

## ***Interactive comment on* “Evaluation of the new UKCA climate-composition model – Part I: The stratosphere” by O. Morgenstern et al.**

### **Anonymous Referee #2**

Received and published: 2 February 2009

#### General comments:

This paper describes a new coupled chemistry-climate model with focus on the stratosphere. A 30(20)-year simulation has been made to compare model output with measurements, looking at both dynamical and chemical aspects. The paper is well written both in terms of language and structure. The evaluation is comprehensive, and at the same time not too excessive and to the point. The paper is purely technical, but as such fits well into the scope of GMD. I agree with publication after some minor additions and corrections.

#### Specific comments:

1) I like short abstracts, but this one is too short. Within 150-300 words one could

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list in more detail which (chemical and dynamical) components have been looked at and mention the most important satisfactory results, but also the main problems that remain.

2) I suggest some additions to make the paper more complete and interesting to read: In the introduction add one paragraph mentioning the most important couplings between chemistry (ozone chemistry, long lived GHGs, aerosols, heterogeneous processing,...) and climate (e.g. Brewer-Dobson, QBO, humidity, ...). Why do we need coupled models. What are the main scientific issues that should be addressed by them.

3) Since this is a rather technical paper, the authors should detail to some extent their suggestions and plans on how to resolve the problems identified in the model. What should development and testing focus on in the near future? An attempt is made in the last three sentences of section 5, but should be more detailed. Which steps are needed to tackle which problem?

Technical comments:

page 382, line 2: add '(UKCA)' after 'model'

page 383, line 13: 'be' is missing

page 383, line 14: I suggest 'Model description' as a header (the entire paper is about 'The stratospheric UKCA model')

page 385, line 3: 'would be important for polar ozone chemistry', so why is scattering of short wavelengths omitted?

page 385, line 13: 'Table 7': "Tables" 6 and 7 should be combined, e.g. one column for wet, one for dry deposition. One could even consider including all this information in Table 1, e.g. bold type species for wet, underlined species for dry deposition.

page 386, line 20: 'of Table' -> 'in Table'

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page 386, line 23: 'Species with feedback...' shouldn't this be a part of the model description?

page 386, line 14: Mention CH<sub>4</sub> and N<sub>2</sub>O here as well. Up to which altitude are these components fixed (thickness of surface layer?)

page 386, line 23: 'Species with feedback...', shouldn't this be part of the model description?

page 387, line 10: 'The bias' -> 'The warm bias'

page 388, line 1: 'UKCA-Strat' -> 'strat-UKCA'

page 389, line 20: remove sentence 'By construction, ..' - obvious.

page 389, line 25: '... and may be related ...' - explain how a warm bias in the tropics could lead to a larger difference in age-of-air

page 390, line 16: '... would be beneficial.' - explain which independent data. Are there any plans to do this? Should be mentioned here, or in the last section.

page 392, line 2: remove 'again'

page 394, line 22: why this information here, and not when that paper is mentioned a few lines above? List of references: remove page numbers at the end of each reference

page 406, lines 91-95: it would look better if these equations were balanced (or at least use dots)

Caption of Table 9: For better readability, write 'Surface boundary conditions needed for chemistry: Volume mixing ratios (VMRs) for CH<sub>4</sub>, N<sub>2</sub>O, and alogen source gases. Cly and Bry ... b) Surface VMRs for the CFCs and CO<sub>2</sub> (needed for radiation). 3-dimensional distributions...'

Table 10: If you combine "Tables" 6 and 7 (rather than merging them into Table 1), then "Table" 10 could become the third column there.

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Caption of Table 11. Move asterix to end of caption and remove =

Caption of Fig.4: add 'in Strat-UKCA'

Caption of Fig.8: '(right)' -> 'Right:'

Caption of Fig.10: insert 'and' before '(bottom)'. Similarly for Figs.11-14

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Interactive comment on Geosci. Model Dev. Discuss., 1, 381, 2008.

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