



# *SynObs Web Meeting 15*

## Agenda

1. Activities since last meeting
2. Introduction of SynObs & Ocean Observing Co-design International Workshop
3. Current status of the flagship OSE
4. How do we coordinate the analysis of the flagship OSE?
5. Discussion on future activities.

# ★ Activities since last meeting

- May 2025: JpGU2025: **organize a session, several presentations**
- Jul. 2025: Busan IAMAS-IACS-IAPSO Joint Assembly 2025 (BACO2025): **presentation**
- Sep. 2025: Pan CLIVAR Meeting and CLIVAR-GSOP Meeting: **presentation, discussion**
- Nov. 2025: **Project Period of SynObs is officially extended to Dec. 2030.**
- Nov. 2025: OceanPrediction DCC South East Asia Regional Team Meeting, **presentation**
- Dec. 2025: AGU2025, **presentation**
- Jan. 2026: DITTO Online Event, **presentation**

- ◆ Planning of the SynObs & Ocean Observing Co-design International Work in August in Japan
- ◆ Collecting the OSE data for the SynObs flagship OSEs
- ◆ Analysis of the SynObs flagship OSEs



Presentation by Billy Kessler in JpGU2025 SynObs Session

# Toward Codesigning Sustainable and Fit-for-purpose Ocean Observing

## SynObs & Ocean Observing Codesign International Workshop 2026

- Period: 24 (Mon) – 29 (Sat), Aug., 2026.
- Location: Mutsu, Japan (Shimokita Culture Hall) <https://shimobun.com/> (Japanese)
- Format: In Person and Online (Hybrid), English, ~50 participants expected
- Jointly organized with 30<sup>th</sup> Data Assimilation Summer School in Japan (DASS, 26 (Wed) -30 (Sun), 10 international students will be accepted)
- Webpage: <https://oceanpredict.org/events/synobs-ocean-observing-co-design-joint-international-workshop>



### Side Meetings

- Ocean Observing Co-design Tropical Cyclone Exemplar Meeting
- Ocean Observing Co-design Coordinating Group Meeting
- SynObs Planning Meeting

### Important Dates

Abstract Submission: Feb. 16<sup>th</sup> (Mon) to Mar. 27<sup>th</sup> (Fri)  
Abstract Selection Confirmation: Apr. 30<sup>th</sup> (Thu)  
Registration: April 6<sup>th</sup> (Mon) to May 22<sup>nd</sup> (Fri)

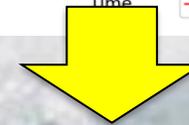
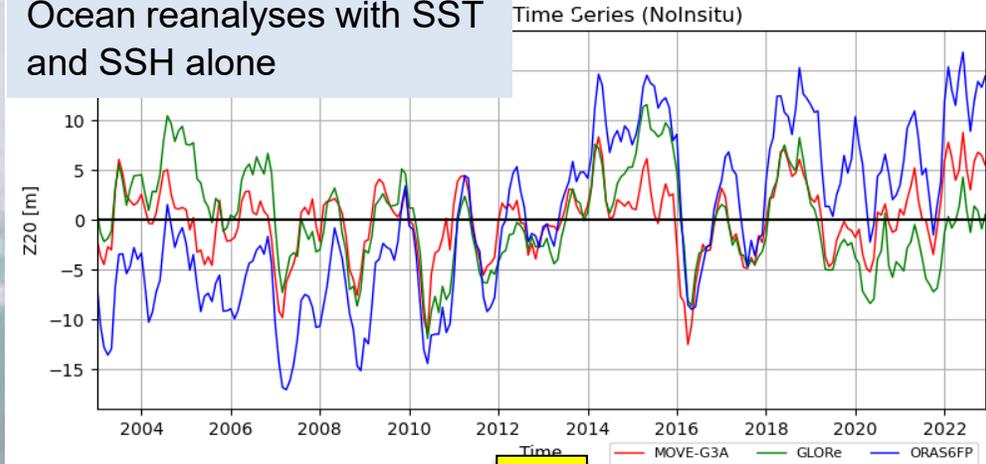


