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

<General comment>

NMVOC mapping is very important procedure to support atmospheric chemistry modeling of ozone and aerosol. This paper by Li et al. integrates many existing chemical speciation information and presents an updated method to convert total NMVOC emissions into model-ready emissions for regional and global chemical transport model (CTM) simulations.
The authors suggest an improved speciation framework of NMVOC in INTEX 2006 Asian inventory adopting an explicit assignment (mechanism-dependent species mapping) and applying updated profiles (composite profiles by median average of local, U.S. SPECIATE and literature profiles). The new mapping methodology is explicitly described and includes some benefits. They added more local source profiles than Zhang et al (2009) to segregate INTEX 2006 NMVOC into the CTM chemical mechanism species. Using the averaged source profiles seems to be more reasonable approach than single profiles for chemical mapping in the subjected geographical region (Asia).
Overall, their subject regarding an improved mapping method and comprehensive source profiles for the anthropogenic NMVOC emissions are relevant to the scope of ACP. However, there are several things need to be added/improved as in the following specific comment section, to make this manuscript to be publishable.

<Specific comment>

1. The speciation profiles, in their present form, are hard to be used by other researchers since they are too summarized or just presented as OFPs. The final speciation profiles developed in this work would better be explicitly presented using comprehensive tabulations, as in Andreae and Merlet (2001), because one of the major virtue of this work is to provide improved speciation information to the related science community.

2. A comprehensive table which explains mapping between authors' chemical species and other major speciation schemes(e.g. SAPRC, GEOS-Chem, MOZART, CB05) would better be developed and presented, instead of individual tables such as Tables 2 and 3.

3. Even though the profile development procedures are described in the chapter 2.2, the reasons of selecting speciation profiles are still unclear. Since large volume local and international speciation profiles should be reviewed during composite profiles development, comprehensive evaluation of existing speciation profiles should be very beneficial to the readers.

4. As the author have described (Page 32666: 23-24) one of the main objective of their study is to develop model-ready anthropogenic NMVOC emission datasets for CTMs. They applied a new mapping method and developed model-ready emissions for 8 chemical mechanisms, such as CB-IV, CB05, SAPRC-99, SAPRC-07, RADM2, RACM2, GEOS-Chem, and MOZART-4. In the context of the aim of their study, I think that the results and discussions about the consistency of the new mapping method for these chemical mechanism species are important and should be included. I guess that many of the atmospheric chemistry modeling

community members also want to see the new NMVOC mapping method can generate a certain level of consistent results for multiple chemical mechanisms.

5. To present the effect of the new mapping methodology for Asian anthropogenic NMVOC emissions, the author compared the OFP that calculated with the newly mapped INTEX2006 NMVOC emissions by applying MIR scale values and the OFP with the previous emissions. The MIR approach assumes high NOx (or highly VOC sensitive) condition for ozone formation (Carter, 1994). If some countries or regions in Asia are highly VOC-sensitive, for which the MIR based OFP may be somewhat useful to investigate the effect of the newly derived emissions of mechanism species on ozone formation. If some countries or regions in Asia are highly NOx-sensitive, for which the MIR-based OFP is not appropriate. The availabilities of VOC and NOx can be affected by meteorological factors. Therefore, the MIR based OFP calculation without any consideration of the geographical distribution of NOx and meteorology in the subjected geographical region cannot reasonably present the effect of the new NMVOC mapping methodology. My suggestion is that a comparison with at least a CTM (e.g., GEO-Scheme, CMAQ, etc.) simulation results (New- versus Previous- mapping) should be included in this paper to investigate the valid effect of the new NMVOC mapping method on ozone (or aerosol) prediction in Asia.

6. Since isoprene and terpenes are also very important precursor species of ozone and aerosol formation, these are considered as primary explicit organic or lumped organic species in most of chemical mechanism such as SAPRAC99/07, CB05, and so forth. I cannot find any presentation for these species in this paper. Are their emissions negligible because this paper only covers anthropogenic emissions?

7. Although authors clearly outlined their methods, some parts of their assumption have weaknesses (e.g., ozone forming potential (OFP) calculation). In addition, the results are somewhat insufficient to support their objective and derive coherent discussions. In the context of their subject, this paper should contain some results and discussions whether the new method can yield consistent emission mapping results for different chemical mechanisms. In addition, it is needed to add reasonable investigations and discussions about how much are the new mapping method and data effective for the CTM ozone or aerosol prediction.

<Minor comment>

1. The authors need to clarify the version of SPECIATE.

2. Figure 10: need separate labels for figures (a) and (b).

References

Carter, W.P.L.: Development of ozone reactivity scales for volatile organic compounds. J. Air & Waste Manage. Assoc. 44, 881-899, 1994.

Zhang, Q., Streets, D. G., Carmichael, G. R., He, K. B., Huo, H., Kannari, A., Klimont, Z., Park, I. S., Reddy, S., Fu, J. S., Chen, D., Duan, L., Lei, Y., Wang, L. T., and Yao, Z. L.: Asian

emissions in 2006 for the NASA INTEX-B mission, Atmos. Chem. Phys., 9, 5131–5153, 2009.