SYMPOSIUM OP'24
ADVANCING OCEAN PREDICTION SCIENCE FOR SOCIETAL BENEFITS

PML | Plymouth Marine Laboratory   European Commission   SEAMLESS   Met Office   University of READING   National Centre for Earth Observation
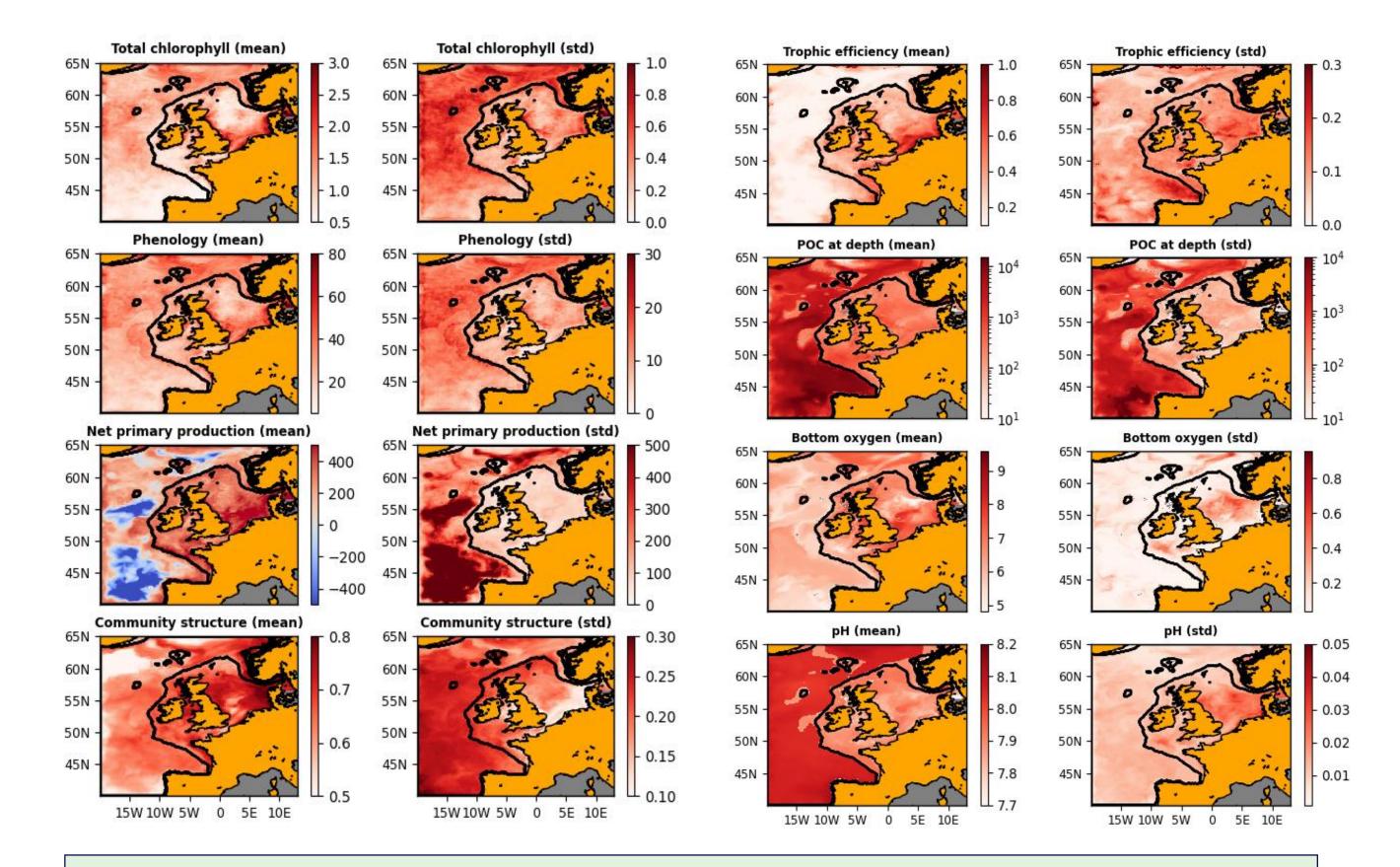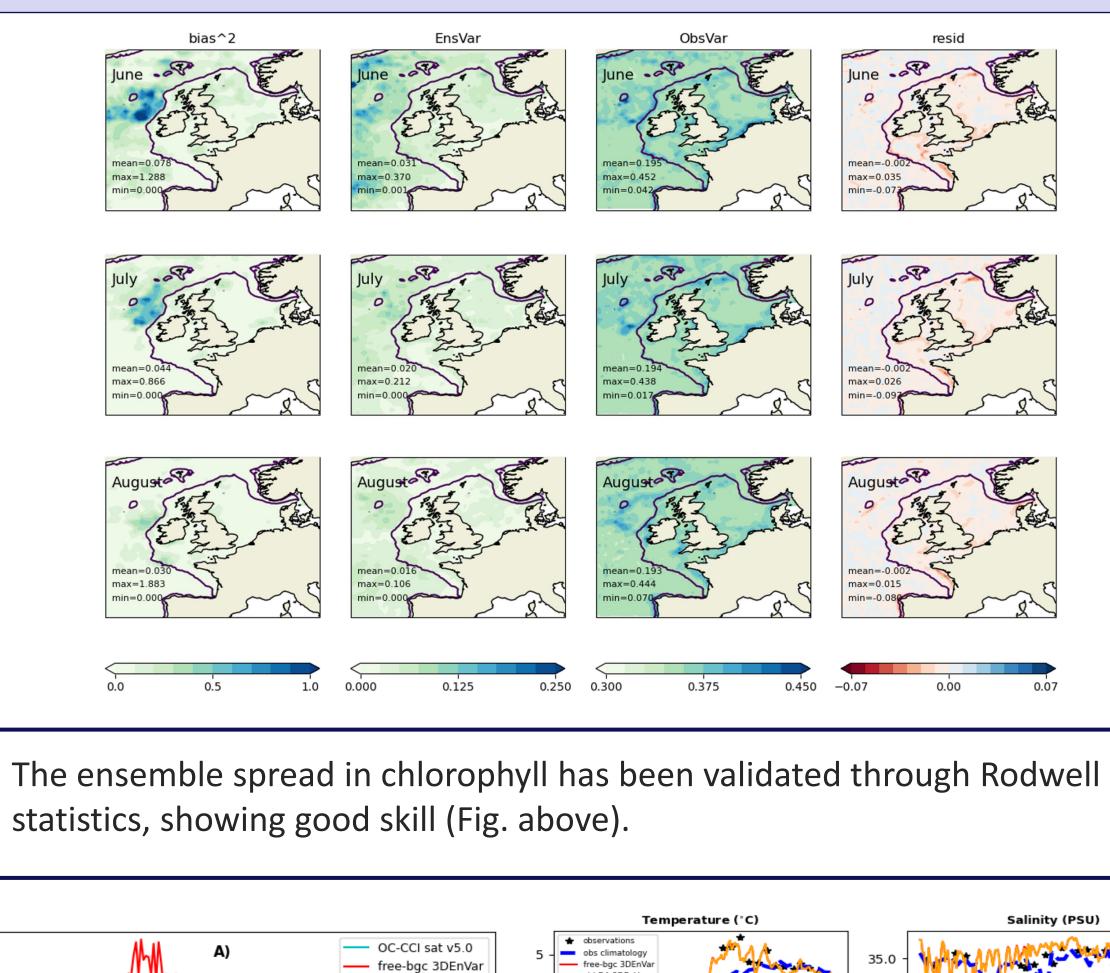
New ensemble-variational data assimilation system for marine biogeochemistry on the North-West European Shelf (NWES)
