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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.

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In this study the authors have determined relative humidity-dependent viscosities of isoprene SOA. Viscosity is a key property of SOA, but measurements of viscosity of SOA materials are not easy and there have been only a few measurements for a-pinene SOA. The authors achieved the viscosity measurements of isoprene SOA successfully by combining two unique experimental approaches of a bead-mobility technique and a poke-flow technique. Based on RH-range observed in Amazon, they concluded that

SOA particles in Amazon are liquid. I found that the study was conducted well and the manuscript is written clearly. I support publication in ACP and I have three specific comments that the authors should consider.

Specific comments:

1. Please justify/discuss how well OFR-generated SOA particles represent ambient SOA. What was O:C ratio of isoprene SOA? Is chemical composition of OFR-generated isoprene SOA expected to be similar to that generated in a larger reaction chamber or in ambient conditions? How long was the reaction time in an OFR and how does exposure (time * concentration) correspond to atmospheric aging time?

2. In the section 4.2, discussion on glass transition temperature (Tg) of isoprene and a-pinene SOA would be helpful. Tg of isoprene is predicted to be lower than the room temperature at low O:C ratio, and it tends to become higher at high O:C ratio (see Table A1, Berkemeier et al., 2014). Higher Tg indicates higher viscosity. As discussed in the text, molecular weight may be indeed primarily important for viscosity and Tg, but O:C ratio does affect them, too (Koop et al., 2011; Saukko et al., 2012). In this sense, it would be great if you could specify O:C ratio of isoprene SOA, if possible, and discuss on Tg.

3. The phase state and viscosity are strongly affected not only by relative humidity but also by temperature. If the authors would like to make general conclusion on the phase state of Amazonian SOA, it would be better if some statistics were presented for temperature to make sure that the ambient temperature is usually higher than the predicted Tg of Amazonian SOA (see Fig. 9d, Koop et al., 2011).

References:

Berkemeier, T. et al.: Atmos. Chem. Phys. 2014, 14, 12513.

Koop, T. et al.: Phys. Chem. Chem. Phys. 2011, 13, 19238.

Saukko, E., et al.: Atmos. Chem. Phys. 2012, 12, 7517.

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