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Interactive comment on "α-pinene secondary organic aerosol at low temperature: Chemical composition and implications for particle viscosity" *by* Wei Huang et al.

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General comments:

My comments mainly relate to the chemical characterization of alpha-pinene SOA compounds, which could be elaborated in this manuscript. I found it interesting to see that the monomer C10H16O4 and the dimer C17H26O8 are major components of the alpha-pinene SOA system, and that the ratio monomers/oligomers is enhanced at the lower temperature.

Specific comments:

Line 68 - Introduction: The authors write: "The molecular formulae of organic species accounting for $\sim$58$-$72 % of SOA mass from α-pinene ozonolysis have been identified, and can largely be grouped into monomers (C8$-$10H12$-$16O3$-$6, oxidation products from one α-pinene molecule) and dimers (C14$-$19H24$-$28O5$-$9, oxidation products from two α-pinene molecules) (Zhang et al., 2015)."

Since later in the manuscript results for the MW 358 dimer (C17H26O8) are selected, it would be worthwhile to also mention that major dimers of the alpha-pinene SOA system have been structurally elucidated. I suggest to add the following sentence: "Major dimers of the alpha-pinene SOA system have been structurally elucidated as a cis-pinyl-diaterpenyl ester (C17H26O8; MW 358) (Yasmeen et al., 2010) and a cis-pinyl-hydroxypinonyl ester (C19H28O7; MW 368) (Müller et al., 2008)."

Line 302: The authors write: "Examples of the thermograms of a monomer (C10H16O4, molecular formula corresponding to hydroxy-pinonic acid), and an adduct (C17H26O8, molecular formula identified in SOA from α-pinene ozonolysis by e.g. Zhang et al., 2015; Mohr et al., 2017) both clustered with I- at t0 are shown in Fig. 6A$-$B."

With regard to the monomer C10H16O4, it would be worthwhile to consult the recent article by Zhang et al. (2017). These authors have studied HOMs in the alpha-pinene ozonolysis system and provided evidence for the formation of isomeric hydroxypinonic acids, with the hydroxy group at different positions of the pinonic acid skeleton, i.e., the 7- and 5-positions.

With regard to the C17H26O8 compound, it would be relevant to also mention the chemical structure. I suggest to do this as follows: ". . .. and a diester [C17H26O8, molecular structure identified in SOA from α-pinene ozonolysis as a cis-pinyl-diaterpenyl ester (Yasmeen et al., 2010) and molecular formula identified in SOA from α-pinene ozonolysis by e.g. Zhang et al., 2015; Mohr et al., 2017] both clustered . . .. . ."

Line 308: The authors write: “For experiment CD, the C10H16O4I1 - thermograms exhibited a multi-modal shape, indicative of contributions from isomers having different vapor pressures, or thermal decomposition of larger molecules. “

As already mentioned above, there is indeed evidence for different isomeric hydroxypinonic acids (Zhang et al., 2017), but decomposition of dimers is also a possibility. It is noted that the MW 368 diester, elucidated as a cis-pinyl-hydroxypinonyl, has a cis-pinic and 7-hydroxypinonic acid residue. In this respect, it would be interesting to examine the thermogram of cis-pinic acid (MW 186). Furthermore, it would also be worthwhile to examine the thermogram of terpenylic acid (MW 172), which could result from the degradation of the MW 358 diester.

Line 410: It is not clear what the authors mean by “adduct”. I think they mean “oligomer”, which is chemically more correct. The dimeric esters with MW 358 and 368, for example, are covalent dimers.

References:

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