**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

Interactive comment on "Evaluation of chemical transport model predictions of primary organic aerosol for air masses classified by particle-component-based factor analysis" *by* C. A. Stroud et al.

Anonymous Referee #2

Received and published: 23 May 2012

This manuscript evaluates the performance of the Environment Canada AURMS model to simulate primary organic aerosols (POA) during a 2007 filed campaign in southern Ontario. The major performance patterns are identified through comparisons of a scaled model PM1 POA against measured PM1 HOA. The analysis is in details and the conclusion useful for future studies, in particular that they point out the importance to reduce uncertainties in a few key emission sectors. This manuscript should be published if the following concerns can be satisfactorily addressed.

General comments:

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Interactive Discussion

Discussion Paper

1. This study compares PM1 POA to PM1 HOA. I wonder if this indirect comparison is meaningful all the time. Is there any way you can use a more direct approach to verify such a comparison? The site measurements differentiate four types of OAs, and HOA is only one of them. Although there is a mobile lab study to investigate vehicle emissions, onroad emissions are not the major source of POA in this region, as the authors mentioned in the paper. It is not clear if cooking and dust emissions contain mostly HOA. That will be hard to imagine as these hydrocarbon-like OA can survive long-time exposure to oxidants or combustion.

2. It was briefly discussed in section 3.8.3 that biomass burning is one of the factors contributing to model bias. Over the North America, biomass burning is very important, as far as POA is concerned. Previous studies with the CMAQ model have found that, the large POA bias can only be resolved with the presence of biomass burning. It would be useful to quantify at what level the missing of biomass burning has on the POA simulation. Checking satellite based fire products may be useful (if this source is important during your study period).

Specific Comments:

Throughout the text: change "spatial and temporal surrogates" to "spatial surrogates and temporal profiles".

5942,

L11-12: These health studies do not differentiate primary or secondary aerosols when linking total mass concentration to health endpoints.

L21. the Earth system;

5943:

L13-15: 1) biomass burning is not on urban scale but with large magnitude. 2) why POA contains toxics? Not implied from its definition. Better to add reference here.

5944

L2: southeastern US

5952

L14-15: are NH3 and VOC considered criterion pollutants in Canada? There are seven polluted defined as criteria pollutants in the United States, for instance, but these are not among them. There are not air quality standards established for NH3 and VOCs.

L19-23: Interesting that only four chemical profiles are used to represent all sectors. Could you explain more where these splitting factors are obtained? The SPECIATE library contains way more profiles. Which profiles are used for cooking and fugitive dust, the two key sectors?

5953

L6. For ORAA, the major sources are fugitive dust, I think. The fugitive dust size fraction in Eldering and Cass (1996) are much smaller than 0.73 (although farming is close).

L17. what is the unit of the bias ($\sim$4)?

5956

L9: Why is Indiana singled out among all big US emitting states that are also closer to the sites?

5962

L1-3: How was the standard deviation calculated? Why it is related to uncertainties, not variations driven by meteorology and emission?

L13: what is HOA solution?

5964

L5-6: Seems to have a problem with either diurnal profile or PBL height.

5965

Section 3.4: Winsor is at the US/Canada border. I wonder if the July 4 has anything to do with the time series as it will be affected by firework emissions.

5968"

L13: "unbiased" is too absolute. Maybe less biased?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 5939, 2012.