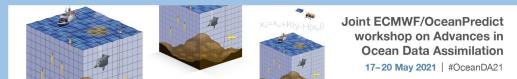


Parameter estimation for ocean biogeochemical component in a global model using Ensemble Kalman Filter: a twin experiment

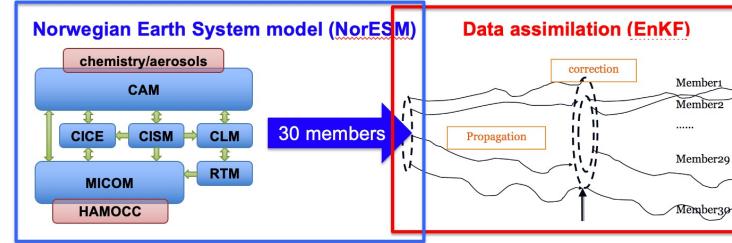


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Joint ECMWF/OceanPredict
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Norwegian Climate Prediction Model (NorCPM)



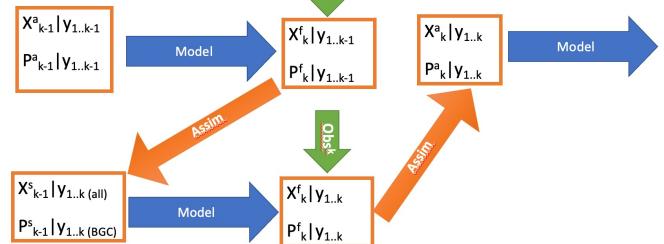
Twin Experiment Setup:

- 30-members ensemble.
- **True model state:** NorESM integration with 5 BGC spatially varying parameter.
- **Synthetic OBS:** generated from a true state with additive perturbation
- Physics : Temperature and Salinity hydrographic profile obs
- BGC : Phyto. Conc., O₂, NO₃, SI and PO₄ surface obs.

BGC parameters

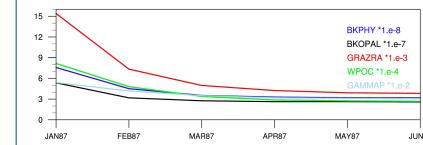
- (1) Half-saturation constant for nutrient uptake (**BKPHY**)
- (2) Maximum zooplankton grazing rate (**GRAZRA**)
- (3) Phytoplankton exudation rate (**GAMMAP**)
- (4) Sinking speed for particulate organic carbon (**WPOC**)
- (5) Half-saturation constant for silicate uptake (**BKOPAL**)

Dual one step ahead smoother (DOSA) scheme (Gharamti et al. 2017)



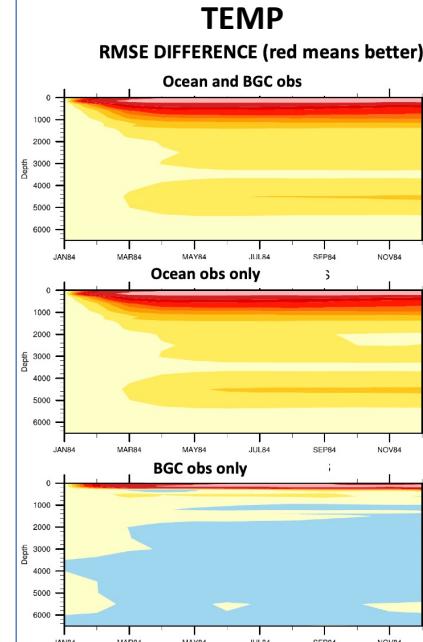
Parameter Estimation

RMSE

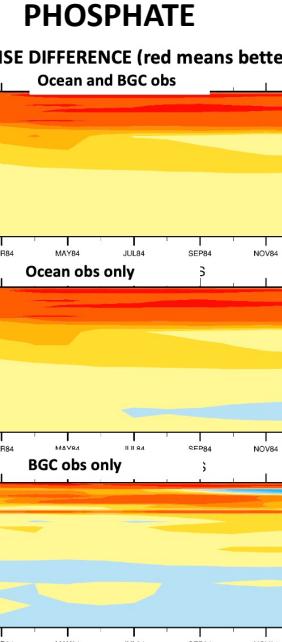


The method converges quickly (less than a year) and largely reduces the errors in the BGC parameters

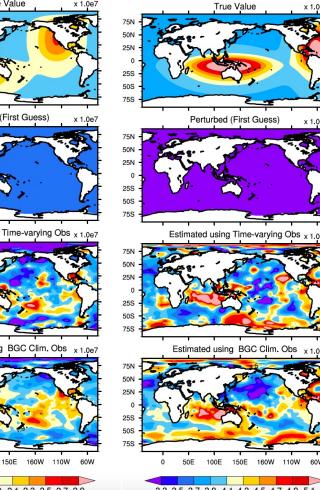
Can ocean obs constrain BGC and vice versa ?



Parameter Estimation

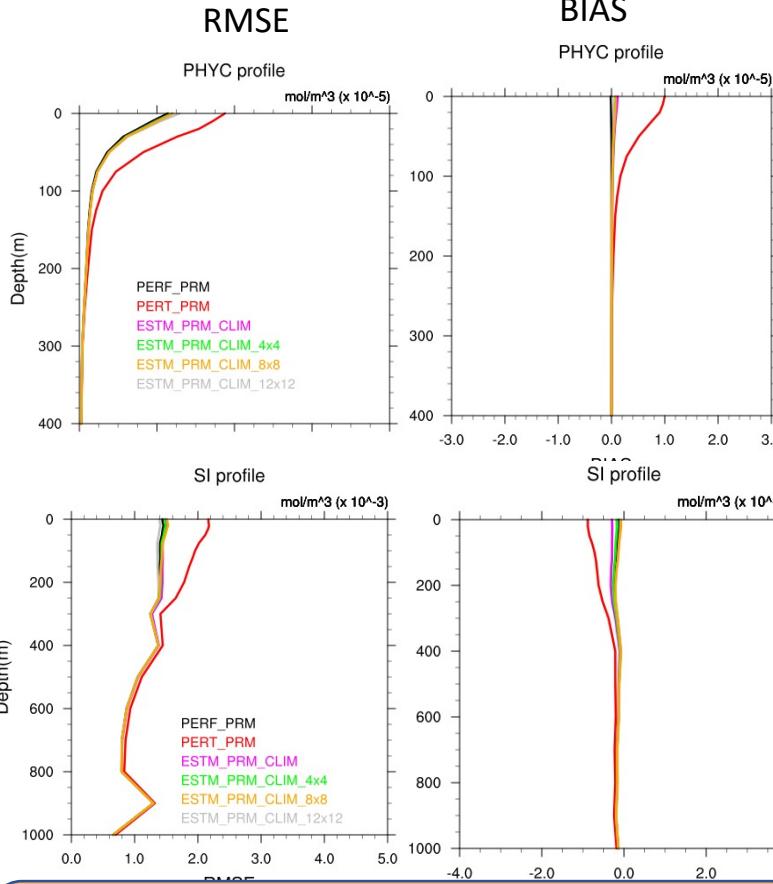


BKPHY GRAZRA



Verification of the optimality of estimated Parameters

Perform a 10-year rerun with the optimised parameter



- The estimated parameters perform nearly as well as that of true parameter values.
- This study demonstrates the applicability of the approach for tuning the system in a real framework.