E. Fulajtar (Referee)

e.fulajtar@vupop.sk

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General comments

The presented study is aimed on novel research topic which is important for understanding the carbon cycle and will contribute to climate change studies. This study demonstrated that 13C stable isotope is a valuable tracer for identification of changes in vegetation and soil quality controlled by climate, land use and soil properties (particularly soil texture). Replacement of savanna vegetation with high portion of C4 grasses by forest vegetation dominated by C3 plants or vice versa, can be identified by the 13C tracer and thus the changes in vegetation cover caused either by climate or by human activities (grazing, timber harvesting, etc.) can be detected.

The overall scientific level of the study approach and the added value of its results should be assessed very positively. Another important contribution of presented study is the geographical focus and the spatial scale of the study area. The studies investigating the distribution of environmental phenomena and their dynamics across the major horizontal bioclimatic zones are very rare. These large scale environmental is- sues are seldom studied. The investigated area extends over two zones - the savanna and the tropical forest. Moreover, the geographical focus to Western Africa is valuable also as source of primary environmental data. Such data from West Africa are scarce (as it is for many large regions of the world) so each gained data set contributes to building the overall geographical coverage of information on environmental factors and conditions.

We would like to thank Emil Fulajtar very much for his valuable voluntary contribution to improve this article. We provide answer to the specific comments below. Our comments are in bold font.

Specific comments

The added value of the paper can be increased if some of the following questions and remarks would be considered. They are listed as bullet points successively from the beginning to the end of the paper and attributed to line numbering of the manuscript.

âA˘c´ The first objective item of the study is formulated as follows: "1) Delineate the spatial patterns of SOM ...". The collected data do not have such spatial distribution and density of observations to allow delineation of spatial patterns of SOM. They can only characterize different types of SOM and their links to different geographical conditions, but not the spatial patterns. It would be better to reformulate this objective item (Chapter 1. Introduction, lines 140-141).

We have deleted 'the spatial patterns' from the text.

âA˘c´ There are mentioned three objectives of the study. It would be useful to formulate some general overall objective and eventually to explain how these three objectives are interconnected or mutually related (Chapter 1. Introduction, lines 140-145).

We have included an introductory sentence prior to the objectives, which sets out the context on which the objectives are formulated. The MS now reads: 'The overall aim

of this work is to provide a field-based assessment of the effects that C_3 and C_4 vegetation have on SOM dynamics. Therefore, the objectives of this study are: (1) delineate the spatial patterns of SOM dynamics across contrasting C_3/C_4 mixed semi-natural tropical ecosystems; (2) investigate any potential variation in tropical vegetation shifts along the precipitation transect; and (3) unambiguously evaluate the effect of vegetation thickening on SOM dynamics in two contiguous but structurally different woodland ecosystems.

âA˘c´ It is written that the site characteristics were provided in three former papers. It is not very convenient for the readers. If this paper should be red, three another papers should be gained. To get a picture on the site characteristics information from three sources should be combined. The site data are not so negligible information to be skipped by the reader and searching for them would require additional work. It would be better to introduce the site characterization also into this paper. At least some brief overview, may be in tabular format should be involved (Chapter 2.1. Characteristics of the sites, lines 149-151).

Revised as suggested. We have now included a Table in the appendix (Table A1) which contains information on latitude, longitude, Mean annual averages for precipitation and temperature, classification of the regional vegetation, soil type and soil textural classes for each site.

âA˘c´ There is no table providing an overview of measured 13C data. Such table is missing. Some 13C data are in Table 1 but this table is focused to 14C data and not all sites are there (in Chapter 2.1. it is mentioned that 14 sites were sampled). It would be good to have full basic information and it would help very much to reader to follow the discussion. If only discussion without an overview of basic data is provided, the reader is depending fully on the particular statements of the authors. If an overview of data would be available the reader would be much more free in his own thinking and interpretation of the ideas presented (Chapter 3. Results, lines 239-240).

All the d13C data that we have discussed in the present MS is presented in graphical form throughout the various figures.

âA˘c´ The discussion is rather complex and it is not easy to follow it. It is separated to 4 subchapters which are aimed on specific subtopics and these subtopics do not match entirely or directly to the three items of objectives or to the four sub-chapter of results. The link between the discussion subtopics is also not so easy to see. It would be useful to link these subchapters by some short introductory general paragraph which would explain why those items were selected for the discussion and how they fit together to make a whole. (Chapter 4. Discussion, lines 316-567).

In addition to the new conclusions section, which explicitly recalls the objectives of the study, we have also edited the discussion header for section 4.3. It now reads ‘ Vegetation shifts along the precipitation transect’. We trust that these edits will guide the reader in a more efficient way throughout the MS

âA˘c´ It is surprising that at the wet sites of transect the woody vegetation is increasing. According to present investigations there is advancing desertification so the diminishing of forests and spread of savanna should be expected. Can the opposite trend be explained or discussed (Chapter 4.3. Stable carbon isotopic composition of SOM with depth across the transect, lines 451-452)?

