

Interactive comment on “Characterization of Aerosol Composition, Aerosol Acidity and Organic Acid Partitioning at an Agriculture-Intensive Rural Southeastern U.S. Site” by Theodora Nah et al.

Anonymous Referee #2

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Characterization of aerosol composition, aerosol acidity and organic acid partitioning at an agriculture-intensive rural southeastern U.S. site

The authors presented aerosol and gas measurements in an agricultural-intensive region in the southeastern U.S. during the fall season of 2016. This paper demonstrated that how particle acidity was affected by NH₃ and secondary organic aerosol formation. The manuscript reveals the findings of the influence of NH₃ on particle acidity and secondary organic aerosol formation through the gas to particle partitioning of semi-volatile organic acids. The topic of this manuscript is well within the scope of ACP. The

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manuscript is scientifically sound and should be accepted for publication after revision. The comments are in the following.

Line 17-40: I feel that the authors described mostly the summary of the results in the abstract. I strongly recommend highlighting important findings of the study in this section.

Line 22: Define “SOA”.

Line 26 and 27: What do authors mean by “study average”. I think it is enough to write only “average” in the entire manuscript.

Line 32 and 33: I suggest to move the sentence “particle-phase.....molar concentration” in the methods or results and discussion section.

Line 42-47: There are specific salts produced by the reaction of ammonia with sulfuric acid and nitric acid based on the meteorological conditions. I suggest the authors to briefly explain these points in the introduction.

Line 53-55: Although the references have been provided to back up the sentence, I suggest to at least briefly describe how ammonia is produced by industrial and vehicular emission.

Line 322 and 323: Authors found that ammonia concentration decreased at 14:00 about 1 hour before temperature decreased. Do you measure the boundary layer height during the campaign as mentioned that the decrease in ammonia concentration was because of the change in the boundary layer height?

Line 368-370: This study found that PILS and filter-based measurements of sulfate is two times lower than that of HR-TOF-AMS measurement. The similar results are also observed for nitrate and ammonium. I suggest clarifying the reason behind this in the revised manuscript.

Line 386-398: This is an exciting result that the organic aerosol mass concentration

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was higher at nighttime. This result probably indicated the unique atmospheric processing of organic aerosols in the nighttime. Nevertheless, I did not find any discussion on the formation mechanisms of organic aerosols at nighttime. I suggest discussing this point in the revised version.

Line 395-399: Authors found that nitrate concentration was increased after sunset and peaked at sunrise due to the formation of organic nitrates from the nighttime chemistry of nitrate and increased gas to particle partitioning of organic and inorganic nitrates due to the decrease in temperature. I do not agree to include the sentence that the result of organic nitrates will be discussed in a future publication. The conclusion stated in lines 396 and 397 does not make sense without the data of organic nitrates.

Line 405: Which temperature and relative humidity data were used for ISORROPIA-II model inputs? Is it fixed temperature and RH values or temperature and RH observed during the campaign?

Line 433 and 435: What do authors mean by highly hygroscopic? Are that sulfate and nitrate alone contribute more to the hygroscopicity of aerosol particles or their salts play a role in the hygroscopic behavior of aerosol particles?

Line 518-520: Which type of biogenic volatile organic compound precursors elevated at high temperature and produced a high amount of organic acids during warm and sunny days? Can you give some examples?

Line 539-542: Glutarate is a higher homologous diacid of oxalate that has almost similar sources and formation processes. What is the reason that oxalate as well as malonate and succinate peaked in the mid to late afternoon but glutarate peaked on the mid-morning? I do not agree with the authors explanation that they have different biogenic volatile organic compound precursors or different production mechanisms. What about the photodegradation of glutarate to lower carbon number diacids during the afternoon?

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