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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The importance of vehicle emissions as a source of atmospheric ammonia in the megacity of Shanghai" *by* Y. H. Chang et al.

Anonymous Referee #2

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This paper deals with an important topic – the contribution of vehicle emitted NH3 to the urban atmosphere. The study links a long term measurements with a short-term campaign performed in and out of a major freeway tunnel in Shanghai. Meteorological parameters from the WRF model and the Hysplit model simulations were used to support the analysis of measured NH3 concentrations. The authors show some interesting results, however some explanations and analysis are not always clear: My main comments are: 1. P34730, chapter 3.2. The authors use the boundary layer height (PBLH) from the WRF model simulations and try to interpret the relations between PBLH for different seasons. There is no information on the WRF model domains, spatial resolution, simulation period. Did you verified the WRF modelled PBLH against

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observations or are there any other studies on this for this region. So, in this context the statement that the boundary layer is similar for four seasons and is not relevant for NH3 concentrations has to be reconsidered.

2. P34728, line 22: "The variations of NH3 in spring and summer were generally consistent with fluctuations of temperature (Fig. 2a)." The variation of ammonia is also consistent with fluctuations of temperature in winter and autumn. This issue needs to be reconsidered.

3. P34730-31 You have not clarified what is the source of the meteorological data you used, like e.g. temperature, relative humidity, rainfall. Only PBLH data were described in the Methods section. It has to be clarified.

4. P34732 " However, it is unexpected that in Shanghai, almost all high NH3 concentration values in summer are concentrated in the direction of South-Southwest- West (Supplement Fig. S3b), which strongly indicates that the urban area is one of the most important NH3 emission regions in Shanghai." This is not clear – from the map 1 it is clear that there are rice fields in the south and west from the city. What is the wind direction frequency for this season – it could also influence the results.

5. P34733 "NH3 also displays a clear bimodal profile during all four seasons, similar to the CO diurnal profile, suggesting a significant influence of on-road traffic (with daily commuting) on ambient NH3 concentrations in the urban environment of Shanghai." – concerns fig.7 Similar profiles were previously observed for agricultural stations (e.g. in (Aas et al., 2012) or (Schaap et al., 2011)). Please compare the profiles you got to other studies. Aas, W., Tsyro, S., Bieber, E., Bergström, R., Ceburnis, D., Ellermann, T., Fagerli, H., Frölich, M., Gehrig, R., Makkonen, U., Nemitz, E., Otjes, R., Perez, N., Perrino, C., Prévôt, A. S. H., Putaud, J.-P., Simpson, D., Spindler, G., Vana, M. and Yttri, K. E.: Lessons learnt from the first EMEP intensive measurement periods, Atmos. Chem. Phys., 12(17), 8073–8094, doi:10.5194/acp-12-8073-2012, 2012. Schaap, M., Otjes, R. P. and Weijers, E. P.: Illustrating the benefit of using hourly monitoring data

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on secondary inorganic aerosol and its precursors for model evaluation, Atmos. Chem. Phys., 11(21), 11041–11053, doi:10.5194/acp-11-11041-2011, 2011.

6. P34736 “During spring, ambient NH3 concentrations appeared to be influenced to some extent by temperature-dependent emissions, likely from agricultural activities including crop fertilization. No such relationship was apparent during other seasons” This is not true. NH3 concentrations seem to be dependent on temperature also for other seasons. It is visible in fig. 2. Please clarify.

7. P34736 While mixing height of planetary boundary layer and relative humidity were not the main factors influencing seasonal NH3 concentrations. The PBL issue has to be reconsidered after the explanation of the PBLH data quality used in this study (please see also comment 1). Compare your results on PBLH with other studies.

8. The diurnal profile of NH3 concentrations showed a typical bimodal cycle during four seasons, with maxima in the morning and the evening rush hours, suggesting a persistent influence of on-road traffic (with daily commuting) on ambient NH3 levels in Shanghai. It has to be reconsidered (please see comment 5).

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 34719, 2015.