Earth System
Dynamics
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Interactive comment on "Differential climate impacts for policy-relevant limits to global warming: the case of 1.5 C and 2 C" *by* C.-F. Schleussner et al.

Anonymous Referee #1

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I really like the premise of this study. This is an excellent step forward in figuring out at least some aspects of exactly what 2°C of warming means. The study is well done, and the paper itself is well written. I am recommending minor revisions.

One general comment is that I think there needs to be a bit more detail about the temperature limits. As much of the paper is phrased, 2°C (or 1.5°C) is seen as the upper limit of global mean temperature rise. However, those numbers are fundamentally heuristic, not hard limits. It could be that 1.9°C is already dangerous, and 2°C is even more dangerous (the authors find that something along these lines is indeed the case). I would appreciate it if the authors would go through their arguments (particularly the

introduction and conclusions) and ensure that their presentations of the global mean temperature limits of 1.5°C and 2°C are presented appropriately, as useful heuristics instead of hard limits.

Another general comment refers to Section 5. It would be useful to see some context. For example, what does a 6% reduction in local yield mean? Is this catastrophic for nobody, a farmer, a region, a nation, etc.? Can it be compensated for? It's hard to say "that's really bad" or "that's not so bad" (or somewhere in between) if only the result is reported.

Specific comments:

Page 2452, first paragraph: I understand why the authors chose two different reference periods, but it makes the presentation a bit confusing and raises some questions. How much do the deviations from past climate affect your results? Could you provide some quantitative evidence that indeed it's not a good idea to make all of your comparisons relative to preindustrial?

Page 2452, line 27 to Page 2453, line 10: I'm a bit dissatisfied with this paragraph, in that I don't think there is any reason one would have confidence in individual grid box results in the first place. In addition to natural variability, there could be numerical errors on such small spatial scales. I take it as a foregone conclusion that aggregation or some other kind of filtering is necessary to obtain robustness.

Page 2453, line 20: Did you check the robustness for more stringent significance levels? It could be that you get similar results for (say) 99% significance, which reduces the chances of obtaining false positives or negatives in your test.

Page 2455, lines 12-13: Why did you only choose 11 and 14 models, respectively? Why did you choose the models that you did? Are the models that you chose significantly different from each other? A bit of transparency would be helpful.

Page 2457, lines 9-10: I know these are cited, but I would say that the point itself is

arguable. I would like to see something less strongly phrased.

Page 2459, line 14: It would be nice to have more description so that the reader doesn't have to read Schewe et al. (2013) to understand what you did.

I don't think a separate Section 4.1 is necessary if you only have one subsection. Just put everything in Section 4.

Either in Section 4 or Section 5, it would probably be useful to talk about sea level rise and consequent saltwater intrusions. This will certainly exacerbate water availability for coastal cities/regions.

Page 2461, line 29 to Page 2462, line 3: Choosing to plot relative changes makes sense, but it might also be helpful to mask out regions with small absolute change, thus reducing this amplification problem.

Section 5.2.4: I don't understand why there isn't any difference between the two different warming levels in the CO_2 ensemble. Some insight would be useful.

Page 2466, lines 9-10: I don't think it's very helpful to specifically call out 2030. This comes across as predicting the future.

Page 2466, lines 25-26: Say more about how this is consistent with the assessment of climate sensitivity. Does it span the same range? Does it have the same mean? Are you talking about median warming?

Section 6.1: How do your generated scenarios compare with the CMIP models? Do they replicate any other scenarios?

Section 8: It would be helpful if you summarized the first few paragraphs in a table so that the reader can easily see the whole picture.

Page 2474, line 8: Can "not unlikely" be a number?

Page 2474, lines 4-15: This paragraph feels a bit hand-wavy. Is it possible in Section

6 to assess the contribution to SLR of the collapse of the Greenland ice sheets in your two simulations?

Page 2475: Mentioning Paris might not be a good idea, as the results from Paris will be clear well before this paper is published.

Figures 2, 3, 5, 6, 8-12: It's really hard to discern much useful information from these figures. They're very crowded, and the individual "panels" are small. I'm not quite sure how to improve these, but something really doesn't work here.

I don't understand the top row of Figure 13. If warming caps at 1.5°C, how can there be any results above this value?

Figure S5: I assume this is percent?