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Atmospheric
Chemistry
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Discussions

Interactive comment on “Polar organic marker compounds in atmospheric aerosols during the LBA-SMOCC 2002 biomass burning experiment in Rondônia, Brazil: sources and source processes, time series, diel variations and size distributions” *by* M. Claeys et al.

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We thank anonymous reviewer #3 for useful comments which helped to improve our manuscript. Our responses to the specific comments raised by the reviewer are as follows:

I don’t have many comments on the paper, except to discuss the oxidation of levoglucosan and the diel trends in the data. It is not clear that the reason for the diel fluctuation in levoglucosan can be primarily attributed to further oxidation in the atmosphere in 1 day – this would assume the highest rates of oxidation from the cited levoglucosan lab studies and would assume that the source burden was the same night and day (levoglucosan/OC 3.1±0.9% at night versus 1.8±0.7% during the daytime). Since this has recently been of interest in the literature, it merits inclusion but requires appropriate caveats. A discussion of the potential daily oxidant concentration would be helpful. If the primary and secondary have opposing diel patterns, it might be appropriate to discuss the levoglucosan to non-SOA associated OC for the diel discussion. Was there diel measurement for malic acid? I am not familiar if there are atmospheric lifetimes associated with the secondary tracer? Are they susceptible to further oxidation as well?

Re: The diel variation in the levoglucosan/OC ratio can at least for a part be explained by the difference in the burning conditions, i.e., flaming combustion during daytime and smoldering combustion during nighttime. It is very likely that this ratio is also affected by further photooxidation of levoglucosan during daytime but we are afraid that our field and other available data do not allow to determine which is the dominant process, considering that flaming combustion is in itself a highly oxidative process. We have stated in our paper (page 10900 – line 9) “Figure 3 shows levoglucosan carbon as a percentage of the OC. It is clear that levoglucosan contributes more to the OC during the night, on average 3.1±0.9% at night versus 1.8±0.7% during the daytime. This diel variation can be explained by a different combustion stage with flaming combustion taking place during daytime when fires are started and smoldering combustion resulting in a less complete oxidation of biomass dominating at night, as has been discussed in more detail by Schkolnik et al. (2005).”. An additional sentence will be added to account for the possibility that levoglucosan is also further oxidized during daytime. The suggestion of the reviewer to consider levoglucosan to non-SOA associated OC for the diel discussion is interesting. We could take the WSOC as a proxy for SOA, and consider the difference OC – WSOC (denoted as water-insoluble OC or WIOC) as a rough proxy for non-SOA OC. Following this procedure, we see that levoglucosan carbon (be it that it is itself water-soluble) represents only a slightly larger percentage of the WIOC fraction during night than during the day, i.e., on average 8.6±2.1% at night versus 6.4±2.6% during the daytime. This night/day difference is (in relative terms; the ratio between the two percentages is 1.34) substantially smaller than that found for the difference in the percentage of levoglucosan carbon to the OC between night and day (the ratio between the two percentages is here 1.72). It may well be that only the difference in levoglucosan carbon to the WIOC between day and night is attributable to further oxidation of levoglucosan during the daytime. A note on this will be included in the revised version. With regard to malic acid, it can be seen in Figure 7 that it does not show clear diel variations. We have noted a similar behavior of malic acid in a previous field study conducted at K-puszta, Hungary, during a 2003 summer field campaign (Ion et al., 2005), and have explained this behavior of malic acid by its formation from both anthropogenic and natural emissions over a relatively long time scale. This additional discussion will be added in the revised manuscript. As far as we are aware, no data on the atmospheric lifetime of malic acid are available. We would think that it is also susceptible to further oxidation during daytime.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 10889, 2010.