**Atmospheric
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Comment

Interactive comment on "Mass tracking for chemical analysis: the causes of ozone formation in southern Ontario during BAQS-Met 2007" *by* P. A. Makar et al.

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I commend Dr. Makar and colleagues for a very careful, competent and exhaustive analysis of ozone formation in southern Ontario. Their AURAMS (A Unified Regional Air-quality Modeling System) was used to analyze data from the BAQS-Met 2007 field study. It is a sound paper that should be of general interest to the community and therefore I support its publication.

There are major difficulties with air quality modeling due to the extreme complexity of the atmospheric chemistry system as this paper illustrates very well. For example, their analysis showed that small errors in the forecasted wind direction could have a major

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effect on ozone concentrations. They show that similar to other regions of the world, land-sea (lake) breeze circulation and the synoptic flow may significantly enhance local scale ozone concentrations. Their mass tracking system is useful for defining the relative importance of ozone production and destruction processes, ozone production rates and for determining the locations of photochemical production regions. The final conclusion is that significant improvements in model performance for calculated ozone result when the model is run at higher spatial resolution.

I recommend that the authors restructure the paper to stress how their work address principles rather than too much focus on the situational detail. However beyond this paper I wonder if maybe our community is getting lost in too much detail and our work is becoming too repetitious. The community knows that the system is complex. We know that air pollutant concentrations are highly dependent on the details of the meteorology. Process analysis is a known and useful tool for analyzing air quality modeling results. Time and time again its been shown that within some limits increasing spatial resolution increases air quality modeling performance at least on a statistical basis. Although this paper should be published as an excellent analysis of ozone formation in southern Ontario, this reviewer wishes that there were some really new principles that could be applied to improve regional air quality models. Is the community just spinning its wheels? For example, do we even understand the atmospheric chemistry of the hydroxyl radical well enough for modeling? William Brune and colleagues (2009) suggest that we do not. I challenge the community to look deeper and beyond.

Reference Chen, S., Ren, X., Mao, J., Chen, Z., Brune, W.H., Lefer, B., Rappengluck, B., Flynn, J., Olson, J. and Crawford, J. H.: A comparison of chemical mechanisms based on TRAMP-2006 ïňĄeld data, Atmos. Environ., in press, 2009.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 14241, 2010.