

Many thanks for all new comments and for an active editorship. Answers to the comments are given below.

Reviewer #1

2nd Review of 'Projected climate change in Fennoscandia — and its relation to ensemble spread and global trends' by Strandberg et al.

This is my second review of this manuscript. The new version of the manuscript is much improved, and the authors have sufficiently answered most of my concerns. I still think that the results of the bias correction should be discussed, especially since one important results is the comparison of spread between RCM and GCM (e.g. 4.2). How does the bias correction impact the spread in RCMs?

We have now also included the raw RCM ensemble in the analysis. It is now included in the new figure 5. We also added text to describe it in section 3.4: "The CORDEX RCM ensemble is compared to its raw equivalent, where no bias adjustment has been performed, to assess the impact of bias adjustment on the climate change signal. The means and spreads are similar in both RCM ensembles, but the raw ensemble systematically shows smaller changes. Although small, these differences are significant in DJF, and in JJA under RCP8.5."

And discussed in 4.2: "In this study, bias-adjusted RCMs are compared to non-adjusted GCMs. Bias adjustment may reduce model spread in absolute values since systematic biases are minimised and all models are forced towards the reference data. Here, it systematically increases the climate change signal in the RCM ensemble. Although this increase is in many cases significant, it is relatively small, and the raw RCM ensemble is more similar to the bias-adjusted RCM ensemble than to any of the GCM ensembles. Consequently, the differences between GCMs and RCMs are likely not explained by the application of bias adjustment."

Minor comments

Line 138-141 and 177-181 are duplicated.

These lines are now merged under the new section 2.5 Definition of global warming levels

Although the manuscript is well written, there is still need for a read trough and correct grammar.

Reviewer #2

I thank the authors for addressing my previous comments and acknowledge the extensive changes to the manuscript. I think that the changes in the methods section improved the accessibility of the paper greatly. Also, the reordering of the Results section makes the structuring of the results more logical. Lastly, I appreciate the addition of a discussion section considering my suggestions for content.

At this stage I only have a few minor comments.

P3 L75-77: "Since this RCM ..." You can remove this sentence as you are repeating this information in the next sentence.

Done as suggested.

P3 L90f: Can you maybe formulate the fourth topic a bit more straight to the point. For example: The role of climate model and emission scenario selection on the projected changes in temperature and precipitation at a GWL +2°C. This is important because

This point is changed to:

"iv) The role of climate model and emission scenario selection in projected changes in temperature and precipitation at +2°C global warming. This is particularly important because the Paris Agreement (UNFCCC, 2015) aims to keep temperature rise well below 2 °C. Consequently, descriptions of projected climate change naturally focus on a two-degree warmer world."

P7 L137-141: "The GWLs are calculated ...". The same information is also presented in section 2.5 (P9 L177-184). I would suggest merging the information of these two sections and either place that information in one of the sections where this fits the best or create a new subsection, e.g. "Definition of global warming levels". I think the latter might be the best option.

These lines are now merged under the new section 2.5 Definition of global warming levels

#3

No further comments

Editor:

I agree with the reviewer that in order to thoroughly assess the effect of bias adjustment on the climate change signal, it is desirable to assess the spread and signal in GCM, raw RCM and bias adjusted RCM. The intermediate step of assessing the signal in the raw RCM allows disentangling the effect of downscaling from the effect of bias adjusting.

Given the small and varying size of the ensembles the min-max range is not a meaningful metric for an uncertainty range as it is extremely sensitive to the exact ensemble configuration. It is definitely better to rely on variance or interquartile range in this respect. That said, there are some outliers in Fig. 5 that deserve more thorough discussion. I am looking forward to receive a revised version of the manuscript along with a point by point response to the remaining reviewer concerns.

We have now also included the raw RCM ensemble in the analysis, see comment above. Figure 5 does not only show min and max values but also the range between the 10th and 90th percentiles, which we think is an acceptable way to show the spread.