

Response to reviewer #2

The response to the reviewer is structured as follows: **RC:** comment from the reviewer, **AC:** author's response, **Changes:** author's prepared changes for the revised manuscript.

RC: In this article, the authors present a thorough procedure for generating physical-biogeochemical ensembles using various stochastic parameterization techniques. The ensembles are verified using observations such as SST, SLA, chlorophyll (ocean color) and later tested in a data assimilation framework. The presented research can be useful however, my major concern is the relevancy of the paper to GMD journal. There is technically no model development but rather a detailed application of stochastic techniques for generating and studying ocean variability. Overall, the paper is quite long and there are lots of sections that seem disconnected sometimes making it really difficult to follow. It took me a long time to read through and I'm disappointed for not being able to prepare a better review. It's just hard to grasp on everything. One other issue is structure and the flow of the manuscript, it felt more like a report rather than a directed scientific study. There is probably some novelty in the choice of the stochastic schemes but I wonder if that's enough for justifying this lengthy article. In general, if this to be reconsidered I strongly encourage a detailed polish so the procedure could look more clear, concise and easier to follow.

AC: We thank the reviewer for the general comments to revise the manuscript. We take note that we should more precisely focus the manuscript, improve its flow, polish it whole, and explain the reasons of the various steps we chose to take at the beginning of each section.

Most of the comments between the two reviewers are common and can be addressed by similar actions in revised manuscript. Below, we iterate parts of our response given also to the other reviewer.

Please note that we propose to reframe the whole manuscript as concentrating on the assessment of a stochastic model composed of (NEMO + updated stochastic module). We believe that in that way the sections will follow each other more naturally, and that paper will better fit the GMD NEMO Special Issue.

We agree with the reviewer that we can present our results in a tighter and more focused manner. The structure of the three main components (i.e. sections 2, 3 and 4) will be placed in the general framework of stochastic model evaluation, in a high-resolution coastal/regional configuration for the Bay of Biscay.

Not only NEMO in this high-resolution coastal/regional configuration is evaluated, so we updated the stochastic module, and we evaluate in this paper the skill of the stochastic model composed of (NEMO + updated stochastic module):

- The updated stochastic module (Section 2), incorporating changes for long-range correlation scales, and the ensemble-based consistency analysis module (Section 3), are new component developments for NEMO.
- The stochastic model skill is quantitatively evaluated with respect to physical-biogeochemical data (Section 3).
- The stochastic model is qualitatively evaluated by using its output to generate incremental analyses, in an ensemble-based data assimilation framework (Section 4).

We think that this (1) is faithful to our original intentions, (2) is a suitable angle to connect the main sections of the manuscript, and (3) better fits the aims and scope of the NEMO Special Issue.

Changes: In the revised manuscript, we will reframe Sections 2, 3 and 4 using the above. Several parts of the text will be re-written, especially the introductory paragraphs of each section and perhaps also some of their titles, to better connect the technical and scientific components of this study.