

## ***Interactive comment on “The Scenario Model Intercomparison Project (ScenarioMIP) for CMIP6” by Brian C. O’Neill et al.***

### **Anonymous Referee #2**

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#### General comments \_\_\_\_\_

This paper presents the rationale and experimental design of the internationally coordinated experiments of the intercomparison project ScenarioMIP proposed within the framework of the WCRP CMIP6 experiments.

This set of experiments aims at investigating future climate projections under different scenarios of emissions of greenhouse gases and aerosols as well as of land-use changes. The paper presents the new framework, which aims at better integrating climate projections with the IAM and IAV communities. It clearly describes the associated objectives and scientific questions. The paper also describes the eight different scenarios organised in two tiers, as well as their rationale. The relation with other CMIP6-endorsed MIPS is also well done and emphasizes the importance of Scenar-

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ioMIP. The overall number of experiments is quite heavy (8 plus extensions) and it is crucial to indeed have 2 tiers but also well clearly show what they will allow so that groups can decide their strategy.

The overall paper is crucial for CMIP6 and certainly deserves publication. It results from a strong collaboration between IAM and Climate modelling communities. The paper is very well written even if some few elements might be improved (see specific comments). It is important that the paper clearly emphasizes why it is needed to have new scenarios, how much they differ from previous RCP scenarios and what they will allow to investigate.

#### Specific comments \_\_\_\_\_

Part 2.2 describes the ScenarioMIP objectives. They are well described and fully relevant. Their role for policy advice on mitigation and adaptation could nevertheless be also mentioned, eg. Page 5, line 17, according to the importance they play on this aspect. It is only mentioned in Table 1 and in abstract.

In part 2.3, it would be good to have few sentences explaining what are the main characteristics of the 5 SSPs (e.g. page 6, line 3). The concept is important but not that well known from climate modelers that will contribute to ScenarioMIP. They are shortly characterised in Figures 1 and 2 but never really described in the paper. This is missing even if references to papers are given. Moreover, the Riahi paper that gives an overview is submitted but not yet available.

Part 2.3 explains the new framework but I think it could be a bit more explicit about why it is needed to update the RCPs to the SSPx-y scenarios. Updated emissions and land-use scenarios are mentioned. The main reason however appears to be for consistency with SSPs and that it will allow integrated studies. However, if the consistency with SSPs is described, not much is said about integrated studies.

Part 2.4 explains the main scientific questions to be addressed by ScenarioMIP. They

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are all important. However, I am missing a paragraph that would also remind the key scientific questions that scenarios can address such as how climate extremes are affected by the scenarios, how these scenarios will allow to address climate impacts, but also issue the questions behind the long-runs . . . In particular, none of the mentioned scientific objectives can only be addressed with Tier 1 whereas several to many groups may only perform Tier 1 simulations. Moreover, it is surprising to have as a first question, one that requires additional experiments that the 2 Tiers already quite demanding.

Part 3.3.2 would it be possible to be a bit more explicit on the underlying marker scenarios which are behind each SSPx-y ?

Part 3.3.2 clearly states that these new scenarios will differ from the ones used in CMIP5. However, this could be made more explicit using Figure 3 which represents both the old and new scenarios but with no comments in the text. Moreover, it would be good to better emphasize how much they will differ with regards to land-use change.

Technical comments \_\_\_\_\_

Page 2, line 11: AR4 and not AR5

Page 16, line 11, the title is misleading and should not mention CO2 since in the text it is clearly said that scenarios will be concentration driven for long-lived greenhouse gases.

Page 17, line 25: the forcing harmonization is not clear. What it aims at should be explained and a reference given.

Page 20, line 24, please add the reference for the data request

Page 20, lines 15 to 19: Specifications for the natural forcing differ from CMIP5, which should be made more explicit.

Page 20, I have not found a mention to the initial year of the scenarios. Page 20

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mentions end of the historical period 2015 but Figure 3 seems to show 2005 as for previous RCPs ? At least it should be mentioned clearly.

Page 21 the paragraph on data availability would rather better fit at the end of part 4.

Page 27, line 27, this reference is mentioned 2015 in the text not 2016. Please check. If 2016, it will important to specify 2016 a and b

Table 2 is a very good idea. However, some links may be missing concerning the overshoot experiments as mentioned in the text but not in the table ?

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Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-84, 2016.

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