

Atmos. Meas. Tech. Discuss., referee comment RC1  
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## Comment on amt-2022-151

Anonymous Referee #1

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Referee comment on "A new hot-stage microscopy technique for measuring temperature-dependent viscosities of aerosol particles and its application to farnesene secondary organic aerosol" by Kristian J. Kiland et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-151-RC1>, 2022

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This work describes a new method for measuring the viscosity of aerosol particles as a function of temperature. The authors combine a hot-stage microscopy method with fluid dynamics simulations and validate their method with a known standard. When applying the method to lab-generated SOA, viscosity values that were 1-2 order of magnitude higher than predictions were observed. This highlights the need for viscosity measurements of complex systems, and motivates the publication of this research.

While the method appears to work as applied to one validation system, it is hard to see the generality of this method as a tool for viscosity characterization without further validation. The authors report just 2 data points and conclude the method is valid, and go on to show orders of magnitude differences in a sample system (compared to estimates based on models). In my opinion, more validation systems need to be explored before the applicability of this method can be established.

In addition to my general critique above, I have some specific comments:

- Can this method work for substances at room temperature or below? What is the viscosity range that is accessible to this technique?
- It seems that the technique could equally measure the melting temperature - can this be related to  $T_g$  and then correlated with a viscosity? This would bypass the need for fluid dynamics and may provide a simpler method for determining  $T_g$  than the traditional DSC methods. Is there an advantage to obtaining viscosity, which is then used to determine  $T_g$  anyway, in order to derive viscosity across the range of temperatures?
- The authors refer to this as a method for measuring aerosol particle viscosity, whereas in fact it is measuring the viscosity of aerosol material (they are no longer individually resolved particles).

- It is unclear to me if the sample is on a needle or a slide? From the schematic, the images are looking from below, so is the particle on the side of the needle? What is the effect of gravity on the shape of this system?