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## ***Interactive comment on* “The relative importance of decomposition and transport mechanisms in accounting for C profiles” by B. Guenet et al.**

**B. Guenet et al.**

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*Answer to comments from the reviewer.*

*Comments from the reviewer were left intentionally in this document and written in roman font. Our answers are written in italics.*

Comments from Anonymous referee 1:

This manuscript presents the results of a modeling exercise aimed at unraveling the vertical transport of soil organic carbon (SOC) in a Haplic Chernozem in the Kursk Region of Russia. Data from a long-term bare fallow experiment site was used to model three theoretical transportation SOC pathways through soil. The author examined the following transportation pathways: 1) diffusion, 2) advection or 3) both diffusion and

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advection. The transport schemes were coupled to two decomposition models. The innovative approach presented by authors' compares a bare soil plot which had no organic matter inputs since 1947, with an adjacent control plot which had regular input of fresh organic matter. As validation model results are compared to field measurements. I must admit I have limited experience in similar carbon transport modeling. Accordingly, I will limit my review to more general comments on the understandability and focus of the paper.

I will begin with some more fundamental issues I have with the paper: Since this paper presents a methodological approach that is quite complex and involved, it imperative that the paper be written extremely clearly. In regards to the clarity of the text:

1. Refine the English – sentences are often awkwardly constructed and can often be written in a clearer and more concise manner. This will improve readability considerably.

*We rewrote largely the ms. We hope that it is now less awkward.*

2. The text is often difficult to follow as it is cluttered with abbreviations that are often difficult to trace quickly. I recognize however that this may be unavoidable given the nature of the study and the necessity to present different equations.

*We tried to reduce the abbreviations and when not possible we used more intuitive abbreviations. For example, for the mineralization formulation we use now MIN instead of FS.*

3. Better use of subtitles. Some subtitles are not very informative (one example: section 4.2 compared with section 4.3)

*We modified the name of the section 4.3 for 'The best transport mechanisms may depend on the SOM mineralization formulation'.*

There are several points which need further clarification / better explanations: - I was unclear on how the diffusion coefficient was determined in equation 9 and 11? The

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diffusive transport of gas through a soil is dependent on the soil properties – more specifically the configuration of air filled pore space through which gas travels through it. Is it therefore not necessary to consider the soil moisture contents and evaluate pre-existing diffusion coefficient calculations (i.e. Penman, 1940; Millington and Quirk, 1960; Millington and Quirk, 1961; Moldrup, 1999).

*The diffusion coefficients were obtained after optimization. The procedure is now described in details in the section 2.3 parameter optimization.*

Minor corrections: - Use numerals for numbers of ten or more. Use words for single-digit numbers (less than 10)

*Done*

- Subject headings 2.2.1 to 2.2.5 could be a bit more explicit

*We had the name of the mechanisms described in the headings.*

P.14147 L.14: “layer” should be plural: “layers”

*Done*

P.14149 L.15: “moderately cold” - this is subjective

*We remove this part.*

P.14149 L.15: “horse traction” should be “horse and plow”

*Done*

P.14149 L.16: “using machine at” should be “mechanically plowed to”

*Done*

P.14149 L.21: “used before” should be previously”

*Done*

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P14150 L.6: “floor of the steppe” should be “soil surface”

*Done*

P14150 L.16: “obtained by” should be “measured using”

*Done*

P14154 L.15: “Fick’s coefficient” should be “Fick’s diffusion coefficient”

*Done*

P14154 L.20, 24: “choose” should be “chose”

*Done*

P14158 L. 22,27: “over estimate” is one word “overestimate”

*Done*

P14158 L.26-27: remove “lead to largely”

*Done*

P14159 L.4,5: “under estimate” is one word “under estimate”

*Done*

P14159 L.16-17: Awkwardly constructed sentence

*We modified the sentence: ‘We found in the results section that for the MIN1 formula-tion, the model with only diffusion never fit the data very well, except for the steppe.’*

P14161 L.25: change “perfectly fit with” “better match”

*Done*

P14161 L.26: This paragraph fits better in the conclusions. Perhaps at the very end as it gives a bit of a final thought.

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*Since we remove the conclusion section we let this paragraph as it was.*

P14162 L.7: Not clear to me “: : :presenting crossing point between the dashed lines: : :”

*Following the comments of the other referees we modified our way to calculate the envelope as it is now described in the methods section. We do not discuss about the ‘crossing point’.*

P14170 Fig 3: The legend. Considering all graphs here have the same legend, why not only include the legend once instead of one for each graph? Perhaps use the full words instead of the abbreviations. In that case you can remove the last sentence of the figure description.

*We include the legend just once.*

P14171-114173: Fig4-6: Colors in graphs. Many people print in black and white and in this case it would be difficult to interpret the graphs without color. You could still keep the different colors but make some change the solid lines to dashed lines or use different symbols.

*We modified the graphs to facilitate the reading for peoples who print in black and white.*

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Interactive comment on Biogeosciences Discuss., 9, 14145, 2012.

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