

## ***Interactive comment on “Implications of CO<sub>2</sub> pooling on $\delta^{13}\text{C}$ of ecosystem respiration and leaves in Amazonian forest” by A. C. de Araújo et al.***

**A. C. de Araújo et al.**

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General Comments:

Lengthening of the manuscript, results section, figures (text and symbols)

We agree with Referee #2. We have followed the suggestions and the manuscript was shortened considerably. In addition, Table 1 and Figures 1 and 8 were removed from the manuscript.

Labels for  $\delta^{13}\text{C}_{\text{soil}}$  and  $\delta^{13}\text{C}_{\text{Reco}}$

We agree with Referee #2 and the labels were edited.

Abstract

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We partially agree with Referee #2 about the abstract have not provided a clear statement of the aims and/or hypotheses of the study. For example, in the first paragraph, we stated that "Samples of sunlit leaves and atmospheric air were collected along a topographical gradient in the dry season to test whether the  $\delta^{13}\text{C}$  of sunlit leaves and the carbon isotope ratio of ecosystem respired  $\text{CO}_2$  may be more negative in the valley than those on the plateau". We agree with the suggestion to be more specific in the presentation of the results and to explain the relevance or importance of the findings. We have edited the abstract accordingly.

Material and methods P4464 last paragraph. What is HDPE?

HDPE means high-density polyethylene and it was now included in the text.

## Results

Page 4472 The 2002 campaigns, are results from this necessary to include? They do not seem to contribute with much new information?

We agree with the reviewer's statement. However, as the logistics for isotopic gas sampling in the Amazon region is not trivial, we have considered including these data as important information to be available and contribute to the general global public database.

P4476 The good correlation between  $\text{ci}/\text{ca}$  and  $\delta^{13}\text{C}$  ( $R^2$  is probably 1.0). Is this because the two parameters are derived from the same data? I agree with the concerns brought up by referee #1 on Fig. 8 and  $\delta^{13}\text{C}$  and I also suggest the authors to omit this part.

The good correlation between  $\text{ci}/\text{ca}$  and  $\delta^{13}\text{C}$  is high (and indeed  $R^2$  is 1.0) because the coefficients  $a$  and  $b$  are both constant (see equation 1). We also agree with Referee #1 and we have omitted Fig 8 as well the sections 3.5 (Carbon isotope discrimination by sunlit leaves), 4.5 (Temporal and spatial variability of  $\delta^{13}\text{C}$ ,  $\text{ci}/\text{ca}$  ratio and  $\text{ci}$ ) and 5.5 (Temporal and spatial variability of  $\delta^{13}\text{C}$  and  $\text{ci}/\text{ca}$  ratio) from

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the manuscript.

Text connected to Table 5. Due to that the number of objects in each regression is only three and the resulting uncertainty in the estimates are probably large, I suggest the authors to point at similarities not to stress the differences in time lag and by,x. The regressions in this Table, are they based on the same data as in Fig. 7? If so this could be informed in the legend.

We agree with the suggestions made by Reviewer #2 about the uncertainty in the estimates of each regression due to the reduced number of points. The texts related to Table 5 were edited accordingly. Figure 7c shows the relationship between  $\delta^{13}\text{C}_{\text{Reco}}$  and D for each topographical section according to the results of Table 5. This is informed in both text and legend of Fig. 7.

Figure 3. Add the line showing the  $\delta^{13}\text{C}$  of the tropospheric background to all graphs to the left and the line showing the corresponding  $[\text{CO}_2]$  to the right. This will make it easier for the reader.

We agree with Referee #2 and we have edited the former Fig. 3.

Figure 5. The combination of the upper two graphs with the lower two is confusing. This is probably because the x-axes are different. Either separate into two different Figures or place the soil data (c and d) to the right in the two upper graphs (a and b). Change the label on the y-axis to  $\delta^{13}\text{C}$  ( $\text{‰}$ ) and draw lines between the  $\delta^{13}\text{C}_{\text{Reco}}$ -data points to make it easier for the reader.

We agree with Referee #2 and we have followed the suggestion of placing the soil data (c and d) to the right in the two upper graphs (a and b). We did not change the label on the y-axis, though we have drawn the lines between the  $\delta^{13}\text{C}_{\text{Reco}}$ -data points.

Discussion

P4477 It is unclear to me what is meant in the sentence beginning with  $\delta^{13}\text{C}_{\text{Reco}}$ ; because leaf conductance  $\delta^{13}\text{C}_{\text{Reco}}$ ;

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On the plateau, the leaf-level photosynthetic capacity is higher than in the valley and causes a decrease of  $c_i$  at the carboxylation site. Schulze (1986) demonstrated that leaf conductance might be more sensitive to soil moisture than photosynthesis. Thus, it is very likely that decreased soil moisture content on the plateau would cause a decrease in leaf conductance, which implies in less diffusion of  $\text{CO}_2$  to the interior of the stomatal chamber therefore lowering the  $c_i$ . As  $c_i$  decreases in the carboxylation site, the  $c_i/c_a$  ratio of a leaf decreases as well as  $\delta^{13}\text{C}_{\text{leaf}}$  and therefore  $\delta^{13}\text{C}_{\text{leaf}}$  increases on the plateau.

Page 4478-4479 Most of the section 5.2 is repetition of results I suggest to move these two pages completely to the results.

We partially agree with Referee #2. We have moved some texts from section 5.2 to section 4.3 accordingly. We have decided to maintain the former Fig. 9 in section 5.2 because it shows the vertical profile of  $\delta^{13}\text{C}_a$  at all topographical sections in the same graph as a function of the altitude and time, thus allowing the visualization of the vertical stratification of  $\delta^{13}\text{C}_a$  along the topography. Yet, the data used in this figure (of high accuracy and precision) confirms the findings of de Araujo et al. (in press) for nighttime conditions in the dry season.

Page 4481-82 Due to the very few data points in the regression analyses do not stress the differences in time lag and slope.

We agree with Referee #2 and we have edited the text accordingly.

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