Geoscientific
Model Development
Discussions

Interactive comment on "High Resolution Model Intercomparison Project (HighResMIP)" *by* R. J. Haarsma et al.

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Response to SC3 by Klaus Wyser:

"There is an inconsistency in the suggested GHG forcing (concentrations) between the historical and future run. For the historical run it is suggested to use the new data for CMIP6 but for the future run it will be the old RCP8.5 scenario from CMIP5 (Table 1and 2)."

We agree that there is an inconsistency between using for the historical run the new data of CMIP6 and for the future the old RCP8.5 scenario. The motivation for that is the European H2020 project PRIMAVERA. The partners in this project will start their simulations in the boreal summer of 2016 and will deliver their Tier 3 simulations up to 2050 by the end of 2016. The Tier 2 simulations will be finished in the boreal spring

of 2017. The new CMIP6 scenario's will be ready only by the end of 2016 according to present estimates, thereby causing a mismatch with the time schedule of the PRIMAVERA runs. Delaying the PRIMAVERA runs is not a viable option because first of the obligations to the European commission and second because the dependencies of other parts (analysis of the runs, model improvements, impact studies) of PRIMAVERA on those runs. We argue that the switch from CMIP6 historical forcing to future RCP8.5 is an acceptable compromise for the PRIMAVERA partners. The difference between the high-end scenario for CMIP6 and RCP8.5 will be limited up to 2050.

We realize, however, that for other centers, this is a sub-optimal solution and that they would prefer to use a high-end SSPx scenario when it is available. We have therefore decided to make the SSPx as the standard for Tier 2 and 3, and included the RCP8.5 option as a targeted experiment (3.4.e) for those centers that have to start earlier. In the description of this targeted experiment (9.3.5), it is stated that if in a joint analysis the SSPx and RCP8.5 ensembles appears to be significantly different, than the RCP8.5 centers are recommended to repeat their simulations with SSPx, which, due to the short integration period of 36 years, should not be prohibitive.

Below we will in detail discuss the mentioned inconsistencies between CMIP6 and RCP8.5 and how they can be handled.

"This inconsistency causes two problems:"

"1) It is more difficult to have a model version that can handle both the old and new foricng datasets at the same time. It would be pretty easy if it would be just a text file that changes when going from CMIP5 to CMIP6 forcing, but this is not the case. For CMIP6 it is recommended that the models use monthly varying zonal distributions or at least separate GHG concentrations in the two hemispheres (see http://www.climate-energy-college.net/search/content/cmip6). For CMIP5 on the other hand only global annual means have been prescribed. Implementing both options for 1-d and 3-d forcing is not impossible yet certainly nothing positive."

This is indeed an issue. For the historical period we recommend the CMIP6 forcing including the monthly varying zonal or hemispheric distributions. For the future period the distribution of the end of the historical period can be used and subsequently rescaled according to the change in the global annual mean as given by CMIP5. This has the advantage that the forcing structure is according to CMIP6 for historical and future period and that when SSPx is available this will only require a change in the content of the input files.

"2) How consistent are the CMIP5 and CMIP6 forcings? I can imagine that there will be a change in GHG concentrations if the new CMIP6 data are used until 2014, and the old data afterwards. We cannot tell because the future GHG emissions aren't available at this stage, but I am pretty sure that the creators of the dataset will check that historical and future scenarios of the CMIP6 datasets match, but I doubt that they check if historical from CMIP6 and future from CMIP5 data sets fit well together. I would suggest that the GHG forcing is kept consistent across the historical and future simulations (as it is to be done in any other MIP). Either we take the CMIP6 GHG forcing for both phases (preferentially), or the old RCP8.5 from CMIP5, but not a blend of the two."

We agree that there will be no perfect match between the historical CMIP6 and future CMIP5 forcings. We are, however, confident that the mismatch will be small, and can be solved with a smooth interpolation. The advantage is that the historical period, which covers 64 years will then be in agreement with the CMIP6 protocol. The much shorter future period of 36 years will deviate, but can more easily be redone if necessary.

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