

Development of the international multi-system OSEs/OSSEs database in the UN Ocean Decade Project SynObs and its contribution to ocean observing systems in the western Pacific region

Yosuke Fujii¹, Shoichiro Kido, Ichiro Ishikawa, and Yasumasa Miyazawa

1: Japan Meteorological Agency/ Meteorological Research Institute

2: Application Laboratory, Japan Marine Science and Technology Center (JAMSTEC)



Synergistic Observing Network for Ocean Prediction



2021 United Nations Decade
2030 of Ocean Science
for Sustainable Development

◆ 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 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.

To achieve the above objective, we will conduct a Multi-System Observing System Experiments (OSEs) and Observing System Simulation Experiments (OSSEs) SynObs flagship OSEs/OSSEs)

★ Plan of SynObs Flagship OSEs/OSSEs

- ❓ SynObs plans to implement OSEs/OSSEs using various ocean prediction systems with a common setting.
 - More than 10 systems will participate in the flagship OSE/OSSE project

◆ OP (Ocean Prediction) OSEs

- Use higher-resolution ocean DA and prediction systems.
- Assimilation run for 2020 (2020-2022 if possible)
- 10-day predictions: Started from every pentad

◆ S2S OSEs

- Use coupled prediction systems including lower-resolution ocean DA for initialization
- Reanalysis run for 2003-2022
- Subseasonal (1-month) predictions: Once a month
- Seasonal (4-month) predictions: from May and Nov.

◆ OP OSSEs

- Use GEOS/NASA coupled simulation as the Nature Run
- 1-year assimilation run and 10-day predictions from every pentad

Systems participating in the OP OSEs

Center	System	Area	Res. (Deg.)
UK MetOffice	FOAM	Global	1/12
NOAA/NCEP	RTOFS-DA	Global	0.08
ECMWF	ORAS5/6	Global	1/4
NASA/GMAO	GEO-S2S V3	Global	1/4
JMA/MRI	MOVE-G3F	Global	1/4
ECCC	GIOPS	Global	1/4
NOAA/NCEP	GLORe	Global	1
NOAA/QUOSAP	MOM6	Global	?
JAMSTEC-APL	JCOPE-FGO	Semi-glob.	0.1
JMA/MRI	MOVE-NP	N Pac.	1/10x1/11
Pukyong Uni.	KOOS-OPEM	N. Pac	1/24
REMO-UFBA	HYCOM-RODAS	S. Atl.	1/12
MetService, NZ	MetService, NZ	S. Pac.	1/24

★ SynObs flagship OSEs (OSE settings and the schedule)

OSE Settings for OP and S2S OSEs

◆ Control Run (CNTL)

- Basically, regular observation data are assimilated
- 20% of Argo data are withhold and used as reference.
- Participants can choose whether or not to assimilate satellite altimetry data

◆ OSEs

- Data of a targeted observation type are excluded (e.g., NoArgo, NoMoor, NoSST etc.)

OP OSSE setting will be discussed at SynObs web MT.

- SWOT, Satellite surface current obs, shallow sea profiles by gliders and other sources will be evaluated.

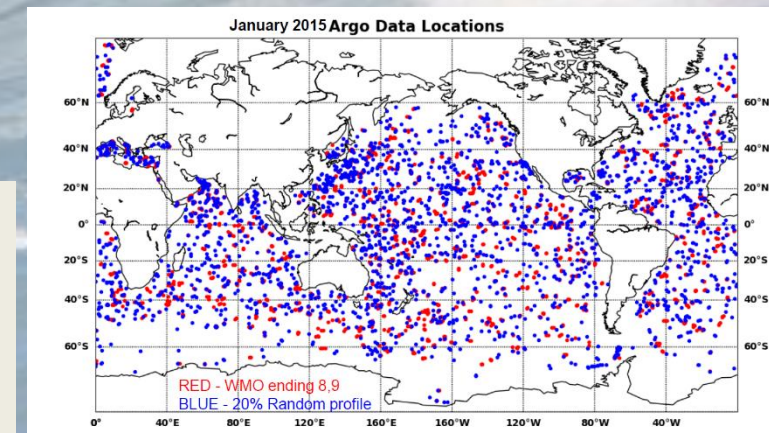
◆ Schedule

- Until the end of 2023: Assimilation (Reanalysis) Runs
- Until Apr 2024: Prediction Runs
- May 2024: WMO OIWS
- Nov 2024: OceanPredict Symposium

