Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2022-14

Anonymous Referee #2

Referee comment on "Repeatable high-resolution statistical downscaling through deep learning" by Dánnell Quesada-Chacón et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-14-RC2, 2022

General comments:

In this paper, the author employed deep learning models to downscale rainfall at a regional scale (1km) over the Eastern Ore Mountains in Saxony. The author used different deep learning algorithms including the state-of-the-art U-Net and U-Net++ models and compared their performance with CNN1 (benchmark). The aim of this work was not only to downscale precipitation but also to explore the repeatability aspect of the downscaling experiment. The findings in this paper are very interesting. In general terms, this paper falls within the scope of this journal, the figures and tables are well organized, and the results are properly discussed. However, the paper needs extensive revision, especially the introduction section.

Specific comments:

Abstract:

The abstract is well written however, some very interesting findings mentioned in the conclusion could also be included in the abstract.

Introduction:

- The introduction requires an extensive language revision.
- The flow of the paragraphs needs to be adjusted.

- The IPCC report citation is wrong, this is the correct citation (IPCC 2021).
- "2011-2020, being the warmest on record." And "while 2020 tied with 2016 as the hottest" something is not correct here, the author needs to check which years are the hottest (2020 and 2021) or (2020 and 2016).
- "…and simultaneous numerous heat waves", this sentence should be improved.
- "On a smaller…in Germany in decades." this sentence is ambiguous and too long. It should be divided into two or three sentences.
- The same remarque for the second paragraph, the first sentence is too long. The author is advised to rewrite it using short and clear sentences.
- "which depending on the application can be a…", this does not sound correct.
- "which depending on the application can be a…into climate4R (Iturbide et al., 2019)." The author is advised to rewrite this paragraph.
- The references used in paragraph 4 are old, the author might consider exploring recent papers.
- The section where the term "reproducibility" term is explained is too long, the author might consider summarising it.

Data:

- "The raw station data…to Deutsch (1996) for the amounts. This sentence is not clear.
- "https://github.com/dquesadacr/Rep_SDDL" this link is not accessible.
- The author indicated that the precipitation dataset was used as a predictand, while several variables were considered from the predictor. In the training phase, shouldn't the author use the same variable from the predictor and the predictand to train the model?

Methods:

- In the caption of Figure 1, The author didn't mention which variable is considered to calculate the relative bias. Is it precipitation?
- Table 1. Replace "d" with "day".
- The links provided are not accessible: https://github.com/dquesadacr/Rep_SDDLhttps://bit.ly/ 215 dl-determinism-slides-v3, https://bit.ly/ 215 dl-determinism-slides-v3
- The focus of this work was on precipitation, however, the author also mentioned that several variables are selected from the predictor (zonal and meridional wind, temperature, geopotential, and specific humidity). How did the author use these variables to downscale precipitation?
- It is advised to add another Figure to show the details of the model used (including the resolution of the input and output), the author is referred to check Figure 3 in (Baño-Medina et al., 2019).

Results and discussion

Minor comments:

- “This could be applied to by …” this sentence needs correction, line 285.
- Figure 4. These matrices are calculated on which years, is it the validation period (2010-2015)?

Conclusion

Minor comments:

- The author mentioned that 5 variables from the predictor (ERA5) were used to downscale precipitation, however, in the conclusion, the author stated that 20 variables were used. Which one is correct?