

Dear Referee,

thank you very much for your time reading our manuscript and the thorough and helpful corrections and recommendations. Thanks to those, we have improved our manuscripts. Here are some of our additional answers to your requests:

- The reader of the paper easily gets confused with the names of the modelling systems (COSMO, COSMO-CLM, ICON-CLM, ICON-A, ICON-NWP, ICON-LAM, ICON-O, ICON-EUclim, ICON-EU-Nest, ICON-GCM etc). This is in part unavoidable as the names reflect the complex history of the ICON model. Figure 1 is certainly helpful in this respect, but as a reference I would appreciate an additional table that lists the individual configurations of ICON and their basic characteristics. Such a table could also serve as a reference for further publications.

Having a table with individual configurations of ICON is a good idea. However, we would not add an additional table into this paper because it would be a rather complicated table and depart from the main point of introducing and evaluating ICON-CLM here.

- page 1 line 10: "with the setups similar

We changed from setups (plural) to set-up (singular). It fits better in this sentence. In some other parts of the manuscript the plural form setups are still kept after another thought.

- page 2 lines 9-10: It is not really clear to me whether ICON-EU-Nest is a global model with regional refinement over Europe or a higher-resolution version traditionally nested into a global ICON model.

We changed the text. Hopefully it is clearer now (page 2, lines 10-12).

„... ICON-EU-Nest, the regional ICON on European domain interactively nested within the global ICON replaced COSMO-EU (high resolution COSMO model configuration for Europe) for higher-resolution forecasts on the European domain...“

- page 2, line 10: "COSMO-EU" needs an explanation

See previous answer.

- page 2 lines 13-14: As written, the unification was scheduled for end of 2019, which is already in the past. The sentence should hence be modified to "This implies that the last unification of COSMO and COSMO-CLM (COSMO 6), carried out at the end of 2019, was the last one."

The manuscript was written in 2019 but there was a delay in submission till 2020. But the text is also not valid anymore since the plan was changed. The last unification was planned for end of 2020 now. The year was changed accordingly in the text (section 1, page 2, lines 15-16).

- page 2 line 20: Wouldn't it be better to speak of "climate projection" here instead of "climate prediction" to highlight the longest time horizon for application of the model?

Yes „climate projection“ was added into the text. „Climate prediction“ is still maintained though since they are different (page 2, line 23).

- page 2, line 23: Did ICON-NWP inherit any parts from COSMO (for instance, the physics package)?

The comparison between ICON-CLM and COSMO-CLM is shown in Table 2 and is referred to in Section 3.1. In our opinion, it is not necessary to mention in this part.

- page 2 line 34: Why was CCLM 5.0 cIm9 used for the comparison and not the latest (and final) unified version COSMO 6 (see above)?

Because all our work was done in 2018-2019 even before the previous release plan of COSMO 6. The release plan was postponed now till end of 2020. So there is no COSMO 6 yet till this day.

- page 3 lines 13-14: Could you briefly explain why this is the case?

Physically one can feed SST into the regional model also on monthly basis. But we want a flexible option because technically it is easier to update SST at the provided forcing data frequency, so we don't have to prepare specifically the monthly data. The text was reformulated a bit to make things clearer (page 4, lines 27-28).

- page 3 lines 20-21: I suggest to replace this expression by "...time dependent GHGs as provided by corresponding GHG scenarios".

Thanks for the suggestion. We changed in the manuscript (page 5, line 2-3).

- page 5 line 13: It is not really clear which "necessary changes" are meant here.

The text was changed to: „...After the technical adaptation in the ICON model source code to enable long-term climate simulations...“ (page 9, line 25).

- page 7 line 12: How were the data transformed/regridded?

We changed the sentence to „... these data were remapped to the lat-lon grids with the same spatial resolution with the observational data ...“ (page 8, lines 24-25). Hope it is more understandable now.

- page 7 line 18: Would be better to speak of "ICLM-REF" and "CCLM-REF" here as the simulations themselves are meant.

Exactly. We changed in the text (page 9, line 1). We also checked again the whole manuscript to make sure that the right names were used.

- page 7 line 28: "a very good performance" -> this statement actually needs some quantification or should, alternatively, be reformulated

We re-structured the manuscript a bit and the sentence was deleted. We also revised all similar statements.

- page 7 lines 28-30: This paragraph actually summarizes the results described later on. It should not precede the presentation of the results I believe, but should rather be moved to the end of the results chapter or even to the conclusions chapter.

The paragraph was moved to the conclusions section. A new small paragraph was written here in this part.

- page 8 line 17: "trends" is misleading here. I'd rather speak of "biases" or "results".

