

Interactive comment on “Vulnerability of soil organic matter of anthropogenically disturbed organic soils” by Annelie Säurich et al.

Anonymous Referee #3

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General Comments: The present article studies SOM depleted peatland soils, which were intensively used for agriculture and therefore lost much of their initial C. Soils were classified into different disturbance classes and were incubated to measure CO₂-emissions and to assess their sensitivity to mineralization. The research topic is very interesting and of great scientific significance as these soils become more and more relevant but the article should be written more clearly and concisely. The results and discussion section should focus more on the central aims of the study. Beside this, there are some fundamental methodical problems and open questions which make it hard to interpret the obtained results. Specific comments: L 95: ... samples of organic and mineral soil horizons. . . L 96 please give more information about the sampled horizons (exact sampling depth, time of sampling) L126 Was the time of sampling

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prior to incubation? L 129 I suppose that 40° C is too high and produces artefacts, so that the composition of the microbial community might be strongly affected. Milder drying at room temperature or incubation of field-moist samples would have been more adequate. L 131 This is unclear. By stirring soil samples, their undisturbed pore distribution gets lost. Please describe in more detail what is meant by 60% water-filled pore space and how it is reached. L 139 40 to 90 h of incubation seem to short to really measure the sensitivity of old peat SOM rather than the mineralization of newly incorporated litter. L 172: The authors should generally rethink their classification system for the degree of disturbance (Table A1). The authors define disturbance according to pedogenic features and separate peats under permanently saturated conditions (Hr) from undrained surface peats (Hw). Both peat classes appear in peatlands with high water tables and do not show any pedogenic alterations caused by human impact. Furthermore, earthified horizons are described as moderately disturbed (D2), whereas aggregate and shrinkage horizons are classified as strongly disturbed (D3). This is not true, since peat in earthified horizons is highly decomposed (no visible plant residues) whereas shrunk or aggregated peat is particularly lesser decomposed. In addition, moorshified peats were classified as heavy disturbed as well as mixtures of peat and mineral soil. I would suggest to separate these two groups as there are fundamental differences in soil formation and C contents.

Results and discussion: Due to methodical problems and questions stated above, it is difficult to interpret the obtained results, especially when regarding the disturbance of the peats or the quality of SOM. The authors should consider and discuss these methodical problems. Nevertheless, there are some interesting results, e.g. showing that characteristics of bogs and fens become more and more similar after intensive drainage.

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