Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC3
https://doi.org/10.5194/acp-2021-492-RC3, 2021

Comment on acp-2021-492

Anonymous Referee #3

Referee comment on "Responses of surface ozone to future agricultural ammonia emissions and subsequent nitrogen deposition through terrestrial ecosystem changes" by Xueying Liu et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-492-RC3, 2021

This manuscript presented a modelling study that aimed to quantify how future changes in atmospheric nitrogen deposition as driven by rising agricultural food production affect surface ozone levels via air-biosphere interactions. Asynchronously coupled air-biosphere modelling simulations were conducted using the atmosphere and land components of the Community Earth System Model (CESM), so that the individual biogeoschemical and biogeosphysical pathways of the nitrogen deposition-surface ozone air quality linkage. The results emphasize the importance of biogeophysical pathways or the meteorological variations induced by vegetation changes in modulating surface ozone.

The manuscript is overall well conducted and presented. The simulations are well designed, and the analyses identify a new linkage of agricultural nitrogen and air pollution. I suggest publish on ACP after the following comments been addressed.

Specific comments:

1) Page 5, Eq. 1:

A few more sentences describing the growth factor are suggested. How it treats different crops? Could it consider ammonia emission factors may be different for different crops? Please clarify.

2) Page 5, Line 20:

Each atmospheric chemistry simulation was conducted for 20 years. What meteorology fields were used to represent the 2000 and 2050 conditions? Please clarify.

3) Page 9, Line 29:

"Ozone dry deposition velocity decreases by 0.002-0.004 …". Should it be increases in ozone dry deposition velocity as shown by figure 5?

4) Page 11, Figure 6:

It appears that the individual effects do not add up when with dynamic meteorology. As shown in this figure, ozone changes due to LAI (figure 6d) and due to HTOP (figure 6g) show large positive values in the central US, while the combined effects (due to ALL, figure 6m) become much weaker. The same issue can be seen for deposition velocity changes over the US (figure 6f/i/6o). Can you explain why?

5) Page 11, Line 15:

"increase local albedo, which results in enhancement in absorbed solar radiation". It is not clear why higher albedo could lead to higher absorbed solar radiation, as higher albedo tends to reflect more solar radiation back to the atmosphere. Please clarify.

6) Page 11, Line 22: Wang et al. (2020) is not listed in the References;

Page 12, Figure 7: There are two (f) panels in the figure;

Page 16: Line 26-31, missing journal and page information for the two citations.