# SynObs flagship OSEs

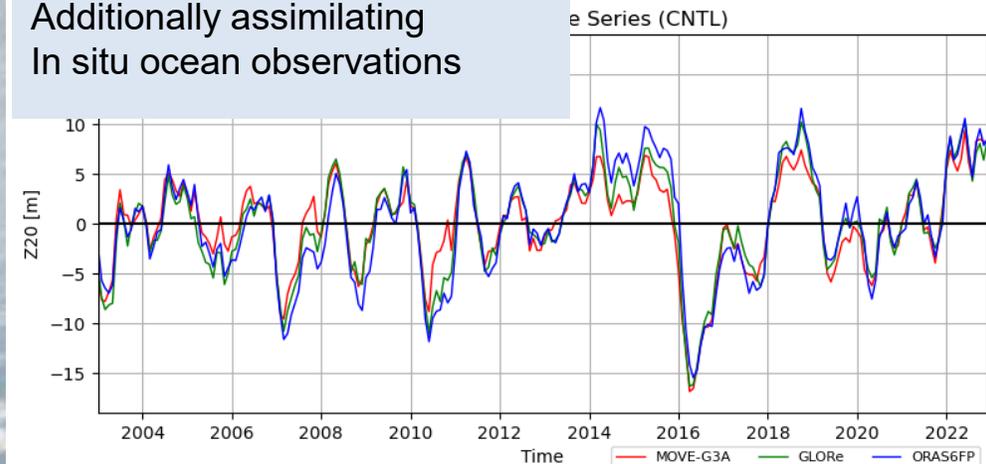
- ❑ Internationally coordinated **OSEs using multiple ocean reanalysis and prediction systems** with a common setting
    - **Observing System Experiment (OSE):**  
Reanalysis/prediction experiment to examine the sensitivity to observation data
  - ❑ **To make robust evaluation** which does not depend on a particular system
  - ❑ Results are stored as netCDF files in **the Japanese DTO on the JAMSTEC sever** and volunteer groups analyze observation impacts.
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- ◆ Observation impact can be demonstrated by reduction of **multi-system Ensemble Spread (MSES)**, which represents **uncertainty** of analyses.
  - ◆ For example, assimilating ocean in-situ observations effectively reduces MSES, i.e., the uncertainty of **Eq-Pac Warm Water Volume (WWV)** analysis (right figure).
  - **Eq-Pac WWV:** Depth of 20°C isotherm (Z20) averaged over 5°S-5°N, 120°E-80°W.

## Timeseries of Eq-Pac WWV

Ocean reanalyses with SST and SSH alone



Additionally assimilating In situ ocean observations



Systems: **MOVE-G3A (JMA)**, **GLORe (NOAA-CPC)**, **ORAS6FP (ECMWF)**

- ❑ The **flagship OSE results** are collected in the SynObs database in the **Japanese DTO** on the JAMSTEC sever.
- ❑ The **data is freely open** for volunteer groups who analyzes the observation impacts using flagship OSE results.
- ❑ The data are stored in **the netCDF format**. You can easily **download the data by wget command**. JAMSTEC have been developing user interface currently.

## Index of /distributions/SynObsDB

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 <a href="#">Extra/</a>	2025-12-22 19:17	-	
 <a href="#">OP-AN/</a>	2025-09-18 19:16	-	
 <a href="#">S2S-AN/</a>	2025-09-25 16:29	-	

	Daily	Pentad/Weekly	Monthly	Point Location
OP-OSE Analysis (OP-AN)	<b>OPA-D (OPA-DH)</b> Variables: OP-2 Resolution: 0.25°, 0.1° Frequency: Daily	<b>OPA-P</b> Variables: OP-1 Resolution: 0.25° Frequency: Pentad		<b>OPA-PL</b> Argo (Daily) Mooring (Hourly)
OP-OSE Forecast (OP-FC)	<b>OPF-D (OPF-DH)</b> Variables: OP-2 Resolution: 0.25°, 0.1° Lead Times: D1, D3, D7	<b>OPF-P</b> Variables: OP-1 Resolutions: 0.25° Lead Times: P1, P2		<b>OPF-PL</b> Argo (Daily, D1-D10) Mooring (Hourly, H1-H240)
S2S-OSE Analysis (S2S-AN)	<b>S2SA-D</b> Variables: S2S-2 Oc Resolution: 1° Frequency: Daily		<b>S2SA-M</b> Variables: S2S-1 Oc+Flx Resolution: 1° Frequency: Monthly	<b>S2SA-PL</b> Argo (Daily) Mooring (Daily)
S2S-OSE Forecast (S2S-FC)	<b>S2SF-D</b> Variables: S2S-3 Oc+Atm Resolution: 1° Lead Times: D1-D35	<b>S2SF-W</b> Variables: S2S-2 Oc+Atm Resolution: 1° Lead Times: W1-W18	<b>S2SF-M</b> Variables: S2S-1 Oc+Atm Res: 1° Lead Times: M1-M4	<b>S2SF-PL</b> Argo (Daily, D1-D126) Mooring (Daily, D1-D126)

