

Review of **Analysis of multiple new-particle growth pathways observed at the US DOE Southern Great Plains field site** by Hodshire et al.

This article adds to the understanding of particle growth processes in the atmosphere. The article is well written and the topic fits to the scope of the journal. The article gives valuable, yet qualitative information about the growth pathways of nano-particles, which is derived from both measurement and modelling. I find it especially important that the authors show that the major growth mechanism can vary even at the same site and the same season.

The major weakness of this study is the missing reliable measurement of organic compounds of different volatilities. However, I find that the authors are well aware of the limitations, which are acknowledged appropriately and discussed extensively. Therefore I recommend the article to be published in Atmospheric Physics and Chemistry with minor revisions.

General comments and questions:

-how representative were the 3 discussed cases in light of the whole measurement period? Can you estimate which growth pathway was the most important at this site? What determines the prevailing growth mechanism, the sulfuric acid concentration?

-you have particle size distribution measurements from 1.9nm-528nm, yet you report only the growth rate between 10-20nm, why? It would be very interesting to see how the growth rate (and the primary growth mechanism, if you can get that information) changes with particle size

-can you estimate how accurately was the sulfuric acid concentration measured and how the uncertainties in the total sulfuric acid concentrations affect your conclusions

-based on the text and the showed results it seems that each of the considered days had a predominant growth-mechanism, however, the other compounds also had a minor, but distinct contribution. Therefore, I think it is wrong to say 'growth by organics alone' (as you do in the abstract) for April 19. I think you need to change the abstract and heading in chapter 3 to say 'Growth primarily by organics' and maybe even add 'with a small contribution from sulfuric acid and ammonia'

-the mechanism on May 9: should it be ammonium sulfate or sulfuric acid and ammonia? Maybe also mention the contribution from amines which seems to be non-negligible

-you claim that on May 11 the mechanism was sulfuric acid/amines/organics, although you say in the text you cannot assess the relative importance of ammonia to amines based on TDCIMS, and also MABNAG predicts both in the particle phase. So why not sulfuric acid, ammonia, amines and organics (or just call it mixed as in the synthesis chapter).

-there is currently almost no discussion on how the results of this study compare to other recent field and laboratory measurements about nano-particle growth rates, compositions and proposed growth mechanisms. I suggest the authors could include a short chapter on that before the conclusions section to give an idea how widely representative their results are.

Specific comments:

-your abstract is too long: you could leave out rows 26-30, which is more like introductory material and is indeed repeated in the introduction chapter.

-the four pathways mentioned in the abstract (row 26-29) and introduction (p.3, row 5-9) seem to be missing the interaction between sulfuric acid and bases (which is mentioned elsewhere, though)

-you could leave out 'analysis of' from the title. It would make it more concise and put emphasis on the fact that you found several different pathways (just a suggestion, though)

-p. 8, row 5. Please use SI units

-p. 13, row 10 citation

-it should be mentioned in the abstract and table 3 what size range you considered

-this reviewer found it confusing that you report a range of GRs for each event. Before carefully reading the methods I did not understand where this range came from. Why not give a mean value and then list all the considered size ranges (10-15, 15-20 and 10-20) in table 3, so you also get a feeling of the variation.