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Comment on soil-2020-107

Anonymous Referee #3

Referee comment on "Transformation of *n*-alkanes from plant to soil: a review" by Carrie L. Thomas et al., SOIL Discuss., https://doi.org/10.5194/soil-2020-107-RC3, 2021

With 'transformation of n-alkanes from plant to soil' Thomas and co-authors have chosen a topic for their review that is an extremely narrow field of research. This is acknowledged by the authors already in their abstract stating 'only a limited number (of studies) have focused on the transformation of these compounds… in soil archives'. Moreover, there is according to my knowledge no discussion or controversy in the scientific community concerning transformation of alkanes from plants to soils. This likely explains why no questions are raised by the authors in or at the end of the introduction chapter. I therefore doubt that the chosen topic merits a review paper that shall attract attention and address a broader readership.

Moreover, the readers of 'SOIL' do not learn anything new and the manuscript contains flaws. The 'major findings' summed up by the authors (decreasing n-alkane concentrations and decreasing CPI) are trivial, known for a long time and described by more than 90% of the cited respective studies. The first part of the third 'major finding' (preferential degradation of odd chain length) is equal to major finding (2) just in other words and the second part of the third 'major finding' (preferential degradation of shorten chain length n-alkanes) is simply wrong and not supported by the majority of the studies cited by the authors (see ll. 164ff and l. 262). Actually interesting or striking features such as the accumulation of soil microbial-derived medium-chain n-alkanes or the increase of n-alkane concentrations at coniferous forest sites (Fig. 3b) are unfortunately not or insufficiently emphasized or wrongly explained (the increase can be simply explained with needles producing no n-alkanes but understory in coniferous forests contributing to the soil n-alkane pool). A review focussing on plant to soil transformation should not include subsoils or peat archives. Statements or citations like in l. 200 or alkane depth functions of peat archives like in Fig. 5 are not helpful and in the worst case misleading, because in steppe biomes there is high bioturbation in typically loose eolian sediments and in peat archives the vegetation may have changed. Apart from Fig. 5, also Figs. 3, 4 and 6 are hardly readable. Concerning Fig. 3b, I can hardly imagine (actually it cannot be) that fresh deciduous forest material and fresh mixed forest material contains no alkanes. Please check and correct your data and figures. Last but not least, it does not become clear what the knowledge gaps are. The authors encourage expanding the dataset to less researched geographic areas… I consider it to be rather unlikely that this approach will help increasing our understanding of plant to soil transformation of n-alkanes.

To sum up, the issues raised above demonstrate that the overall aim formulated by the authors at the end of the introduction (l. 68ff: 'consolidation of the available information on the fate of n-alkanes in soils… better process understanding of degradation…') is only inadequately achieved. Most importantly, soil microbial build-up of n-alkanes is insufficiently addressed.

Specific Comments

l. 48 and 50: I exemplarily checked both Marzi et al., 1993 and Hoefs et al., 2002 and found them to be inappropriately cited. Marzi and Hoefs use CPI and OEP, but not in the sense that their studies or results support what the authors cite them for, namely well preserved or highly degraded plant organic matter. Please be more specific with your citations.

Result chapter: numbering of subchapter makes no sense

l. 238: cannot be correct, oxidation of alcohols does certainly not produce n-alkanes. The succession of oxidation is aliphatic – aldehyde – alcohol – acid.

l. 283ff: I do not agree with the statement that 'retaining the range of chain length and the most abundant chain length' 'evidences that there is limited change… no preferential degradation...'. Fig. 2a shows that all ACL lines increase.