



EGUsphere, author comment AC2  
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## Reply on RC1

Adrian Rojas-Campos et al.

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Author comment on "Deep learning models for generation of precipitation maps based on Numerical Weather Prediction" by Adrian Rojas-Campos et al., EGU sphere,  
<https://doi.org/10.5194/egusphere-2022-648-AC2>, 2022

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Dear Referee 1,

Thanks for your comments and observations. These will allow us to improve the readability of our paper. Following I attach a specific response to each of your questions.

Best regards,

- Introduction section

(1) there is a confusion about scientific question. Did it compare different model algorithms or generate precipitation map or both?

We developed different algorithms to generate precipitation maps and compare the algorithms in their performance to obtain information about how to solve best this specific problem. Our results show that the CGANs between the different models generated the highest quality precipitation maps. We will clarify this in the text.

(2) What is the novelty of this study? Just complete set of variables?

The novelty of this study is to use the complete set of variables from the atmospheric simulation and the combination of two steps into one: downscaling the precipitation forecast and correcting its bias with a single algorithm. This will be made clear in the text.

(3) There is a lack of some references in this section, such as line 22 "Among the most successful methods are the Numerical Weather Predictions models (NWP), which consist of systems of equations that simulate the dynamics of the atmosphere and provide highly accurate weather forecasts over long periods." Line 27 "However, NWP models still preserve some limitations, the most important being the large number of computational resource needed to generate forecasts" and so on. Please double check the whole text.

References will be added to the manuscript.

- Data section

(1) I think it is not well-structured. There is no information about study area, and some information lacks of reference. Thus, I do not know is it your result or others, such as "The

south-western part is characterized by low precipitation amounts between 500 and 700mm/yr due to lee effects of the Eifel mountain range”.

We provide a basic description of the precipitation properties of the target area. We will provide additional information about the area. The mentioned quote is not our finding but known information about the region. We will add the respective references.

(2) Please give more descriptions about COSMO-DE-EPS forecast, providing more information or reliability for readers.

This information will be added.

(3) Please give full name of “RW, YW, RQ” when they are first used in this study.

This will be corrected.

- Methodology section

Please give more descriptions about five deep learning models, such as:

(1) Why choose these five models in this study?

Two of the models are chosen as references: the baseline more is one of the most basic models possible, U-Net was previously used in the literature to solve very similar problems. The rest of the models are original contributions from this work and are selected according to the literature and the proven performance to solve this task.

(2) How to set up these models in this study? For example, how to choose variables? How to calibrate and validate model parameters? How to deal with the correlation of independent variables?

Deep learning models allow performing an automatic selection of the relevant variables by the estimation of the weights. It also manages the calibration and validation of the parameters. The correlation of independent variables is managed automatically by adjusting the weights during backpropagation. The good performance of the models was tested by evaluating the predictions on an independent test set.

(3) The setup is done by this work or referred from other study?

This is an original contribution from the study.

- Result section

In this section, the key information is from Table 2 and Figure 3. But it confused me that COSMO-DE-EPS data in Table 2 is original data or after correction? Maybe I missed some information. If it had been corrected by observation, it is not surprised that it has good performance.

Table 2 presents the scores of the COSMO-DE-EPs original data. It is actually a good original performance. But the deep learning models that we trained based on this information obtain a significant improvement in their fidelity, in comparison with the original COSMO-DE-EPs. This information will be clarified in the manuscript to avoid confusion.

- Conclusions section

In this section, authors presented a summary of results. Maybe authors can discuss some uncertainties about five models, such as the parameters and the influences of model uncertainty on precipitation generation results.

An additional paragraph with considerations about the limitations of the models will be added to the discussion.