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Interactive comment on "Seasonality of greenhouse gas emission factors from biomass burning in the Brazilian Cerrado" *by* Roland Vernooij et al.

Anonymous Referee #2

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The present manuscripts tackles an important and data-scarce topic: the seasonality of burning efficiency in open vegetation types. The authors introduce the topic by describing the biogeochemistry of fire combustion influenced by climate season, as well as set the ecological context by characterizing the fire ecology and biodiversity of the Cerrado biome, and its implication for carbon balance and related fire management. The study aims at providing new data on spatio-temporal variability of the emission factors from combusting cerrado fuel in controlled fires to update large-scale fire data bases on biomass burning. Data were collected from the smoke plumes. From the obtained data new emission factors were calculated using the state-of-the-art mass balance equation. Fuel type was derived from high-resolution vegetation type classifications using

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remotely sensed data from Rapid-eye, MODIS and Landsat. Fuel amount estimated from quantifying recovery time since last fire which was derived from Landsat data. Here, the study lacks to inform the reader how this data on fuel type and fuel amount is integrated into the emission factor quantification in equ. 1 and 2, respectively. The authors need to add respective information and they need to describe how the upscaling is done in order to analyse the spatio-temporal variation.

The results describe seasonality pattern found in emission factors for N20, CO and CH4. The authors find that N20 has seasonality trends opposite to CO and CH4, where the latter indicate incomplete combustion. Statistical significance are mentioned, but not reported in detail with respective results in section 3.2. Even though it is marked in Table 3, examples should be provided in the text.

The results are then discussed in detail and contextualized using earlier publications, offering the reader to understand where earlier findings could be confirmed and where uncertainties, especially for N2O, still persist. It underlines the importance of reporting spatio-temporal variabilty in each measurement campaign also in global studies. The discussion contains a detailed description of uncertainties arising from sampling strategy, multi-day burning fires, and emission factor calculation. To avoid confusion, please also cite the original study where these numbers were taken from (it is correctly done in the methods, but worth repeating here on page 15, line 2). p. 15, lines 14-23: The discussion of the role of peat carbon contributing to carbon combustion in Cerrado fires is somewhat arbitrary, since peat combustion was not explicitly measured in these experiment, nor was the carbon storage in organic soils quantified or its proportion in the study area quantified. I would suggest to carefully discuss the wider implications of burning organic (peat) soils in the Cerrado.

The key finding of this study is clearly the fact that lower N2O emissions were found that could impact global N2O budgets if the burning conditions measured here are representative of all savannah areas which are a large contributor to global biomass burning. However, the conclusion should also contain key results (numbers) for the EF

factors for CO, CH4 and N20, incl. their uncertainty range.

Overall, the manuscript is well written, the results are substantiated and contextualized using earlier findings. The figures and table are of good graphic quality and well present the results of this study. I recommend accepting this manuscript with minor revisions.

minor corrections: p. 8, line 12: please explain BA abbreviation p.9, line 25: it should read "In Figs. 5-7 the green diamond" p. 12, line 11: explain abbreviation RSC.

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