Suggested OSE Settings

1	CNTL	Ocean Model		SST	Argo 80%	Mooring	Other TS	Alt. (optional)
2	NoAlt	Ocean Model		SST	Argo 80%	Mooring	Other TS	
3	NoArgo	Ocean Model		SST		Mooring	Other TS	Alt. (optional)
4	NoMoor	Ocean Model		SST	Argo 80%		Other TS	Alt. (optional)
5	NoSST	Ocean Model			Argo 80%	Mooring	Other TS	Alt. (optional)
6	NoInsitu	Ocean Model		SST				Alt. (optional)
7	SSTonly	Ocean Model		SST				
8	Free	Ocean Model						
9	HalfArgo	Ocean Model		SST	Argo 40%	Mooring	Other TS	Alt. (optional)
10	Oper	Ocean Model	Oper. Setting	SST	Argo 100%	Mooring	Other TS	Nadir Altimeter

Distributions of Argo floats whose last digits of WMO number is 8 or 9 (red) and 20% random profiles (blue). Example for January 2015 (Thanks to Li Ren, NASA/GMAO.)



★ How will we analyze OSE/OSSE results?

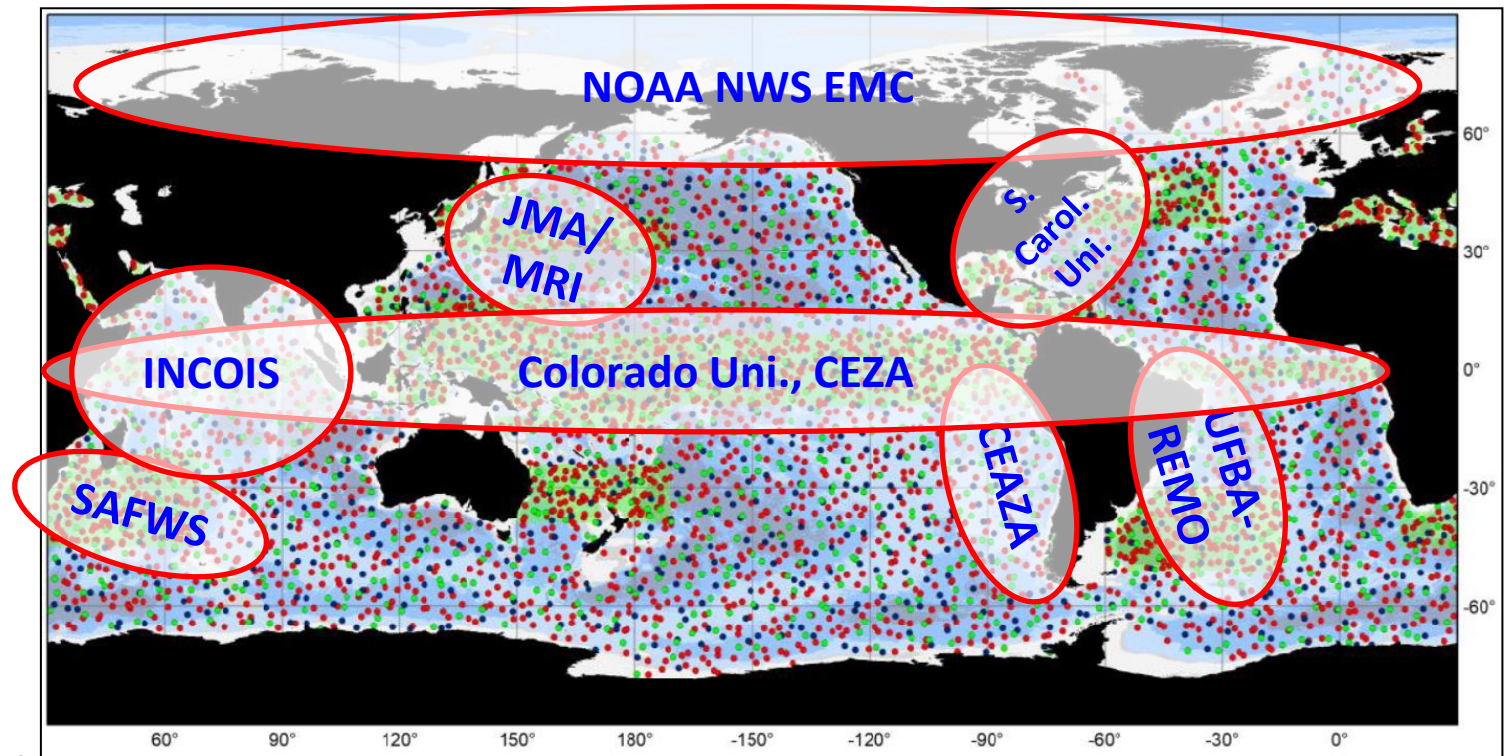
❓ Assign variables/diagnostics and regions to potential groups and request analysis.

