

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

### **Anonymous Referee #2**

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This paper describes the distribution of greenhouse gases (and some of their impacts) as needed for the CMIP6 experiments, especially ScenarioMIP and AerChemMIP. I find the paper very thorough in its documentation, and is clearly a very useful addition to the CMIP6 papers. I have minor comments listed below, and the authors can decide whether to integrate them in the next version:

Line 50-52: I am not convinced that the SSP are more evenly spaced than 2.6-4.5-6.0-8.5. The addition of 1.9 is useful for the lower end, but 6.0 or 7.0 is basically equivalent in terms of distance.

Line 63-64: “it is a collective choice. . .” seems like a policy statement that I don’t feel belong to the paper.

C1

Line 72: ESMs are driven by many more emissions than CO<sub>2</sub>

Line 86: the correct reference to the description of the experiments is the GMD papers, not the es-doc site.

Line 111: while aerosol abundances are important in present-day and early 21st century, this becomes much less of an issue further in the 21st century

Line 133: it might be beyond the scope of this paper but it would be useful to know how much of the difference in concentrations comes from the updated model. Could the old model be run with the current emissions/harmonization?

Line 188: it might be worth explaining in more details the meaning of “harmonization” and “categorization”

Line 225/line 238/line 553-554: the fact that the paper is from 2015 (WMO 2014) highlights one issue that keeps coming back, that is that the emissions/concentrations of ODSs are out of phase with the WMO recommendation. This is rather unfortunate, but also points to the fact that the system needed to create seems rather complicated/obscure and therefore limits the possibility to easily generate concentrations from other scenarios.

Line 256: “AerChemMIP”

Line 261 (also lines 268-269): what is the justification for bringing negative emissions to 0? Don’t we have the technology assumption to keep them negative? This seems arbitrary without a justification

Line 305: there has been a lot more work on OH concentrations since 2001 and 2011.

Line 327: problem with reference

Line 376: “while we do not entertain. . .” seems very much a lost opportunity. Even if it is only partial, adding knowledge on uncertainty, especially on feedback, would be quite important to discuss and include.

C2

Section 2.7: this section seems to be out of place since the discussion focuses on the concentrations

Line 584: It seems rather unfortunate that the research community only has access to a handful of those 475 scenarios. I strongly encourage the authors to identify a path towards a better integration between the two communities.

Section 4.4: it would be amazingly useful (and most likely powerful) if we had on the same graph all those scenarios, including IS92 and SRES!

Line 691-692: Why is SSP5-8.5 much higher than RCP8.5?

Section 4.5: I am not sure I fully see the value of this section. It seems that it will be much more useful to do an evaluation of MAGICC against the CMIP6 models.

Line 799-801: based on this, it seems that the whole discussion on latitudinal and seasonal variations could be significantly reduced.

Line 955: "AGAGE"

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-222>, 2019.