

Comment 1: *P4:25 provide volume of subsample taken for CO₂ analysis*

Response: Done as suggested.

Comment 2: *P8:l6 value instead of values.*

Response: Done as suggested.

Comment 3: *P8:l5 We then computed the threshold adsorption value at 56 keV that equated to the transition from pore (smaller adsorption) to solid phase (larger adsorption) Im sorry but I dont really understand. Does this mean that you empirically determined the threshold grey value based on local minima in the summed histogram of the entire aggregate? Or is the threshold theoretical by comparing X-ray attenuation of air and mineral matter? Or did you per aggregate set the threshold grey value so that the total number of voxels assigned as pores equated to V_p / volume of one voxel? Needs further explanation.*

Response: We have used your wording to make this clearer.

Comment 4: *P10:l13 excess CO₂ concentration sounds awkward. Would be better to use just omit (based on the excess CO₂ concentration scaled to the TOC content) from this sentence. The actual unit of your reported respiration is not g C mg C-1 but in fact g C mg-1 day-1. Consider revising..*

Response: Revised as suggested.

Comment 5: *p13:4-7 Difficult sentence to follow. Please rephrase (perhaps split in two).*

Response: We have changed this to make it clearer.

Comment 6: *Discussion/conclusion: At present only a 24h incubation has been used to estimate microbial utilization of the native SOM present in the aggregates. It is well known that cumulative C-mineralization usually follows a non-linear course. Firstly: SOC is inherently composite and exists of a continuum of decomposability and so after depletion of C respired at a high rate from labile constituents within a few days, only slower respiration indicated by a more gradual CO₂ emission following a 0-order kinetic is usually observed. In the present study we are merely looking at a quantification*

of the breakdown of the most labile parts. Their content may well have differed among the studied aggregates. Likely this is then what dominantly determined the variation in total respiration over 24h. It is then also evident that only weak correlations with quantifications of pore structure or physical distribution of the OM were found. Secondly, it is well known that drying leads to death of microorganisms and a peak C-mineralization flush after rewetting is related to the microbial processing of this necromass. Again the time frame of the soil incubations was likely too short to have a representative measure of microbial utilization of the majority of OM present. Alternative mechanisms explaining transient effects of soil moisture changes on microbial activity have been grouped under the term Birch effect. I would ask the authors to be more critical in their discussion and conclusion on the relatively limited approach used to assess microbial processing of native SOM.

Response: We have added a sentence regarding the lability of SOM to the Discussion. By email we agreed that the Birch effect was not relevant because we did not dry the soils significantly prior to the SHR measurements.