



Interactive comment on “The SOCOL version 3.0 chemistry-climate model: description, evaluation, and implications from an advanced transport algorithm” by A. Stenke et al.

Anonymous Referee #1

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This article presents a new version of the SOCOL chemistry-climate model. After a description of the evolutions included in the model, a number of diagnostics, based on previous chemistry-climate model intercomparison/evaluation exercises (CCMVal-1, CCMVal-2), are discussed. Overall, the article is clearly written and well prepared. The paper is useful as a documented performance benchmark against which future developments of the model can be compared. The illustration of the overall improvement is interesting and useful as synthetic information. I recommend publication after the following comments are addressed.

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General comments

If my understanding is correct, vs2 simulation uses an underlying GCM different from that of the vs3 simulations. Can you make two simulations with the same GCM and the transport schemes presented in this article to distinguish between what is linked to the change of GCM and what is linked to the change of transport scheme? If not, as the differences in Figure 1 (b) and Figure 1 (d) are striking, additional references that would show the impact of a similar change in transport scheme would be beneficial.

Specific comments

- page 3422 line 5: CCly and CCly page 3430 line 7 have slightly different definitions. Please specify which one you used.
- page 3424 line 25: rather than the ‘The Chemistry scheme is called’ shouldn’t it be ‘The CTM is called’?
- page 3425 line 3: can you provide an indication of the ‘further reduction of the wall clock time’?
- page 3425 line 15: does the model with 39 levels go up to 0.01 hPa?
- page 3428 line 11: why did you analyze the 1975–2004 period, and not the 1960–2004 period as defined in CCMVal-2 REF-B1?
- page 3428 line 22: for the years 1950... why 1950?
- page 3429 line 4: ‘wet deposition velocities’: I think that the correct wording should be ‘wet removal rate’, and Hauglustaine 1994 has a different list of species that undergo wet removal. What is your list of species that undergo wet removal?

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- page 3429 line 22: instead of 'The assimilation' use 'The nudging'
- page 3430 line 7: 'Due to the absence of atmospheric sinks and sources': please provide additional explanations for this 'absence'.
- page 3433 line 12: does the SOCOL vs2 simulation cover the CCMVal-2 REF-B1 period, i.e. 1960-2005, or does it cover the 1975-2004 period?
- page 3433 line 22: I would not include the sentence: "The general characteristics of the model temperature biases are similar in both revisions.", as this is not the case for all parts of the stratosphere.
- page 3435 line 6: 'shows very similar temperature biases...'. Can you indicate that this is true for all time periods and all latitudes analyzed? This seems a very strong argument. Can you include references that would confirm (or not) a similar result?
- page 3439 line 25: I think that 'substantial' is a little too strong
- page 3342 line 11: the best agreement of T42 versus observations is not that clearly visible. Can you add four figures, for 1980-1989 and for 1990-1999 of the differences between NIWA and the corresponding T31 and T42 simulations?
- page 3459 Figure 4: what is this NCEP/NCAR data compared to the NCEP data listed elsewhere in the text?
- page 3461 Figure 6 (and following): please indicate over which years the climatologies (obs and model simulations) have been calculated.
- page 3463 Figure 8: it would be preferable to have averages over the time period of the HALOE observations (1992-2001).
- page 3466 Figure 11: the NIWA 1990-1999 contours are curiously unsmoothed. Do you have an explanation for that?

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Typing errors

- p 3428 line 11 : horizontal resolutions
- page 3433 line 19 the ERA-40
- page 3436 line 21 to be a more reliable
- page 3342 line 23: previous sections
- page 3457 Fig2: relative to the ERA-40 reanalysis

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