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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Process analysis and sensitivity study of regional ozone formation over the Pearl River Delta, China, during the PRIDE-PRD2004 campaign using the CMAQ model" *by* X. Wang et al.

Anonymous Referee #4

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This paper presents a comprehensive modelling analysis on chemical and synoptic meteorological factors influencing ozone formation during one of the main ozone months (October) for the Pearl River Delta region of China. MM5-CMAQ model output is compared with c.12 monitoring station data in the region during this month during the PRIDE-PRD campaign in 2004. Model investigations include integrated process rate analysis, ozone production efficiency analysis, and VOC vs. NOx precursor sensitivity analysis.

The manuscript has a good structure, is concise, and has clearly-presented written En-

glish. However, it is hard to defend that the overall conclusions of the authors present significant new insight into regional photochemical ozone in general. Thus the authors conclusion on page 26853is that: "Through the transport process during nighttime and morning, O3 precursors originating from different source regions are mixed and transported to downwind rural areas where they are then involved in the daytime O3 photochemical production. . ...these close interactions among precursor emissions, physical transport, and photochemical production ultimately resulted in regional O3 pollution over the southern and western Pearl River Delta. . .." Such conclusions could have been written from our knowledge already of regional photochemical ozone, although I suppose it can be said that the authors have confirmed from the simulation work they present here that such processes are occurring in the PRD region. The above general comment about lack of significant new insight aside, the manuscript is suitable for publication in ACP, subject to response to other points raised:

Section 3.1 and Table 3: It is stated that simulated ozone values "compare well" against observed ozone but yet the correlation coefficient is only 0.60 so the explanatory coefficient of variance is only 36%. (Also the mean bias is -17.4%). The low CoV points to considerable residual lack of model skill at simulating variability in ozone. The authors state that the model evaluation statistical diagnostics are comparable to results of other CMAQ applications, but a statement of comparability with previous applications of this model doesn't in itself equate to adequate demonstration of fitness for purpose. Furthermore, Table 3 indicates that the simulated-observed comparison was censored to include only pairs of data where observed ozone exceeded 40 ppb. No explanation is given for this censoring. Defend the justification for not using all data in the comparison - the suspicious might infer that inclusion of the additional data lowers the correlation (and increases the magnitudes of the bias statistics) between simulations and observations still further, otherwise why not retain all comparative data pairs?

For the sensitivity analysis, it is not stated how the NOx and VOC emissions reductions of 25% are applied. Is it linearly distributed across all spaces and even applied across

time and space?

A large number of the figures are too small usefully to discern the detail of their content (and of their axis labels also in some instances). Thus the 12 time series in Fig. 3 are too small to be of practical use in judging comparison between observed and simulated hourly ozone. Also Figs. 7, 8, 9, 11, 12, 14 and 15 are all hard to read.

P26843, line 16: delete one of “across” or “over”.

P26851,line 10: define the acronym OBM.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 26833, 2009.