

Review of the revised version of 'Climate Model Downscaling in Central Asia: A Dynamical and a Neural Network Approach'

by

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Recommendation: minor revision

Most of my review comments have been addressed. However, the statement in the response letter on the use of MAE is inconsistent with the manuscript. There are also a few minor points that should be corrected or clarified before publication, which are listed below.

Use of MAE

I had commented on the fact that free-running GCM simulations and observation are completely different realisations of random internal variability, and that any comparison that uses pairs for a given time, including calculating the MAE between timeseries from GCM-driven RCMs or emulators and from observations makes no sense.

In response to this, the authors have removed the original section 3.1.1. and Figure 3. This is however not made clear in section 2.1. of the response letter, which says

'We are aware that the simulations are in the so-called "free" mode and do not include any kind of data assimilation and do not "see" the observations. However, we conduct averaging of 30 years on each day, i.e. we have 30 first of January for example and the resulted pattern is not only a random pattern of a single day.'

This reads as if the averaging over 30-years had been done in the original version, which is not the case, and no wrong analysis had been conducted. It only becomes clear in section 2.2. of the response letter that the original section 3.1.1 of the manuscript has been removed. It is unclear to me why the authors discussed their response to this issue in such an unclear way.

More importantly, the statement in the response letter means that there should now be an evaluation of the representation of the annual cycle instead of an evaluation of the temporal variability in the timeseries. However, it seems that this is not the case. The explanation of the MAE calculation (lines 228- 232) does only mention timesteps, which indicates the use of the simulated and observed timeseries, and the averaging over 30 years for each day of the year is not mentioned. The MAE results that are shown are based on setups where the pairing is justified (comparing ERA-Interim-driven CCLM simulations with observations, or comparing GCM-driven CCLM and CNN simulations) and there is no indication that any of these results are based on the annual cycle rather than on the full timeseries.

Please clarify the situation and explain the use of MAE in the manuscript such that there is no room for misinterpretations of what has been done.

Further points

- The terminology for the mapping from low resolution to high resolution randomly switches between 'upscaling' and 'downscaling'. A consistent terminology should be used, preferably using the standard term 'downscaling'.
- The reason for randomly shuffling the data (line 160) should be given, as it should be clarified that the input and output datasets are shuffled in the same way in order to retain the original pairing.
- The reason for choosing the SoftMax constraining (equation 2) rather than a simple, linear scaling is explained in the response letter, but not in the paper. The explanation should be added to the paper.