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 <a href="#">OPA-D SST 20200101 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200102 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200103 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200104 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200105 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200106 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200107 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200108 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200109 M..&gt;</a>	2025-04-26 16:10	4.0M	
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 <a href="#">OPA-D SST 20200111 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200112 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200113 M..&gt;</a>	2025-04-26 16:10	4.0M	
 <a href="#">OPA-D SST 20200114 M..&gt;</a>	2025-04-26 16:10	4.0M	
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# ★ Collection of the data for the flagship OSEs

## ➤ Data Collection for OP Analysis

System	Center	OSEs	Period	Provided Data
FOAM	UKMO	CTL, NoAlt, NoArgo, Free, (HalfArgo)	2020-2022 (HalfArgo: only 2020)	Almost all
GIOPS	ECCC	CNTL, NoAlt, NoArgo, NoMoor, NoInsitu, NoSST, SSTonly, Free, HalfArgo, Oper	2020-2022	Almost All
JCOPE-FGO	JAMSTEC	CNTL, NoAlt, NoArgo	Only 2020	SSH, ArRef
MOVE-G3F	JMA/MRI	CTL, NoAlt, NoArgo, NoInsitu, NoMoor, NoSST, SSTonly, HalfArgo, Free, NoUSArgo	2020-2022	Almost All
MOVE-NPR	JMA/MRI	CTL, NoAlt, NoArgo	2020	SSH, 50mT
ORA6FP	ECMWF	CTL, NoAlt, NoArgo, NoInsitu, NoMoor, NoSST, Free	2020-2022	Almost All
OPEM_MOM5	Pukyong U.	CTL, NoAlt, NoArgo, HalfArgo, Free	2020	Only daily data

## ➤ Data Collection for S2S Analysis (2003-2022)

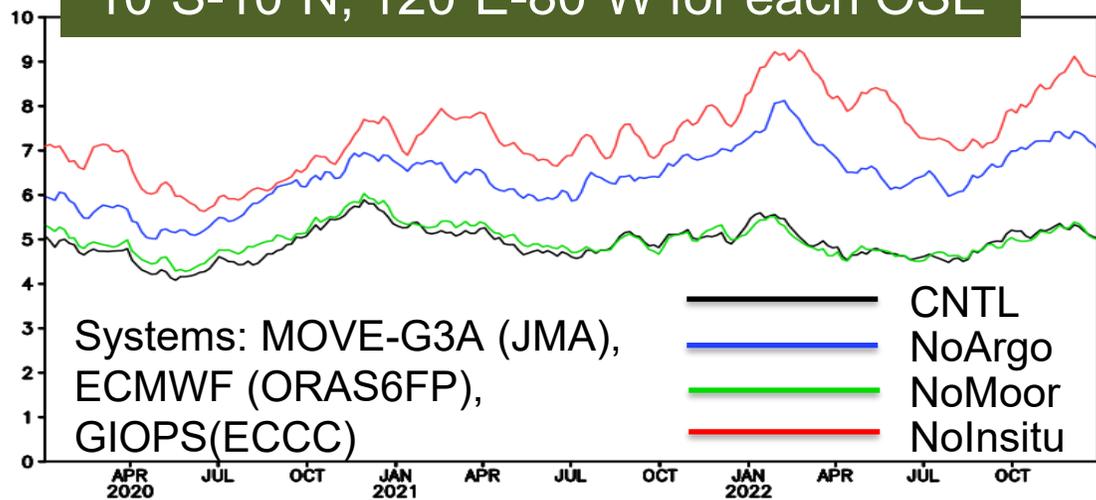
System	Center	OSEs	Period	Provided Data
MOVE-G3A	JMA/MRI	CTL, NoAlt, NoArgo, NoMoor, NoSST, HalfAlgo, Noinsitu, Free, SSTonly, NoUSArgo	2003-2022	Almost All
ORA6FP	ECMWF	CNTL, NoAlt, NoArgo, NoInsitu, NoSST	2003-2022	Only monthly data
GLORe	NOAA-CPC	CNTL, NoInsitu, Free	2003-2022	Only monthly data

