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Interactive comment on "The SSP greenhouse gas concentrations and their extensions to 2500" *by* Malte Meinshausen et al.

Malte Meinshausen et al.

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Reply to

Interactive comment on "The SSP greenhouse gas concentrations and their extensions to 2500" by Malte Meinshausen et al. Ron Stouffer ronstouffer@gmail.com Received and published: 14 October 2019

REVIEW:

A Review of "The SSP greenhouse gas concentrations and their extension to 2500" by Meinshausen et al. General Comments This paper is documenting the GHG concentration used in CMIP6 and therefore in AR6. It is important to publish such papers. I found the paper to be well written and informative, although the text does need cleaned

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Discussion paper

up in spots as I point out below. I am not an atmospheric chemist so much of the discussion is outside my area of expertise. Given my lack of expertise, I do not think this review is very helpful to the authors.

REPLY: Many thanks for your time to look through the manuscript. Your expertise as a member of the CMIP6 panel is much appreciated. END REPLY.

REVIEW: Detailed Comments 1. Lines 70 -77 – In CMIP (and the IPCC), AOGCMs are physical climate models. They may have some chemistry/vegetation/etc. incorporated into them BUT they do not close the carbon cycle and therefore need some concentration inputs. ESMs close the carbon cycle and therefore can be run with concentrations or emissions. The paper discussion confuses these things. All AOGCMs need concentrations of CO2 and potentially other GHG. Furthermore, there are concentration driven scenarios in the CMIP6 design (as noted in paper) which require concentrations. The discussion needs cleaned up.

REPLY: Thank you. We apologise for any confusion that arose from our previous formulation. We reworded now, so that it reads: “The atmosphere-ocean general circulation models (AOGCMs) are physical climate models that may include biogeochemical model components, such as vegetation or some atmospheric chemistry, but they are not able to project CO2 concentrations from emissions due to an incomplete, imbalanced or non-existent carbon cycle. The climate models that have this ability to project CO2 concentrations from emissions, are often referred to as Earth System Models (ESMs) (Jones, Arora et al. 2016, Lawrence, Hurtt et al. 2016). These ESMs are also often run in ‘CO2-concentration driven mode’ for computational ease and to allow for an easier separation between carbon cycle feedbacks and climate responses. As of today in phase 6 of the Coupled Model Intercomparison Project (CMIP6) (Eyring, Bony et al. 2016), both AOGCMs and ESMs use concentrations from all non-CO2 greenhouse gases (GHGs) to perform multi-gas experiment (such as the future scenario projections) due to either missing non-CO2 gas cycles or a prohibitive computational burden.” END REPLY.

2. Line 326 – Figure reference messed up.

REPLY: Thanks. Fixed. END REPLY.

3. Line 446, Figure 4 – In my version, the figure is hard to see. There is black text over top of other text and the figure itself, obscuring the information in the figure.

REPLY: This is a mysterious technical issue as the black text does show up normally as blue marker text in our PDF and EPS readers, but then turns odd in the automatic conversion on the journal's website. We hope that the final version won't face the same technical issue. END REPLY.

4. Line 731 – Text says "Check". It is important to check the data and the figure. It is something that most readers (non-atmospheric chemists like me) would understand.

REPLY: Apologies for these leftovers. Now revised as we deleted the temperature projections from this manuscript. END REPLY.

5. Line 735 – Text says "To Do - show this in figure. . .".

REPLY: Apologies for these leftovers. Now revised as we deleted the temperature projections from this manuscript. END REPLY.

6. Line 749 – five high priority – I thought there are 4 tier 1 scenarios. Type-o? If not, explain.

REPLY: IPCC WG1 will display five SSP scenarios as their so-called 'high priority' scenarios, which are the four TIER 1 SSP scenarios that were prioritized in the CMIP6 ScenarioMIP protocol in addition to SSP1-1.9, which caters for the renewed interest in a scenario that is potentially 1.5C compliant. We adapted the text accordingly. We attempted to describe this background already earlier in the paper in lines 112ff., where it says: "These nine scenarios comprise five high-priority scenarios for the Sixth Assessment report by the IPCC report, which is the group of four "Tier 1" scenarios highlighted in ScenarioMIP (O'Neill, Tebaldi et al. 2016) in addition to the SSP1-1.9 scenario that

reflects most closely a 1.5°C target under the Paris Agreement. “ END REPLY.

7. Line 924 – concentrations already rose to – Awkward in sentence. Change to – concentrations are 411 ppm.

REPLY: Thanks. Adapted. It now reads “In 2019, atmospheric CO2 concentrations are 411ppm.” END REPLY.

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