

Interactive comment on “The vertical variability of ammonia in urban Beijing, China” by Yangyang Zhang et al.

Anonymous Referee #1

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Monitoring NH₃ concentration in the air is an important step to validate the remote sensing data of NH₃ column concentration and understand the emission sources for mitigation. Owing to the high cost of monitoring, long term monitoring data with a high vertical resolution is little. This paper provided such a dataset in Beijing where is suffering serious air pollution, and NH₃ emission is believed having a significant contribution.

Generally speaking, although the innovation on scientific question is not strong in this paper, its contribution on the understanding of NH₃ emission, transportation, mixture in the atmosphere is still significant through providing a long term dataset. From such a perspective, this paper is deserved publication with proper revision suggested as follow.

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Specific comments:

Line 22-24 Seasonal variation of average NH₃ concentration across the profile was described in the abstract; it is well-known in previous studies. Seasonal variation of vertical distribution of NH₃ concentration should be the point of your study. It is also true for transport analyses. Please, revise it.

Line 42-44, NH₃ emission in China has been updated. Please see Zhang, X., Wu, Y., Liu, X., Reis, S., Jin, J., Dragosits, U., Van Damme, M., Clarisse, L., Whitburn, S., Coheur, P., Gu, B., 2017. Ammonia emissions may be substantially underestimated in China. Environ. Sci. Technol. 51, 12089-12096.

Line 45-51, contribution of NH₃ to the urban air pollution have been studied well. See follow Gu, B., Sutton, M.A., Chang, J., Chang, S.X., Ge, Y., 2014. Agricultural ammonia emissions contribute to China's urban air pollution. Front. Ecol. Environ. 12, 265-266. Wu, Y., Gu, B., Erisman, J.W., Reis, S., Fang, Y., Lu, X., Zhang, X., 2016. PM_{2.5} pollution is substantially affected by ammonia emissions in China. Environ. Pollut. 218, 86-94.

Line 141 "75th", "th" is superscript

Line 153 Weekly NH₃ concentration was low to 4.4 μg m⁻³, here you said almost NH₃ concentrations were above 5 μg m⁻³, please give a detailed number (how many percentage).

Line 159-163 Move the "BAO tower" results to the discussion section, they are previous results, not yours.

Line 171 Does the first "autumn" should be "summer"? Check the whole manuscript and revise the relative expressions.

Line 193 NH₃(g) + HNO₃(g) → NH₄NO₃(p)

Line 233-234 The BAO study (1985) may be too old to compare with your study (2016).

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Please find other comparable references.

Line 271 You say twice about the surfaces can be sources or sinks. Please rephrase the whole paragraph to give a clear statement.

Fig.2 3 replicates were performed, but where is the S.D. for NH₃ concentrations?

Others: please improve the quality (readability) of Figs. E.g. how do you get the results of NH₃ emission distribution in fig. 1 left; do statistical analyses for all seasons in fig.3; the heights (15, 63, 120, 180, 240 and 320 m) were selected in fig.5, which are 2, 63, 180, and 320 m in fig.6, and 8, 63, 120, 180, 240 and 320 m in fig. S6, it is good to select the same height. Fig S2.

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