

## ***Interactive comment on “Incremental improvements of 2030 targets insufficient to achieve the Paris Agreement goals” by Andreas Geiges et al.***

### **Anonymous Referee #2**

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In this paper, the authors first estimate emissions related to Nationally Determined Contributions scenarios, and then calculate corresponding climate impacts. The paper is well written albeit brief in the analysis. The study design is particularly interesting and novel and the methods used are comprehensive. Presentation of the climate impacts and results in general, could be improved. The results section is shorter than the methods. Discussion could be made more interesting. Overall, this will be a very good paper, but I think there are some changes that are within the authors reach to greatly improve the work. Criticisms below.

The authors appear to have made no efforts to make neither the results nor code avail-

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able. I urge the authors to make, at least the additional data used to make the figures available. Additionally, data on the NDC emissions scenarios and corresponding temperature outcomes from MAGICC would also be useful to the community (e.g. Fig 1).

One weakness, given the substantial work already done, is why not more climate impacts considered. The authors have gone great efforts in the first half of the work relating to NDCs, then only present three first order climate impacts. In the paper the authors estimate sea level rise impacts, extreme temperatures and economic damages – from different models/approaches. Considering Precipitation, both high and low indicators, would have surely been straight forward to add to the statistics on extreme temperatures, for example.

Figure 4 is nicely designed, essentially useless. Even if one could accurately read such small graphs, knowing the change in probability density function conveys very little information. You have made great efforts to make the first half of the paper policy-relevant – linking to NDCs etc – and then the way the Temperature and SLR impacts are presented and discussed is without value. At least CDFs could be used to show % of land impacted, or population impacted. In any case the figures are so small they cannot be used – the only point is to demonstrate that you have the information but have no intention for other people to use it.

Perhaps an illustrative diagram in section 2.1 would help describe the methods. I'm not convinced by using Txx – hottest day in the year, because I am unconvinced that the GCMs are able to consistently, especially across regions, reproduce the single hottest day each year. Why pick such a difficult target, when perhaps 5th hottest day each year, or a p99 over the 21-year period would probably equally be sufficient to estimate the changing temperature distribution and is likely much better reproduced by the models? If you insist on this indicator, can you provide some validation that at least the GCMs used accurately reproduce Txx for the historical period with error less than 0.6 degC – because that's the difference between your BE33 and 1.5C scenarios.

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Figure 3 – why is 1.5 in red, and NDC in Blue? This doesn't make sense and is opposite to Fig 4 and Fig 2 colour schemes. Are there no uncertainty ranges associated with the economic impacts assessment from the Burke methodology?

It's not clear what is the point of the including these climate impacts. The results are presented in a mechanical fashion. Why they are included, and justification for the specific impacts, is not provided. In the discussion there are only 4 lines about them. Try to explain the "so what" for the reader. What does 1m sea level rise mean? Does 1-3degC really make a difference for the hottest day of the year. It doesn't sound like much to regular people, but if you're an expert, we know it has impacts on animals, vulnerable people, chance of crop failure, labour productivity, power plant efficiencies, peak electricity demands, rail tracks and roads – and on and on and on. So try and bring this perspective to the reader, on why 1-3 degC change in hottest day of the year is significant. The same applies to sea level rise that is in the order of centimeters. . . doesn't sound like much, but if you live in Netherlands, or Bangladesh, or Miami – its terrible news!

Supplementary information is quite concise and no results provided in data form.

Line 79: Spell out AR5

Line 198-199 – you say 4degC here – but you should clarify that this is for the hottest day only, not mean temperature rise, as it could easily be misunderstood.

Line 231: You say results in line with other studies, yet you only provide one citation? Consider works that could back up this statement e.g. by Piontek et al (2014, PNAS), Scheussner et al (2016, ESD), Byers et al (2018, ERL), Mora et al (2018, Nat CC)

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