

## ***Interactive comment on “Millennial-age GDGTs in forested mineral soils: <sup>14</sup>C-based evidence for stabilization of microbial necromass” by Hannah Gies et al.***

### **Anonymous Referee #1**

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The manuscript titled “Millennial-age GDGTs in forested mineral soils: <sup>14</sup>C-based evidence for stabilization of microbial necromass” by Gies et al., showcases an isolation method for both isoprenoid and branched glycerol dialkyl glycerol tetraethers (GDGTs) from mineral soils for subsequent compound-specific radiocarbon analysis. Based on the turnover times of millennia, the authors concluded a presence of stabilized microbial necromass in the soils. The manuscript encompasses a thorough description and validation of the methodological approach. It is well suited for publication for Biogeosciences. However, there are some errors and potential points for improvement. Firstly, this study uses newly produced GDGT data in comparison with previously published data of 2 sites in Switzerland. However the results from the individual sites are insuf-

C1

ficiently discussed. For example, regarding Fig. 5, there is only one reference line for the turnover time for bulk SOM even though your study features 2 separate sites. Both GDGT and additional data from Van der Voort et al. (2007) partially differ between the sites. Consider showing individual reference lines for bulk SOM and discuss how the differences between data from both sites do or do not affect your overall conclusion. Secondly, there is no explanation of the MBT'5Me and the CBT' ratio. The results for the ratios are currently not discussed and do not contribute to the overall conclusion. This could be integrated better. Thirdly, there are some typing errors and additional suggestions, which are listed below.

Line 28: Since you already introduced <sup>14</sup>C as a term for radiocarbon, you should keep to writing <sup>14</sup>C instead of radiocarbon

Line 33: Starting from line 33, you inserted an indentation at the beginning of a paragraph. You should either dismiss the indentation or do it constant throughout the manuscript.

Line 38: “the relative abundance of branched versus isoprenoid GDGTs...” Since you already introduced the abbreviation brGDGTs and isoGDGTs, you should just write: “the relative abundance of brGDGTs versus isoGDGTs...”

Line 40: See line 38.

Line 44: “. . .and soil pH Weijers et al. (2007), respectively. . .” Weijers et al, 2007 in brackets.

Line 53: Apparently, this paragraph was falsely edited by the authors since punctuation is placed in the middle of a sentence. This should be re-written.

Line 63: Again, since you already introduced isoGDGTs and brGDGTs, you should stick to the abbreviations.

Chapter 2.1 Study site: You may want to consider incorporating a map showing the study sites. Or you may also refer to Fig. 3 to show where the study sites are located.

C2

Line 94: “As extracting several kg of material is impractical, focused instead on pooled isolation and  $^{14}\text{C}$  measurement of isoprenoid GDGTs and branched GDGTs, respectively. . .” I assume, a “we” is missing between impractical and focused.

Line 97: “For this study, the pooling of the GDGTs reduced the required initial sample size to a maximum of 500 gdw of soil.” How exactly was the pooling performed? What compounds were pooled together?

Line 100: “In brief:” no need for a new paragraph.

Line 112: C46 subscript.

Line 179: What is the “MBT’5Me? And the CBT’ ratio?

Line 260: “The  $\delta^{14}\text{C}$  values of living organisms, and their constituent lipids, directly reflect that of their metabolic carbon source as, unlike stable isotopes, they are impervious to biological fractionation effects (Ingalls and Pearson, 2005).” This is sentenced quite cumbersome. I would suggest rephrasing.

Line 344 & 346: You should stick to writing subsurface or sub-surface.

Line 346: “. . .that exhibit such sub-surface concentrations peak..” Either concentration peaks or exhibit such a sub-surface concentrations peak.

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