RC3

We thank the reviewer for appreciation of work and for the comments. We believe the current comments can greatly help improve the quality of the paper. Please find our responses in the attached file.

This paper discusses a way of modeling pan evaporation using 3 methods: the Penman-Monteith equation, multiple step-wise regression, and the Kohonen self-organising map. The novel element to this work appears to be the fact that the pan evaporation was measured with 3 class A pans but two contained sediment and one contained submerged macrophytes on top of sediment. To me, this is the part that sets the paper apart and is important, because the authors are trying to create more realistic conditions for the observational experiment before using the data for a modelling study.

Thank you for your understanding!

I liked the part of the discussion lines 248-250 where the authors discuss the low winds in this study and in earlier studies. I think that the fact that they honestly state a kind of negative result is helpful and proper.

Thanks again!

1. I was disappointed that the methods were not discussed in more detail, in particular, the Kohonen self-organising map method. I can see that proper citations are given, and that this method has been applied to evaporation modelling before. However, I think that the paper would benefit greatly from an introduction to the Kohonen method. Then all 3 methods could be explained to the reader alongside the relevance to the physical process being studied. Why were these methods chosen in the first place? What are the pros and cons to these methods?

K-SOM provides an indirect method for the estimation of pan evaporation, that seems necessary to get evaporation of natural ecosystems including lakes. In other words, applying an indirect method, in which the pan evaporation is estimated from other, easily measurable meteorological parameters such as sun radiation, air temperature and relative humidity has of primary importance. This approach has widely been used for pan evaporation projection among others by Kisi et al. (2016) and Lin et al. (2013). Kisi et al (2016) compared the soft computing model K-SOM and multiple linear regression (MLR). The authors demonstrated the superiority of K-SOM over MLR even in the model performance.

The Penman-Monteith model is considered as the international standard for computing potential evapotranspiration and predicting crop water requirement. Penman-Monteith equation (FAO-56) may also be proper method to get pan evaporation with submerged macrophytes. Wang et al. (2021) reported that actual evaporation is important for hydrological research due to its direct impact on the hydrologic processes (water cycle, water resources management). The above authors concluded that to estimate pan evaporation, it is essential to find the proper formulation of Penman-Monteith equation. It may be especially true even in pans with seeded macrophytes. In accordance with composition of lake ecosystems, this is the method in evaporation estimation that implies living organism.

To our best knowledge, no similar work has been published previously using the three modelling methods for seeded pan evaporation estimation. (This last sentence goes to Introduction)

Added references:

Kisi, O., Genc, O., Dinc, S., Zounemat-Kermani, M.: Daily pan evaporation modeling using chi-squared automatic interactiondetector, neural networks, classification and regression tree, Comput. Electron. Agr., 122, 112-117, DOI: 10.1016/j.compag.2016.01.026, 2016.

Lin, G.F., H.Y. Lin and M.C. Wu Development of a support-vector-machine-based model for daily pan evaporation estimation. Hydrol. Process., 27 (22) (2013), 3115-3127

Wang, L., Hang, S., Tian, F., Comparison of formulating apparent potential evaporation with pan measurements and Penman methods, J Hydrology, 592, January 2021, 1258162021, https://doi.org/10.1016/j.jhydrol.2020.125816

2. Figure 5 should be explained. I can see that this is related to figure 3 but the links are not made clear. The x and y axes are not labelled in either figure. How do the hexagons map to the inputs or outputs? I can't figure this out from reading the manuscript. Also, I found no definition for "importance" in the caption. This is part of the lack of time spent discussing and explaining the relevance of the methods used in the study.

These are not traditional Fig. with x and y axis. The Fig. 3 is a schematic layout of correlations, the winning nodes, and their neighbourhood.

To Fig. 3: “As similar input patterns could have different outputs, to determine the best output for a given input pattern is to use the mean output value as the clustered input patterns to the correspondent neuron, and then the closest (most similar) neuron would be directly used for the given input pattern (Chang et al., 2010, Kohonen, 1990).”

Description of Fig. 5 can be found in lines 215-220.To Fig. 5: “Superimposed on K-SOM patterns of input meteorological variables, radiation, air temperatures including minimum and maximum, relative humidity, wind speed could be captured revealing their co-variability with the pan evaporation.”

To References

Kohonen, T., 1990. The self-organizing map. Proceedings of the IEEE 78 (9), 1464–1480.

F-J. Chang, L-C. Chang, H-S. Kao, G.-R. Wu, Assessing the effort of meteorological variables for evaporation estimation by self-organizing map neural network. Journal of Hydrology, 384, 1–2, 118-129, 2010, https://doi.org/10.1016/j.jhydrol.2010.01.016

3. Tables 1 and 2 are very large and comprehensive. While I think that the information is critical to explaining the conclusions of the paper, I do not think that the information in them is easy to make sense of. Is there any way that the tables could be re-organised or even some of the information could be turned into figures to display the information in a clearer way? One suggestion for table 2 is to keep information for the correlation values only in the tables, but to put all the statistics (max, min, mean, std. dev.) in a figure with sub panels. Are all the statistics relevant? Perhaps the authors could be a bit more selective? I agree that information on the full, training and testing data should be presented.

The Table 1 is important. We keep it in its original form. In case of Table 2 some elements will be omitted (CV, max and min).

4. Figure 1 was not displayed with very high resolution. Could the authors provide a higher quality figure?

Yes

5. Figure 4 box plot whiskers and circles are not clearly defined. Software packages which compute these types of diagrams are not all the same. Please could the range (and meaning) of the box lenghth, whiskers and circles be stated explicitly.

Completed the title of the Fig: “The lower and upper ends of the box indicate the 25th and 75th percentiles of the variances, respectively, while the horizontal bar within the box indicates the median. The two horizontal bars indicate the range that covers 90% of the variances. Outliers are indicated with circles.”

6. Table 1 has three lines at the bottom saying "Based on observed means" but I don't know what these lines are referring to. Is it the full, training and testing data sets?

We correct it

Minor corrections

In figures with multiple panels, the sub-panels should be labeled with letters (a, b, c,...) in order to make the discussion of the results clearer in the body of the paper and make it easier to clarify the definitions in the captions.

We clarify where it is necessary

L167 "displays a regular pattern" does not make sense to me. Can the authors make clearer what the Relative humidity and global radiation statistics are exhibiting and why it is important to notice this?

The last two sentences will be omitted from the manuscript.

We plan to extend the description of the results with weather conditions of the studied six seasons using Thornthwaite index, TI. In the next step, the evaporation will also be analysed based on TI. We discuss differences in pan evaporation based on actual weather conditions. See also answers of Ref 2.

L178 Where is F defined? I could not find it.

Completed

L241 Please change "few" to "little"

Done

L247 Please change "researches" to studies"

Done

L273 Please change neural network to "a neural network approach".

Done

L290 the range or tuple presented is unclear. Is "(-0.42-0.44)" really (-0.42 to -0.44) or (-0.42, -0.44)? Also, it seems strange to put the larger number -0.42 in front of -0.44 if indeed they both are negative.

Clarified

L296 Please change "has high priority" to "is superior to". I'm not sure about the phrase "prediction precision" precision sounds like a computational error here. Are you talking about skill? High correlation or low RMSE? Is there a better way to phrase this?

Modified as accuracy in prediction