Atmos. Chem. Phys. Discuss., 15, C6116–C6118, 2015
www.atmos-chem-phys-discuss.net/15/C6116/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Plant surface reactions: an ozone defence mechanism impacting atmospheric chemistry" *by* W. Jud et al.

Anonymous Referee #1

Received and published: 21 August 2015

Major comments Overall, this is an excellent manuscript that relays exciting experimental results. The methodology is sound, and the authors have obvious expertise that is well conveyed. The quality of the manuscript is outstanding, and the majority of my minor comments are only for clarification of concepts. My only concern is the broader applicability of the results and the conclusions drawn about previous experiments in forested ecosystems. Viewing Fig 4, the effect is most strong for one variety of tobacco plant with particularly strong production of diterpeniods. How representative is the impact of the surface chemistry on the stomatal uptake of ozone? In particular, there is some language noted below under minor comments which should be more cautious in discussing results from the literature. On a similar line, the fluid dynamics modeling adds an interesting dimension to the manuscript, but how applicable is it

to the real world? For example, would surface heating due to light absorption affect the fluid dynamic results? Can this simulation produce realistic values for water vapor conductance?

Minor comments The use of conductance for interpreting the ozone loss in the chamber should be better integrated into the main text of the paper. For example, the concept is necessary for the discussion of Fig 3, but the concept is more fully introduced below. While the main explication of conductance can remain in the Appendix, there should be a brief description in the Methods section. In addition, what is the area basis for the conductance measurement? Is it the one-sided leaf area? If so, are the exudates restricted to one side of the leaf? What is the area basis for the exudate experiments (Fig 3)?

Page 19879, 21: "in H3O+ respectively NO+" should be "in H3O+ or NO+ respectively" Page 19885, 11: Is there any GC/MS info about the content of the 3H02 leaf exudates? Page 19886, 19: Make clear this is the microscopic simulation discussed in the Methods. Are the macroscopic results presented in the main text, or only the Supplement? Page 19887, 23: Provide an example reference. Page 19888, 17-18: Can any values for wind speed or u star be attached to this statement? Also, would small-scale convection due to leaf-surface heating have an effect? Page 19888, 20-25: But, this overestimation would depend strongly on the amount of unsaturated carbon-carbon double bonds located on the leaf surface. Referring to Figure 4 and variety 3H02, the effect could be relatively small. This is somewhat addressed in the final paragraph of Section 3.5 on the following page, but these statements should be qualified. Page 19889, 25-27: It's great to put forward this hypothesis, but there is not enough justification to mention these initial results. Wait until the experiments are fully conducted, since no details are given in the current paper. Page 19890, 3-7: Should address observations in Karl et al 2010 (Science 5 November 2010: Vol. 330 no. 6005 pp. 816-819 DOI: 10.1126/science.1192534) which observed uptake of oxygenated VOCs in forest ecosystems. Page 19890, 23-25: Could the experimental conditions have blocked the

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production of OH by the mechanism described by Liu et al 2014 (Science 26 September 2014: Vol. 345 no. 6204 pp. 1596-1598 DOI: 10.1126/science.1257158), since IR was excluded from the chamber? Fig. 1: What is the photograph in the background? This info should be given in the figure caption. Supplement Table S1: I understand having an atmospheric point of view to define uptake by plants as negative for an ecosystem, but the term assimilation only makes sense from the leaf point of view and uptake into the leaf should be positive.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 19873, 2015.