Reviewer #2:

We thank reviewer #2 for the constructive comments and helpful suggestions. We drafted some amendments to the paper based on them – as explained below.

This paper briefly introduces the state of the art of atmospheric forcing into ocean model forecasting, with a focus on the air-sea flux datasets.

General comments:

Although I understand this is an introductory chapter, I miss a brief discussion on the main limitations of current satellite-derived flux products in terms of the spatial and temporal resolution required for ocean forcing.

To the best of our knowledge all satellite data used for calculating flux products to force today's operational ocean forecasting systems are ingested via some kind of atmospheric model, e.g. flux products as output from an NWP model or from a fully coupled ocean-atmosphere model with satellite data being assimilated. Consequently, the spatial and temporal resolution of satellite-derived flux products used in operational ocean forecasting systems strongly depends on the methods and atmospheric models applied (including their biases) to calculate these flux products. This is a complex topic for discussion which is beyond the scope of this manuscript.

Moreover, limitations of available flux products are being addressed in subsection 2.1 *Applications in Global OOFS* (4.1 in revised manuscript) and subsection 2.2 *Applications in regional and coastal OOFS* (4.2 in revised manuscript). In these subsections we discuss the limitations of global and regional flux products.

To highlight this point made by the reviewer we modified a sentence in the Conclusion section of our revied manuscript:

"This study provides some information about the diverse range of air-sea flux datasets that are now available for the community to use as air-sea forcing in OOFS. NWP systems provide the majority of flux products to force today's OOFS. Generally speaking, the quality and usefulness of these datasets are influenced by the spatial and temporal resolutions of remotely sensed and in situ observations that are assimilated into the NWP systems and are limited by associated biases which should be taken into account when choosing such datasets."

Also relevant, NWP output is not only used because of its low latency but also (and mostly) because of its ubiquity.

Agreed. We added this point to revised section 2.1 *Atmospheric forcing for ocean forecasts.*

Moreover, some more emphasis on the current limitations of the NWP output in terms of its relatively poor spatial resolution and quality in the ocean forcing context is also desirable.

As stated above, limitations of NWP outputs and the spatial resolution required are being addressed in our discussion of air-sea fluxes for global and regional models.

Regarding satellite-derived flux datasets, I believe too much (positive) attention is given to SAR-derived wind stress in the context of coastal forcing, while no explanation on the current limitations of such technique is provided. Although quite some efforts have been devoted to SAR wind retrievals over the past two decades (see publications from, e.g., Horstmann, Mouche, Grieco, Moiseev, Zecchetto, Zhu, etc.), there is currently not a single SAR wind processor that can provide a coastal wind stress product of sufficient quality and/or coverage for use in operations, while its use for OOFS development purposes must be done with caution and on a test-case basis.

On reflection, we agree with the reviewer's comment and have revised and moderated our wording at various places in the manuscript where SAR is mentioned and expanded our discussion of SAR-derived wind stresses with a cautionary note.

Specific comments:

1. L47: Wind stress is well-determined from scatterometers since SEASAT-A (1978) and ERS-1 (1991). Suggested references: Jones et al. (1982), Stoffelen and Anderson (1997), Portabella and Stoffelen (2009).

   We have updated our statement by citing two of the above publications.

2. L48-50: Similar to the CMEMS L2 OCN product, Khan et al. (2023) use a very old technique (Portabella et al., 2002) to systematically derive coastal wind vectors from SAR. Many publications (incl. Portabella et al., 2002) point out the limitations of such technique, in particular the lack of small-scale variance in the derived wind direction component (which is mostly driven by the background wind direction, i.e., the NWP wind direction). Moreover, the uncertainty in the wind direction component is then propagated into the wind speed retrieval. I would therefore not recommend the use

   As stated above, we agree with the reviewer's comment and have revised our wording at various places in the manuscript where SAR is mentioned and expanded our discussion of SAR-derived wind stresses with a cautionary note.

3. L65-66: "…has the potential to produce biases, particularly in the radiative flux fields and precipitation (Trenberth et al., 2009; Weller et al., 2022) **and in the wind stress vector components (Belmonte and Stoffelen, 2019; Trindade et al., 2020)**".

   Sentence and references have been updated accordingly.

4. L67: Please, explain why atmospheric reanalyses are suitable for OOFS development.

   The following statement has been added to the revised manuscript: "In essence, atmospheric reanalyses are often used in OOFS development and in ocean reanalyses for the following reasons: they are typically of higher quality than output from operational NWP systems (where there is less time for quality control); they are available over an extended period of time, often covering multiple years to decades to explore various weather and climate phenomena in the ocean model in response to the atmospheric forcing; and model parameters in an atmospheric reanalysis are being kept constant over the integration period to produce a consistent data set."

5. L82-83: Please provide references. Also, briefly explain how do satellite data supplement NWP output in forcing ocean models. For example, Trindade et al. (2020) show how scatterometer-derived wind stress can be used to remove NWP model output local biases.

   Table 1 lists five different NWP and/or atmospheric reanalysis flux data sets. A reference to Table 1 has been added to this statement in the revised manuscript.

   We have adopted the suggestion by the reviewer and added the reference to Trinidade et al. (2020) as an example of how satellite data can supplement NWP output in forcing ocean models.

6. L116: Please, name a few high-resolution regional NWP models and add corresponding references.

   Statement and references added: "Examples of regional atmospheric models are the UK Met Office Unified Model–JULES Regional Atmosphere and Land configuration (Bush et al., 2023) and the Weather Research & Forecasting Model (WRF) (Skamarock et al., 2008)."

7. L125-130: Please, moderate the benefits of using SAR-derived wind (stress) for coastal OOFS development purposes.

   Agreed and moderated the benefits of using SAR-derived wind (stress) for coastal OOFS development purposes in accordance with the reviewer's comments.

References:

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Jones, W. L., Schroeder, L. C., Boggs, D. H., Bracalente, E. M., Brown, R. A., Dome, G. J., ... & Wentz, F. J. (1982). The SEASAT-A satellite scatterometer: the geophysical evaluation of remotely sensed wind vectors over the ocean. Journal of Geophysical Research: Oceans, 87(C5), 3297-3317. https://doi.org/10.1029/jc087ic05p03297.

Portabella, M., and Stoffelen, A., "On scatterometer ocean stress," *J. Atm. and Ocean Techn*., **26** (2), pp. 368–382, https://doi.org/10.1175/2008JTECHO578.1, 2009.

Stoffelen, A., and Anderson, D., “Scatterometer data interpretation: derivation of the transfer function CMOD-4,” *J. Geophys. Res.*, vol. 102, no. C3, pp. 5767-5780, 1997.

Trindade, A., Portabella, M., Stoffelen, A., Lin, W., and Verhoef, A., “ERAstar: a high resolution ocean forcing product”, *IEEE Trans. Geosci. Rem. Sens.*, **58** (2), pp. 1337-1347, https://doi.org/10.1109/TGRS.2019.2946019, 2020.