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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 #1

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The paper "Modeling ultrafine particle growth at a pine forest site influenced by anthropogenic pollution during BEACHON-RoMBAS 2011" by Cui et al. investigates the origin of aerosol formation and growth events, and to model their characteristics within the 3-D regional WRF-Chem model. They found that the inflow of anthropogenic pollutants is important for the activation of the burst of Aitken mode particles. They also compared measured and modeled number size distributions to evaluate WRF-Chem model simulation in a forest site. The reviewer recommends publication of this manuscript in the Atmospheric Chemistry and Physics after major revisions.

Major comments

-Abstract: The reviewer cannot understand the definition of Aitken-mode Particle burst Events (APEs). What is the size range of Aitken-mode? It would be better to use the term "nucleation-mode" in the manuscript. Authors need to define the size range of nucleation- and Aitken-modes and to use these two terms separately.

-Abstract, L20-27: Authors mentioned that the condensation of monoterpene oxidation products onto freshly nucleated particles drive their growth. However, the measurement showed that sub-100 nm particles mainly comprised of sulfate. The interpretation and measurement results are conflict.

-P5622, Figs. 2 and 3: Previous studies showed that the inflow of anthropogenic pollutants can activate the burst of nucleation mode particles in a deciduous forest where emission of isoprene is dominant (e.g. Jung et al., 2013). It will be very good addition if isoprene data is available in this study.

-Fig. 3: It is better to show one event day as a typical example of APEs so that readers can clearly see diurnal variations of related parameters on APEs.

-Fig. 3: Ambient temperature is also important for the burst of nucleation mode particles in a forest. Thus, the reviewer suggests adding ambient temperature and comparing them between APEs and Non-APEs periods.

-Fig. 3: It will be good addition if authors can add condensation sink before APEs start to occur. Please discuss a role of pre-existing particles on the activation of the burst of nucleation mode particles during APEs and non-APEs periods.

-Fig. 3: Because SO2 data are available, authors could use the statistical proxy from Mikkonen et al. (2011) or Petäjä et al. (2009) to estimate the sulfuric acid concentration. Petäjä, T., Mauldin, III, R. L., Kosciuch, E., McGrath, J., Nieminen, T., Paasonen, P., Boy, M., Admov, A., Kotiaho, T., and Kulmala, M.: Sulfuric acid and OH concentrations in a boreal forest site, Atmos. Chem. Phys., 9, 7435–7448, 2009. Mikkonen et al.: A statistical proxy for sulphuric acid concentration, Atmos. Chem. Phys., 11,

11319–11334, 2011.

-Sections 4.2, 4.3, and 4.4: It is very difficult to capture the authors' points on comparison study using the model simulation. The reviewer strongly recommends restructuring the sentences so that readers can easily understand the results and interpretations.

-P5631, L17-20: Authors mentioned that WRF-Chem is not available to simulate new particle formation in a forest site in this study in section 4.2. Thus, how reliable the predicted contribution of nucleation to surface CCN concentrations is in section 4.4?

Minor comments

-Abstract, L7: Please define the size range of Aitken mode.

-Abstract, L10: Ultrafine particles are particles having diameter of smaller than 100 nm. It would be better to express particles having diameter of 4-30 nm as nucleation mode particles?

-P5631, L17-20 and P5614, L2: The contribution of nucleation to surface CCN concentration. 67% or 65%, which one is correct?

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