Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2019-50-RC2, 2019


Geoscientific Model Development Discussions

# *Interactive comment on* "AtmoSwing: Analog Technique Model for Statistical Weather forecastING and downscalING" *by* Pascal Horton

**Anonymous Referee #2**

Received and published: 22 May 2019

## 1 Summary

The paper presents the AtmoSwing software. AtmoSwing can be used to optimise and apply analogue models in various contexts and to visualize the results in an interactive way. The software is the fruit of many years of research and development work conducted by the author.



## 2 General comments

I appreciate the sound development work presented in the paper. The paper is scientifically sound, well structured and merits publication. However, there are a few minor points to be clarified.

## 3 Specific comments

1. page 2 line 30-33: The literature cited here is very old. Are analogue methods still used for the cited purposes? If this is the case, please replace with more recent literature, if not, I think this paragraph could be omitted. If you decide to keep it, please marque as historical use.
2. page 3 line 1-5: Please mention the predictands evaluated in the mentioned project.
3. page 5 line 18: "This preselection is now often implemented as a moving selection..." Please add a reference.
4. page 5 line 28 and page 19 line 13-14: I don't understand the hours UTC here. Especially 24h UTC, that would be rather 00h UTC. What is the reasoning behind taking values at a specific time of day? Does the choice depend on the longitude? Or are those hours meant to be forecast lead-times or time ranges? In this case "UTC" doesn't make any sense. Please clarify.
5. page 6 line 10: You state that the moisture index MI "does not represent an actual physical quantity, but expresses the water content and the degree of saturation". To me the water content and the degree of saturation are physical quantities. Please clarify.

6. page 6 line 21: What does “close in distance but too dissimilar in pattern” mean? Doesn’t a distance in PCA space measure dissimilarity in the contribution of different patterns?

7. page 6 line 26: Similarly, “an analogy of the atmospheric circulation instead of a Euclidean distance” is not clear to me.

8. page 6 line 27: Isn’t the RMSE the same as the Euclidean distance in this case?

9. page 7 line 16-25: The term “temporal extrapolation” is confusing in this paragraph. It makes me think of techniques like kinematic extrapolation which are used for example in a nowcasting context. I understood that in the first part of the paragraph you talk about analogy of temporal trajectories and their limitations. In the second part NWP forecasts are used on the synoptic scale, but they are based on the numerical resolution of dynamic equations and not extrapolation. Please revise.

10. page 7 line 22: You mention precipitation and temperature as examples for predictands that are difficult to simulate for numerical models. I’m not sure that temperature is a very good example here, given the performance of modern weather forecast models. What do you think? Under which circumstances and for which temporal scales an analogue forecast of temperature typically performs better than a numerical model?

11. page 12 line 23: “Different authors” which ones?

12. page 16 line 25: I think it would be useful to specify which kinds of objective functions are minimized and which ones are maximized. For example error functions are minimized and skill scores are maximized.

13. page 18: At some point I got a bit lost between “calibration periods”, “optimisation periods”, “archive periods” and “validation periods”. Please define calibration



period vs. optimisation period. In which cases within sample skill is measured, and in which cases out of sample skill is measured? Is the archive length always the same? In line 29: “The contrary is expected for the later period” please explain why.

14. page 19 line 10: Why is this expected? Please specify.

15. figure 4: This figure is unclear to me. Especially the meaning of the connections with different line types, arrows and points. I didn’t look at the code, so the figure might be useful in the software documentation or user manual, but I don’t see the purpose of this figure within the paper.

16. figure 5: What are the numbers in the circles? Please add the information in the caption.

17. figure 7 and 8: Incomplete caption. What are the crosses?

18. figure 9 caption: What does “optimised directly” mean?

19. figure 11, 12 and 13: The axis annotations, legends and crosses are very small. Please increase their size.

## 4 Technical corrections

1. page 2 lines 9-13: I’d suggest to stick to present tense here.

2. page 2 lines 15-17: There is some wording in this sentence that seems strange to me in the given context: Incidentally, proposed, assumed, most efficient. Please rephrase the sentence.

3. page 3 line 29: There are sections missing in the outline.

4. page 4 lines 30-31: These phrases are a bit vague, please rephrase.
5. page 5 line 9: “that which” -> “the one that”
6. page 5 line 14: “eventual” -> Did you mean “possible”, “potential” or “optional” ?
7. page 5 line 15: “compromise to take into account” I’d suggest “trade-off between taking into account...”
8. page 5 line 24: determined -> found?
9. page 5 line 26: “plays a greater significance” -> “plays a greater role”
10. page 7 line 9: Paranthesis around the citations are missing.
11. page 7 line 29: “catchment” is used here while “region” is used before and after.
12. page 7 line 29: “for use in” -> “for their use in”
13. page 17 line 28: The Binn station was responsible for damages? Please rephrase.
14. page 22 line 4: “allowing them to be” -> “such as”
15. figure 12: Typo in the caption: Fig. 12 -> Fig. 11
16. table 1: “model vintage” -> “model generation” (vintage is rather for wine)

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