

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-538

Anonymous Referee #2

Referee comment on "Evaluation of interactive and prescribed agricultural ammonia emissions for simulating atmospheric composition in CAM-chem" by Julius Vira et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-538-RC1>, 2021

The effort of modeling interactive agricultural emissions of NH₃ by the FANv2 process model in the CAM-Chem model is of great interest for climate modeling due to the response of these emissions to climatic parameters. Its evaluation by comparison to prescribed emission inventories and to atmospheric observations of gaseous NH₃ and aerosol NH₄⁺ as well as NH₄⁺ wet deposition fluxes and satellite NH₃ total column observations is extremely useful in this respect and points to a number of improvements to be done in the model to better represent observations. The paper is overall well written and within the scope of the journal and deserves publication in ACP after a few minor improvements listed below:

Page 19, line 10-15: the impact of crustal material on the partitioning of NH₃ to the aerosol phase and subsequently on dry deposition flux is expected to also affect NH₃ levels over Africa and lead there to a higher underestimate. This has to be somehow discussed.

Page 21, lines 12-13: (despite) Here, it could be mentioned again the involvement of sulfate aerosol that is overestimated (more ammonium sulfate formed in the model) as stated earlier by the authors, so it seems that modelled aerosol is more acidic than observed and it make sense to have less nitrate partitioning in the aerosol phase (see for instance Nenes et al., Atmos. Chem. Phys., 21, 6023–6033, 2021). I would expect that the result will be different when the model will account for crustal and sea salt nonvolatile cations, bringing nitrate simulations closer to observations? Changing temporal resolution of NH₃ emissions is also affecting the acidity of the aerosol and thus the partitioning of nitrate to it.

Page 17, line 21: do you have an explanation why NH₃ concentrations behave differently at the Agourou site than the other sites?

Page 20, line 8: I propose changing title to 'nitrate aerosol' since measurements do not necessarily concern NH_4NO_3 as also stated by the authors at the bottom of this page.

Page 5, line 13: please specify if it is nitrate observations in bulk aerosol, PM_{10} or $\text{PM}_{2.5}$

Page 7, line 21: 'of by' I would keep 'of'

Page 10, lines 28-29: here you could clarify that wet deposition flux of NH_3 and NH_4^+ are measured together as NH_4^+

Page 17, line 8: specify north of the equator

Page 17, line 9: Central and West Africa

Page 20, line 6: I would remove 'regarding'

Page 25, line 1: 'to to' remove one

Page 25, line 3: ' the the' remove one