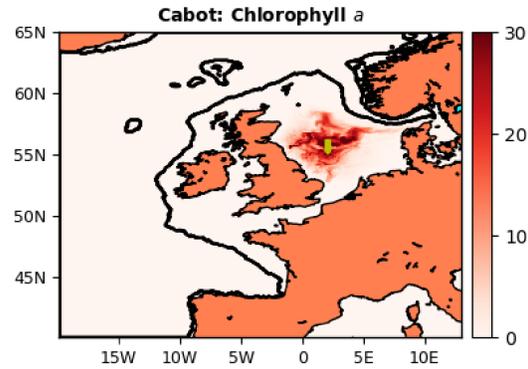


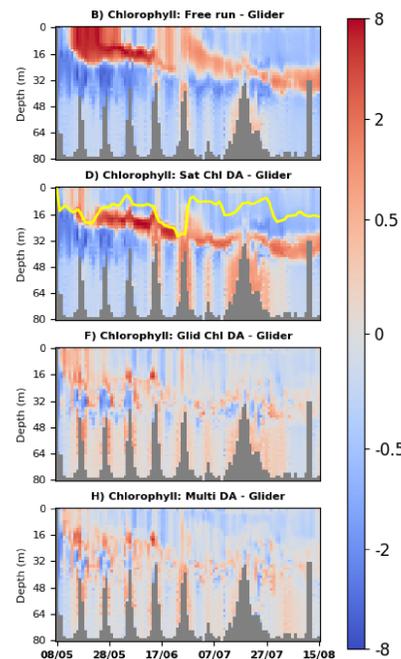
# Assimilation of multi-platform observations into two-way coupled physical-biogeochemical model on the North-West European Shelf

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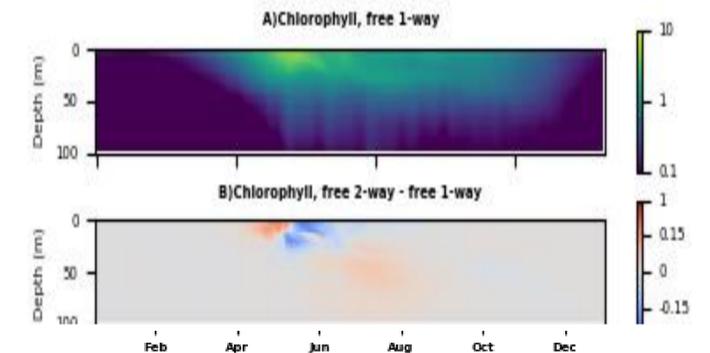
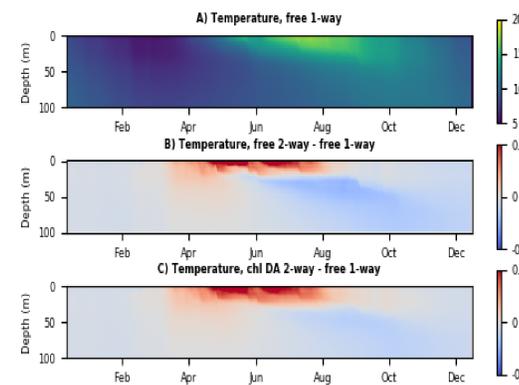
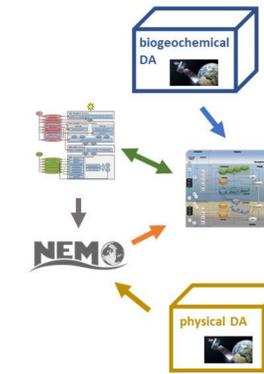
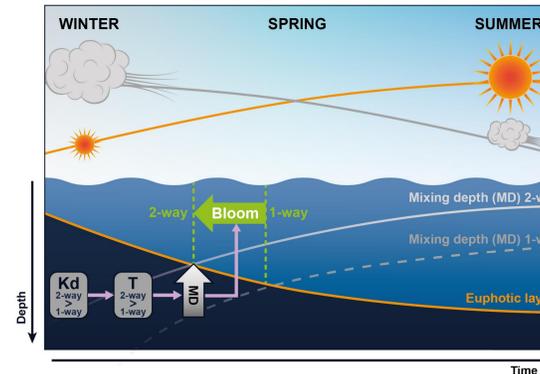


Future CMEMS operational system for North Sea biogeochemistry will need to handle observations from multiple different platforms: e.g. gliders, satellites. We have introduced and tested multi-platform assimilation of biogeochemical variables focusing on a particular Cabot glider mission during May-August 2018 in the North Sea. The glider measured chlorophyll-a and oxygen, and the multiplatform DA combined this with assimilation of glider temperature and salinity, satellite SST and OC CCI chlorophyll. We used the glider mission to test the impact of different assimilative system components on the model skill.

- Physical DA component improves physics but has only limited impact on the ecosystem model skill.
- OC chlorophyll assimilation gradually propagates beneath the ML and has mostly desirable impact on the model skill in sub-surface chlorophyll (however locally it can produce spurious features).
- Chlorophyll assimilation has major (mostly mixed) impact on the simulated oxygen, whilst temperature assimilation can moderately improve oxygen bias.
- Multiplatform DA improves all the assimilated variables across the whole water column.



Is there a way how to constrain further the interplay between physics and biogeochemistry in the multi-platform system? We used a spectrally resolved light module (based on OASIM) to drive heat fluxes in the upper ocean. The module introduces feedback from biogeochemistry to physics based on the underwater irradiance being attenuated by the simulated biogeochemical tracers. This development corrects the timing of the model bloom thanks to reduced convective mixing and critical turbulence hypothesis.



The assimilation at the moment is weakly coupled, but the two-way coupling will be used to inform a strongly coupled scheme providing a stronger link between physical assimilation and biogeochemistry.

References: Skakala et al. (2021), JGR-Oceans, Skakala et al. (2021) submitted to Ocean Modelling

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