

Interactive comment on “Dynamic light absorption of biomass burning organic carbon photochemically aged under natural sunlight” by M. Zhong and M. Jang

Anonymous Referee #1

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Referee comments:

This manuscript presents nicely the evolution of OC light absorbance as a result of photochemical oxidation of biomass burning throughout the day cycle, a topic of great interest in the field of biomass burning optical properties. It combines laboratory and field measurements, and discusses the effect of RH and NO_x on the absorption of wood smoke OC. The manuscript is well written, and the findings contribute to a better understanding of the different stages of photochemical oxidation on light absorption of wood smoke OC. Therefore, the manuscript is appropriate for ACP after addressing the comments below:

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General comments:

The authors specifically note that in order to focus on wood burning OC with minimal influence by BC, wood smoke was produced from the smoldering-phase burning; however a short explanation of the characteristics of the smoldering phase is missing (i.e. the biomass burning is generally divided into three basic combustion phases: ignition, flaming and smoldering which are all characterized differently). The authors should be more careful comparing the current study to previous studies which may be conducted at different combustion stages (smoldering vs flaming, etc). The formation of SOA highly depends on the combustion stage, temperature and oxygen etc..

The authors state in the Results and discussion P.20791 line 15: "Saleh et al. (2013) have explained that the increment in aged OC absorption is caused by the formation of SOA, which absorbs more than fresh POA in the short wavelength visible and near-UV regions". And use this explanation in the conclusions to explain the increase in the absorption. The authors should provide evidence that the increase in the absorption was a result SOA formation. e.g. SMPS measurements showing an increase in the number of particles, or alternately introduce only gases from the burning to the chamber (filtering the POA) and measure the absorption.

P.20782 line 1: The authors explain the decreases in MAC_{OC} by the bleaching effect. This sounds like a reasonable explanation; however, the authors need to conduct a control experiment to measure the absorption on a filter containing the POA and SOA in dark condition (after the same number of hours as the original experiment)

The authors state in the "Light absorption of ambient aerosol" section p.20789 that the wildfire emission is the main source of the ambient aerosols in UF area during the examined episode based on the elevated OC values, the authors should also check the metrological condition and the back tracers to insure that this is indeed the case during several hours of measurements. Also and more importantly, the authors made an assumption that the change in the light absorbance was as a result of photooxidation

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process. However, an alternative explanation could be changes in the burning phase or ambient temperature (changes the partitioning of semivolatiles) and RH. The authors need to discuss these possibilities

Specific comments:

P.20789 and throughout the paper: Please be consistent using either BC or EC

P.20972 line 13: Please define " initial total MACoc"

P.20793 "Effect of NO_x on light absorption of OC": Please add a short discussion about the atmospheric relevance the NO_x concentration use in this measurement

P. 20795: section 3.5.4 "Hygroscopic properties of wood burning aerosol" Please compare the results to the relevant literature

Fig.2: Please add the RH values to the figure legend and add one point before the sunrise

Fig.3: Please add the NO_x values to the figure legend, add one point before the sunrise

Technical correction:

P.20784 Line1: Define POA p.20785: Line1: Add reference after "solar radiation" Line 2: Change "blank" to "black" p.20794 Line 6: Define SVOC P. 20794 Line 11: Correct Figs. To Figures P.20794 Line 3: Correct Supplement to Supplementary material Fig 5. : Please be consistent with the colors (e.g. Fresh- blue, Aged- red, in both panels (a and b)

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 20783, 2013.