

Interactive comment on “Spatial and temporal variability in the ratio of trace gases emitted from biomass burning” by T. T. van Leeuwen and G. R. van der Werf

Anonymous Referee #1

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General comments: The manuscript is well written and fairly concise, though the introduction/section 2 could be shortened somewhat by removing the fairly detailed description of the combustion processes. Some discussion of why certain satellite-derived products may do a better job in explaining changes in EF compared to others and/or why they do well in certain regions might be a better use of the space.

Combustion efficiency vs. burning efficiency: are these the same thing or does CE refer to something more specific. A line of clarification would be helpful for the reader or else CE should be used throughout.

The decision to exclude laboratory measurements is defensible, however there should

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also be some caveats given for ground- and aircraft-based measurements, too. Ground-based measurements can be biased towards the smoldering-phase combustion products while aircraft-based measurements can be biased towards the flaming-phase emissions (e.g., Yokelson 2008). These effects can be partially offset by considering the measured CE or MCE, however they do not necessarily mean the measurements represent the climatic ‘norms’ for different fire-influenced regions.

Specific comments [page (line)]: I’ve omitted the 235 before each page number

60 (4-5) : As written, the statement “the partitioning of biomass burned into emitted...has received relatively little attention” is a little misleading, since there are at least 30 years of emission measurements available in the literature. Do the authors mean studies specific to burned area-derived products?

60 (18): “less satisfying” -> lower?

61 (18): suggest changing “amount of gas” to “amount of gas or particle mass” to include aerosol emissions

61 (26): Please provide a reference for SAFARI-2000

63 (15-17): The final sentence of the paragraph is a little vague. Something describing factors that might affect the representativeness of the EF (i.e., are the fires representative of typical conditions?) would aid planning of future field measurements.

63 (27): MCE also has some predictive use for certain aerosol species and characteristics (e.g., Christian et al., 2003; McMeeking et al., 2009; Janhall et al., 2010 and earlier work by Ward, Hardy and others)

65 (2): start → starts Section 2.1: Should explicitly state somewhere in this section that in most fires all of these processes occur simultaneously in different parts of the fuel bed.

66 (22): vegetations’ → vegetation’s

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69 (4): Please provide the date of the most recent result that was compiled into the annually updated of the A&M inventory.

69 (17): "specie" to "species"

69 (21): does any literature give estimates of the range of fuel C% for different ecosystems? This would help constrain the uncertainties in the study. Converting from g kg DM to g kg C emitted would eliminate this source of variability

70 (22-23): slightly unclear. Suggest adding "has relatively high rates of emissions of reduced gases compared to sampled regions; . . .".

71 (7-13): How do these values compare to correlations observed in a couple different field studies or individual fires? This would give some idea of how tight a correlation one would expect for a relatively simple situation .

72 (21): Can a quantitative example estimate be provided here? For example 20% of annual emissions. . .40%?

72 (26): "right month of the year" is contradicts the earlier statement "ideally, EFs are thus measured during both peak and shoulder of the season", making it sound like there is a "correct" period to measure fires despite the argument that measurements are also needed in the shoulder of the season. Suggest this be changed from "right" to "peak" month of the year?

72 (27-30): Please provide a reference describing the extra-tropical seasonal cycle.

79 (5-10): Yokelson et al. (ACP, 2008) performed a similar analysis for TROFFEE which may be more appropriate to refer to since they focused on tropical fires, which are more relevant to this study compared to chaparral fires.

80 (2): analytical? Should this be analytical or statistical?

Tables and figures

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Table 2: Minor point, but acronyms in the left-most column could be replaced with full text descriptions (to avoid having to refer to the caption). Please provide units. Are the A&M2001 and updated results combined? It would be interesting to see how they have changed.

General comment on figures: The figures would be clearer/easier to interpret if the color scheme for savanna/tropical/extratropical was consistent across all of the figures. The current draft has savanna as purple in Fig. 1, green in Fig. 2, and blue in Fig. 3.

Figure 1: Please give units on the color scale in the plot as well as the caption.

Figure 2: Please provide the coefficients of the regressions somewhere on the plot or else at least refer to where in the text (or what table) they are provided.

Figure 3: Change symbols from crosses to circles and remove shadows. X-axis labeling is a little confusing. It might be more clear if the label was changed from "month" to "Time from month of maximum burning (months)"

Figure 5: Black symbols are difficult to see on the red color background and the plot is too small. Might be easier to see colored symbols on grayscale. Please provide a legend describing the different symbols on one of the plots and label one of the color scales. Change $1e10$ g to 10 Gg in the caption. Why not average temperature and precipitation over the same period as the fire emissions (or at least do it between 1997-2008 if 2009 data are unavailable).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 23559, 2010.

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