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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The Response of surface ozone to climate change over the Eastern United States" *by* P. N. Racherla and P. J. Adams

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RESPONSE TO ANONYMOUS REFEREE 2

Specific comments

#1 Since the GEOS-CHEM model (*Bey et al.*, 2002) and the "unified" model that we utilize share a common heritage, we do not present here a detailed analysis of the present-day O_3 distributions; instead, we cite earlier studies, which have focused on that issue. Please see Section 3.1 of the revised version.

#2 The point regarding a less extreme warming scenario is well taken. We have not investigated that issue in the current study but expect that the result could be, in general, extrapolated to other studies of its kind.

#3 Yes; these results were presented in an earlier paper (*Racherla and Adams*, 2006).

#4 We wanted our “ozone season" to include more than the traditional summertime months (Jun/Jul/Aug); the decision to use the months May-Sept was guided by the months through which the O_3 data is reported to the US EPA towards the calculation of the 8-h std.

#5 We now present updated, detailed analysis of the residual 50% of the increase in O_3 episodes (please see Section 3.2). We explain how the increased O_3 chemical production is due to a combination of increases in: 1) natural isoprene emissions; 2) HO_2 concentrations resulting from increased water vapor concentrations; and, 3) NO_x concentrations resulting from reduced PAN. A discussion on what might happen if isoprene nitrates were assumed to be a terminal NO_x sink is also included towards the end of Section 3.2.

#6 A detailed discussion on the PAN-NO_x changes in the future climate simulation is presented in Section 3.2 now. One main inference we have drawn is a shift (increase) in the NO_2:NO ratio.

#7 A very valid point indeed: we have a separate paper (due for submission to ACP) on these issues coming out shortly.

#8 We agree, this figure (now Fig. 6) has been replaced with one illustrative panel.

#9 This is an important point. The most substantial aspects of the budget that we have discussed (eg. O_3 chemical production values and dry deposition) are fairly robust. Net transport is, of course, sensitive to the choice of the surface layer alone vs. boundary layer, which includes the first 2 model layers.

#10 We have clarified these issues as appropriate in the revised version.

#11We have reworded the abstract and these comments have been suitably incorporated.

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Interactive Comment