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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mapping Asian anthropogenic emissions of non-methane volatile organic compounds to multiple chemical mechanisms" *by* M. Li et al.

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This paper discusses issues regarding processing of emissions of volatile organic compounds (VOCs) for air quality models in use different chemical mechanisms. Although the focus of this paper is on the emissions inventory for Asia, the issues they bring up are applicable for emissions and modeling everywhere. The speciation profiles used to determine model species for representing VOCs are important to model predictions of the effects of the VOCs on air quality, and they have significant uncertainties. They are also processed in inconsistent and undocumented manners when used to derive model-ready inputs for different chemical mechanisms, introducing additional

uncertainties in the model predictions. In this work the authors examine and update a number speciation profiles representing important VOC sources in Asia, derive the model species for the profiles in a consistent manner for representative mechanisms, and show that the updates have significant effects on emissions input and are likely to have significant effects on model predictions. The effects of the particular updates used in this work may not be as great when examining emissions in the United States or Europe, but I suspect that there are similar issues with other profiles that would affect modeling in these regions. The issues discussed in this paper are something that modelers, and those that use model outputs, should better understand and appreciate. I believe that this paper makes an important contribution in this regard.

The paper is generally clearly written and informative, and I have only a few questions, comments or suggestions. These are given below.

The high contributions of glyoxal and methyl glyoxal are surprising to this reviewer, who more used to U.S. emissions inventories. They give a reasonably good discussion of what caused this increase. But the large decrease for acetylene, which Figure 6 indicates was previously one of the two most important VOCs in terms of mass emissions, is also significant. The discussion suggests that it is due to the same changes that caused the large increases in the glyoxals, but it looks like the decrease in acetylene mass is quite a bit greater than the increased mass for the glyoxals. It might be helpful if they specified specifically why acetylene is so high in the INTEX-B inventory compared to the updated inventory in this work. Figure 9 indicates that the acetylene contribution in INTEX-B is huge for all regions except for "Other East Asia".

Table S1 or perhaps a separate table in the Supplementary Materials should indicate which profiles were updated or modified for this work and perhaps have some sort of indication of whether the modifications were potentially significant (e.g., by giving their OFP's or OVOC fractions). Or were all the profiles listed in Table S1 modified? Were the ones with only one profile listed not modified?

It would be helpful to people interested in this work if the updated profiles developed in this work were available in the supplementary materials or at least at a web site that is cited in this work. By this I mean profiles in terms of chemical compounds or Speciate 4 chemical categories, not in terms of model species. I couldn't find them at the web site they gave, though maybe I didn't look in the correct place.

Simon et al (2010) is the only reference citation given regarding the SPECIATE database, which appears to be the primary profile database used in this work. However, the current version of SPECIATE is 4.3, which is dated later. Which SPECIATE version did they use in this work? Would using the latest version affect any of the results or have any profiles that would be better? The reference citation for the SPECIATE database should be given when it is first mentioned, which is not the case in this manuscript. That citation, and the SPECIATE version, should also be given in Table S1.

A number of chemical categories in the SPECIATE database do not have model species assigned to them by Carter (2013). How important were they to the total mass of emissions and the profiles in this work?

Part of this work involves estimations of ozone formation potentials (OFP's) of the profiles and emissions sources, which is useful. However, many chemical categories used in SPECIATE and presumably the other profiles do not have MIR values assigned to them. How were these treated? In this regard, they state that they ignore OFP's of unidentified mass. Isn't this introducing a bias in the analysis, by assuming poorly characterized profiles are necessarily less reactive? But this is not a major issue if the objective is to see which of the identified compounds attribute to OFP's, as done on Figure 5.

It might be an interesting comparison to see a version of Figure 5 for the INTEX-B speciation inventory, given the differences shown in Figure 6.

The only comment I feel absolutely needs to be addressed concerns the need to indi-

cate the SPECIATE version used. However, I hope they can consider the other suggestions when finalizing this paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 32649, 2013.