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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling ultrafine particle growth at a pine forest site influenced by anthropogenic pollution during BEACHON-RoMBAS 2011" *by* Y. Y. Cui et al.

Anonymous Referee #3

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General comment:

The manuscript "Modeling ultra fine particle growth at a pine forest site influenced by anthropogenic pollution during BEACHON-RoMBAS 2011" by Cui et al. investigated the ultra fine particles observed in a pine forest site. With the model WRF-chem and different nucleation and growth parameterizations, they concluded that sulfuric acid from anthropogenic influence triggers the formation of particles and the oxidation products from local biogenic VOC emissions are responsible for growing the particles. The reviewer recommends publication of this manuscript in the Atmospheric Chemistry and Physics with major revisions.

Specific comments:

Abstract

What is the size range used as Aitken mode in the study? Does it refer to the size range 4 – 40 nm in the manuscript? There is not a exact size range defined for Aitken mode particles, however, particles below 10 nm should not be included as Aitken mode.

P5616, Line 5-10

MBO is mentioned here as the dominant VOC emissions at the site. Since previous studies have indicated possible contribution to particle growth by MBO (e.g. Arthur et al. 2009). It would be good to include the contribution from MBO.

P5618, Line 25.

Does night time boundary layer height of 100 m representative for the site under study? Is there reference to theoretical estimates or observations of the night time boundary layer height at the site?

P5620, Section 3.2

Activation nucleation parameterization relates the formation rate of particles at 1nm to sulfuric acid concentration. The author applied this parameterization to introduce particles of 4 – 6 nm. How much uncertainty does this miss-match of particle size introduce to the result?

P5627, Line 27 –29

Figure 7b is the size distribution plot from simulation with AN nucleation and condensation of oxidation products from VOCs. Based on this figure, I have difficulty figuring out that the observed ultra fine particles are not due to air mass change. Could you please give more detailed explanation and possibly modify the figure? It appears to me that the airmass change may explain for a significant part of the ultra fine particles observed.

ACPD

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What is the average time for the airmass to move from the anthropogenic influential area to the site of study? If the transport time is less than 10 hours, particles formed at the anthropogenic origin would arrive at the site in size range 4 – 40 nm, based on the estimated growth rate as about 3nm/h. A more detailed analysis is needed to differentiate the ultra fine particles due to local nucleation and particles due to airmass change.

Technical comments:

1. Fonts in Figure 4, 5, 6 are too small.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 5611, 2014.