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Interactive comment on "The Scenario Model Intercomparison Project (ScenarioMIP) for CMIP6" *by* Brian C. O'Neill et al.

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We thank the reviewer for taking the time to read and comment on the paper, which has led to an improved manuscript.

Comment:

The paper clearly describes the ScenarioMIP design. Below are some comments about the forcing factors and definitions of radiative forcing that I hope the authors will consider and find helpful.

How is radiative forcing (e.g., Page 7 line 21) defined in relation to the SSPs? Is it 'Effective Radiative Forcing' or just 'Radiative forcing"? This should be clarified as there are different definitions of radiative forcing. See Section 8.1.1 in Myhre et al.,IPCC,

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2013.

Response:

We have clarified in footnote 3 (p. 7) that the definition of radiative forcing used in the scenarios is just “radiative forcing”, not “effective radiative forcing”.

Comment:

Are the forcing values for 2100 associated with the SSPs (e.g., 4.5Wm-2, 6.0Wm-2 etc) just from anthropogenic factors? If the recommended future solar and volcanic forcing factors are not included in the numbers, it could mean the radiative forcing for the future won’t actually match what is expected.

Response:

The forcing values for 2100 only include anthropogenic factors, consistent with the CMIP5 approach.

Comment:

The Figure 2 "Total Radiative Forcings" panel does not appear to have any natural (solar or volcanic) forcing variations in the past or future periods, however the "Temperature change" panel does have past volcanic forcing variations in it. Should the radiative forcing and temperature panels include the past and future volcanic and solar radiative forcing variations that are proposed?

Response:

(This comment applies to Figure 3, not Figure 2.) We have clarified in the caption and the figure (which is from Riahi et al., 2016) that the radiative forcing panel shows total anthropogenic forcing only, and that the temperature projections include natural forcing during the historical period and include solar but not volcanic forcing in the future, consistent with the approach taken in CMIP5. We have added references in the caption to the simple climate model used and to the methodology.

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Comment:

The future volcanic forcing (lines 17-19, page 20) is described as "ramped up" from the historical period in 2015 for the following 10 years. Should the impact on the analysis of MIPs that require simulations up to 2020 be considered? For instance DAMIP will require historical simulations be extended to 2020 (via ssp245). Delaying the "ramp up" could avoid the issue (e.g., Fig 14 in Jones et al., GMD, 2011).

Response:

The choice of how to handle volcanic forcing had to necessarily be a compromise. The need to maintain the same constant level as used in the piControl – and the ensuing need to make a smooth transition between historical and this constant level – dictated this choice. The assumption is that the value at the end of the historical simulation and that of the constant won't differ by a large amount and therefore the "ramp-up" won't introduce a significant signal. Note that the volcanic forcing during the historical period is also a time-varying forcing. DAMIP analysis will use single forcing (natural-only) experiments that will represent the effect of the forcing trajectory however specified.

Comment:

Are the authors aware of the unusual total solar irradiance being proposed for the future period (Lines 15-17 Page 20)? The proposed decline in TSI over the period and inconsistent magnitude/phase of the solar cycle may make comparisons with CMIP5's RCP simulations a little bit more difficult than expected. Additionally a more appropriate reference for the implementation of the future solar irradiance may be Matthes et al, "Solar Forcing for CMIP6", 2016 [to be submitted to GMD].

Response:

For consistency with assumptions in other components of CMIP6, we have chosen to use the proposed projection from Matthes et al (and updated the reference to this paper).

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Comment:

Given the ease of use of simple climate models (e.g. temperature panel in Fig 3), it would be useful to see the expected impacts of some of the choices with respect to what was done for CMIP5. For instance what is the expected impact of the proposal for future natural forcing factors on the global temperatures?

Response:

We anticipate that this type of comparison will be done once final marker scenarios are selected for each scenario in the design, and once emissions and land use projections have been harmonized across models and to historical data.

Comment:

There appear to be two "Riahi et al., 2016" in the references list. Are both referred to in the text?

Response:

We have corrected the reference list to indicate a Riahi et al reference in 2016 and another in 2015, and refer to them correctly in the text.

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