

***Interactive comment on “The effect of
meteorological and chemical factors on the
agreement between observations and predictions
of fine aerosol composition in Southwestern
Ontario during BAQS-Met” by M. Z. Markovic et al.***

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Comments: The subject is appropriate to ACP. This manuscript presents the results from an intensive, collaborative field campaign during the summer of 2007 that investigated the effects of trans-boundary pollution, local pollution, and local meteorology on regional air quality in Southwestern Ontario. The study found that the agree-

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ment between modeled and measured pNO_3^- at the ground site (observed mean (Mobs) = $0.50 \mu\text{g m}^{-3}$; modeled mean (Mmod) = $0.58 \mu\text{g m}^{-3}$; root mean square error (RSME) = $1.27 \mu\text{g m}^{-3}$) was better than aloft (Mobs = $0.32 \mu\text{g m}^{-3}$; Mmod = $0.09 \mu\text{g m}^{-3}$; RSME = $0.48 \mu\text{g m}^{-3}$). It was also found that the assumption of thermodynamic equilibrium is consistent with observations of gas and particle composition at Harrow with the inorganic thermodynamics model, ISORROPIA, in an offline mode. This study is interest. Therefore I recommend clearly the acceptance for publication of this manuscript in ACP after revisions. Several editorial comments for improving the information content and presentation of the paper are listed as follows.

1. P24782, lines 20-23: Since ISORROPIA can only be used to simulate the gas/particle partitioning between the gas phase and fine particle ($\text{PM}_{2.5}$) instead of PM_1 (see Yu, S. C., Dennis, R., Roselle, S., Nenes, A., Walker, J., Eder, B., Schere, K., Swall, J., and Robarge, W.: An assessment of the ability of three-dimensional air quality models with current thermodynamic equilibrium models to predict aerosol NO_3 , J. Geophys. Res.-Atmos., 110,D07s13, doi:10.1029/2004jd004718, 2005), therefore, one of the biggest reasons for the poor agreement between modeled and observed values is that this study only measured PM_1 instead of $\text{PM}_{2.5}$ chemical composition. The authors need more test this and say this in the text part.

Please see the answer to following comment

2. P24801, lines 10-27, whole section: As I mentioned, ISORROPIA can only be used to simulate the gas/particle partitioning between the gas phase and fine particle ($\text{PM}_{2.5}$) instead of PM_1 , and one of the biggest reasons for the poor agreement between modeled and observed values is that this study only measured PM_1 instead of $\text{PM}_{2.5}$ chemical composition. The authors need more test about this with more sensitivities. This is the biggest concern I have about this paper.

The authors respectfully disagree. ISORROPIA is used to simulate gas/particle partitioning under the assumption that the thermodynamic equilibrium condi-

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tions are established between the gas and condensed phases of semivolatile inorganic constituents. In both the measurements and the model, we are only probing the fraction of the total aerosol mass loading for PM₁. The aerodynamic lenses of the AMS instruments restrict the measurements to particles with aerodynamic diameters less than 1 μm . As stated in our expanded version of section 2.3 “AURAMS employs a sectional representation of the PM size spectrum. PM is represented by 12 size (diameter) bins in the AURAMS output, each including 9 chemical species. PM₁ mass loadings were calculated as the sum of bins 1 through 6 plus 0.042 * bin 7.” Thus our approach is consistent for both the measurements and the model, and the fact that there may be significant mass loading for particles larger than PM₁ does not influence our results.

3. Tables 1 and 2 should include other Statistical metrics like those listed in Yu, Shao-cai, Brian Eder, Robin Dennis, Shao-hang Chu, Stephen Schwartz, 2006. New unbiased symmetric metrics for evaluation of air quality models. Atmospheric Science Letter, 7, 26-34.

The authors updated Tables 1 and 2 to include the following statistical parameters: mean error (ME), normalized mean error (NME), and normalized mean bias (NMB).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 24781, 2010.

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