

Interactive comment on “Historical greenhouse gas concentrations” by Malte Meinshausen et al.

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This comment raises the fairly narrow question as to whether the level of detail provided by this reconstruction of greenhouse gas concentrations is appropriate for CMIP.

Without diminishing the tremendous amount of work represented by this reconstruction nor its possible value in other contexts, discussions with modeling centers over the protocol for the Radiative Forcing MIP (<https://dx.doi.org/10.5194/gmd-9-3447-2016>) suggests that much of the detail in these specifications will not implemented as part of the CMIP6 protocol. In particular:

1) We fear that few modeling centers will implement the latitudinal variations or vertical profiles of well-mixed greenhouse gases as described in section 4. We discussed this only with GFDL and the Met Office, so we may well be wrong, but these are two top-notch centers with strong local interest and expertise in radiation issues, and both will

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use time-dependent scalar values.

2) The three options for describing atmospheric composition (lines 369-377) offer a useful range of compromises but option 1, using a subset of gases, might be improved by greatly restricting the number of halocarbon species provided. It is not clear how many, if any, line-by-line models include the long list of species. It is certain that no climate model radiation codes include more than a few. Based on rough calculations using radiative efficiencies from IPCC AR4, including only CFC-11, CFC-12, HCFC-22, CFC-113, HFC-134a, and CCl₄ reproduces the total instantaneous radiative forcing in 2014 to within 0.045 W/m².

If the protocol includes levels of details that modeling centers are unlikely to observe it may be more appropriate to reduce to level of detail to something practical.

On a distinct issue, we are surprised that the protocol does not include estimates of CO. Rough estimates suggest a clear-sky instantaneous radiative forcing at 2014 of roughly 0.05 W/m², or the same contribution from one gas as from 35 of the specified halocarbons in total.

With best regards - Robert Pincus, University of Colorado (lead coordinator, RFMIP)
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