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Interactive comment on "Gone or just out of sight? The apparent disappearance of aromatic litter components in soils" *by* T. Klotzbücher et al.

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This paper focuses on the stability of aromatic litter components in the (mineral) soils and provides some interesting insights on the paradoxical evidence of persistence or lability of aromatic organic carbon (OC; including lignin) in the soil and dissolved organic matter (SOM and DOM). This research topic has received increasing attention in the past decades and this opinion paper is timely for synthesizing the mounting (controversial) evidence for/against the stability of aromatic OC in soils (although I feel that more literatures can be included). In addressing this issue, the authors have put a special emphasis on the analytical limitations of detecting and quantifying mineral-protected aromatic OC, which in my opinion is indeed a key bottleneck limiting our understanding on the fate of plant OC in the soils. I therefore wish that the authors may extend the discussions of future research strategies in the last part to provide some "practical" suggestions on potential research directions or tools to overcome the current analytical weaknesses. For instance, a key issue with the lignin CuO oxidation method is its unknown extract efficiency, which may vary for samples with different mineral matrix or SOM interactions. But this is rarely tested or stated in the papers because we are short-handed dealing with complex macromolecules such as ligninâĂŤthere is hardly any pure natural macromolecular lignin standard for us to test the method. Can we circumvent this problem using pyrolysis GC/MS or isotopic labeling? Or a combination of different methods may provide further insights on the “hidden” lignin? Before any major analytical breakthrough is made, we must make full use of the current tools for soil lignin studies rather than abandon them, right?

I also agree with the authors that there is a big gap between the long-term fate of lignin and short-term laboratory experiment including sorption studies, in which “hot moments” of lignin transformation may not be captured. For instance, sorption experiments that observed selective binding of aromatics to minerals are typically void of microbial interactions due to the use of HgCl2 (and alike). In natural soils, aromatics that are presumed to sorb selectively to minerals may be preferentially degraded by microbial communities living at the mineral surfaces as well, hence leading to the paradox of “dissolved” and “solid phase line of evidence”. Inclusion of both natural geochemical and microbial processes in laboratory or field experiments may be key to finding the missing piece of the soil lignin “jigsaw puzzle”âĂŤI believe this goes beyond mineral protection and analytical limitations.

Last but not least, as indicated by the title, the discussion of this paper is focused on plant derived aromatics (lignin and tannin). But how important is black carbon in the overall distribution of aromatic signals in the soil and DOM? Can we distinguish the two? I think it may be useful to briefly differentiate and clarify the fate of lignin/tannin versus black carbon in the soil for the readers’ benefit.

Other minor comments: Pg 3, L13: I’m not sure if this sentence is totally trueâĂŤforest floor is the result of greater litter inputs versus losses through mineralization and

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translocation via leaching and bioturbation, etc. For tropical forests with strong litter mineralization, forest floor can be thin or almost absent as well. Actually, I don’t think it is necessary to mention the cause for forest floor formation here so this first sentence may be deleted.

Pg 3, L15: decreases with depth.

Pg 3, L20: 25-89% is a very high estimateâĂŤdoes this only apply to soils with limited bioturbation and to subsoils? What about root input? Does this DOC flux include root exudates, which should be differentiated from that leaching from aboveground litter? As root biomass decreases with depths, it is natural that root-derived DOC decreases in mineral soils.

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