

General comments

This manuscript was written on the topic of optimizing the influence of key parameters in a phase-averaged spectral wave model using a genetic algorithm. WAVEWATCH III is a leading numerical model used in operational wave forecasting in many countries due to its highly robust physical structure and relatively high accuracy. It is necessary to ensure its accuracy through physical parameter tuning and sensitivity analysis. However, since many physical parameters interact with one another and collectively affect model accuracy, an approach such as that presented in this study is both appropriate and valuable. The manuscript addresses an important topic and presents a useful methodological approach. Nevertheless, several points would benefit from further clarification or discussion before the manuscript can be considered for final publication. My comments and suggestions are provided below.

Specific comments

1. (Chapter 1)

In the sections describing past research, it is necessary to explain the physical meaning of this variable and why it is important, rather than simply presenting the CDFAC values. In addition, for major physical variables, explaining them in terms of physical mechanisms would also help readers better understand the main text. It is explained in detail in Table 2, but it seems necessary to explain the introduction in terms of its physical meaning rather than the variable name.

2. (Chapter 1)

In the section explaining the optimization algorithms, if various optimization algorithm methods are also briefly described, it is expected that the understanding of the methods used in this study will improve.

3. (Chapter 2)

Regarding the buoys used for accuracy verification, it is unclear whether any data are available from buoys located east of Taiwan. If the explanation for the observational gap is supplemented, it would likely help in understanding the current research findings.

4. (Chapter 2)

Unlike in the deep sea, wave deformation occurs in coastal areas, where the influence of bottom topography plays a major role; therefore, the effects of key physical variables may also vary. It is necessary to examine whether it is appropriate to apply the same values to both the deep sea and coastal areas. It would be helpful to discuss in the discussion section to improve model accuracy in shallow waters by applying criteria specific to deep and shallow waters to the source code.

5. (Chapter 3)

Please clarify in your manuscript which high-resolution coastline dataset was used in the model configuration. For example, was GSHHG used, or was another high-resolution coastline dataset employed?

6. (Chapter 3)

Figure 6 is difficult to understand; the values are hard to recognize. If the x-axis represents time, it would be helpful to also show the typhoon's path over time within the red box on the left in the figure below. This would allow readers to more intuitively relate the spatial distribution of significant wave height to the typhoon's movement.

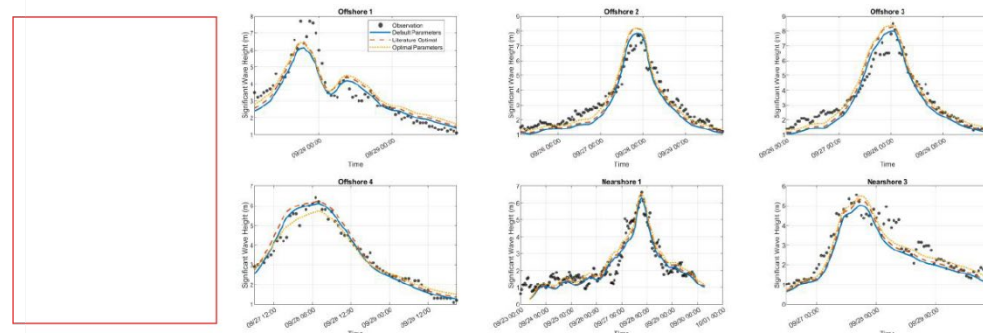


Figure 6. Time series comparison of simulation results among three parameter schemes

7. (Chapter 3)

As shown in Figure 7, the time-series comparison results generally exhibit patterns very similar to the default settings, with only the wave height appearing to have increased. If the calculations differed from the observed values when using the default settings, those patterns persist even after optimization. While optimization of physical variables is possible, I believe that optimization alone has limitations in ultimately accounting for the nonlinear effects that occur, such as sudden changes in the marine environment and phase differences at extreme wave heights caused by typhoons. The recognition of these issues and the research findings should be further elaborated upon, and the discussion section should address ways to advance the spectral phase-averaged numerical model beyond the optimization of physical variables.

8. (Chapter 4)

Since wave models rely heavily on the accuracy of the 10m-wind field, it is necessary to discuss methods or research directions that can effectively and accurately reflect nonlinear patterns and the interaction between wave and wind.

9. (Chapter 5)

As explained earlier, a more cautious approach is needed to improve model performance in coastal environments, and since the determination of source-term physics package in WAVEWATCH III can also affect the simulation results and model performance, this point should be discussed.

Technical corrections

1. (Chapter 5, Line 449)

The spacing between the words appears unusually wide. Please check whether this is due to an unintended double space or a formatting issue.