Replies to Reviewer #3's Comments

We are grateful for the Referee's thorough review and constructive feedback. We have carefully addressed all comments and revised the manuscript accordingly. Below, we provide detailed, point-by-point responses to each of the Reviewer's suggestions.

We would like to thank the authors for opening a much-needed discussion on ocean ensemble forecasting. In particular, I find their classification of types of ensemble initialisations very useful. If I may, I would like to add a point here about a type of ensemble that could be coined as identity-retaining ensembles. The idea is the following: While the Monte-Carlo ensemble initialization relies on explicit perturbations, the data assimilation informed ensemble derives ensemble increments for each member and thereby maintains spread. Ensemble forecast cycles are initialized such that each ensemble member is initialized by a forecast of the same member from the previous cycle, removing the need for explicit perturbation. This is the case in EnKF applications, but even without any data assimilation an identity-retaining ensemble is perceivable that describes flow-dependent uncertainty with an error of the day, potentially differentiating predictable regimes from unpredictable circulation patterns.

To provide more context, I would like to suggest that the need for initialization in ocean prediction is discussed in more detail. A comparison with atmospheric prediction that lies the scientific foundation for ensemble forecasting could be useful here. An important difference is that weather prediction benefits from very accurate analysis, and the scope of the EPS is to model the uncertainty due to unstable growing modes which can be adequately described using Monte-Carlo type perturbations. Ocean ensembles, on the other hand, need to deal with large uncertainties in the initial conditions, driving the need for approaches that are different to what is needed in weather prediction, as e.g. identity-retaining ensembles.

Thank you for these insightful suggestions. In the revised manuscript, we have expanded our discussion of the need for initialization in ocean prediction, explicitly discussing ensemble data assimilation methods. We recognize that atmospheric prediction provides important foundational concepts for ensemble forecasting; however, we have chosen to maintain our focus on ocean ensembles to avoid diluting the core scope of this work. We appreciate the Reviewer's feedback and trust the additional details will offer clearer insight into the specific challenges and strategies involved in ocean prediction

With regard to the listed ocean ensembles, I'd like to point to the comments of reviewer #1, adding to the overview list of operational ocean ensemble systems. Perhaps a sorting of this list with respect to forecast variables could be useful, e.g. waves, storm surge, ocean circulation/ hydrodynamics, and sea ice, and a remark on how these systems fit into your classification of ensemble initializations.

We have revised the table following the Reviewer's suggestions (and those of Reviewer #1), by incorporating more operational centers and sorting the list with respect to forecast variables. Thank you.

Please note that the Topaz 4 model is not operational any more and has been replaced by Topaz5; https://data.marine.copernicus.eu/product/ARCTIC_ANALYSISFORECAST_PHY_002_001/description.

Corrected. Thank you.