We thank both reviewers for their time spent in reviewing the revision. We note that reviewer #2 was satisfied with the changes made in the first revision and we trust that the documented minor revisions will further improve the manuscript.

In addition to the responses to reviewers, there is one additional change made requested by the journal. As GMD cannot reproduce coloured tables, the original shaded ranges in Table 6 have been converted to bold text. The caption has been updated and reference in the text also updated. The caption in table S4 has been updated since the shading in the supplementary material for calibration v1.4.0 has been retained.

Reviewer #1

Revision did not address my main concern, namely that paper does not show “that two very different future projections to a given emission scenario can be obtained using emissions from the IPCC Sixth Assessment Report (AR6) (fair-calibrate v1.4.0) and from updated emissions datasets through 2022 (fair-calibrate v1.4.1) for similar climate constraints in both cases.”

Once again, emissions used in simulations with v1.4.1 parameters, for all scenarios except SSP2-4.5, significantly differ from those used in simulation with v1.4.0 parameters from 2015 forward (Figure 12a). Scenarios in v1.4.1 case “take into account the recent past. Scenarios used in v1.4.0 case do not. As a result difference in CO_2 concentration (Fig 12b) caused not only by use of different model parameters, but also by use of different emissions
I did not suggest using the same emissions in both cases. I do understand that historical emissions were used for parameters calibration. I suggested rerunning simulation for v1.4.0 using AR6 historical plus SSP2-4.5 emissions until 2022 and scaled (harmonized) AR6 emissions from 2023. I I still think it needs to be done.

We’ve added a new subplot to figure 12 (12c) which shows the temperature projections from the five main SSPs under v1.4.1, v1.4.0, and v1.4.0 with historical emissions extended to 2022 under SSP2-4.5 and future projections harmonised to 2022. This neatly shows the narrowing of the plausible 21st century temperature projection space that we previously claimed (but did not demonstrate) occurs by updating the scenario start date to include 8 more years of “historical” data (either updated best estimates, in v1.4.1, or approximated by SSP2-4.5 in v1.4.0-2022-harmonized). The paragraph that relates to this plot in the main text has been duly updated.

Authors also did not explain why use of 841 ensemble member will “allows many quantiles of the full distribution to correspond to a single ensemble member at each point in time.”

This minor point seems to be causing some confusion. It isn’t critical to the intent of the paper, so it’s cleanest to delete this part of the sentence and slightly reword. We will try and explain what we mean:

A posterior size of 841 is an author preference. A user can choose any posterior size N they like, though as stated in the paper, we recommend 500 <= N < 0.2 * #(effective samples).

841 = 840 + 1. 840 is highly composite. It exactly divides 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 15, 20, 21, 24 …; it is quite an “efficient” number in that it packs in a lot of factors into a relatively small magnitude.

Select an output variable from FaIR, let’s say global mean surface temperature. Pick a timebound, say 2025. Then in 2025, you can label the 841 FaIR ensemble members from coolest to warmest in the order 0, 1, 2, …, 838, 839, 840. Let’s say you want the median (50th) and 5th to 95th percentiles of the distribution. These can alternatively be thought of as the first, tenth and nineteenth vigintiles (twentieths). As 840 / 20 = 42 (exact), we can assign ensemble member 42 to be the 5th percentile, number 420 (42 * 10) to be the median, and 798 (42 * 19) to be the 95th percentile. 0 and 840 are the minimum and maximum values of the ensemble. Between every pair of adjacent vigintiles there are exactly 41 other ensemble members, and we have therefore split the ensemble into twentieths assigning a single ensemble member to each quantile without interpolation. In 2026, we can do the same, grabbing members 42, 420 and 798 as our quantiles of interest when lined up in temperature order from 0 to 840. The ensemble members corresponding to these quantiles may not be the same ensemble members that formed the percentiles in 2025. Usually, this is OK, as we are not reporting “storylines”, we want to present the range of an ensemble. Because 840 is highly composite we can also do this even division into quantiles with thirds, sevenths, fifteenths, and several other numbers. Again, there is nothing special about 841 other than 840 is highly divisible; if you want hundredths, 841 won’t work, but 100k + 1 will for integer k, and many earlier versions of fair-calibrate used a posterior size of 1001. It is not a requirement to create equal partitions, you can interpolate between ensemble members to get quantiles as usual.