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Geoscientific
Model Development
Discussions

Interactive comment on "A new version of the CNRM Chemistry-Climate Model, CNRM-CCM: description and improvements from the CCMVal-2 simulations" *by* M. Michou et al.

Anonymous Referee #2

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The authors document the changes in performance between a previous version of their model, CNRM-ACM, and the new version, CNRM-CCM. They compare new model results to CCMVal-2 model results, ERA-40 and ERA-interim reanalyses, and various observational data sets. Basically they show that the new model performs better in many respects than the predecessor. The paper is useful as a documented performance benchmark against which future developments of the model can be compared. It is generally well written and the graphs are lucid. A weakness of the paper, as commented on by reviewer 1, is that it only documents performance and does attempt to explain the differences in performance. The authors indicate that differences in the coupling method and changes to the radiation scheme may have caused the perfor-

mance improvement. It is possible that investigating these causes would require a substantial effort. I suggest that more is made of the linkages between the different performance changes. For example, differences in tropopause temperature would be linked to changes in the stratospheric water vapour; changes in the Brewer-Dobson circulation would be linked to changes in total ozone, etc. Also, a few sentences about the future applications of the model may be of interest, as well as possible future lines of model development. There is a tendency in the field of CCM modelling to become more comprehensive, e.g., by incorporating a troposphere-stratosphere chemistry scheme, or by coupling to an interactive ocean. CNRM-CCM does not include these features but may well do so in future versions.

I recommend publication after the following minor comments are addressed:

Section 2.1.1: How do you deal with sea-surface forcing? Which off-line SSTs are used? Can you use an interactive ocean with chemistry?

P1134, l6: So you do not couple other GHGs, such as CH_4, N_2O, and the CFCs?

P1136, l11: Is this inconsistent with P1134, l6?

P1136, l24ff: It is correct that most CCMVal-2 models do not include a detailed tropospheric chemistry, but many use a background chemistry based around CH_4 oxidation, which is relatively adequate in remote regions of the planet. This might have been an alternative approach to take.

P1138, l12: What are the consequences of not having a QBO in your model? Erroneous wave amplification of planetary waves? Biases in polar ozone? Please expand.

P1145, section 3.2.4: Errors in transport were often reflected in unrealistic Cl_y, e.g., in CCMVal-1 Cl_y used to be larger in the stratosphere than the maximum of imposed chlorine at the surface, or unrealistically smaller. How does your model behave in this regard? I suggest to include a plot of total organic + inorganic chlorine, as a function of time, such as in WMO (2007), figure 1-10.

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Reference:

World Meteorological Organization (WMO), Scientific Assessment of Ozone Depletion: 2006, WMO Global Ozone Research and Monitoring Project – Report No. 50, 2007.

Interactive comment on Geosci. Model Dev. Discuss., 4, 1129, 2011.