# Z20 MSES Reduction by In-situ Observations

- Mooredings and ships have substantial impact if Argo is absent (NoInsitu - NoArgo).
- Impact of mooredings complementary to others is notable in the east. Eq. Pac. (NoMoor - CNTL)
- Argo data have large impact complementary to others in broad area (NoArgo - CNTL)

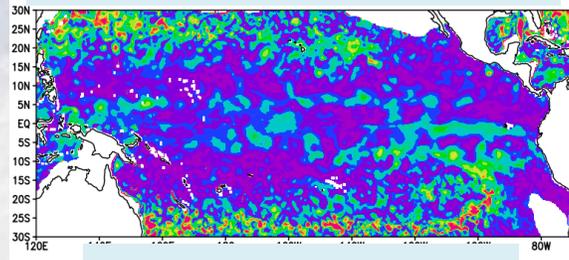
**Impacts on predictions will also be investigated!**

Time Series of Z20 MSES averaged in 10°S-10°N, 120°E-80°W for each OSE

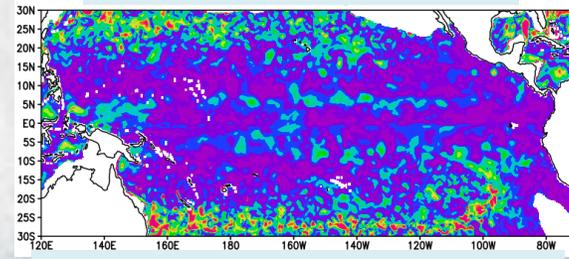


## MSES of Z20 (2020-

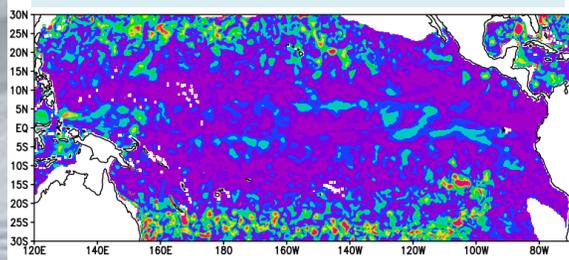
NoInsitu (without all In situ)



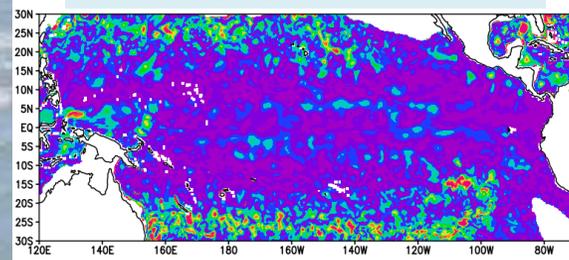
NoArgo (without Argo)



NoMoor (without mooredings)

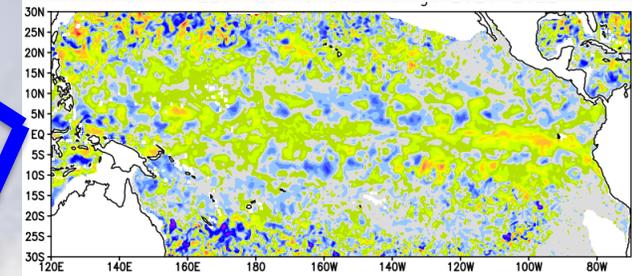


CNTL (regular reanalyses)

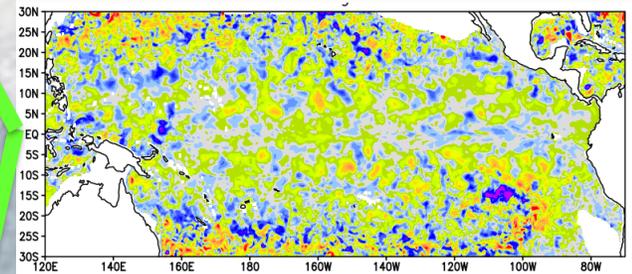


## Difference of MSES

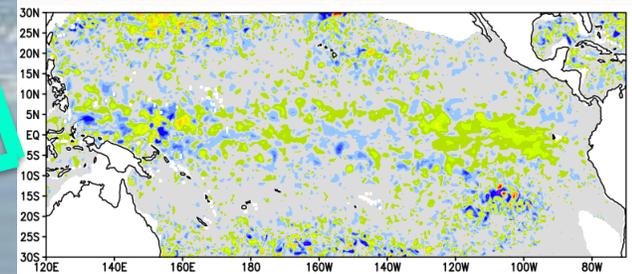
NoInsitu - NoArgo (Impact of mooredings and ships if Argo is absent.)



