**Biogeosciences
Discussions**

Interactive comment on "Drought effects on soil CO_2 efflux in a cacao agroforestry system in Sulawesi, Indonesia" *by* O. van Straaten et al.

Anonymous Referee #2

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The paper from Van Straaten et al entitled "Drought effects on soil CO2 efflux in cacao agroforestry system in Sulawesi, Indonesia" investigated the effects of throughfall water exclusion on the soil CO2 efflux. The study was conducted on a cacao plantation in Indonesia. The peculiar ecosystem analyzed makes this analysis very interesting. In fact considering the extension of cacao agroforestry ecosystem area, the study of the effect of water stress and drought on soil carbon effluxes is of high interest in particular in terms of management of these ecosystems. The experimental design and the statistical analysis is in my opinion in general satisfying, even if I am not an expert of these kind of experiments. The paper is well structured even if in some parts can be sharpened while in other parts, such as the statistical analysis, should be expanded. The topic is well introduced and the analysis follow really well the Introduction. Moreover, the Introduction is particularly interesting for the readers. Methods are very often

described in detail. My concern about the methods regards the confounding effect that temperature, water availability, productivity and distribution of litter can have on the presented results. Results and Discussion are in general clearly presented and elaborated. For these reasons this paper is in my opinion valuable and suited for publication in Biogeosciences. There are some major points that need to be addressed before publish the paper:

1)To test if there are statistical significant differences between the control and roof the authors use very often months of data. The differences are very often not significant but in my opinion the authors can use a moving window (for example of 2 weeks) and calculate the p-value in order to understand if and when the differences between the roof and control become significant. Also the differences during the CO2 flush in April 2008 should be discussed better. At a first look it seems that the differences between control and roof are not so significant but maybe looking at the derivative of the time series the authors can justify this CO2 flushing.

2)In my opinion the linear regression between soil moisture and soil efflux is not completely correct since the response to drought can be confounded by the effect of productivity and temperature. One possible solution is the use of a model driven at least by soil temperature and soil water content. In this way it is possible to estimate the parameters describing the sensitivity to soil water content. Then look at the spatial variability of these parameters and add this information in the interesting Fig 2.

3)The authors showed that the overall relationship of soil CO2 efflux with temperature was not so strong. In my opinion this relationship should be tested stratifying the data in class of soil moisture (according for example with the quantile). The different water availability can confound the sensitivity to temperature (although the soil temperature seems really constant during the measurement period).

4)The litter layer development as well as an indication (if available) of the time courses of the productivity of the plantation need to be included. These information are nec-

essary to support the hypothesis of a reduction of autotrophic respiration due to the reduction of roots respiration of cacao plants induced by drought. The authors showed that chambers near tree stems (for cacao trees) were more sensitive to drought. Is there also an impact of litter accumulation and distribution under the roof?

Specific and minor comments:

Title: I suggest to modify the title as: "Spatial and temporal effects of drought on soil CO_2 efflux in cacao agroforestry system in Sulawesi, Indonesia".

Method section: The positioning and displacement of the chambers should be describe in detail. The data analysis should be expanded and clarified a bit, in particular in the last part (from line 525 1151) The reference Rdevelopment core team, 2008 is missing.

Results Section: Pag. 11555 Lines 9-10: Please move this in the methods Pag. 11559 Lines 5-10: Please reformulate this sentence

Table 2: A plot instead of a table can be more easy to interpret.

Table 3: In my opinion this table is not so interesting. The authors can consider the idea to plot the mean diurnal courses with error bars in place of the table.

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