As explained in the Introduction, the progressive ‘thickening’ of woody vegetation in grasslands and savannas is a global phenomenon that has been widely documented

(Archer et al., 2001; Boutton et al., 2009; Guillet et al., 2001; Krull et al., 2005; Liao et al., 2006; Pessenda et al., 1998). Woody thickening is being promoted by climate change, changes in fire regimes and other anthropogenic land use activities (Jackson et al., 2000; Krull et al., 2005; Silva et al., 2008) with increased woody (C_3) plant growth in response to continually increasing atmospheric CO_2 concentrations a likely key driver (Bond and Midgley, 2012; Buitenwerf et al., 2012; Donohue et al., 2013).

On the other hand, it is also true that in some other regions like in some arid and semi-arid areas of the Sahel, the opposite trend is being observed. The reasons for such contrasting dynamics are discussed in the MS: 'The arid Sahelian ecosystems studied (HOM sites) may have experienced a relatively recent reduction in woody cover as evidenced from the large enrichment in ^{13}C towards the surface. There may be several reasons behind this potential thinning of woody biomass at the driest sites, with a combination of overgrazing, fuel harvesting, fires, and above all the severe droughts suffered over the past few decades, being the most likely causes (Krull et al., 2007)'.

âA˘c´ It is mentioned that the trend in isotope composition along the depth is influenced by soil properties and even that the vegetation is influenced by soil properties. This statement call out a question to which extend the vegetation dynamics and climate impacts can be investigated with the use of 13C stable isotope. Can be the impact of different soils and the climate change impact on the vegetation distinguished (Chapter 4.3. Stable carbon isotopic composition of SOM with depth across the transect, lines 452-455)?

Given the large number of factors affecting SOM dynamics, this is a very hard differentiation to make indeed. However, we think we have succeeded in doing just that with the explicit assessment of the effect of vegetation thickening on SOM dynamics in two contiguous but structurally contrasting transitional ecosystems occurring on comparable soils. Such setting was chosen to minimise confounding effects posed by climatic and edaphic factors, as fundamental differences in $\delta^{13}C$ fractionation dynamics have been reported for different soils and types of organic matter.

âA˘c´ There is no conclusion. Some short chapter on conclusions would be very helpful especially because of the complexity of the discussion. It should summarize all finding with respect to the paper objectives (Line 568).

Revised as suggested.

Technical comments

Lines 910-912: Figure 1 should be split to two figures: 1) Map with the study sites location and 2) photos of soil profiles.

Revised as suggested. All the figures have been re-numbered.

Lines 918-922: The figure titles are long and descriptive. It would be better if the styles of point data and trend lines are explained directly within the figure in graphical form. It means that there should be a legend window aside the graph area where the graphical symbols (all different point styles and trend line styles) would be depicted and described by short titles.

We have attempted to include a legend that encompasses the information provided in the caption, but given the large number of symbols (data points) in that figure, its inclusion within the panel actually results in a too overloaded figure, which will still

require some explanation in the caption. Hence, for the sake of clarity we have chosen to leave the figure as is.

Lines 922- 929 and Lines 940-947: These parts of the explanations involved in the figure titles do not fit very well into figure titles. They should fit more into the discussion chapter.

Whole sentences from the captions of these two figures have now been moved to the main body of the article. This is also in line with the recommendations posed by Reviewers #2 and 5.

Final comment Despite of the listed comments the paper should be considered as valuable contribution to the research at the studied field. All presented comments are trying only to provide some advances how the paper may be improved, but their consideration should be left fully to the willingness of the authors.

We do thank again Emil Fulajtar for his valuable contribution to improve this article.

Finally I would like to answer the questions of review criteria as they are listed at journal website: http://www.biogeosciences.net/peer_review/review_criteria.html

Aspects to be taken into account in the full review and interactive discussion, the referees and other interested members of the scientific community are asked to take all of the following: 1. Does the paper address relevant scientific questions within the scope of BG? Yes 2. Does the paper present novel concepts, ideas, tools, or data? Yes 3. Are substantial conclusions reached? Yes 4. Are the scientific methods and assumptions valid and clearly outlined? Yes 5. Are the results sufficient to support the interpretations and conclusions? Yes 6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes 8. Does the title clearly reflect the contents of the paper? Yes 9. Does the abstract provide a concise and complete summary? Yes 10. Is the overall presentation well structured and clear? Yes, but the suggestions what can be improved are explained above under the General Comment and Specific Comments. 11. Is the language fluent and precise? Yes 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Several suggestions for changes are explained under the General Comment and Specific Comments. However, I prefer the authors to consider, which suggestions they would like to consider or not. 14. Are the number and quality of references appropriate? Yes 15. Is the amount and quality of supplementary material appropriate? Yes