We agreed and changed „trends“ to „results“ (page 11, line 12).

- page 8 lines 17-18: Any ideas WHY?

It might be due to the positive radiation bias in ICON. We added a discussion into the text (page 11, lines 21-25).

- page 9 line 5: "over the whole evaluation period" -> this expression is misleading as the figure shows no time series of the bias.

Yes, indeed. We changed the text to "averaged over the whole evaluation period" (page 12, line 7).

- page 9 lines 15-16: The numbers obviously refer to events per 20 years. Without providing the length of the period the numbers are, however, not interpretable. I'd suggest to use the unit [days per year] for these numbers and, actually, for the entire Figure 11. This is much easier to understand and to compare to other studies.

Yes that is very true. We changed Figure 11 so that the numbers show days per year instead of per 20 years. The related title and texts were also changed accordingly.

- page 9 line 20: "too low values" -> you're obviously referring to gauge undercatch and evaporative losses here, this should be mentioned (and supported by some reference).

Yes indeed that was what we meant. The text was changed according to your suggestion for better understanding. References for the low precipitation of E-OBS data was also cited (page 12, line 26-28).

- MSLP evaluation in Chapter 4.3: MSLP is evaluated in the same fashion as the other variables, but I see rather little value in this. What is most important here is the spatial MSLP pattern (in addition to the general magnitude), so the evaluation should consider the mean spatial field. The authors might think about replacing their MSLP evaluation by some more informative MSLP analysis.

Thanks for the recommendation. We added an evaluation for MSLP now (Figure 12). The spatial pattern of MSLP from ICLM-REF is compared with the driving data ERA-Interim and additionally with CCLM-REF. A paragraph was also added in the text (page 13 line 32 to page 14 line 8).

- Figure 17: In addition to the naming of the simulations (see above) the variable names in the headers refer to the internal model names of the respective parameters. This is rather cryptic and could be replaced by the full names (2m temperature, cloud cover etc). Alternatively, the abbreviations should be mentioned in the caption.

Perhaps the reviewer referred to Figure 3 (?). We changed the variable names in this figure to full names now. We also revised all naming of the simulations and variables in table, figure, captions, etc. in the manuscript.

- Figure 4: These maps obviously employ some uncommon projection and the Euro-pean continent seems a little "distorted". Why don't you use the same projection as in Figure 2, for instance?

The maps were revised. Hope they look good now.

- Figures 8 and 9: The y-axis of these figures misses a label and the unit of the bias

Sorry it was the result of automatic cropping. All figures should have the full axes now.

- Figure 11: As explained above I'd suggest to use the unit [days per year] or [events per year] for these indicators (instead of [days per 20 years]). Furthermore, in topographically structured sub-domains such as AL or SC, the spatial averaging of the number of days defined by a temperature threshold makes little sense in my opinion as it completely neglects the large spatial variability. One way to improve on this might be to present the bars as medians with whiskers on top of it reflecting P5 and P95 of the spatial variability within a subdomain. Furthermore, I suggest to place the black EObs bars to the left of the green simulation bars, not between them (also modify the legend in this case)

Thanks for the comment. We changed the unit from days per 20 years to days per year. However, our main purpose here is to compare the performance of the two models not to look specifically to the spatial variability of the sub-regions. Therefore, we would like to keep the bars as they are. In addition, we also think that adding the whiskers would make the plot very busy and overwhelmed with information. The observation bar we also would like to keep in the middle as it helps with the comparison of both simulations to the reference data.

- Table 1 is hardly readable, the space between the table lines should be enlarged

The space between the table rows were increased, now it is table 2.

SPELLING AND GRAMMAR

Thanks for all of the language corrections. We took over most of them. Only one remark below.

- page 1 line 7: "tests"
- page 2 line 1: "the CLM-Community developed"
- page 3 line 16: "with a user-defined"
- page 3 line 19: "the greenhouse gas"
- page 3 line 23: "retrieve" instead of "get"
- page 4 line 3: "for the European domain"
- page 5 line 14: "was tested"
- page 5 line 33: "Tiedtke/Bechthold" (with a "t")
- page 6 line 34: "British Isles"
- page 7 line 12: "for the purpose"
- Chapter 4 "Results": Past tense is used for describing the simulation results in this chapter. Use of present tense would be more appropriate and clearer in my opinion.

Past tense is actually used in scientific writing in Results section, for example Results indicated that ...

Nevertheless, none of the author is native English speaker. We already indicated to the editor that we would agree with a language editing once the manuscript is accepted and in the final form. At this stage there might be more revision, thus it would not bring much to have language editing now.

- page 8 line 12: "...British Isles, Mid-Europe,..."