**Atmospheric
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Interactive
Comment

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

**Anonymous Referee #1**

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General comments.

The paper describes new observations of particle formation events in the Rocky Mountains near Denver, Colorado. The paper is a useful addition to the literature, extending the range of locations where particle formation has been observed. In addition, the paper makes a detailed analysis of the observed formation events and evaluates different particle formation mechanisms. The paper is well presented and clearly written and should be of interest to many in the community. I recommend publication after the authors have considered some comments listed below.

Specific comments

Is the condensation sink (CS) calculated using wet or dry particle diameter? If CS is

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calculated from dry diameter then how much of the observed dependence of formation events on RH might be due to swelling of particles.?

Fig. 7. Are the values of sesquiterpenes shown here interpolated from the two-hour-mean observations? The figure should be replotted to make the time resolution of the observations apparent.

Fig. 8. Is it possible to give uncertainty ranges on the linear fit? The slope of 1.94 appears (within the likely uncertainty range) to suggest a square dependence on sulfuric acid concentrations. Is this slope significantly different from the value of 1.24 calculated by Sihto et al. (2006).

P15593. I think the following statement "Most of the data fit between two lines with slope 1 or 2" is possibly misleading. The presentation of the purple and red lines in Fig. 8 does suggest this is the case. But does the vertical position of the 2 lines not depend on the value chosen for the intercept of the straight line? I would have thought that the gradient of the linear fit suggests a square rather than linear dependence.

P15591, L19-20. Clarify whether you mean no other correlations with other parameters were explored or no other correlations were found. I think it is premature to claim a "clear relation" between the ratio of growth rates and sesquiterpenes from Fig. 7. How does this relationship compare with monoterpene concentrations or sulfuric acid? What about other days when both parameters are available?

P15595. The "activation by organic molecules" is an interesting and useful section of the paper. However, it is not clear what the "simplified" organic mechanism involves. Without a detailed description of the simplifying assumptions it is difficult to interpret the results. How do the assumptions made affect the calculated $J_2$ rate? What measurements of organic compounds would be required to use the full mechanism of Bonn et al., (2007)? What concentrations of aldehydes have been assumed? Given the likely uncertainties in your assumptions I do not think the statement that "strong improvements" in prediction of nucleation rate is valid. This section could be improved by

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a more complete description of the mechanism, the necessary assumptions and the likely uncertainties.

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