

## ***Interactive comment on “Relative humidity-dependent viscosities of isoprene-derived secondary organic material and atmospheric implications for isoprene-dominant forests” by M. Song et al.***

### **Anonymous Referee #1**

Received and published: 7 February 2015

This is an important study of viscosity of a mixture of organic compounds that could serve as a model for the organic material in isoprene derived secondary organic aerosol. The measurements have been carried out over a range of relative humidity values, and the results clearly show that the organic material in model isoprene derived aerosols is not as viscous as that in model aerosols produced from alpha-pinene. I have no major suggestions for improving this paper. Minor comments are listed below.

1134, line 1: for the benefit of the readers, please specify a typical size of an organic

C119

molecules for which the Stokes–Einstein equation should be applicable.

1136, SOM preparation section: please estimate the contribution of ozone to SOA production. With 15 ppm ozone in the flow and  $k = 1.3E-17 \text{ cm}^3/(\text{molec} \cdot \text{s})$ , the lifetime of isoprene should be about 3.6 minutes. The volume of the oxidation flow reactor is not specified in this paper and it is also not specified in the cited papers by Liu et al. (2013 and 2014). However, the Liu et al. (2014) paper quotes a residence time of 110 s at the same flow rate as used in this study. Therefore as much as 50 % of isoprene could potentially be oxidized by ozone instead of OH. Is this an issue considering that ozone-driven oxidation is also capable of producing aerosol from isoprene, e.g., Ref. [1]?

Related to this, the authors should probably mention in this section that the high concentrations used in the oxidation flow reactor results in an unrealistically high contribution of the RO<sub>2</sub>+RO<sub>2</sub> reaction products and Criegee intermediate reaction products to the SOA formation. The authors do mention the caveat to the conclusions resulting from high mass concentrations on page 1147; all I am suggesting is to explain it to the readers what could go wrong when using high concentrations.

Section 4.2: It may be worth mentioning the study of O'Brien et al. (2014), who looked at how much different types of particles flatten upon impact with an impactor substrate [2]. Their measurements suggest that laboratory models of isoprene derived particles are less viscous than those of alpha-pinene derived particles, and less viscous still than ambient aerosols.

1. Kleindienst, T.E., Lewandowski, M., Offenberg, J. H., Jaoui, M., Edney, E. O., Ozone-isoprene reaction: Re-examination of the formation of secondary organic aerosol. *Geophysical Research Letters*, 2007. 34(1): p. L01805, doi:10.1029/2006GL027485.

2. O'Brien, R.E., et al., Physical properties of ambient and laboratory-generated secondary organic aerosol. *Geophysical Research Letters*, 2014. 41(12): p. 4347-4353.

C120

C121