

# Contribution of the GODAE OceanView Observing System Evaluation Task Team to OceanObs'19

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## Summary

GODAE OceanView Observing System Evaluation Task Team (OSEval TT) is contributing to **OceanObs'19** through

1. Writing a Community White Paper (CWP)
2. Making several **recommendations** to ocean observation and ocean/climate prediction communities.
3. Proposal of Ocean Observation Impact Annual Report (OIAR)

## Recommendations for OceanObs'19

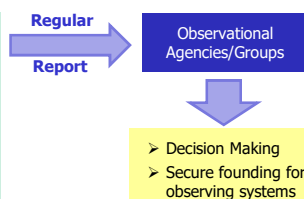
- ◆ **Further development** of Observing System Evaluation (OS-Eval) activities based on **Ocean Data Assimilation and Prediction (ODAP)** systems **at international level** with the support of the international ODAP (e.g., OceanPredict and CLIVAR-GSOP) and observational communities.
- ◆ Improvement of **data assimilation methods** in ODAP systems.
- ◆ Advancement of **OS-Eval methodology**.
- ◆ **Clear interpretation of the results** considering OS-Eval limitations, to help the observational community better interpret results.
- ◆ Developments towards performing **OS-Eval in near-real-time**.
- ◆ Efforts towards new frontiers of the ODAP systems, such as **coastal regions, the deep ocean, polar regions, coupled data assimilation, and biogeochemical applications**, to design and optimize the observing systems that underpin those frontiers.
- ◆ Closer collaboration between the ODAP and ocean modelling communities to **reduce model systematic errors**.
- ◆ **Multi-system evaluation** under international coordination to improve the robustness of the results by moderating system-dependency.
- ◆ **Enhanced communication between the ODAP and observational communities** to better understand the respective needs and issues of each group. Specifically, for the ODAP community to understand the key needs, opportunities, and issues of those managing the observing system; and for the observational community to understand the potential of ODAP systems, as well as their strengths and weakness.
- ◆ Provision of **human and financial resources and infrastructure** for the OS-Eval activities under the collaboration between the ODAP and observational communities.
- ◆ Implementation of **standard reporting of observation impacts** to support decision-making and to provide quantitative demonstrations of data impacts that may strengthen the case for funding and improvements to ocean observing systems.

## Ocean Observation Impact Annual Report (OIAR)

- OSEval TT **proposes to publish a regular report** on the use of observation data in ocean/weather/climate prediction systems, information of data misfit and analysis increment, spread of ocean reanalyses, and results of OS-Eval studies.
- Publishing the regular report can be an effective way to **make a feedback to observational communities**. It helps decision making and supports to secure funding for developing and sustaining ocean observing system.
- OSEval TT co-chairs decide the structure and edit the report. The task team members draft sections assigned by the co-chairs. The co-chairs may ask other relevant groups (e.g., TPOS, Argo, GSOP etc.) some input.

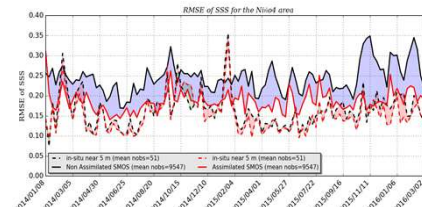
### OIAR

- use of observations in prediction systems
- Spread in multi-system ensemble
- Data misfits and analysis increments
- Summary of recent OSEval studies
- Results of international OSEval campaign



## Contents of Community White Paper (CWP)

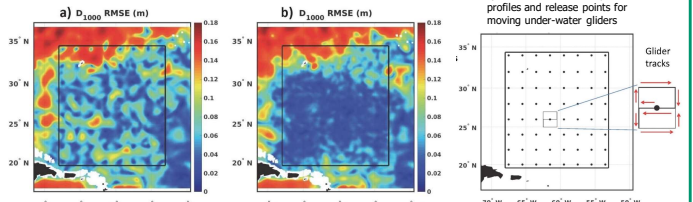
### ➤ Examples of OSE experiments



RMS of innovation for SMOS (thick lines) and near surface (5 m depth) in-situ salinity observations (dashed lines) averaged over the NINO4 region: in black the control experiment, in red the OSE with assimilating SMOS data by the Mercator Ocean ODAP system.

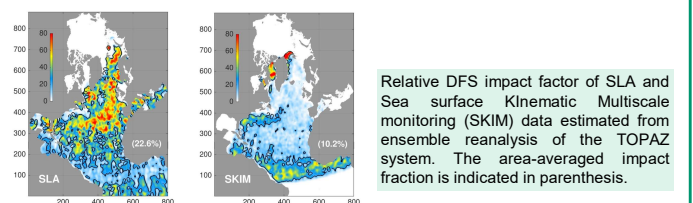
Assimilating SMOS effectively reduce misfits from SMOS without increasing the misfits from in-situ data.

### ➤ Examples of OSSE experiments



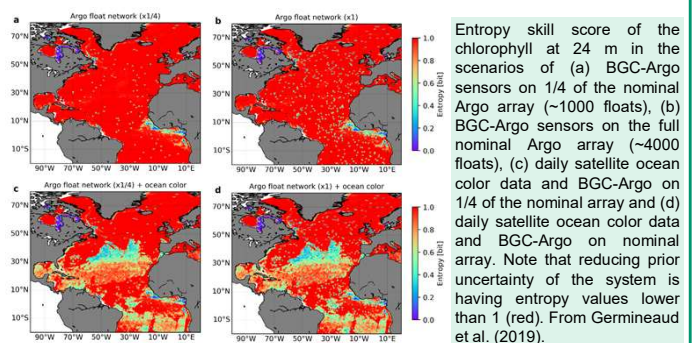
RMSE maps for (a) the stationary profiler experiment, and (b) the moving glider experiment in NOAA-AOML and Uni. Miami. Stationary profilers and gliders were released at longitude-latitude grid points shown in panel (c). All gliders executed a reverse figure eight pattern.

### ➤ Examples of adjoint and ensemble-based approaches



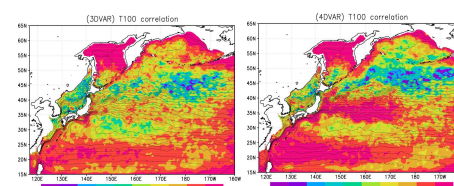
Relative DFS impact factor of SLA and Sea surface Kinematic Multiscale monitoring (SKIM) data estimated from ensemble reanalysis of the TOPAZ system. The area-averaged impact fraction is indicated in parenthesis.

### ➤ New challenges following evolution of ODAP systems



Entropy skill score of the chlorophyll at 24 m in the scenarios of (a) BGC-Argo sensors on 1/4 of the nominal Argo array (~1000 floats), (b) BGC-Argo sensors on the full nominal Argo array (~4000 floats), (c) daily satellite ocean color data and BGC-Argo on 1/4 of the nominal array and (d) daily satellite ocean color data and BGC-Argo on nominal array. Note that reducing prior uncertainty of the system is having entropy values lower than 1 (red). From Germaineaud et al. (2019).

### ➤ Discussion on limitations and efforts toward more valuable evaluation



Distribution of the observation impact is different between 3DVAR and 4DVAR results.

Impacts of in-situ temperature and salinity profiles in (a) 3DVAR and (b) 4DVAR versions of JMA's operational western North Pacific system. Panels show correlation coefficients of 100-m-depth temperature anomaly with respect to the monthly climatology between assimilation runs with and without assimilating in-situ temperature and salinity profiles. The correlation is calculated for 2005-2011. Low correlation indicates high impact.