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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.

M. Lin et al.

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Correction on Response to Referee 2

Due to a technical issue of LaTeX, previous response to specific comments 1 is incomplete. We apologize for the mistake and correct the response as follows:

Specific Comments 1:

Evaluation of CMAQ performance is covered very well in the paper, but it is not entirely clear how the results may be of use to others. The comparison of CBIV and SAPRC99 remains inconclusive; although there are sometimes large differences between the results, it is not clear why the more simplified CBIV scheme is "better". More concrete

conclusions on this are required here.

Response to Specific Comments 1:

We agree with the reviewer that the statement that "CB4 is better for regional ozone" is not defendable. Therefore, we have removed this statement and followed the suggestion by Review 1 to compare with TRACE-P measurements. The discussion about the chemical mechanisms has thus been rewritten in the revised manuscript. The overall conclusions are summarized below:

Central eastern China is found to be the most sensitive region to the choices of chemical mechanisms. Central eastern China appears to be the most sensitive region in our study to the choice of chemical mechanisms. Evaluation with TRACE-P aircraft measurements reveals that neither the CB4 nor the SAPRC99 mechanisms consistently capture observed behavior of key photochemical oxidants in springtime. However, our analysis finds that SAPRC99 performs somewhat better in simulating mixing ratios of H_2O_2 and PAN at flight altitudes below 1km. The CB4 mechanism overpredicts H_2O_2 by a factor of two, which is caused by higher self-reaction rates of HO_2. SAPRC99 predicts 50% of higher PAN because more PAN products and lower decomposition rate of PAN are considered in SAPRC99 than in CB4. The overall higher load of VOC, explicit organic peroxy radicals, and inclusion of radical recycling processes explain why SAPRC99 predicts 10-20 ppb higher O_3 during summertime for central eastern China and downwind areas. Our findings suggest that future model studies over this region should carefully examine chemistry sensitivities, especially in regulatory applications such as designing of emission control policies. Between CB4 and SAPRC99, the more detailed SAPRC99 mechanism is suggested for future studies examining high O_3 episodes, the impacts of large releases of reactants, and multi-day effects. But results need to be interpreted with care.

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