We would like to sincerely thank the reviewer for their positive comments, which were of great value. Please find our responses below (reviewer comment in bold font, our response in standard font and the suggested changes in italic font):

1. L 110; L115; L135; L150, L630-660; L670 : references could be added to ensure consistency with the rest of the article.

We thank the reviewer, the following references/links have been added to address the issues:

L110: here we don't have a specific reference, but the following weblink can be provided: "*https://www.cefas.co.uk/science/emergency-response/*"

L115: we will provide the following reference:

Guiavarc'h, C., Roberts-Jones, J., Harris, C., Lea, D.J., Ryan, A. & Ascione, I. (2019) Assessment of ocean analysis and forecast from an atmosphere-ocean coupled data assimilation operational system. Ocean Science, 15, 1307–1326. Available from: https://doi.org/10.5194/os-15-1307-2019

L135: we will provide the following references:

MacLachlan C., A. Arribas, K.A. Peterson, A. Maidens, D. Fereday, A.A. Scaife, M. Gordon, M. Vellinga, A. Williams, R. E. Comer, J. Camp and P. Xavier, 2015. Description of GloSea5: the Met Office high resolution seasonal forecast system. Q. J. R. Met. Soc., DOI: 10.1002/qj.2396.

Polton JA, Harle J, Holt J, Katavouta A, Partridge D, Jardine J, Wakelin S, Rulent J, Wise A, Hutchinson K, Byrne D. Reproducible and relocatable regional ocean modelling: fundamentals and practices. Geoscientific Model Development Discussions. 2022 Sep 29;2022:1-47.

Tinker J, Hermanson L. Towards Winter Seasonal Predictability of the North West European Shelf Seas. Frontiers in Marine Science. 2021 Aug 12;8:698997.

Ciavatta S, Kay S, Saux-Picart S, Butenschön M, Allen JI. Decadal reanalysis of biogeochemical indicators and fluxes in the North West European shelf-sea ecosystem. Journal of Geophysical Research: Oceans. 2016 Mar;121(3):1824-45.

L150: we will provide the following reference:

Balmaseda MA, Hernandez F, Storto A, Palmer MD, Alves O, Shi L, Smith GC, Toyoda T, Valdivieso M, Barnier B, Behringer D. The ocean reanalyses intercomparison project (ORA-IP). Journal of Operational Oceanography. 2015 Apr 17;8(sup1):s80-97.

L630-660: we will provide the following references:

SST:

O'Carroll AG, Armstrong EM, Beggs HM, Bouali M, Casey KS, Corlett GK, Dash P, Donlon CJ, Gentemann CL, Høyer JL, Ignatov A. Observational needs of sea surface temperature. Frontiers in Marine Science. 2019 Aug 20;6:420.

Salinity:

Vinogradova N, Lee T, Boutin J, Drushka K, Fournier S, Sabia R, Stammer D, Bayler E, Reul N, Gordon A, Melnichenko O. Satellite salinity observing system: Recent discoveries and the way forward. Frontiers in Marine Science. 2019 May 22;6:243.

Argo:

Roemmich D, Alford MH, Claustre H, Johnson K, King B, Moum J, Oke P, Owens WB, Pouliquen S, Purkey S, Scanderbeg M. On the future of Argo: A global, full-depth, multi-disciplinary array. Frontiers in Marine Science. 2019 Aug 2;6:439.

SSH/SLA:

Le Traon, P.Y., Dibarboure, G., Jacobs, G., Martin, M., Remy, E., Schiller, A. Use of satellite altimetry for operational oceanography. In "Satellite Altimetry Over Oceans and Land Surfaces". Stammer, D. (Ed.), Cazenave, A. (Ed.). (2018). Boca Raton: CRC Press.

SWOT:

Morrow, R., Fu, L.-L., Ardhuin, F., Benkiran, M., Chapron, B., Cosme, E., d'Ovidio, F., Farrar, J. T., Gille, S. T., Lapeyre, G., Le Traon, P.-Y., Pascual, A., Ponte, A., Qiu, B., Rascle, N., Ubelmann, C., Wang, J., and Zaron, E. D.: Global Observations of FineScale Ocean Surface Topography With the Surface Water and Ocean Topography (SWOT) Mission, Frontiers in Marine Science, 6, https://doi.org/10.3389/fmars.2019.00232 , 2019

Surface currents:

Röhrs J, Sutherland G, Jeans G, Bedington M, Sperrevik AK, Dagestad KF, Gusdal Y, Mauritzen C, Dale A, LaCasce JH. Surface currents in operational oceanography: Key applications, mechanisms, and methods. Journal of Operational Oceanography. 2023 Jan 2;16(1):60-88.

