Response to Referee #1 Comments

Anonymous Referee #1
Referee comment on "The Met Office operational wave forecasting system: the evolution of the Regional and Global models" by Nieves G. Valiente et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-261-RC1, 2022

Summary
The paper describes and evaluates four wave models run by the UK Met Office.

Our thanks to the reviewer for some constructive critiques. Comments have been addressed and we feel these have significantly improved the manuscript.

The manuscript has been modified substantially and special emphasis has been put in: (i) reduction of content, (ii) restructuring of manuscript, and (ii) highlight of main contributions that will lead to further numerical model development. The latter has paid particular attention to the influence of spatial resolution mainly in coastal settings and effects of the tidal currents on the wave field. We believe these outcomes will contribute to further develop not only the Met Office system but will potentially help with the optimisation of other wave systems.

Note that line number corresponds to the revised manuscript with "All Markup".

General comments
The manuscript would be excellent as a technical report, but has been submitted as a journal article, so I review it in that context. It is not yet suitable as a journal article. It is too long, and too much of the content will not be of much interest to readers beyond the author list.
I also hope that the authors recognize that many of us (S&E professionals) spend a lot of time writing, but not everything we write should necessarily be submitted for peer review. Some can be unpublished. Some can be published in technical reports. Some can be submitted for peer-review. As authors, we need to down-select and curate, and we should be careful not to impose unnecessary burden on the volunteer review system.

As both authors and reviewers we appreciate the time that has been taken by all the reviewers of this manuscript to give it a fair reading. Our intent in the original manuscripts was to follow GMD's guidance that a model description paper should include a comprehensive description of the numerical model if this falls within the scope of the journal. It must describe both the underlying scientific basis, purpose of the model and give an overview of the numerical solutions employed in order to be easily reproduced. Additionally, "all technical details which could substantially affect the numerical output should be described". However, the multiple component nature of the Met Office global-regional and operational numerical wave modelling made for a long manuscript in order not to compromise reproducibility aspects.

The manuscript describes the current Met Office WW3 based wave operational forecasting system with unstructured multi-resolution. The data produced by these models support national and international business, as well as governmental and research activities that require good quality forecast to complete their functions. In particular, the models described in this paper are currently being used in several international projects for climate projections (e.g., used to generate boundaries for CHAMFER, see https://noc.ac.uk/projects/chamfer; global and regional configurations are run as part of the Met Office-NOC effort for wave climate projections using UKCP18 winds). In this regard, we felt it was essential to document the system and those new developments that have not been addressed in a peer review publication to date and could potentially reach a wider audience in the wave modelling community. The significant number of views and downloads of the preprint also supports this idea and suggests that there is some wider interest in a description paper documenting the Met Office wave operational system.

Following the reviewer comments, we have focused the restructured manuscript on the key elements that make this set of configurations unique (e.g., SMC multigrid resolution) while highlighting those outcomes that although particular to the Met Office configurations, offer some insights for the optimisation of other wave systems. We hope these changes address the reviewers, and we believe that the amendments we have made to the manuscript have helped to highlight the main contributions that were possibly hidden in too much detail in the previous manuscript version.

The paper describes and evaluates four different models. This is too ambitious for a paper, unless it is a glossy "overview" type of paper.

We agree. Although some references to all the models that are part of the operational system have been left, these have been kept to the minimum and the manuscript now focuses on the two baseline configurations: global GS512L4EUK and regional AMM15SL2. Most results regarding influence of resolution and wave-current interactions in model performance can be extrapolated to the other two configurations that have been left out.

The abstract is too long.

We agree. The abstract has been reduced by a 15%. Please refer to L7-21.

The last section is too long. The reader should be able to find quickly what has been accomplished in the paper, without having to sort through a lot of discussion. Discussion and conclusions should be separated, and the conclusions should be a bald summary of what was found/accomplished.

Discussion was trimmed and is now "Discussion and ongoing development" (L474-531). This section is now similar to other examples in GMD (e.g., Lewis et al., 2019; Castillo et al., 2022). As suggested by the reviewer, "Conclusions" (L532-561) were added as an individual section where the main outcomes were lined up.

The English is excellent grammatically, and the paper is well-proofed (I found only one typo) but the writing appears rushed and haphazard in places. The sentence connectors do not always work (e.g. see how the word "hence" is used). There are references to things that are not explained (and should be explained or not mentioned). And, paradoxically, too much detail in many places, with much of the text unbearably laden.
Lines 245-250 are a good example.

We hope that both the new manuscript structure and the focus on the wave-current interaction and resolution in the accuracy of the models helps build a story that is now not rushed and more clearly explained. The main authors went through the text and have worked to present this more fluently.
L245-250 text referred to the ensemble configuration. Those lines were removed from the manuscript as now it focuses on the baseline configurations GS512L4EUK and AMM15SL2.

I recommend that the authors start with a list of interesting and novel findings from their work and use that as a basis for the paper. It may help to think about how much time an average reader will devote to reading the paper. One hour? Two? Start there, and then consider how to best present the most useful information. All six co-authors should read the manuscript carefully and think about how the text can be more considerate of the readers' situation. Find ways to draw attention to the most useful parts, so that they are not missed by a reader who only wants to spend a very short time with the paper (e.g. 10 minutes).

Thanks to the reviewer for these recommendations. Following this approach, we have completely restructured the manuscript. This also led to a significant reduction of the content. We have now put special focus on the impact of resolution and the effect of wave-current interactions in the model accuracy. We believe that the addition of the conclusions where the main outcomes are highlighted will contribute to further develop and optimise not only the Met Office forecasting system but other wave numerical models.

I estimate that the paper is between 13000 and 13500 words from abstract through conclusions. I suggest that 8500 words be used as a upper limit, though of course, a good paper could be shorter or longer based on the quantity of interesting findings and useful information.

We do appreciate the extension of the manuscript, and there has been an 20% reduction in the number of words without, we believe, compromising the description of the models and level of information needed for reproducibility purposes. Operational models are subject to rigorous evaluation that include spatial verification over long periods of time against various observation datasets, focus on locations for certain situations and evaluation of general model properties. All these aspects are covered in sections 4 and 5 and we believe those are necessary to provide a comprehensive picture of the model behaviour. We do appreciate these have an impact into the extension of the manuscript but hope all the discussions included are meaningful to describe different aspects of the model performance.

The model description (section 2.2) needs to be checked by someone that is deeply familiar with the model features being described. I got the impression that the writer of this section is very familiar with the model's technical implementation and operation but less familiar with at least some of these features.

Thanks for the comment. This section has now been checked and modified accordingly by two of the co-authors who are very familiar with WW3 model source terms and parameterisations. Refer to L71-126.