

## ***Interactive comment on “Exploring the Parameters Space of the Regional Climate Model COSMO-CLM 5.0 for the CORDEX Central Asia Domain” by Emmanuele Russo et al.***

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Review of "Exploring the Parameters Space of the Regional Climate Model COSMO-CLM 5.0 for the CORDEX Central Asia Domain" by Emmanuele Russo et al.

General comments The study of Russo et al. is investigating the impact of different parameter settings in the COSMO-CLM RCM on the model's performance in the CORDEX region Central Asia Domain. It is using a PPE (Perturbed Physics Ensemble) setup, trying to answer the question on how (and whether) an optimal configuration can be found and if it is transferable to other regions (specifically, CORDEX Europe) and universal throughout the simulation domain. The most sensitive parameters are high-

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lighted for three different variables (temperature, precipitation and total cloud cover) separately and commonly.

The study gives a very valuable insight into the parameter space for the different parameterisations available in COSMO-CLM and how they might influence the model results overall and for different variables and areas. The performance of the model is summarised in several metrics which are easy to understand.

The results of the study show that the sensitivity and performance of the model for the investigated parameter space is different in Central Asia and Europe. Also for sub-regions this can differ significantly and the results show opposite effects of several parameter settings for different areas. Thus, it shows that re-tuning the model and investigating the sensitivity when moving to a new model domain should be carried out, and also variations within the domain and for different variables should be considered.

Overall, the study represents a substantial contribution to modelling science and I recommend its publication. Some few specific comments for minor revision can be found below.

Specific Comments: Page 5 line 3: Normally, ERAInterim reanalysis data are used to drive RCMs evaluation and calibration experiments. Conversely ... → “Normally” and “Conversely” are true for CORDEX simulations but I wouldn't use them as a general standard. I think you have a valid point there on the resolution jump. Thus, I'd suggest to write: “Within CORDEX, ERAInterim reanalysis data are used to drive the RCMs evaluation experiments and usually for calibration. NCEP2 data are employed in this study with the specific purpose of reproducing the spatial resolution jump ...”

Page 5 line 30: A k-means clustering technique (Steinhaus, 1956; Ball and Hall Dj, 1965; MacQueen et al., 1967; Lloyd, 1982; Jain, 2010; Russo et al., 2019) → Do you really need to include all 6 references for the k-means clustering technique here?

Page 12 line 33: In this case, the reason for the biases is most likely related to some

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structural error in the model formulation. → I suggest adding “or the model setup”, e.g. the horizontal and vertical resolution, rdheight, number of vertical levels or - for the IMO region - the proximity of the domain boundary could also be a reason for (parts of) the bias.

Please add a paragraph (either in 2.2 on observations or in the conclusions) on the uncertainty of the observation. Although you are using different data products, the source behind them is (at least for those based on station data) probably similar and may be sparse for some areas you consider.

Comments Figures and Tables: Additionally to the comments in RC1 (especially sorting the lines in figures 5-7), I'd suggest to increase the font size in figure 11 if possible.

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