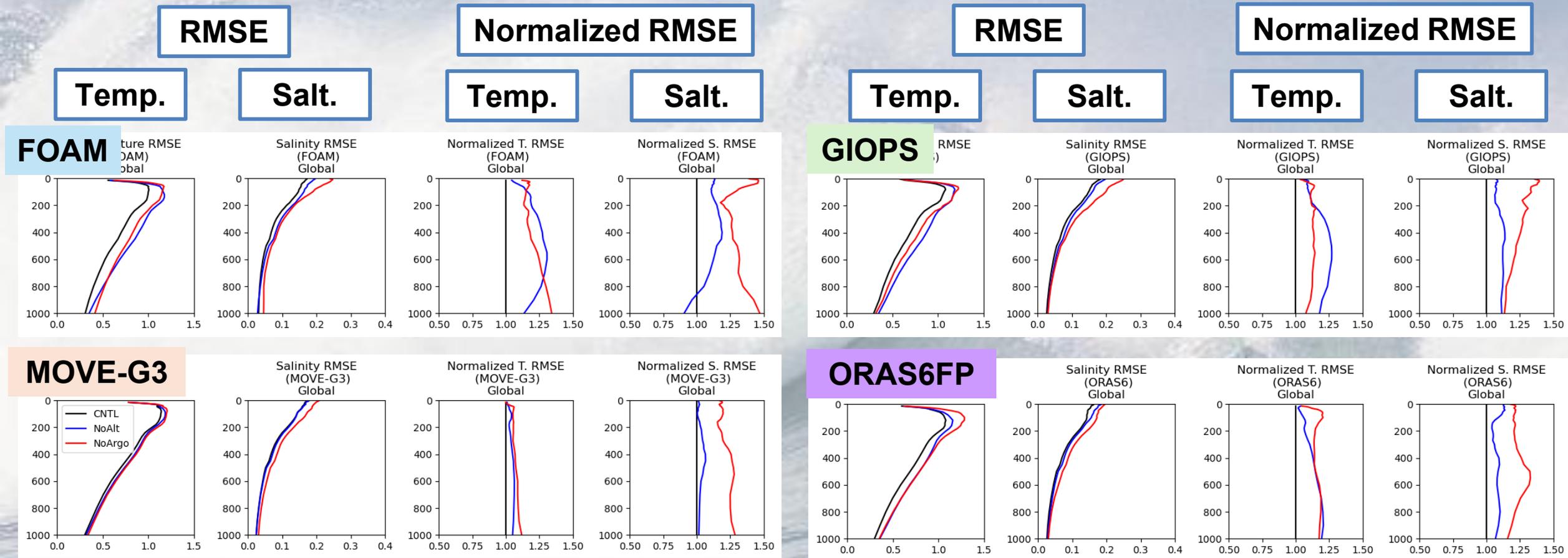
NoArgo - CNTL (Impact of Argo complementary to others)



NoMoor - CNTL (Impact of mooredings complementary to others)