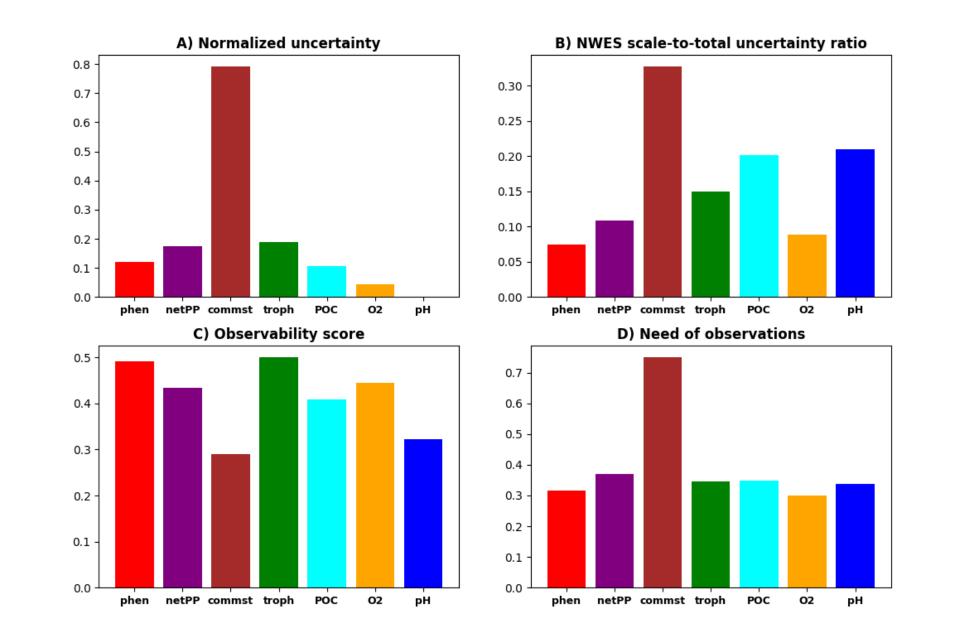
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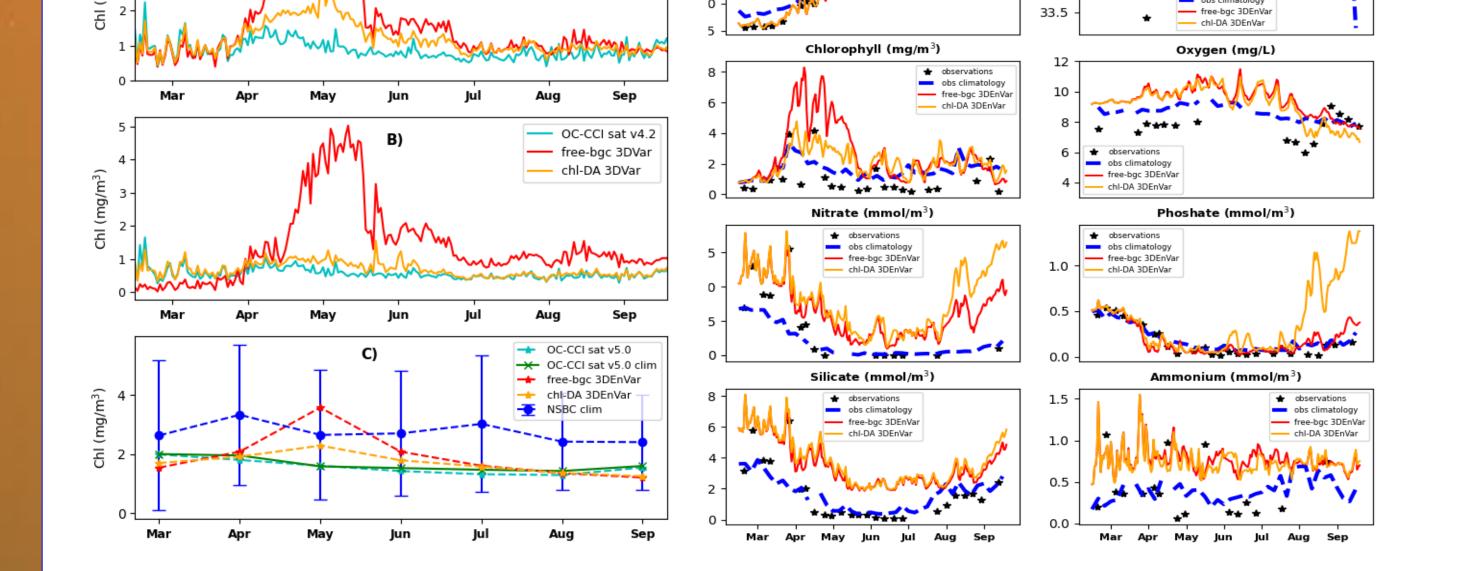
We have transferred existing developments in ensemble-variational/hybrid DA for physics on the global domain, to the NWES domain and the coupled physics-biogeochemistry NEMO-FABM-ERSEM model. We have designed new ensembles based on NEMO model (spatio-temporally varying) parameter perturbations, ERSEM model parameter perturbations, atmospheric forcing and observation perturbations. 30 member ensembles were run and used in ensemble-NEMOVAR system, providing information on flow-dependent background variances and spatial correlations. The system was used to assimilate satellite SST, T & S in situ observations, OC satellite and glider total chlorophyll.

