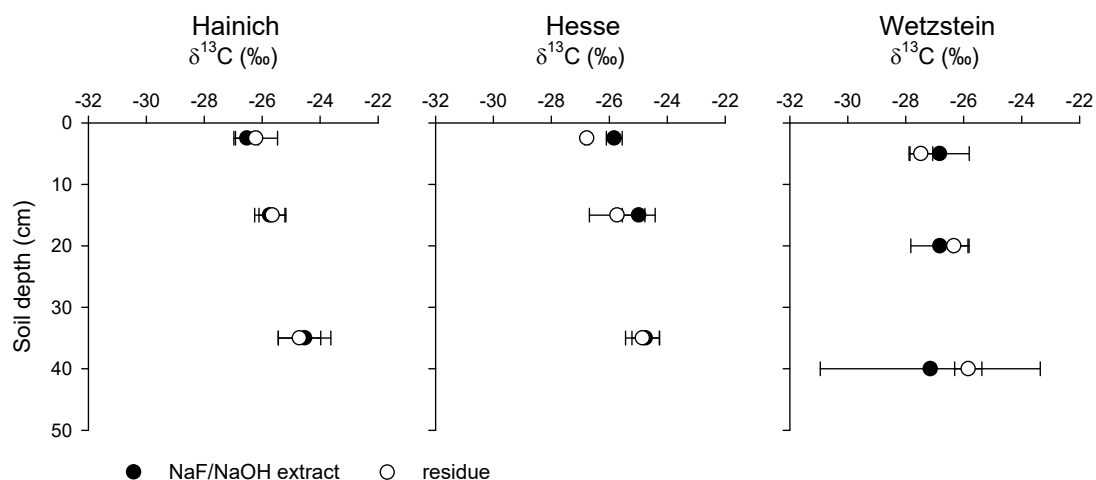


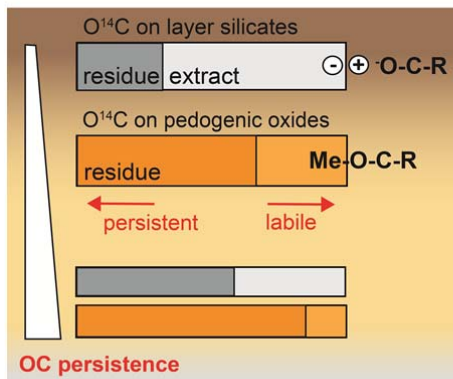
Supplement:

- 1) As recommended by referee 2, we attempted gaining additional evidence on the origin of NaF-NaOH-extractable and residual OC using the  $^{13}\text{C}$  data from the AMS of the  $^{14}\text{C}$ -laboratory. However, as shown below for the tree forest sites (average of three samples per depth and standard deviation), extracts were neither consistently enriched nor depleted in  $^{13}\text{C}$ , so that no general conclusion on, e.g., differences in the degree of microbial processing can be drawn. Given the uncertainties of AMS-based  $^{13}\text{C}$  data, we would prefer not to include them in the manuscript.



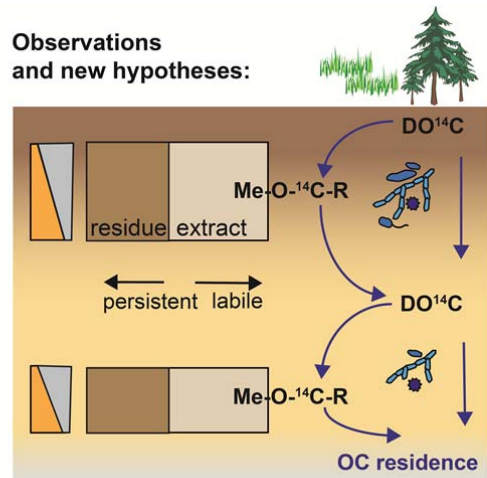
- 2) In order to enable better distinction between the original expectations regarding the effect of desorption on OC persistence and  $^{14}\text{C}$  contents, and the new hypotheses derived from the unexpected results, we suggest adding the following graphical summary to the conclusions of the revised version.

**Original expectations:**



- E1:** Persistence of MOC is due to resistance to desorption in NaF/NaOH
- E2:** OC resistance to desorption is affected by:
- mineral composition
  - OC loading of minerals
  - vegetation type

**Observations and new hypotheses:**



For acid to neutral forest and grassland soils:

- H1:** Similar extractability is due to similar dominant bond types
- H2:** Differences in <sup>14</sup>C are mostly due to input and exchange with DOC