Comments for the manuscript by Ye et al.:

The manuscript "A daily reconstructed chlorophyll-a dataset in South China Sea from MODIS using OI-SwinUnet" by Haibin Ye et al. presents a novel approach to reconstructing missing chlorophyll-a data in the South China Sea using a combination of Optimal Interpolation (OI) and Swin Transformer-based Unet (SwinUnet). This method addresses the common issue of sporadic missing data in satellite-derived chlorophyll-a products, which can significantly hinder marine research and applications. By leveraging the strengths of both OI and deep learning through SwinUnet, the authors aim to provide a more accurate and spatially comprehensive dataset of chlorophyll-a concentrations. This reconstruction is crucial for understanding ecological effects in the South China Sea and improving the utilization of remote sensing data in marine studies.

General comments:

1. Innovation: The combination of OI and SwinUnet for reconstructing missing chlorophyll-a data is commendable. It addresses a significant gap in marine science research by providing a method to fill in missing satellite data, which is a common problem due to factors like cloud cover, sun glint, and sensor limitations.

2. Evaluation: The manuscript does an excellent job of comparing the OI-SwinUnet method against other common reconstruction methods such as DINEOF, OI, and Unet, demonstrating its superiority in handling missing data reconstruction in the South China Sea.

3. Applicability and impact: The study's findings have significant implications for marine science, particularly in understanding the spatial and temporal distribution of chlorophyll-a in the South China Sea. The reconstructed dataset can enhance studies related to marine ecology, biogeochemical cycles, and ocean dynamics.

Specific comments:

1. I would recommend revising the title of the manuscript by adding "the" before "South China Sea".

2. Introduction: The introduction provides a solid rationale for the study, situating it well within the current state of literature. However, it would benefit from a more detailed discussion of recent advances in data reconstruction techniques, particularly those employing machine learning and deep learning methods beyond the marine sciences, to highlight the novel contribution of OI-SwinUnet.

3. Method: The detailed explanation of the OI-SwinUnet model, including its components and the rationale behind its design, provides clarity and demonstrates the robustness of the approach. However, more details on the specific configurations of the SwinUnet architecture used in this study (e.g., number of layers, heads in multi-head

self-attention) could further enhance this section.

4. Results: The results convincingly demonstrate the superiority of the OI-SwinUnet method over traditional reconstruction methods like DINEOF, OI, and Unet through comprehensive statistical evaluation. While the statistical metrics employed are appropriate, incorporating a discussion on the practical significance of these statistical improvements in real-world applications would add value. Moreover, presenting case studies or specific instances where the reconstructed data reveal new insights about marine ecological processes could illustrate the method's impact more vividly.

4. Validation and metrics: The use of various statistical metrics (RMSD, R^2, bias) for model evaluation is appropriate. Additionally, assessing the model's performance across different missing data patterns (MCAR, MAR, MNAR) adds to the robustness of the findings. Future work could include comparisons with in-situ measurements if available, to further validate the reconstructed chlorophyll-a concentrations against ground truth data, and discussing how these advancements can influence our understanding of phytoplankton dynamics in response to climate change.

5. Discussion on limitations and future work: While the manuscript highlights the advantages of the OI-SwinUnet method, a more detailed discussion on its limitations and potentials for improvement would be valuable. For instance, how does the method perform in extremely turbid waters or under conditions of very high cloud cover? Also, exploring the potential of incorporating additional satellite sensors or data sources could be mentioned as a direction for future research.

6. Implication: The manuscript could benefit from a more detailed discussion on how the reconstructed dataset can be used to advance marine science research, beyond the examples provided. Potential applications in climate change studies, marine resource management, and oceanic carbon cycle research could be explored.