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Interactive comment on "Implementation of the Community Earth System Model (CESM1, version 1.2.1) as a new basemodel into version 2.50 of the MESSy framework" *by* A. J. G. Baumgaertner et al.

Anonymous Referee #3

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The paper by Baumgaertner et al. describes the coupling of two model systems, namely the Community Earth System Model (CESM1) with the Modular Earth Submodel System (MESSy). With that, the dynamical core of CESM1 can be used as a replacement of that of ECHAM5. The coupling is described in very technical detail and would provide a basis of many possible model studies.

For the reader, the paper is packed with many technical details are hard to follow as it requires the detailed knowledge of MESSy and CESM1. My impression however is that all relevant details are documented, which includes also the chemistry scheme MECCA, the new submodel VERTDIFF for the simulation of vertical diffusion and the detailed setup of the namelists as well as a technical implementation documentation

that gives also information about the run scripts.

The coupled model is documented by two example applications to demonstrate the strength of the model, the simulation of the global electric circuit and the comparison of trace species (surface OH and zonal mean ozone).

The example of the global electric circuit is elaborated to a certain extent while the comparison of two plots of chemical trace species is not very sufficient. Unfortunately I cannot judge the global electric circuit example, because I am not expert in this field.

The comparison in trace species is reduced to only two plots that are compared. Although this is a model description paper, I would expect somewhat more explanation about the scientific meaning of these figures. The figures are thought only to be an example that can show that these two parameters are simulated similarly. However, the example of surface OH with given boundary conditions is more or less determined by the boundary fluxes and the integration of the chemistry module. I see this not as the best test of the full capability of the model. Therefore similarities are not surprising. It would be a better test to show OH for a higher model level, in which the results is also affected by the calculated transport and dynamics. Therefore I suggest to replace the surface OH figure by one example on a different model level.

The comparison of polar ozone profiles does show that the EMAC model does reproduce the ozone hole better than the new model (20-25 km, September/October). This should be mentioned. My impression is also that the maximum ozone mixing ratios are somewhat too high compared with polar observations. As the relevant quantity ozone column is weighted by the molecule number density, it would also be nice to have lower panels of Fig. 5 that show the corresponding time development of the ozone column.

I suggest this paper may be the basis documentation of future scientific studies by this model coupling, therefore it seems justified to publish this model description in GM with the small changes and additions suggested above.

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