

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

Anonymous Referee #2

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General Comments

This manuscript describes one year’s worth of weekly integrated ammonia concentrations at 16 levels between 2m and 320m above ground on a tower in metropolitan Beijing. Concentrations were comparatively high throughout the year, highest in summer and, on average, a bit less than half the summer values in winter. A source allocation exercise indicated both local (urban) and regional (agricultural) influences. The profiles showed relatively little variation in the vertical, suggesting a well-mixed boundary layer much of the time, or smearing of more detailed features due to integrating over a week with passive samplers, or most likely a combination of both.

The paper is well written, concise, and addresses a topic of increasing interest to the

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community, namely ammonia in the atmosphere. Sufficient material is presented to substantiate the conclusions, and proper credit is given to previously published work. The authors are aware of the limitations of weekly integrated passive samples, but nevertheless provided a useful data set that deserves to be published. The reported ammonia concentrations certainly have the potential to play a significant role in the atmospheric chemistry over Beijing, and the added details of the vertical distribution in the boundary layer and potential source regions is useful information.

Specific Comments

Line 20: a bit convoluted. Rephrase to “the highest seasonal NH₃ concentrations across the profile were observed in summer (), followed by spring () . . .”

L35: “In China, annual . . . “.

L35: European plus US?

L89: how are the 10 million defined? The number of distinct vehicles multiplied by the number of trips for each per day, integrated around the whole ring road?

L99: add a sentence to explain how the MDL is defined mathematically.

L102: add a sentence to this paragraph that explains how particle NH₄⁺ is kept from the ALPHA sampling medium.

L143: check your numbers; from Fig. S3, the winter percentage looks more like 23%.

L159: remove “higher”

L167: a convoluted sentence. Please rephrase.

L177: their instead of there?

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L205: an additional factor for the straighter profile near the ground is the larger surface roughness in an urban area, vs. the fields around the BAO tower, causing stronger mixing.

Table 1: is it possible / would it make sense to add the Zhou et al. (2017) results to this table, since they are from the same tower?

Fig. 1: I would change the scale to $\text{kg}/\text{km}^2/\text{yr}$ for increased portability

Fig. 3: add a big “Beijing” label near the top row and “BAO” near the bottom row for easier identification

Fig. S4: state the units of the slopes

Fig. S6: from years of experience seeing people averaging wind directions incorrectly, windroses that look like this always immediately cause me concern! There seem to be almost no winds from the north. Sometimes, this is an artifact of simply arithmetically averaging wind directions, which results in many northerly winds showing up as southerly instead (since the average of 355 and 5 is 180, for example). The proper way to do this of course is a vector decomposition into easterly and northerly wind components before averaging these and then calculating the average wind direction. Please confirm that wind directions have been averaged properly here.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-762>, 2018.

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