

## ***Interactive comment on “Nucleation and condensational growth to CCN sizes during a sustained pristine biogenic SOA event in a forested mountain valley” by J. R. Pierce et al.***

### **Anonymous Referee #1**

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The manuscript describes a study of new particle formation and growth up to CCN relevant sizes under a clean conditions dominated by biogenic SOA. The findings are presented in a clear and well structured way, and those are within the scope of ACP. Therefore, I recommend publication of this paper after the following comments and questions have been addressed.

### **Specific Comments**

More than half of the introduction, starting from page 28504 line 1, is focused on the current study. I would recommend condensing and removing details such as describing Figs 1 and 2.

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It should be possible to have more evidence about the suspected under-counting of <30 nm particles by the Whistler peak SMPS (page 28518, line 12-). This is important for the current interpretations and possible future studies. The SMPS is for on-going measurements, so does it detect <30 nm particles during other time periods? How about long-term correlation with the total number concentration from the UCPC? Would it be possible to do calibration experiments using small particles?

Are the new (e.g. 30 nm) particles observed simultaneously at the Peak and the Raven's Nest? Even a relatively small time difference, or lack of that, could tell something about the origin of these particles.

As described in the Sect. 3.3 (page 28520), it is possible to calculate critical diameters and overall hygroscopicity parameters ( $\kappa$ ) from the SMPS size distributions and CCN concentrations. Why was this not done? The Raven's Nest SMPS detects particles smaller than 685 nm, but there could be larger particles having an effect on CCN concentrations. Are these seen at the Peak where size distributions are measured up to 10  $\mu\text{m}$ ?

Why does Fig. 11 shows signals instead of mass concentrations? Is the sulfate signal larger than noise? If the highest sulfate concentrations are larger than the noise, what about 100 nm and smaller particles; is it possible to detect concentration changes in 100 nm particles (page 28521, lines 4-6)? In the instrument description section (page 28507, line 14) it is mentioned that the AMS detects 100–700 nm (vacuum aerodynamic diameter) particles, but why is the size range wider in Fig. 11?

The conclusions based on Fig. 12 are not clear (page 28521, line 7-). The AMS detects 100–700 nm particle mass, so it does not tell much about the composition (hygroscopicity) of 100 nm particles. It could be possible see the changes in organic oxidation state by plotting size-resolved organic  $m/z$  43 and 44 signals.

## Technical corrections

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Page 28506, line 25: from 15 to 10 mm?

Page 28507, line 25: Wrong year for the Roberts and Nenes paper?

Page 28526, line 4: m missing from microphysical

Page 28535, Fig.3 caption: Petjata et al. (2009)?

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