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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effect of regional precursor emission controls on long-range ozone transport – Part 1: short-term changes in ozone air quality" *by* J. Jason West et al.

Anonymous Referee #1

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This paper describes the effects of NOx emissions from different source regions on surface ozone, quantifying transport between source-receptor pairs and assessing the air quality impacts in populated regions. The study clearly identifies the regions on which long range transport has the greatest influence, but demonstrates that there can be substantial differences between its effects on major urban areas within a single region. As previous studies have shown, tropical source regions are identified as having the greatest effects on ozone. While this paper confirms the results of earlier studies, it provides a more coherent and self-consistent analysis, and contributes interesting new elements in comparing export tendencies with extra-regional production, drawing attention to the role of NMVOC emission changes in altering this balance. The results

of this paper are interesting and scientifically valuable. The manuscript is clear, well organized and well presented and is suitable for publication in ACP with relatively few changes.

One thing missing from the paper is an assessment of the uncertainties or limitations inherent in the study. How robust are the results? How sensitive are they to the assumptions made or the approaches taken? While a full quantitative analysis is not expected here, it would be valuable to provide a brief assessment of this that goes further than the simple warnings provided at the end of the conclusions.

page 7039, line 15: How is population weighting done? Are the weighted values greater than spatially-weighted mean O3 over key regions? Table 1 does not allow a direct comparison as population-weighted values are only presented for a 3-month period. Are the differences consistent, and are they meaningful in light of the O3 removal expected in highly polluted populated regions?

page 7043, line 9: "lower sensitivity" needs to be explained more clearly here, as it provides little insight into how the differences arise. Does it reflect differences in chemistry, in boundary layer mixing, or just different emissions It would be valuable to explore this more deeply.

page 7045, line 16: it would be helpful to emphasize the physical scale of these "metropolitan" regions (about 900x900 km square); although the approach taken here is appropriate from a global modeling perspective, the scales remain far larger than those typical of metropolitan regions, even for the largest megacities.

page 7048, line 9-12: The conclusion here needs to be supported by a more detailed or quantitative analysis. The O3 sensitivity is governed by O3 distribution and therefore lifetime, not just by production. While the statement made here may be true, it should be relatively easy to quantify the relative contributions of the different effects.

page 7050, line 2: "...decrease...increased... is unclear and should be rephrased

Figure 5 would be clearer with the individual frames on each plot removed.

Table S3: the results of the model used here are significantly different from those of the models in the other study cited. The conclusions of this study would be stronger if the reasons for the differences were known. A brief assessment of the cause of the differences would be a valuable addition to the paper (see note for page 7043 above.)

Table S4: dividing the mean O3 response by mean emissions is not likely to give a good representation of mean sensitivity (which is the mean of the response from each model), particularly as the sensitivity is likely to drop as NOx emissions increase due to greater importance of O3 removal by NO.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7033, 2009.