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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Summer ammonia measurements in a densely populated Mediterranean city" *by* M. Pandolfi et al.

Anonymous Referee #2

Received and published: 12 June 2012

The manuscript, 'Summer ammonia measurements in a densely populated Mediterranean city' by Pandolfi et al. presents real-time summertime measurements of ammonia by two AiRRmonia instruments from two sites, one an urban traffic influenced site and the other located in the city center, in Barcelona, Spain. The manuscript is of interest to ACP readers. Scientific and editorial issues need to be addressed before publication.

General Comments: The analysis presented is not very detailed. It mainly compares time series of different measurements. However, the time series figures are difficult to read and understand because they are small and include multiple panels and traces, many of which are not discussed in the text. Figure 5, in particular, is confusing and detracts from the discussion in section 3. It is difficult to assess the impact of NH3 on

particle formation without a more complete set of gas-phase precursors and particle composition measurements at both sites.

Results Section 3.1 Why not compare the 1 minute data between the two instruments? I realize the ancillary measurements are reported hourly, however, the focus of this paper is NH3 measurements and the 1 min time resolution is brought up in section 2.2.1.

Results, Section 3.2. How was the traffic density measured at these locations? Was it measured concurrent with the measurements as part of this study? Is a reference available for the data? Also 'Raval area' is used for the first and only time in the manuscript. Since it is not marked on Fig. 1, it should be removed and CC site used instead.

Results, Section 3.3 From what sector does the sea breeze come? Defining the direction of the sea breeze in line 11 page 10393 would make it easier to understand Fig 5. c and f.

Results, Section 3.3.1 The first paragraph (page 10394, line 4) concludes that traffic is more effective in increasing BC levels than NH3. Are BC and NH3 emitted by the same types of vehicles? In addition to giving the time of the increase, figure 4 should be brought into the discussion showing that traffic density is also increasing at these time periods.

The last paragraph on page 10394 claims that NH3 is decreasing due to particle formation, however, particle formation is a complicated process. With no particle measurements at the CC site, there does not seem to be enough data to support this hypothesis.

The use of equilibrium in the last paragraph of section 3.3.1 is very confusing and needs to be better defined or constrained. It does not seem that this equilibrium refers to the portioning between the gas and particle phases. Nor does it seem to refer to dry or wet NH3 deposition. I really do not understand what is meant in p. 10395, line

26, ‘A certain degree of equilibrium for the concentrations of NH3 with time’. Is this referring to some type of steady-state NH3 concentration assumption? If so, it needs to be justified. Here ‘equilibrium’ seems to be used in unique context that needs further explanation.

Specific Cases, Section 4.1 The last paragraph of this sections needs to make it clear that the first 3 sentences refer to Barcelona and not all cities in general.

Table 1. What do the negative values for the BC minimum mean?

Figure 2. The axis labels are confusing as they suggest one quantity is subtracted from another. I suggest labeling the axis as ’AiRRmonia Instrument #1 NH3 [ug/m3]’ and ’AiRRmonia Instrument #2 NH3 [ug/m3]’

Figure 3. Figure 3 is difficult to read due to the multiple panels, multiple traces, and compressed time axis. It is very difficult to differentiate between the UB and CC data, identify cycle or patterns across days, and discern correlations among the species. Though the boxes indicate the special cases, the compressed time axis hinders the interpretation. Also, the discussion in the text focuses on Table 1. I suggest moving this figure to the supplemental material.

Figure 5. This figure is not organized very well. It is small, cluttered with many traces, boxes, and bars, and difficult to read. I suggest splitting it into two figures. Either keep panels a-f in one figure to show and compare the common measurements at both sites and put the additional measurements at the UB site in their own figure or separate according to measurement site. The labeling and layout imply that panels g, i, k, and m refer to the CC site. Separating would also simplify the figure legend.

Figure 6. Axis fonts are different for the panels. Since only the correlations are discussed in the text, the fit equations could be left off the figure since their meaning is not clear without adequate discussion.

Minor Comments and Technical Corrections

In certain sections of the paper, the authors switch between NH3 and ammonia. Once NH3 is introduced for ammonia, it should be used throughout. In some figure captions the 3 in NH3 is not in subscript format.

Abstract, p10382, line 23. Insert particle into ’gas-to-particle phase partitioning’

Introduction, p 10383 line 5. Remove of after excess

Introduction, p. 10384, lines 18-26. This paragraph implies that there are few previous studies of NH3 from vehicles with catalytic converters or from urban areas. However, 6 reverences to vehicles and 10 references to urban areas going back to 1996 and 2002, respectively, are given. While not as comprehensive as O3 or CO measurements, NH3 has been measured enough over the last decade to shift the emphasis from just measuring NH3 to the analysis of the these observations.

Introduction, p. 10386, lines 12-21. The first sentence in this paragraph is awkward and confusing.

Methods, p. 10386, line 16. Recommend ’The two measurement sites were 4.7 km apart.’

Methods, p. 10387, line 19. Recommend ’The measurements of NH3 were supplemented with a set of ancillary hourly measurements of ..’

Methods, p. 10388, line 1. Recommend ’Not all the parameters were monitored at both sites. The concentrations of NH3, BC, and meteorological data were measured at both sites while PM...’

Methods, p. 10388, line 6. Insert ’a’ before 1-min

Methods, p. 10389, line 12. Insert ’The’ before filter.

Results, p. 10394, line 24. I do not understand the use of the word ‘tile’ in this sentence.

Results, p. 10396, line 8. Vice versa is two words.

Results, p/ 10397, line 7. There is no panel o in figure 5.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 10381, 2012.