❓ Analysis of variables or diagnostics for the global ocean

- ◆ Impact of Argo on heat budget and surface flux (ECCC)
- ◆ Diagnostics related to tropical cyclone (Ocean Observing CoDesign TC Exemplar Team)
- ◆ Comparison b/w forecasted value and Argo observation (OceanPredict IV-TT)
- ◆ Trajectory of Drifters (UKMO)
- ◆ Heat budgets and MHWs (ECMWF)
- ◆ Near-surface ocean current (ABoM)

❓ Regional Analysis

- ◆ MLD in tropics (Colorado Uni)
- ◆ Tropical waves ▪ Peru coast (CEZA)
- ◆ WN Pacific (JMA/MRI)
- ◆ Brazilian Coast (UFBA-REMO)
- ◆ Agulhas Current (SAFWS)
- ◆ Arctic and Antarctic (NOAA NWS EMC)
- ◆ Indian Ocean (INCOIS)
- ◆ Western North Atlantic (S. Caroline Uni.)



★ Possible Collaboration in the West Pacific Region

I. Evaluation of Tropical Pacific Observing System (TPOS) in the western Pacific Region.

- SynObs plans to evaluate impacts of TPOS according to the request from TPOS Science Advisory Team.

II. Evaluation of doubling of Argo floats in the western boundary current regions

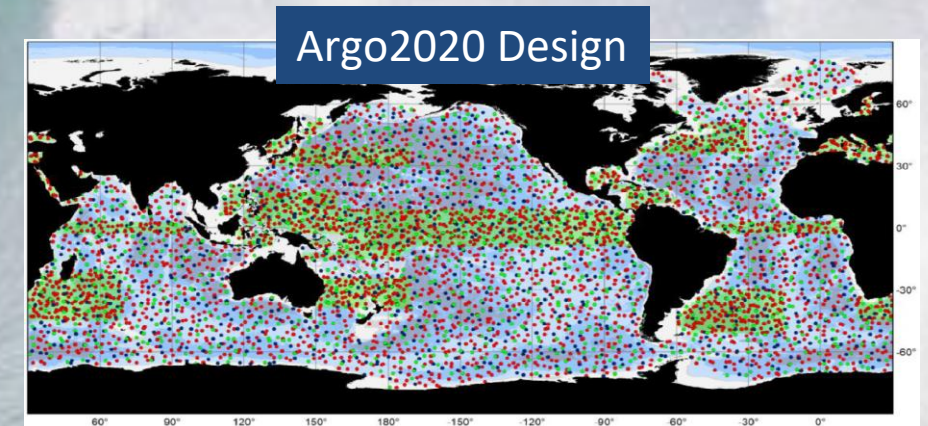
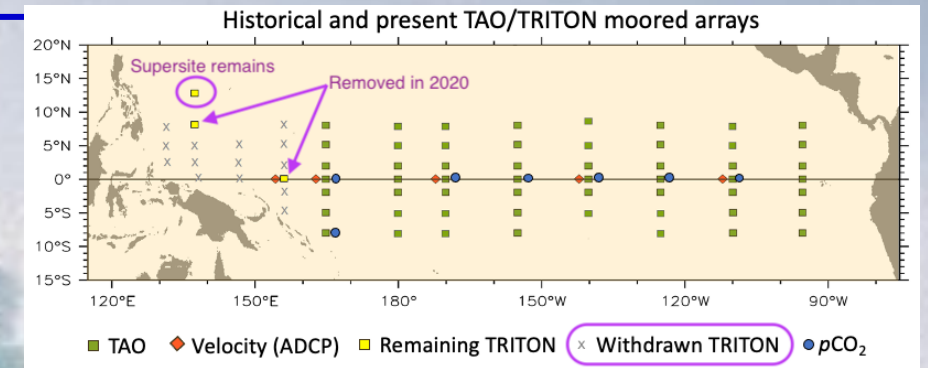
- Contributing to the new design of the global Argo array

III. Evaluating the impacts of ocean observations on the marine heatwave predictions.

- Collaborating with the Ocean Observing Codesign Marine Heatwave exemplar team.

IV. Evaluation of data observed by fishery industries

- Collaboration with fishery industries is effective to increase ocean observations in coastal and marginal seas.



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Thank you!!

SynObs Contact

SynObs Co-Chairs: Y. Fujii (JMA/MRI), Elisabeth Remy (Moi)

E-Mail: synobs@mri-jma.go.jp

<https://https://oceanpredict.org/un-decade-of-ocean-science/synobs-2>

Mailing List

SynObsML@googlegroups.com

Please mail to synobs@mri-jma.go.jp for joining