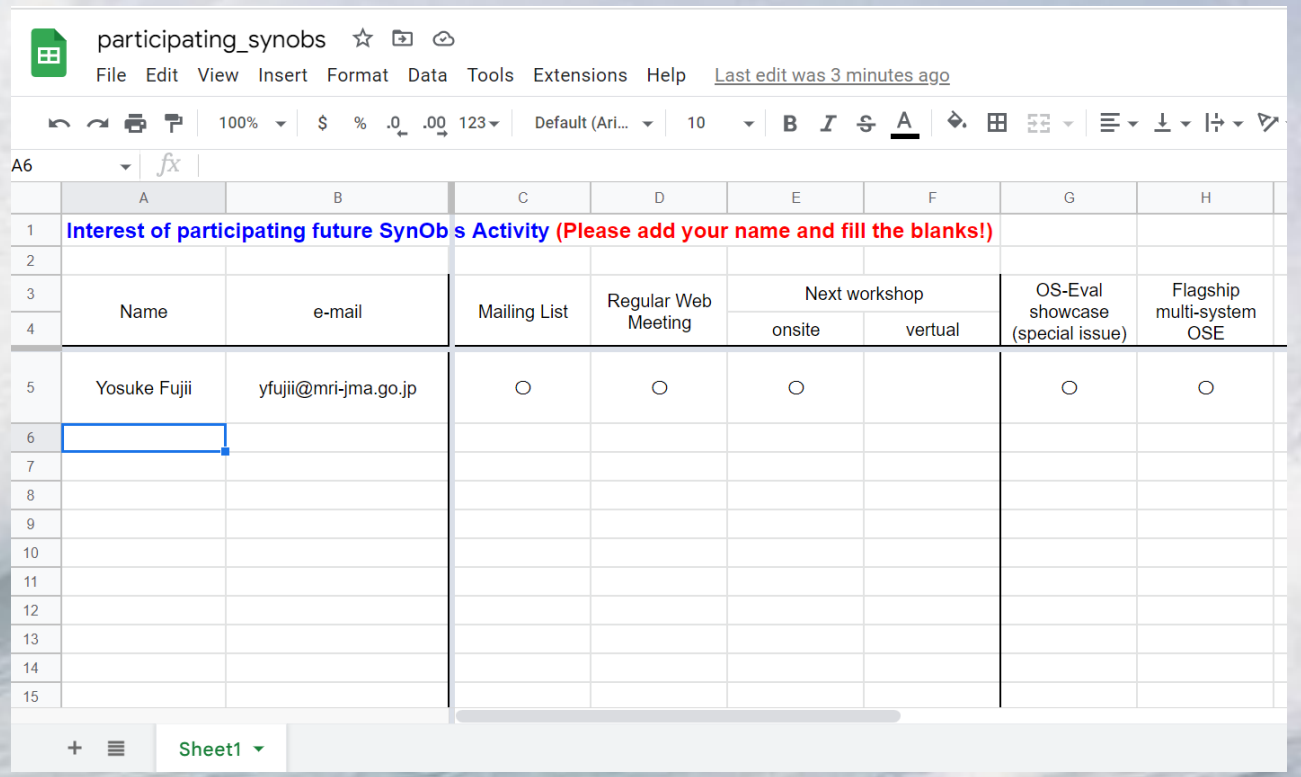
- Discussion 1 (16th Morning): Observing System and OSE/OSSE. (Focus on the communication between observational and ocean prediction communities.)
- Discussion 2 (16th Noon): Use of Fishery and Coastal data.
- Discussion 3 (16th Evening): Coupled Prediction Task Team Active Plan
- Discussion 4 (17th Evening): SynObs Activity Plan (In particular, we will discuss about the collaboration for the multi-system OSE/OSSE.)

☆ How can you get involved in SynObs?

- The participants of this workshop have already been involved in SynObs!!
- Mailing List (oseval-tt@googlegroups.com)
- Should we keep the Slack workspace?
  ⇒Note that the data are delated 3 months after they uploaded because it uses free ID
- Regular Web Meeting: Informed through the mailing list.
- Participate the flagship multi-system OSE/OSSE (will be explained in Discussion 4).
- You can also submit your OS-Eval achievement to the special issue “OS-Eval Showcase”
- Other Activity?

★ Please show your interest!





- Please click the link of “Participating Future SynObs” in the “Informations” folder of the “0_general” channel
- Write your name and indicate what activities of SynObs you are going to participate in the spreadsheet!


Thank you!!

★ OceanPredict contributions to the UN Ocean Decade