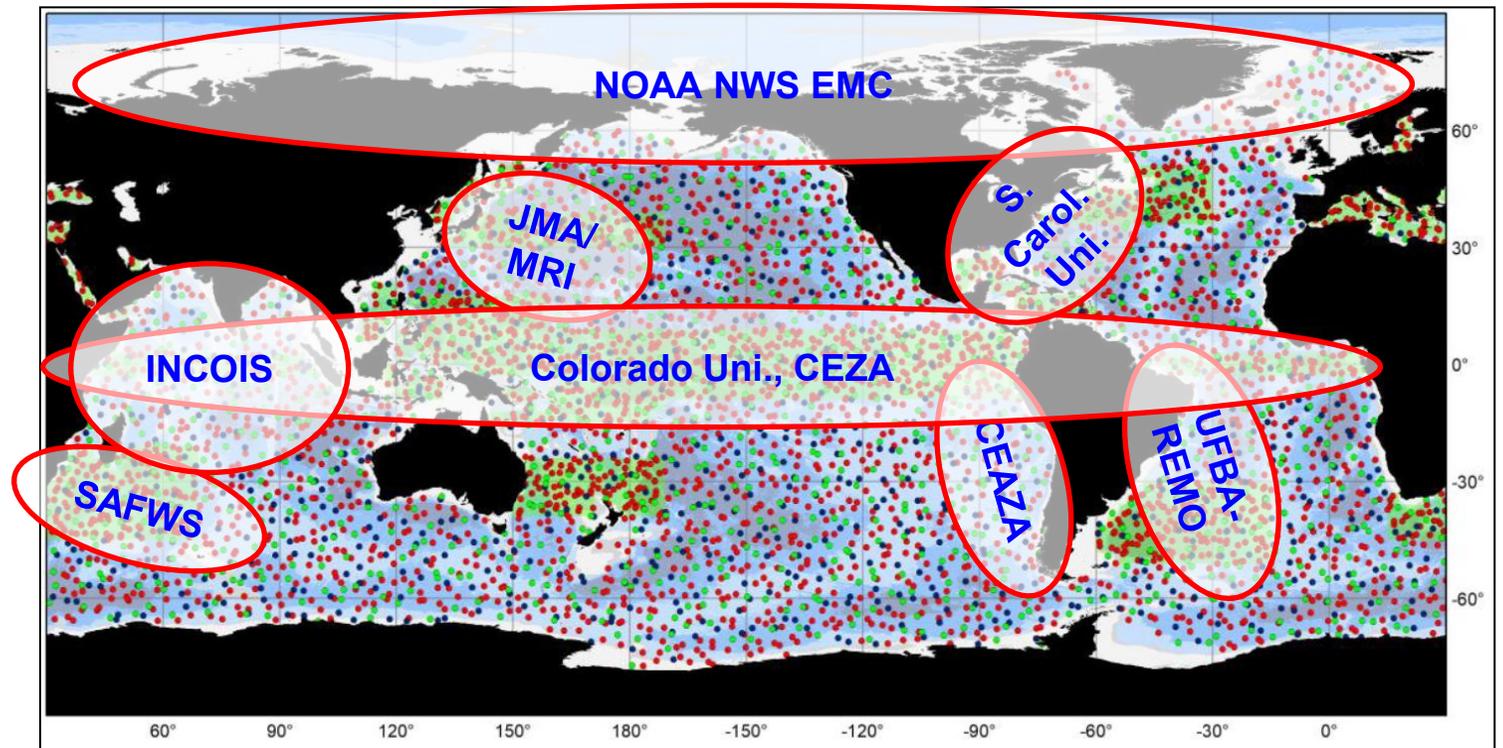
# ★ RMSE profiles against independent Argo in 2020-2022 in each system



- ✓ Argo data mostly reduce the accuracy of temperature and salinity profiles in all systems.
- ✓ Impacts of satellite altimeters has dependency on systems. In FOAM, GIOPS, and ORAS6, the impact on temperature is substantial and that on salinity is moderate. In MOVE-G3, although the impact on temperature and salinity is positive but smaller than other systems. Although assimilating altimetry data are effective in the mid-latitudes, it is not easy to improve the interior ocean TS fields in the tropics.

# ★ How will we analyze OSE/OSSE results? (Discussion before)

- ❑ **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.)



## ★ How do we coordinate the analysis?

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- I will take a questionnaire to confirm what groups are interested in and what variables or regions they are interested in. (I promised to do this in the previous meeting, but I have not done.)
- If your group is interested in the analysis, you can start the analysis in your timing, but please inform me when start your analysis.
- Any suggestion promoting the analysis?
- I am also sorry that I have not write the draft of BAMS yet. But I will try.

# ★ Discussion on Future Activities

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Feb. 2026:	OSM26, <b>organize a joint session with Ocean Observing Codesign</b>
Apr. 2026:	12 <sup>th</sup> , OceanPredict Steering Team Meeting
Aug. 2026:	SynObs & Ocean Observing Co-design International Workshop
Nov. 2026:	DITTO Summit (Yokohama, Japan)
2029:	OceanObs'29, <b>Yosuke Fujii becomes a member of the program committee.</b>

- ◆ Continue the SynObs flagship OSEs (Analysis of OSE results, Predictions)
- ◆ No US Argo OSEs?
- ◆ OSEs for SWOT? OSSEs?
- ◆ Construct the framework to share the observation quality information (through collaboration with NOAA real-time ORA-IP?)
- ◆ The 2<sup>nd</sup> Special Collection?
- ◆ How can we contributing to OceanObs'29?