General

Davidson F., Alvera-Azcarate A., Barth A., Brassington G. B., Chassignet E. P., Clementi E., et al. (2019). Synergies in operational oceanography: the intrinsic need for sustained ocean observations. Front. Mar. Sci. 6, 450. doi: 10.3389/fmars.2019.00450

L670: References will be added as follows:

Groom S, Sathyendranath S, Ban Y, Bernard S, Brewin R, Brotas V, Brockmann C, Chauhan P, Choi JK, Chuprin A, Ciavatta S. Satellite ocean colour: Current status and future perspective. Frontiers in Marine Science. 2019 Aug 29;6:485.

and also

Brewin RJ, Sathyendranath S, Platt T, Bouman H, Ciavatta S, Dall'Olmo G, Dingle J, Groom S, Jönsson B, Kostadinov TS, Kulk G. Sensing the ocean biological carbon pump from space: A review of capabilities, concepts, research gaps and future developments. Earth-Science Reviews. 2021 Jun 1;217:103604.

Brewin RJ, Ciavatta S, Sathyendranath S, Skákala J, Bruggeman J, Ford D, Platt T. The influence of temperature and community structure on light absorption by phytoplankton in the North Atlantic. Sensors. 2019 Sep 26;19(19):4182.

Kulk G, Platt T, Dingle J, Jackson T, Jönsson BF, Bouman HA, Babin M, Brewin RJ, Doblin M, Estrada M, Figueiras FG. Primary production, an index of climate change in the ocean: satellite-based estimates over two decades. Remote Sensing. 2020 Mar 3;12(5):826.

Laine M, Kulk G, Jönsson BF, Sathyendranath S. A machine learning model-based satellite data record of dissolved organic carbon concentration in surface waters of the global open ocean. Frontiers in Marine Science. 2024 Jun 12;11:1305050.

Kong CE, Sathyendranath S, Jackson T, Stramski D, Brewin RJ, Kulk G, Jönsson BF, Loisel H, Galí M, Le C. Comparison of ocean-colour algorithms for particulate organic carbon in global ocean. Frontiers in Marine Science. 2024 Apr 24;11:1309050.

Telszewski M., Palacz A., Fischer A. (2018). Biogeochemical in situ observations–motivation, status, and new frontiers. New Front. Operational Oceanogr, 131–160. doi: 10.17125/gov2018.ch06

Johnson K., Claustre H. (2016). Bringing biogeochemistry into the argo age. Eos Trans. Am. Geophysical Union. doi: 10.1029/2016EO062427

2. L340, L880 : EO has not been introduced, and it seems a little odd to mention the Earth Observation community only there in the summary. It could also be explicitely mentioned in the paragraphe on observing systems design L893

We thank the reviewer for spotting this and we will introduce EO already on the line 340 and also add explicit mention of EO on the line 893, as requested.

3. What we see on Fig 2 is not really explained.

What is error 242? (see title of the figure), does blue mean an error reduction?

The “242” in the Figure title is a typo and will be removed. We will change the Figure caption to better explain the content of the Figure, please find the suggested text below:

“*Change in temperature Root Mean Square Errors (RMSE) between two experiments. The reference experiment uses parameterized background covariance matrix model, the second experiment uses the ensemble-based hybrid background covariance matrix model. Temperature RMSE is computed using model short-range forecasts against all in-situ observations in the upper 200 m (left) and in the 200-1000 m range (right), for year 2017. Negative values show improvement when using ensemble-based hybrid background covariance model*.”

4. L698: Kd has not been introduced

Thank you, we will introduce it.

5. L244 : It may be easier to follow by adding one sentence, maybe on the time scales of the impact of the atmospheric forcing.

Thank you, we will address this by the text below:

“Both waves and surge models are highly influenced by the wind (waves, surge) and atmospheric pressure (surge). Saulter et al. (2020) showed that assimilation of data into a regional wave model using NEMOVAR improved the forecasts over lead times of up to 12 hours, but errors in the surface forcing and wave model parameterisations dominated the forecast errors beyond 1-2 day lead time. The Met Office thus plans to develop capability to….”

6. L426-427 : a couple of sentences could explain explain what we see on Fig4.

Thank you, we propose to add the following text to the Fig.4 caption (we think it is very specific information to be discussed in the main part of the text):

“In the tropics we see negative correlations associated with warm SST and low wind speeds, which are linked to diurnal variations in solar radiation, with correlations strengthening as the ocean surface warms throughout the day. In contrast, the significant positive correlations of SST with 10 m wind speed in the North Atlantic are linked with strong SST gradients and tend to be associated with areas of stronger winds, the location of which varies synoptically. These areas of larger ocean/atmosphere correlations in mid-latitudes were shown to extend vertically into the ocean, throughout the mixed layer (Wright et al., 2024).”

7. L455: "the combined impact of physics and BGC DA is also dependent on the assimilation methodology": maybe one or two examples would help to link with future tests and potential improvements.

We propose to expand the sentence as follows:

“The combined impact of physics and BGC DA is also likely to be dependent on the assimilation methodology (Nerger et al, 2023), for instance how alignment of fronts and other features is considered (Anderson et al., 2000; Yu et al., 2018), and how increments of different variables are projected onto different scales (Waters et al., 2017).”

8. L 473: as there are slightly more details about this in 3.2.2 the authors may refer to this section

Thank you, we will do so.

9. L1040 : inconsistency between Eyre et al (2021) in the text, and (2022) in the references

Thank you, we will correct this.

10. L 1188 : add the year in reference Nerger et al (2023)

Thank you, we will address this.

Best wishes,

Jozef Skakala and the co-authors