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Discussions

Interactive comment on "Seasonality, drivers, and isotopic composition of soil CO_2 fluxes from tropical forests of the Congo Basin" *by* Simon Baumgartner et al.

Simon Baumgartner et al.

simon.baumgartner@uclouvain.be

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We thank the Referee for their review. We have identified three main issues raised by the referee and will respond to each below.

The static manual chamber method used in this study is a well-established method used to measure soil GHG fluxes (e.g. Garcia-Montiel et al., 2004; Imer et al., 2013; Werner et al., 2014; Courtois et al., 2018). While we acknowledge that more advanced methods to measure GHG fluxes exist (i.e. portable gas analyzers), logistical constraints of working at four remote sites in the Democratic Republic of the Congo for extended periods of time prohibited methods that required multiple expensive instru-

ments and reliable access to electricity. We chose the well-established methodology of evacuated gas sampling of static chambers because they 1.) were cost effective for sampling multiple sites for 2.5 years, 2.) were simple to perform for our field assistants, 3.) did not require electricity, and 4.) did not require materials that could be stolen or easily damaged. In conclusion, to conduct a long-term survey in the Congo Basin, we decided the exetainer sampling of permanently installed static chambers was the only reliable and suitable technique.

In response to the concern regarding the 1 hour sampling duration, none of the total 1108 individual soil CO2 flux measurements showed saturation of CO2 concentration in the chambers (i.e. by reaching a plateau, see examples for each site in Figure 1). All of the measured fluxes exhibited linear increases with very high r2 (see Figure 2 below) and only fluxes with a r2 > 0.9 were considered in our analyses. Furthermore, we would like to point out that, in the absence of chamber saturation effects, longer flux durations result in more accurate flux calculations, since the ΔCO2 is larger for each time interval relative to the measurement accuracy. Nevertheless, we thank the reviewer for requesting more detailed method descriptions and will edit the manuscript accordingly.

Regarding the number of replications, we used a minimum of three chambers per site as replicates which we described in the methods section. During the short-term sampling campaigns, five chambers were used. The results from these short-term campaigns with the additional chambers showed extremely low variability between chambers at the same site. We only conducted the long-term measurements in the montane forest with only three chambers in the same locations because the sampling material and time of our field assistants were limited given the logistics with doing research in the DRC. Moreover, three of our sites were located in the lowland forests (Yangambi, Djolu and Yoko) and separated by more than 100 km. These sites exhibited both low intra- and inter-site variability, further confirming that our number of replicates was sufficient for measuring soil CO2 fluxes from these forests. We will add more detailed

information to the manuscript.

While we feel the inclusion of stable isotopes is relevant and of interest to the reader, we agree that certain points of the discussion are maybe somewhat speculative. We will tone down the language of this section in the revised draft and offer carbon limitation as merely a possible explanation for the observed trends.

In addition to the three main issues, several comments on word choice and phrasing were made. We thank the Referee for their suggestions and will amend the revised manuscript accordingly.

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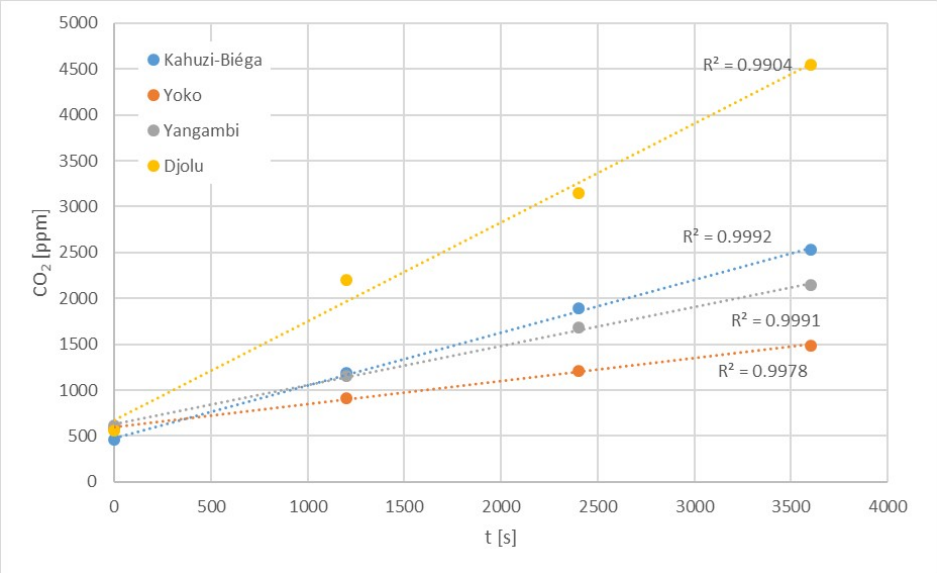

Fig. 1. Examples of CO2 concentration over time during a single chamber measurement for each site

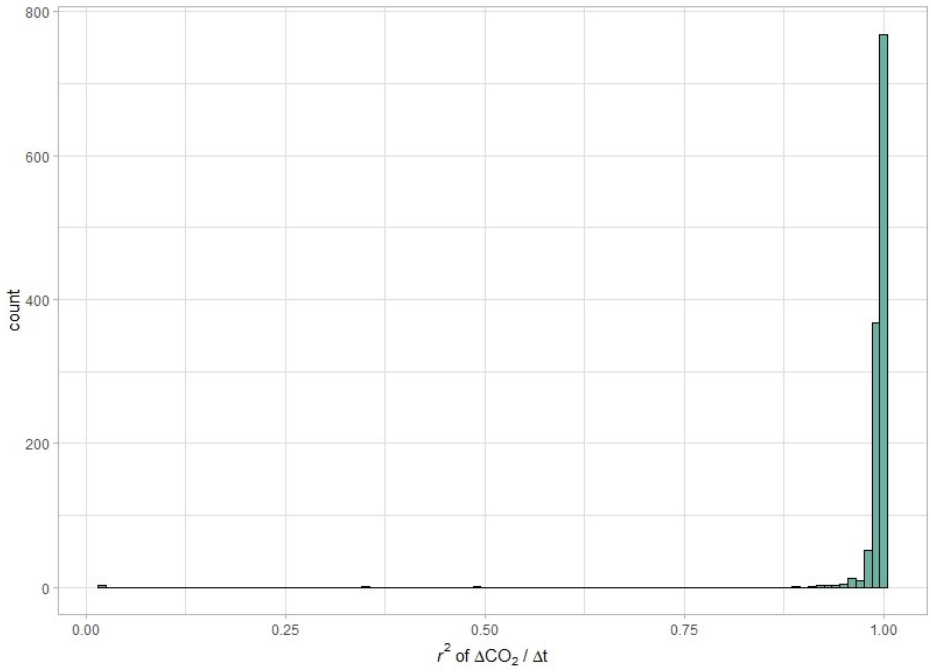

Fig. 2. Histogram of the r2 values for each linear fit