

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-162

Anonymous Referee #2

Referee comment on "Estimation of surface ammonia concentrations and emissions in China from the polar-orbiting Infrared Atmospheric Sounding Interferometer and the FY-4A Geostationary Interferometric Infrared Sounder" by Pu Liu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-162-RC1>, 2022

This paper is analyzing hourly variation of NH_3 concentrations and quantifying surface NH_3 concentrations and NH_3 emissions in China, using observations from GIIRS and IASI. A three parameter Gaussian function is used to fit NH_3 vertical profiles from GEOS-Chem and get information of NH_3 concentration at different heights. Surface NH_3 concentrations and total NH_3 emissions are estimated based on the mass balance method and ratio from GEOS-Chem.

It was found that diurnal NH_3 concentrations are larger than nightly NH_3 concentrations. A good agreement is obtained between the ground measurements and the estimated. The NH_3 emissions range from 12.99 to 17.77 Tg N yr⁻¹ between 2008 and 2019 in China. The paper also discussed the uncertainties and capabilities of the method. The topics of paper fits the scope of ACP and the scientific idea is new. The article is generally well written and easy to follow. I have the following comments of the paper but I am supportive of publications if these aspects can be addressed.

Major concerns:

Please indicate the basis for the satellite data quality screening and the number of valid pixels after eliminating invalid pixels. If the proportion of remaining valid pixels is low, the study results will be misleading and appropriate data supplementation should be performed.

In the paper, two kinds of satellite observations are using to estimate surface NH₃ concentration. Figure. 3 and Figure. 7 show the differences in spatial distribution and numerical magnitude between them. Although there are problems of scale conversion, the comparison of the estimation results is of great necessity, especially at similar satellite overpass time.

Figure. 8 shows an abrupt change of surface NH₃ emissions in China during 2014-2015. The value of surface NH₃ emission is estimated around 17 Tg in 2019, which may be overestimated compared to previous findings. Its accuracy is questionable, and I suggest extending uncertainty analysis.

The quality of the figures in the paper needs to be improved, and there are errors and inconsistencies in the graphic descriptions, which should be carefully corrected.

Minor comments:

Page 2, line 32: Change "To provide a scientific basis of..." to "To provide a scientific basis for...".

Page 3, line 43: Change "Some studies have carried out..." to "Some studies have carried out conducted...".

Page 3, line 52: "China's 53 cultivated land area accounts for only 8% of the world, but it consumes about 30% of the world's nitrogen 54 (N) fertilizer". Please add article references.

Page 5, line 103: Change "are" to "is".

Page 7, line 126: There is a misuse of symbols in units (molec·cm⁻²).

Page 8, line 151: Describe the information of sites in tabular form.

Page 9, line 168: Change "is" to "are".

Page 9, line 175: Check the following formula format.

Page 14, line 242: Description in 3.2 is not fitting to Figure. 5.

Page 15, line 248: There are any errors in Figure. 5, suggest reconstruction.

Page 20, line 304: Why is the time series of the Fengyun geostationary satellite data so short? Can you give an explanation?

Page 20, line 305: Change "are" to "is".