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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Combined effects of surface conditions, boundary layer dynamics and chemistry on diurnal SOA-evolution" *by* R. H. H. Janssen et al.

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We would like to thank Referee #1 for his positive comments on the manuscript. Here, we comment on the two weak points as identified by the referee:

The weak point of this manuscript, as already mentioned by the first referee is the missing comparison with measured data. Measurements of vertical profiles in and above the BL are available from many campaigns and would make the conclusions of the paper much stronger. The authors mentioned the Humppa-Copec campaign and this data for example would have been a very suitable data-set (including airplane

in-situ measurements) especially seeing that one of the co-authors would be able to access all the data.

We agree with both referees that a comparison with a more complete data set would have been favorable. We searched for the most complete data set available in terms of above-canopy observations of dynamics, gas-phase chemistry and organic aerosol. Indeed, for that purpose the HUMPPA-Copec campaign would provide a good opportunity. However, when we set up this study the data from that campaign were not yet available. In a follow-up study, we plan to use data from HUMPPA and other recent campaigns.

Note, however, that although a lot of campaigns are already including more meteorological data, there is still information that is missing (also in the HUMPPA campaign): as our study suggests, the concentration jump at the interface of the BL and the FT in the transition from nocturnal to diurnal stability conditions is key to help the further evaluation of the gas phase species and aerosol-concentrations. Another key variable that is usually not measured continuously is boundary layer height. Our study stresses the importance of these variables and the need to observe these in future campaigns.

The second weakness of the manuscript is the (necessary?) simplifications for some parameters like for example the assumption of constant concentration profiles of reactive species in the FT.

Our modelling philosophy is to use a system that can reproduce the observations in a satisfactorily way while including the smallest number of processes and free parameters as possible. Species in the FT are transformed by chemical reactions, but since there was no information on FT reactant concentrations, we made the simple assump-

tion of having constant concentration profiles. More complex assumptions could be made (e.g. modification of the lapse rate of the reactants due to chemical transformations) but these would not take away the existing uncertainties, while increasing the degrees of freedom of the model. This will be explicitly mentioned in Sect. 2.1.