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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Efficient N_2O_5 Uptake and NO_3 Oxidation in the Outflow of Urban Beijing" *by* Haichao Wang et al.

Anonymous Referee #1

Received and published: 9 March 2018

This paper presents NO3 and N2O5 observational data from a suburban site in Beijing during the summer of 2016. The authors use these data to investigate the oxidation of volatile organic compounds (VOC) by NO3 and the effect of N2O5 heterogeneous uptake on reactive nitrogen loss and ClNO2 production in the Beijing urban outflow. Nocturnal biogenic VOC oxidation was shown to be dominated by NO3, and the heterogeneous uptake of N2O5 was found to be a significant loss mechanism for reactive nitrogen. The uptake of N2O5 was found to produce approximately a factor of four more inorganic nitrate than organic nitrate from the NO3 + VOC pathway and result in significant ClNO2 production. These results are compared, and broadly agree, with previously reported observations and represent a valuable contribution to the growing body of work on the importance of nocturnal chemistry on local atmospheric composi-

tion. I recommend publication of the manuscript once the following minor comments / technical corrections have been addressed.

Minor comments / technical corrections:

Lines 60-61: Please could the authors state if these are mass or molar yields.

Line 148-150 – It would be easier for the reader if the authors could be consistent with the order of N2O5 and ClNO2 in this sentence.

Figure 3: The scale on the NO plot makes it difficult to see NO mixing ratios. Please consider either a log scale or a discontinuity to make this more visible.

Lines 276-278: This sentence is confusing, please restructure.

Line 289: Please re-reference the recent studies in the NCP.

Figure 8 and lines 389 – 392: There is an inconsistency between the text and Fig. 8. In the text the authors state that on the three days with the largest discrepancies between the steady state calculated N2O5 lifetime and that calculated using the overall k(N2O5) the steady state calculation is much higher than the overall k(N2O5). In Fig. 8 however, the discrepancy on 30th May is in the opposite direction, with the steady state lifetime approaching a factor of 2 lower than the overall k(N2O5). The authors should correct this statement and provide an explanation for this discrepancy. The authors should also explain why there is no steady state calculated N2O5 lifetime for 31st May in Fig. 8.

Figure 9: Although the acronyms used in the x-axis labels are described in the text, it would help the reader if they were re-stated in the figure caption.

Line 301 and Table 3: Please check that X. F. Wang and Z. Wang references are correct.

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