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Ocean Science
Discussions

Interactive comment on "Marine Ecosystem forecasts: skill performance of the CMEMS Mediterranean Sea model system" *by* Stefano Salon et al.

Anonymous Referee #1

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General comments:

The manuscript entitled "Marine Ecosystem forecasts: skill performance of the CMEMS Mediterranean Sea model system" by Salon et al. aims to evaluate the skill performance of the biogeochemical model for the Mediterranean component of the CMEMS biogeochemical products. They build their evaluation approach on two complementary simulations: 1) pre-operational run which consists of a 2-year re-analysis biogeochemical simulation daily coupled offline to the physical component, and 2) operational biogeochemical run as of April 2018. They perform the model evaluation by GODAE Class 1 and 4 metrics allowing them to qualitatively and quantitively document

the model consistency in reproducing the key Mediterranean biogeochemistry features and its accuracy to routinely reproduce the observed values. In addition to model data comparison to climatologies, satellite images and literature, their use of ARGO floats mounted with biogeochemical sensors for a Class 4 (specific time and location) skill performance evaluation framework is the merit of this manuscript that stands out as a novel concept, and introduces to the modelling community a tool for validation of biochemical variables that is high resolution in time, with off-shore coverage that is not limited to ocean surface and not hindered by cloud cover. The scarcity of observations is a challenge for a sound model validation and this is much more of an issue for the biogeochemical variables, thus new tools as such are of high value stressing that the floats not only allow data for a hindcast simulation, but can be used as a supplement to forecast simulations. The authors introduce techniques that are applicable to many other regional/global cases, and advancements may further benefit the modelling community, while they acknowledge that the use of floats requires further improvements such as the need for better corrections/adjustments on the raw float data in order to make a direct comparison.

In summary, authors start by introducing the modelling framework for the Mediterranean, and build the case for the skill assessment by introducing the model simulations and the dataset used for model validation, present examples for different state variables and their statistics using climatologies, satellite images, literature and float data, and finalise by discussing the outcome of the techniques introduced in this manuscript. The language was clear, and the text was easy to follow, and introduces (for the case of biogeochemical modelling) new concepts and tools.

Specific comments:

(P8 L1-10) Authors discuss further in the manuscript that direct comparison of model results with the sensor data should be done with caution as the applied corrections may not reflect true value. Thus, application of the introduced metrics which is consistent within itself (e.g. normalising the data to its own surface value) is a good ap-

proach. As these are new metrics, for their applicability to other regions, the choice of the criteria deserves a discussion. Do 10% of the surface chl value, or 2mmol/m3 nitrate have a significant meaning? Are these values applicable enough throughout the Mediterranean or have the authors seen regional inconsistencies? Are the strict choice of seasons (jan-mar and apr-oct) valid in practice (can't tell much from Figure 9, but wouldn't using MLDs from the ARGOs yield better estimation of which criteria to use? ARGO profiles show deep chl formation in late Jan and late March 2016 hence much deeper mwb than then model)

(P11 L8-10) Does this partly explain the lower modelled NO3 concentrations (e.g. nwm) due to the lack of N river load time-series? How does model perform in terms of N/P ratios? Does it represent the high N/P ratio character of the Med Sea and its regional differences?

(Fig9) How does BGC-Argo surface chl compare with the satellites? P11 L4 suggest the model has a higher (0.015) bias for the winter (model vs satellite), supported by Fig8 with more pronounced bias for the west/northwest Med, while paragraph of P11 L32 suggest the model has lower values when compared to BGC-Argo data. Is there a consistent ratio between satellite and float data, and how applicable is it to use global correction of division by 2 as suggested by Roesler et al. (2017) taking into account the regionally different ratios shown in the same article. As the Mignot et al. (2018) manuscript is in review, I cannot comment about their results but can the application of their method suggest different correction factors with a better regional fit?

(P14 L20-23) Authors point out that the introduced BGC-ARGO related metrics are already being implemented for data assimilation purposes with consequent improvements in model solutions. Before the assimilation phase (e.g. pre-opetaional runs), does the skill assessment documented here (of BGC-Argo metrics) reveal any prior messages for model parameter adjustment such as for light attenuation or nutrient assimilation rates, or errors of physical model origin? I can see the use of this dataset not only for forecasting purposes and skill assessment purposes, but its high resolution

coverage including ocean interior is of high value. A short comment on that would be good scientific addition to the manuscript.

I see that the manuscript is designed as a document for the overall skill assessment of MedBFM, but both the abstract and the manuscript throughout have stressed the importance and usefulness of their new metrics (GODAE Class 1 and 4, and especially the use of BGC-Argo), and I agree with them, and these sections of the manuscript stand out as the novel scientific content. The title fails to give this message and won't promote this novel scientific content of the manuscript. I leave it to the authors consideration.

Technical corrections:

(P2 L1) As a user-driven

(P3 L21) semi-labile

"In situ" appear as in-situ in various parts of the text. Ocean science journal asks for the use "in situ".

(P7 L16) replace relays by relies

(P7 L20) remove first "run"

(P8 L8) Add CORR acronym

(P9 L24) model simulates well

(P18 L1) represent a useful

(Fig10) Color code for NITR1 and NITR2 is missing

(Fig13) Authors used CHL for 60-100 m twice, suggesting NO3 is missing at that depth range in the figure.

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