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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evolution of trace gases and particles emitted by a chaparral fire in California" *by* S. K. Akagi et al.

Anonymous Referee #3

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The manuscript presents a detailed analysis of the changes in the chemical composition of a biomass burning plume. The authors use the in-situ measurements of particles and gases made during a prescribed fire in California in November 2009. The plume was unperturbed by other pollution and particularly isolated and stable. As a consequence, using a pseudo-lagrangian approach, this case study allows a detailed discussion of the fate of the different particles and gases within a fire plume aging over 4.5h in the continental U.S.. Measurements made near the source are used to determine emission ratios and emissions factors. The evolution of the primary emitted and secondary produced compounds is discussed and compared to previous studies. The results of this experiment are valuable for further investigation and evaluation of model capability to reproduce such chemical composition changes in biomass burning plume. As a consequence, the results presented in this paper are of significance for a

number of readers of ACP and the topic is relevant for publication in ACP. I recommend publication after revision.

General comments:

1. In Section 3.1, the authors discuss the error and uncertainties for the ERs and the NEMRs while the figures and example of NEMRs are not yet shown. In this Section 3.1, Table 2 is introduced but little discussion is given as the authors refer the reader to previous paper (i.e. Burling, 2011). As a result, it is difficult for the reader to find the objective of this section. If the authors' purpose is to discuss the difference between the estimated ERs (plot based) and the average of initial NEMRs, then the values for the latter should be added in Tab. 2. Also it seems that the initial NEMR values are expected in Table 2 as stated in the legend of Figure 7.

2. The discussion about the ER standard error and the changes in NEMRs during the plume aging should be done in the Section 3.2. Having this discussion here in the text is misleading to the reader, as he expects here a discussion about the initial conditions and emissions ratios, factors. This discussion should be lead in each subsection, to determine if there was a significant change in the chemical composition of the plume downwind.

3. It is not clear if the blue points and error bars in Fig6 to 12 are for ERs or the average of the ten initial NEMRs and how systematic is the choice made between the two values (and why?) (see Fig. 8 for example). Adding a sentence of comment about this point in the beginning of each section will add some clarity.

Specific comments:

Figure S1. The time of the profile is not specified in the caption of the Figure nor in the text. Could the authors specify it in both of them? How does the BL height changed between the two flights and during the experiment?

p22494 l4-5 The profiles of the measured wind direction are not shown on Fig1.c.

Giving those profiles beside the profiles of the wind speed will support the statement.

p22494 l8 The authors state that the mean wind speed in the lower layer is roughly 2.5m/s. Is that an average between the two flights? Please clarify.

p22495 l1 The authors use the term "nascent " which is not clearly defined and not of common use. Do the authors mean they sample the freshest plumes? Are these locations above the fire area? Also the authors state that the center and top portions were sampled. Was it done systematically? Or some of the samples are from the center and others from the top portions?

p22506 l18 Please introduce Fig 9 at the beginning of the paragraph. As a general comment, it is much more easier for the reader to follow the discussion if the figures are clearly introduced at the beginning of the paragraph it may concern, which is often not the text in the submitted version of the manuscript.

p22508 l7 Please specify that the plot showing the change in PAN versus CO2 is not shown for clarity purpose.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 22483, 2011.