

# ***Interactive comment on “Mitigation of Model Bias Influences on Wave Data Assimilation with Multiple Assimilation Systems Using WaveWatch III v5.16 and SWAN v41.20” by Jiangyu Li and Shaoqing Zhang***

## **Anonymous Referee #1**

Received and published: 27 November 2019

This study investigate the challenge of model bias on wave model data assimilation. It apply a set of twin-model experiments to quantify the different error sources in wave model: initial, boundary, and model error. Based that It provide a simple statistical approach to reduce the impact of model bias and improve the assimilation results. The topic is interesting and important for wave data assimilation, well fit for GMD. The experiment are well designed and manuscript is in good shape. Here I only have few points to further polish this work. Therefore I suggest miner revision for current version.

1 There are three error sources: initial/boundary/model-bias. You have identify them in

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your biased/unbiased twin experiment. It turns out both boundary and model-bias are important.

In my pointer of view, both error sources could lead to SWH biases/uncertainties for assimilation/simulation. It would be great to separate them and quantify the improvement percentage by your data assimilation from your biased/unbiased twin experiments. The SWH bias and its decrease percentage may give your hind on mitigation the assimilation bias for the real observation. Similar separation should apply to real observation assimilation cases. In your figure 5, mainly represent the SWH bias. You can recalculate figure 6 (RMSE) after remove the bias in figure 5, which represent the uncertainties related to boundary/model bias.

When you apply average to reduce the assimilation error of SWH. You only reduces the uncertainty part but not the bias part. You have to direct remove the bias from the reanalysis.

2 In your real observation assimilation, the boundary and model-bias are both included. You may compare spatial pattern and the decreasing percentage of SWH bias with those your biased/unbiased twin experiments to speculate which source (boundary/model-bias) has stronger impact in certain area..

3 You only applied one kind of wind forcing for different models and then use them to do the bias correction. Since the bias also come from the boundary forcing. I encourage you using two kinds of wind forcing to further investigate the bias/uncertainty generated by the boundary forcing.

4 it is unclear how do you get the SWH bias for bias correction, what is the spatial pattern. I thought it should refer to the figure 5, but I did not find those in the manuscript.

5 Model description in page 4. This part need be more condensed with appropriate reference. Readers would appreciate more on the differences among those models, instead of the comparison to their own previous version. You may highlight the advan-

tage or disadvantage among three modes.

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-243>, 2019.

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