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Interactive comment on “Cloud condensation nuclei activity, droplet growth kinetics and hygroscopicity of biogenic and anthropogenic Secondary Organic Aerosol (SOA)” by D. F. Zhao et al.

Anonymous Referee #2

Received and published: 30 October 2015

This manuscript explores the effect of mixed anthropogenic and biogenic SOA on CCN activity and droplet growth kinetics, compared to pure biogenic or anthropogenic SOA. The paper is well written and logical, and I would recommend publication, subject to a few comments:

Page 19913 section 3.1.1: It would add an interesting angle to refer to the study of Rickards et al (2013) in which a review of existing studies attempting to link kappa and O:C were combined. <http://pubs.acs.org/doi/abs/10.1021/jp407991n> They found that

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systematic variability between κ parametrizations determined from different studies remains large, consistent with the O/C ratio providing only an approximate guide to aerosol hygroscopicity. They do however present a new parameterization based on collated laboratory/field data. Given the propensity to rely on simplified metrics, it would be useful to highlight where your results lie as compared to these parameterizations. Indeed, does this comparison confirm any of your findings?

Page 19914 line 3 and figure 1: “The CCN activity of the three types of aerosol is generally similar at similar OH dose. In addition, with exception of BSOA, kCCN is largely invariant over a wide range of OH doses” But in the figure, kCCN appears to be slightly higher for BSOA than for ASOA or ABSOA at a given OH dose (particularly around molecules $\text{cm}^{-3} \text{s}$). Plus, it looks like there is a slight increase in kCCN with OH dose for ASOA. Are these differences not significant / important?

Page 19914, second para and figure 2: In figure 2a it is hard to follow the same SS since they change very soon after the addition of BVOC. In 2b it looks to me like there is a slight increase in kCCN after addition of AVOC. Do you not consider this significant? Could you also please comment on how you decided the delay time between additions of the different VOCs?

Droplet growth kinetics. Section 3.1.2: Of course, this is an area gathering increased attention. With regards to the ‘threshold droplet growth analysis’, whether there is, or isn’t, any kinetic mass transfer effects from the phase state of the aerosol might depend on how the aerosol have been treated. If there is sufficient water, or any plasticizer for that matter, in the particle then water uptake in the CCN counter is likely not going to be affected. Is the aerosol exposed to rapi/slow drying for example? It would help draw out potential effects with regards to this if more detail on the method was given rather than just referring to previous studies.

Section 3.3, line 13: ‘an approximate cubic relationship between K and surface tension’. It is much easier to simply state that sensitivity to surface tension in the Kohler equation

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is increased at the point of activation. There is no need to reference a numerical approximation.

Please could you add error bars to the diamonds in figure 7.

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