

Interactive comment on “Greater soil carbon stocks and faster turnover rates with increasing agricultural productivity” by Jonathan Sanderman et al.

Anonymous Referee #2

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The manuscript is well-written and describes an Australian long-term (at least 40 years) field trial with a gradient in productivity. The authors discuss the paradox between an increased turnover in the treatment with the highest productivity leading to the largest SOM accumulation. The turnover rates of ^{14}C demonstrates a factor of three between the decomposition rates of the different treatments. Overall, decomposition rates or the ones used in multi-pool C dynamic models are not able to reflect this difference in decomposition rate between the treatments. It is suggested that the most productive system (with the highest turnover) produces the largest amount of microbial necromass that is stabilized in the soil and compensates the turnover of plant residues.

As a general remark, I appreciate the model efforts and the demonstration of large

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differences in turnover rates based on the ^{14}C analysis. However, the conclusion that microbial necromass compensates differences in residue input remains speculative. The authors hardly suggest ways forward to demonstrate this difference in necromass using analytical techniques nor do they refer to other field trials that show similar or contrasted behaviour. I would have liked to see this addressed in the discussion.

Specific remarks Page 9 line 25 Please specify in brackets the corresponding components of Fig. 3.5 related to the different pools.

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