

Interactive comment on “A model based on Rock-Eval thermal analysis to quantify the size of the centennially persistent organic carbon pool in temperate soils” by Lauric Cécillon et al.

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In their paper, the authors use thermograms resulting from thermal analyses, i.e. the pyrolysis and oxidation phases of Rock-Eval pyrolysis, to quantify the size of the centennially persistent organic carbon pool in temperate soils. They calculate a large range of variables that are further used to forecast the size of this SOC pool. These variables fall into two categories.

The first category gathers temperatures corresponding to the integration of the cumulative frequency curve up to a given (arbitrary) threshold value. It encompasses 25 variables corresponding to a series of five threshold values (i.e. 10, 30, 50, 70 and

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90%) applied to the five thermograms obtained during measurements (i.e. S2, S3, S3', S4, S5). This approach is no more than a simple and fractional discretization of thermogram shapes.

The second category includes indices corresponding to the integration of the gas flow curve. It contains five variables including two standard parameters related to the composition of SOM (HI, OI) and three indices calculated solely from S2 pyrograms (flows of HC measured during the pyrolysis phase). These last three parameters have been constructed in order to characterize the whole shape (and information) of thermograms by taking into account the most labile thermal fraction (i.e. $T < 400-450$ C). Unfortunately, the authors misuse them as they pretend to apply these indices in order to characterize the size of the centennially persistent organic carbon pool in samples from bare fallows. Moreover, their results show that these indices are not relevant (because obviously wrongly applied); their explanation stresses the sensitivity to the OM's most labile fraction of these indices, which is exactly their goal.

Consequently, it may have been preferable to limit their comparisons to the previous 25 variables proposed, and to explain why the other indices cannot be considered as relevant. However, if their idea is the introduction of some elements of comparison, it would undoubtedly be more interesting to propose other indices, such as the relative surface (or the part of HI corresponding to the relative surface) of the flow curve above certain threshold values (e.g. 460 C and 520 C), which correspond to the most stable thermal fraction of carbon pools.

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