Responses to Comments by Reviewer #1

We appreciate very much the constructive comments and suggestions of the reviewer, and have revised the manuscript accordingly. In the following, we explain our response to each comment of the reviewer. All revisions are highlighted with red color in the marked manuscript.

Comment 1: This study implemented the new source term package of wind input and dissipation into WAVEWATCH III. The basic concept was provided in their previous work and the method was applied to hurricane conditions in this study. The performance of the new package looks good. However, the reason (physical background) of improvement for hurricane condition is unclear. At first, the author tested the new method under moderate wind condition, U10=10m/s, showing that the advantage of new method is the wave development at the young wave age. This finding cannot explain the differences under hurricane condition. The author should explain the mechanism of the differences under hurricane condition. The other specific comments are below.

Response:

First, we would like to express our sincere thanks to the reviewer for his/her positive comment on the performance of the source term package presented in this study. The physical background of the improvement is further emphasized in the revised manuscript *[Page 9, Lines 199-207]*. Please kindly note that one important improvement to the source term in this study is the reasonable inclusion of physics-based breaking wave effect on the wind energy input. Better numerical results on the wave condition at a young wave age can thus be viewed as a good verification to the proposed model. Further explanation of the merit of the model under a hurricane condition is also added in the revised manuscript *[Page 31, Lines 587-598]*.

Comment 2: What's the spatial resolution for the idealized test and the hurricane condition simulations? The spatial resolution cannot affect the results?

Response:

Thanks for the comment. For duration-limited wave cases, the spatial resolution is chosen to be 1/30°. It was verified that a finer resolution leads to no change of the simulation results. For hurricane cases, the spatial resolution is 1/12°, which seems to be a popular choice in hurricane simulations (Fan and Roger, 2016). It is also found that a finer resolution will not change the simulation results. The relevant information is added in the revised manuscript. *[Page 11, Lines 262-266; Page 21, Lines 465-466]*

Comment 3: Why duration-limited simulations were conducted just for the new package? How about other source term package?

Response:

Thanks for the comment. In this section, the main purpose is to verify the applicability of the proposed model for waves in shallow water conditions. Since the other source term packages, in their original forms, were not necessarily valid for shallow water waves, particularly with depth-induced breaking, a direct comparison is not meaningful.

Comment 4: The model performances should be summarized by some statistics such as RMSE.

Response:

The mean absolute error (MAE) and root mean square error (RMSE) of the models are added in the revised manuscript. *[Page 23, Lines 492-495; Page 25, Lines 509-511]*

References:

Fan, Y., and Rogers, W. E. (2016). Drag coefficient comparisons between observed and model simulated directional wave spectra under hurricane conditions. Ocean Modelling, 102, 1-13.

Responses to Comments by Reviewer #2

We appreciate very much the constructive comments and suggestions of the reviewer, and have revised the manuscript accordingly. In the following, we explain our response to each comment of the reviewer. All revisions are highlighted with red color in the marked manuscript.

General Comments: This manuscript evaluates the performance of a newly proposed formula which considers the wave breaking effect/air-flow separation effect in a more realistic way. The formula is added in the widely used ocean wave model WaveWatch III and verified in both deep and shallow waters under controlled normal conditions and hurricane conditions. The improved formula is proved to excel the existing formula previously embedded in the ocean wave model, therefore representing a significant contribution to the ocean wave modeling community.

Response:

First, we would like to express our sincere thanks to the reviewer for his/her positive comments on the contribution of this study.

Comment 1: In section 3, when only the inter-formula comparison is involved, more reasoning is expected to convince readers that the proposed formula performs better than other formulae. Explanations presented in line 340-342 should be given more details.

Response:

Thanks for the comment. More detailed explanations are added in the revised manuscript *[Pages 15-16, Lines 348-352]*.

Comment 2: In section 4.3, more information should be given to explain why all the formulae perform worse for the mean wave period T02? Figure 12 deserves several sentences of description.

Response:

The possible reason for the underestimation of T02 is added in the revised manuscript *[Page 22, Lines 488-491]*. Since the simulation results for Hurricane Ivan and Hurricane Katrina show common characters, descriptions of Figs. 11 and 12 are blended *[Page 22, Lines 476-488]*.

Comment 3: Section 4.4, line 510-520, the comparison among different models is too brief. The readers will appreciate if the authors could provide more insight about the performance of others models and why.

Response:

Thanks for the comment. More explanations on the merits of ST-XY as compared to other source term packages are added in the revised manuscript *[Page 31, Lines 587-598; Pages 31-32, Lines 610-623; Page 32, Lines 631-636]*. Comparisons of the mean absolute error (MAE) and the root mean square error (RMSE) for different models are also presented *[Page 23, Lines 492-495; Page 25, Lines 509-511]*.

Minor Comment 1: Line 38, Line 40: citations should be added

Response:

The citations are added accordingly. *[Page 3, Lines 41-42]*

Minor Comment 2: Figure 10, move the color-bar of the bathymetry outside to the right side of the figure, add the explanation of purple line? to the legend.

Response:

The figure is revised accordingly. *[Page 22, Line 471]*