Atmos. Chem. Phys. Discuss., 8, S10046–S10049, 2008
www.atmos-chem-phys-discuss.net/8/S10046/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mechanisms controlling surface ozone over East Asia: a multiscale study coupling regional and global chemical transport models" *by* M. Lin et al.

O. Cooper (Editor)

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Received and published: 22 December 2008

This review is by Owen Cooper, editor of this manuscript. For now I am making recommendations as to how the manuscript can be improved from both a scientific and stylistic viewpoint. I have not yet had the benefit of reading the reviews of the two anonymous referees, and I will wait until I have read their evaluations before I make my recommendation regarding publication in ACP. I am providing my comments now to allow the authors plenty of time to address my concerns, especially the need to obtain the actual ozone data from several sites in China, rather than relying on values reported in the literature.

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Interactive Discussion

Discussion Paper

Please note that the ACPD editorial website has a flaw in which the apostrophes and quotation marks that I enter in my report are replaced by character strings such as: &#8220 I have not been able to resolve this problem, but hopefully it will cease as soon as ACPD upgrades its website next year. My apologies if these characters make my report difficult to read.

Major comments:

1) The authors need to make a clear statement about the purpose of the paper and what they hope to achieve. In the Introduction the authors state that “the response of local and regional O3 in Asia to choice and implementation of chemical mechanisms has not yet been evaluated.” This appears to be the main motivation of the paper but it needs to be more prominent. Also, in the Conclusions, the authors need to provide some recommendations for future model simulations and configurations. At line 15, page 20242, say something like:

“The purpose of this paper is to provide a first step in evaluating the response of CTM simulations of local and regional O3 in Asia to the choice of chemical mechanisms, horizontal scales and boundary conditions. From this analysis we make recommendations regarding optimal regional-scale CTM configurations for future studies of east Asian ozone production.”

2) I am concerned by the fact that the model is run for the year 2001, but only 12 of the 22 surface stations discussed in this study have data from 2001. I don’t think the authors have done enough to address the influence of interannual variability when comparing a simulation of 2001 ozone to measurements from other years. The authors did point out that the transport patterns were slightly different in 2001 compared to the climatology, but what about the ozone values? How different was ozone in 2001 compared to other years? This comparison needs to made for the sites that have data from 2001 and other years, such as Beijing, Mondy, LinAn and Mt. Waliguan, as well as for several of the Japanese sites.

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3) A recent paper that needs to be referenced and compared to is Wang et al. [2008]. This paper describes the summertime ozone variation at Miyun, a rural site on the northern edge of the North China Plains and downwind of Beijing. These authors describe the influence of the summer monsoon on the decrease of ozone mixing ratios in July, even though CO mixing ratios increase. This paper is especially relevant to your discussion of ozone overproduction during summer on page 20251

Y. Wang, M. B. McElroy, J. W. Munger, J. Hao, H. Ma, C. P. Nielsen, and Y. Chen, Variations of O3 and CO in summertime at a rural site near Beijing, Atmos. Chem. Phys., 8, 6355-6363, 2008

4) Please elaborate on the vertical collapsing to 8 layers. Does this mean that CMAQ only calculates transport and chemistry on 8 levels? How many levels are in the lowest 2 km? Wouldn’t coarse vertical resolution explain why O3 is over predicted in Beijing at night because you are not developing a strong surface inversion? Similarly in Section 4.2.1 you discuss the effect of model resolution on boundary layer depth. You state that the finer scale MM5 run has a better resolved nocturnal boundary layer depth, but I don’t see why this would matter if the MM5 data for both the 27 km and 81 km runs is degraded to only 8 levels. Shouldn’t both CMAQ runs have nocturnal boundary layers that are equally resolved by this coarse vertical resolution of only 8 levels?

5) The standard of English is quite good, but there are many instances of grammatical errors or awkward phrasing that need to be corrected. Please proof read the paper for these types of errors.

Minor comments

Abstract, line 7 change inflows to inflow

Abstract, line8 should be “over the northern domain”

page 20244 line 14 What do you mean by physical parameterization? Do you mean

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parameterization of deep convection, and/or shallow convection?

page 20250, line 6 change response to respond

Page 20251 lines 22-24 You note that ozone at a site north of Beijing in 2005 is greater than ozone in Beijing over 1995-2005, and imply this is due to interannual variability. But couldn’t this just be spatial variability, with the site north of Beijing sampling the aged urban plume that has more time to produce ozone?

Page 20252, line 4-5 I don’t follow why you need to state that the 2004 data are not shown, when the model was not run for 2004.

Page 20252 line 21-24 Here you state that the typical flow pattern of air to central China during the monsoon is from the southwest, but to me it looks like it’s from the south or southeast.

Page 20258, line 27 Wouldn’t high nighttime ozone at Mt. Happo be explained by the fact that this is a high altitude site that becomes decoupled from the surface and dry deposition processes at night?

Throughout the paper, when discussing data in units of ppbv, refer to the data as mixing ratios and not concentrations.

Figure 6 Here the back trajectories from Mt Tai are initialized at 1000 m, but Mt Tai is at 1500 meters. Why the discrepancy? The back trajectories need to be initialized at 1500 m. In the text you need to give more explanation of the clustering method. Did you specify that only 4 clusters would be produced for each year? What does the color of each trajectory signify?

Figure 2a The caption mentions whiskers but I don’t see any in the figure. Please be specific about which years you are showing data from, for the model and the observations.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 20239, 2008.

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