

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2022-198

Anonymous Referee #2

Referee comment on "A generalized spatial autoregressive neural network method for three-dimensional spatial interpolation" by Junda Zhan et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-198-RC2>, 2022

This manuscript presents a novel method for three-dimensional spatial interpolation. The technique employs neural networks for optimizing spatial weights calculation in a spatial auto-regression model. Based on that, the concept of generalized spatial distance is proposed to further enhance the spatial feature extraction ability of the model. The model is tested with simulated datasets and temperature observations of Argo. The presentation of the method, the evaluation procedure and the analysis are straightforward and clear.

I think there are some minor improvements that can be made to the manuscript.

- The authors only list the parameters of GSARNN model in detail in the manuscript. The configurations of traditional methods, such as the p value of IDW and the variation function adopted in Kriging, should also be mentioned in the comparison experiments.
- The results of case 2 turn out that the neural network-based models generate smoother spatial patterns than traditional methods. I wonder if that is worth discussing.
- I think the point of how long it takes to run the model deserves more discussion in the manuscript. The authors briefly mention this as a limitation in the conclusion section, but some basic statistics on how long it takes would be a helpful addition.
- Please express the information of GSDNN unit in Figure 2. Maybe Figure 1 is redundant and it can be merged into Figure 2.
- In Figure 13, it would be better to make clear that the values in the left column represent depths below the sea surface.
- In Table 1 and Table 4, you'd better change 'Hyperparameters' to 'Hyper-parameters'.
- When a matrix or a vector is represented by a word or a character, it should be written in bold, such as in Formula 10.