The ensemble spread in chlorophyll has been validated through Rodwell statistics, showing good skill (Fig. above).

The Figures above show performance of the ensemble-NEMOVAR system compared to standard NEMOVAR reanalysis assimilating the same data.

We analyzed uncertainty of several ecosystem target indicators for net primary production, phytoplankton community structure, dissolved oxygen, carbon export, ocean acidity, phenology. The most uncertain is the phytoplankton community structure.

Annual mean values and uncertainty of the different target indicators. The indicators are less uncertain on the Shelf (bathymetry < 200m)

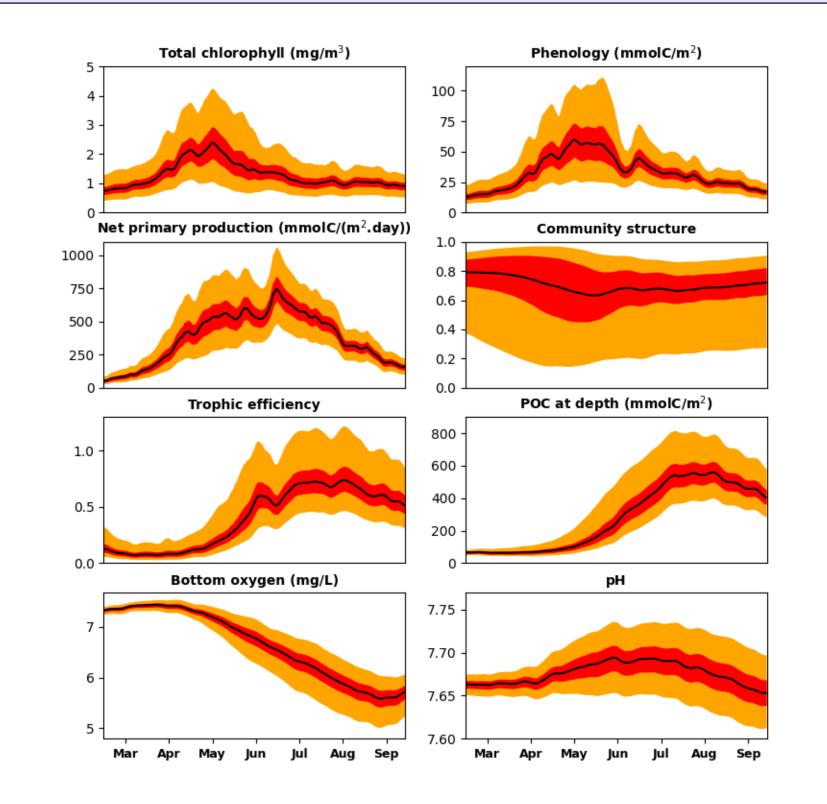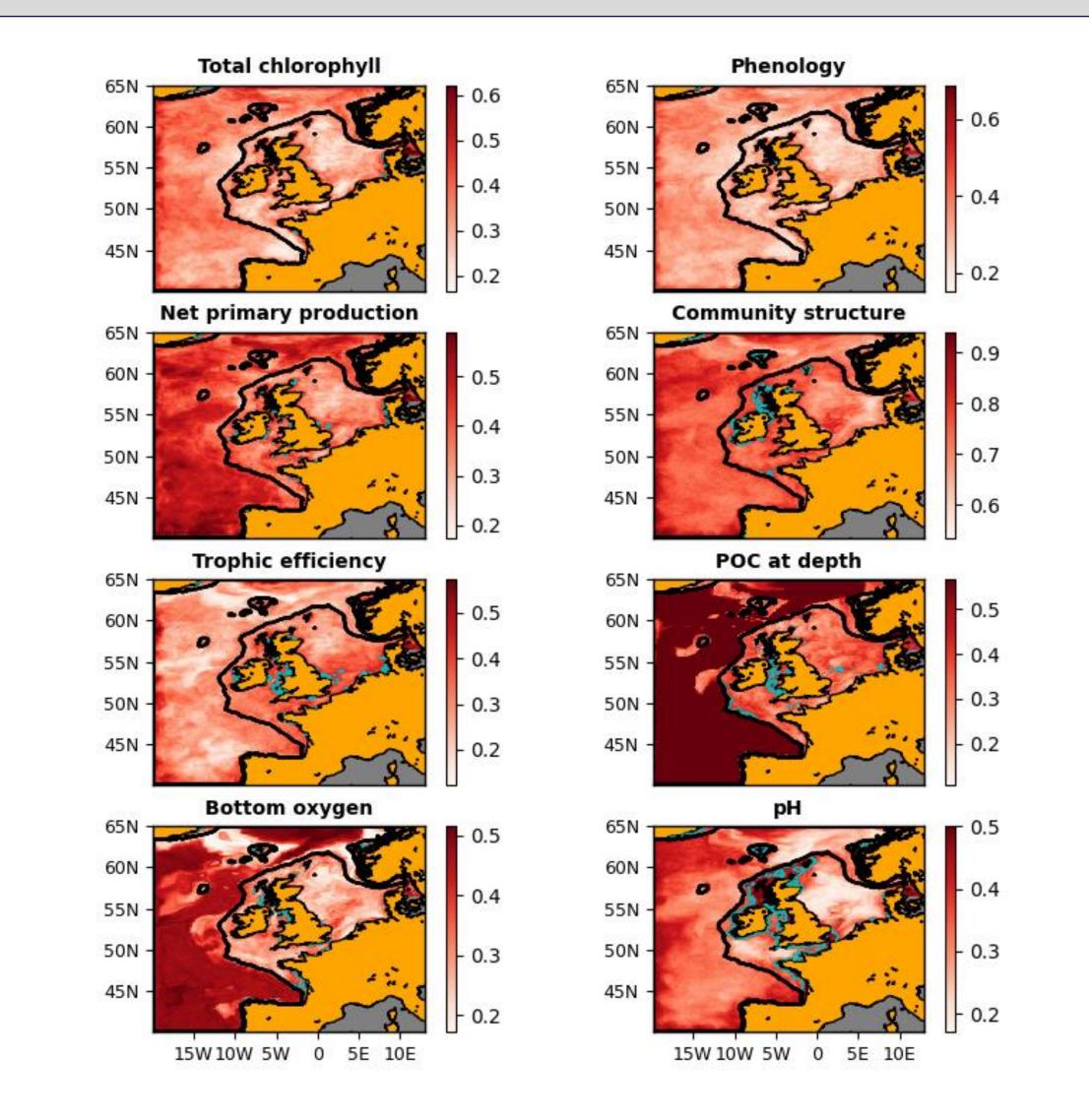We developed number of metrics to characterize observability of target indicators and the need for observations. The indicator that needs to be observed with the highest priority is the phytoplankton community structure. The Figure below indicates that the region where observations are needed most are the UK coastal waters.