**Atmospheric
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Discussions

Interactive comment on "Temporal and Spatial Variability of Ammonia in Urban and Agricultural Regions of Northern Colorado, United States" *by* Yi Li et al.

Anonymous Referee #2

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This manuscript reports the results of a long-term monitoring campaign measuring ammonia using passive samplers at several sites in NE Colorado. This dataset is unique in terms of its duration, and the numbers of sites in a region of high spatial variability. In addition, a full annual record of time-integrated, vertically resolved measurements from a 300 m tower in the region are presented. The observations are compared to a new NH3 product from IASI, and to the output of a regional chemical transport model. Overall, I think this is a high quality manuscript within the scope of ACP, and it should be published after addressing the following points. Minor comments:

Section 2.2.1 – Please clarify whether Q was calculated for every hour over the sampling interval and then averaged, or was the average T and P for the interval used to

calculate Q?

Section 2.3 – Is it possible to give some measure of the minimum detectable level in the column from the satellite? How often is a 'successful' retrieval achieved? This becomes relevant for the discussion in Section 3.3

Section 3.2 – The authors examine the relationship between ammonia concentration and temperature at individual heights and find minimal correlation at the lowest height, possibly due to the offsetting influences of emission rate and mixing. What about integrating the column up to 300 m and comparing the partial column integral to temperature? This would help to (partially) separating dilution and emission.

Section 3.3 More information should be provided about what proportion of days have successful retrievals that contribute to the satellite-derived column quantity. Are the rejected values likely to be lower, and does this result in a bias for the 'average' value reported? The left and right axes for Figure 7 seem to have been chosen to emphasize the 'agreement' between the two quantities. To some extent, that's fair but it would be more honest to at least have the zeros aligned on each side. Also, no effort is made to relate the column integral from BAO to the satellite column. This seems like a missed opportunity.

Section 3.4 The CAMx model description should be in Section 2. How are the livestock emissions used in the model different than what is estimated earlier in the paper?

Technical comments:

Line 67 – 'ag' should be 'agriculture'

Lines 81-84 – are these values based on an inventory? More information would be useful beyond just a reference to the report.

Line 86 – 'showed that both' should be 'showed that together'

Lines 384-385 – Isn't it really the duration of the integration period rather than the 'long

time between successive passive measurements' that precludes this determination?

Line 935 – need to fix grammar

Figure 1 – Is there much value in having a Google Earth image in the background for this figure? I just find it makes it harder to see the symbols.

Figure 6 – I suggest making the outlines of the symbols for each site darker/thicker so that they stand out from the background color.

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