

Interactive  
Comment

## ***Interactive comment on “Online coupled meteorology and chemistry models: history, current status, and outlook” by Y. Zhang***

Y. Zhang

Received and published: 25 March 2008

Reply to Comments by Anonymous Referee 2

Comments:

This is a review article of coupled meteorological-air quality models. As far as I know, it is the first such review and an important study because it helps to disentangle the capabilities of several very complex models, giving users of such models and readers of papers based on such models more insight into their relative abilities. I strongly encourage its publication. Below are a few minor comments that the author should address.

Comments:

P. 1838. Mickley et al. found#8230;What processes were treated as online versus

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offline in this study?

Reply:

The main difference in the online and offline simulations of Mickley et al. (1999) lies in whether the radiative forcing of O<sub>3</sub> was calculated every 5-hr online (in GCM) using simulated O<sub>3</sub> from a detailed online tropospheric O<sub>3</sub>-NO<sub>x</sub>-NMHCs chemistry or calculated offline using monthly-mean O<sub>3</sub> fields from the same GCM simulations. In the online calculation, the radiation does not feedback into the GCM climate calculation. This has been clarified in the revised version.

Comments:

P. 1838. "Constrains"; should be "constraints";

Reply:

This has been corrected.

Comments:

P. 1838. What do you mean by "variables are simulated together in one time step without a model-to-model interface"? Do you mean that the equations are all solved simultaneously with a nonlinear equation solver or that processes are operator split seamlessly between meteorological and air quality processes?

Reply:

"a model-to-model interface" means an interface between the meteorological and atmospheric chemistry/air quality models. In online models with this type of coupling (i.e., unified online coupling), the equations can be solved simultaneously with a nonlinear equation solver or the meteorological and air quality processes can be solved seamlessly using operator splitting, the latter has been used in nearly all 3-D AQ models at present.

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This has been clarified in the revised version.

Comments:

P. 1842. Also simulated highly-simplified aerosol treatments and the direct radiation feedbacks (personal communication). Unless there is a traceable and publicly accessible description of treatment or result, such personal communications should not be included as a reference in a review article. Review articles are, by definition, reviews of the public (peer-reviewed and grey) literature, which is the standard method of communicating scientific results. This also applies to the statement on p. 1852, The feedbacks between meteorology and chemistry via aerosol radiation (personal communication).

Reply:

Alexander Baklanov, personal communications, Danish Meteorological Institute, 2007; in p1842 has been removed. Baklanov (1988) should be a sufficient citation for this statement.

Jerome Fast, Personal Communications, PNNL, 2007; in p1852 has been replaced by Gustafson, W. I., E. G. Chapman, S. J. Ghan, R. C. Easter, and J. D. Fast (2007), Impact on modeled cloud characteristics due to simplified treatment of uniform cloud condensation nuclei during NEAQS 2004, Geophys. Res. Lett., 34, L19809, L19809, doi:10.1029/2007GL0300321.

but it is being implemented (Hong Liao, Chinese Academy of Sciences, China, personal communications, 2007); in p1862 has also been removed.

Comments:

P. 1845. Please define community model. I assume this means model that has been released publicly. If so, it is not clear why it is relevant whether a model is a community versus a research-grade model. In either case, the definitions should be clear.

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Reply:

A community model refers to a model that is publicly available. This type of model represents synergistic model development efforts by contributors from community and it can be either an application-oriented or a research-grade model or both. Examples include NCAR's CAM3, NOAA's WRF/Chem, and EPA's CMAQ. While this is not directly relevant to the online coupling feature of the model, it is an important feature of WRF/Chem that is worth mentioning, as it represents a major trend of development and application of current models including online coupled models.

Comments: P. 1845. and will become more complete as more developers from community; What happens in the future is not so relevant to the present paper and is speculative. The paper should focus on what has occurred to date, particularly since all models will change in the future.

Reply:

In the revised version, the statement and will become more complete as more developers from community contribute to its further development; has been removed.

Comments:

P. 1865 ff. The case studies do not appear to add much to the paper. If they are important, the author should explain why they are important. My feeling is that they most people will skip over this information. To make the paper more concise and effective, I would suggest removing the case studies unless a good rationale is provided for keeping them.

Reply:

The purposes of the case study section are (1) to illustrate some of the feedbacks discussed previously using a few examples, which will support their occurrence and pro-

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vide quantitative estimates on the magnitudes of some of such feedbacks (2) to review the current status of model capability in simulating such feedbacks with the state-of-the-sciences treatments. This information supplements the detailed description in previous sections for a better conceptual understanding of feedbacks.

The rationale for inclusion of case studies has been added in the revised version.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 1833, 2008.

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