Atmos. Chem. Phys. Discuss., 14, C10592–C10594, 2014
www.atmos-chem-phys-discuss.net/14/C10592/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparison of secondary organic aerosol formed with an aerosol flow reactor and environmental reaction chambers: effect of oxidant concentration, exposure time and seed particles on chemical composition and yield" *by* A. T. Lambe et al.

Anonymous Referee #3

Received and published: 30 December 2014

The paper "Comparison of secondary organic aerosol formed with an aerosol flow reactor and environmental reaction chambers: effect of oxidant concentration, exposure time and seed particles on chemical composition and yields" by Lambe et al. discusses in detail the comparability of aerosol flow-reactor and aerosol smog-chamber measurements. The comparability is quantified by the obtained SOA yields as well as by van-Krevel plots and the averaged carbon oxidation state obtained from aerosol

mass spectrometer measurements. After a brief introduction, a very detailed experimental section, discussing all major parts of the performed experiments follows. The following section deals in detail with the interpretation of sample mass spectra, H/C and O/C ratios, averaged carbon oxidation states and SOA yields. Further the effect of seed particles on SOA yields is discussed. The paper is well written and within the scope of ACP. Therefore, I recommend publication of the presented study after considering the following comments:

Title: The title extensively long and appears to be more a short abstract then a title. I recommend shortening of the title in a focusing form.

Introduction: The introduction well introduces the reader to the scientific content of the present work. However, present intercomparison studies are not discussed. The discussion of the comparability of these two experimental setups is of highest interest for the community and should therefore be introduced as well. For example: Jang et al. (Environ. Sci. Technol. 2003, 37, 3828-3837, doi: 10.1021/es021005u) studied the aerosol growth by heterogeneous nucleation on seed particles in a flow reactor and an aerosol chamber. Ofner et al. (Z. Phys. Chem., 2010, 224, 1171-1183, doi: 10.1524.zpch.2010.6146) studied and compared the evolution of infrared active functional groups using a flow reactor and a smog chamber. The evolution of carbonyls in this study can be linked to the averaged carbon oxidation state. Bernhard et al. (J. Aerosol Sci., 2012, 43, 14-30, doi: 10.1016/j.jaerosci.2011.08.005) compared the ozonisation of mono-terpenes in a flow-reactor with aerosol chamber studies. Further, the cited studies on flow reactor measurements should be discussed in more detail.

Experimental: The experimental setup of the PAM reactor should be reported in more detail. While the involved aerosol chambers are well defined in the literature, only rudimentary information on the PAM reactor is provided. Especially, UV/VIS spectra of the applied mercury lamps, which cause photolysis inside the flow reactor, and photon flux measurements would be interesting. The knowledge of the photon flux inside the reactor would assist the calculation of photolysis rates of several gaseous species.

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Particle monitoring and analysis – p. 30582, line 24ff “While AMS measurements . . . additional supporting measurmements . . .”: Please specify these supporting measurements. Several other techniques, especially optical spectroscopy in the UV/VIS and IR is able to assist AMS measurements. Also offline techniques like FT/MS could assist the interpretation of chemical reactions related to aerosol formation in aerosol chamber and aerosol flow reactor beyond O/C ratios and the averaged carbon oxidation state. p. 30585, l. 17: “The observation suggests . . .” This sentence is of utmost importance due to the discussion of comparability of these two methods and should therefore be discussed in detail and added to the abstract and the results.

Figure 7 (and some others as well): If the 1 sigma uncertainty is in the size range of the symbol, please remove the error bars to prevent misinterpretation of the kind of symbol.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 30575, 2014.