Observing System Experiments for Argo in the Mediterranean Sea & Black Sea

Authors: N. Pinardi, M.Mariani (INGV), P.-M. Poulain (OGS)

Description of impact study carried out: During the last two years INGV carried out an investigation aimed at the understanding of the impact of the present MedARGO horizontal sampling and vertical/time sampling scheme on the quality of MyOcean Monitoring and Forecasting Center (MFC) operational analyses through Observing System Simulation Experiments (OSSE) and Observing System Simulations (OSE). The simulation results were made available also to the biochemical OSE experiments carried out by OGS.

Results:

OSE Results indicate that: 1) ARGO assimilation improves the accuracy of the Temperature and Salinity analyses by 35% with respect to simulation on the whole water column; 2) half of the present ARGO array increases the analysis BIAS of 30% for Salinity between 0-100 m and 10% in terms of RMSE (7% for T and 12% for S).

OSSE Results. The OSSE methodology used is based on the identical twin experiment approach, which uses synthetic data extracted from a 'Nature run' and the inserted in a 'perturbed run' (Table 1).

Name	Model and Assimilation characteristics	Assimilated data set: Synthetic ARGO
SIM-TRUTH	Simulation (MyOcean Med-MFC model) for 2012	NO
SIM-PERT	Simulation (MyOcean Med-MFC model) for 2012, perturbed physics and initial conditions	NO
OSSE-1	SIM-PERT with 3Dvar	5 days drift, parking depth 350
OSSE-2	SIM-PERT with 3Dvar	5 days drift, parking depth 700
OSSE-3	SIM-PERT with 3Dvar	5 days drift, parking depth 150
OSSE-4	SIM-PERT with 3Dvar	3 days drift, parking depth 350
OSSE-5	SIM-PERT with 3Dvar	3 days drift, parking depth 700
OSSE-6	SIM-PERT with 3Dvar	5 days drift, parking depth 350, "perfect" vertical sampling

Table 1: OSSE characteristics Table

Vertical profiles of RMSE (Fig. 1) show an improvement when the simulated float drifted with a parking depth of 700m and when probes had a surfacing time of 3 days. Positive impact of perfect sampling has been evaluated to reduce the RMSE error of misfit around the 10-15% in the entire water column.

Conclusion: The OSSE study has shown that the assimilation of temperature and salinity data from synthetic ARGO monitoring system in the Mediterranean Sea can improve the quality of analyses if a deeper drifting depth and a shorter drifting time is considered in future ARGO sampling schemes. Full profile transmission could be considered also as a major improvement for MyOcean operational analyses.
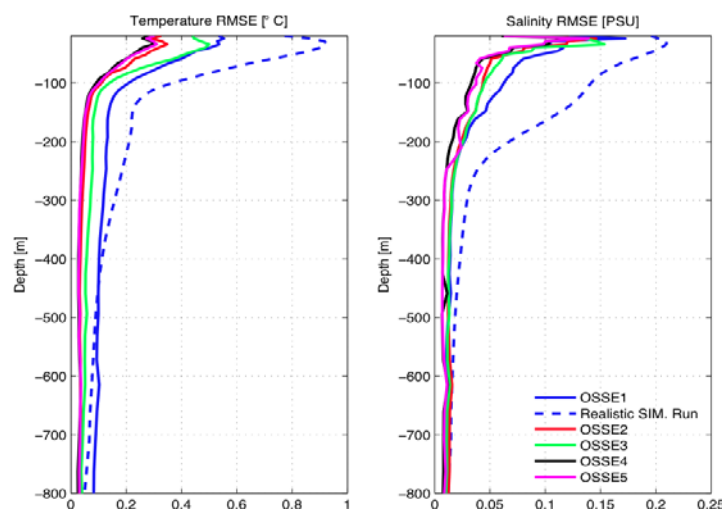
Figures:

Fig. 1 OSSE Root Mean Square Error (RMSE) for Temperature (left) and Salinity (right)