

Interactive comment on “New particle formation in the front range of the Colorado Rocky Mountains” by M. Boy et al.

Anonymous Referee #2

Received and published: 16 November 2007

General:

The manuscript investigates new particles formation in a continental mountain site. While similar kind of investigations have been performed during the recent years in other environments, the study can be considered original enough to warrant its publication. The paper is well written and has a clear structure. I have a few comments that the authors should consider carefully before the paper can be accepted for publication.

Specific comments:

Very little has been said about the performance of the instruments measuring trace gases and H₂SO₄ during the campaign. What about the accuracy and detection limits of trace gas measurements, did that has any influence on the results? Why no H₂SO₄

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

data were available for type A event days?

The authors could mention briefly whether and how their classification criteria for the events are related to the criteria used by other researchers in analyzing nucleation events (page 15587). In literature, quite different classification criteria have been used.

Unlike stated in the text (page 15591, lines 24-25), there a few recent papers in which formation of larger organic molecules by oligomeration reactions have been observed in field measurements as well (e.g. Kalberer et al. 2006 EST 40, 5917-5922; Surratt et al. 2007 EST 41, 517-527; Iinuma et al. 2007 EST 41, 6678-6683)

The description of the third mechanism "nucleation by activation of organic molecules" (page 15595) is incomplete in the sense that no information is given about the functional dependence of the J on concentrations of organic compounds. Without this information, it is very difficult to get a proper idea on how this mechanisms works and how the curves related to this mechanism in Figure 10 have been created. From Figure 9 alone, such information cannot be deduced in a simple way.

One conclusion based on Figure 10 is that none of the three nucleation/activation mechanisms can be excluded in explained observed particle formation. Especially, also activation by organic vapors seems possible. Could this latter result be simply due to the combination of facts that 1) the analysis is based on measured particles number concentration in the 6-10 nm size range, not in the 3-6 nm size range, and 2) the contribution of organics to the growth nanometer-size particles is very high anyway?

The term "mass balance" in section 3.3.2 is slightly misleading, normally mass balance is used to when comparing the gravimetric mass of particles to the sum of measured/estimated chemical constituents. Furthermore, the lower plot of Figure 11 compares two different things: 1) the absolute mass concentration change which may be negative when particle sinks exceed their sources, and 2) contribution of sulfuric acid to condensational enhancement of particulate mass which is always positive.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Minor technical comments:

I doubt that the term "trend" is correct here when analyzing the daily patterns of various variables and new particle formation (page 1558, lines 9-10)

The statement, "mean growth rates of particles ... 3.96 nm/h for all 4 days", is unclear. Was the average the same for all the 4 days, or was the overall average during these three days equal to 3.96 nm/hour? (page 15590, lines 20-22).

There some resemblance between the sesquiterpene concentration and the ratio of particle growth rates with/without TD (Figure 7) but the relation is definitely not clear as stated by the author (page 15591, lines 15-19).

I recommend that the authors use the term "formation rate" rather than "nucleation rate" when discussing the increase in the number concentration of different-size particles. Nucleation refers to a specific process, whereas "formation" or "apparent formation" can be used for particles of all sizes.

Table 1 would be more readable if the days were ordered according to the strength of events (e.g A, B, undefined, non-event), not in the chronological order.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 15581, 2007.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper