

## ***Interactive comment on “Information content of incubation experiments for inverse estimation of pools sizes in the Rothamsted carbon model: a Bayesian approach” by B. Scharnagl et al.***

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### **Reply to comments of G. Wohlfahrt (Editor)**

*(1) Firstly, the authors do not touch upon how their choice of fixed parameters affects their conclusions. Here the authors may want to vary the parameters and see whether, how and why their conclusions are affected. Secondly, as also one of the reviewers suggested, it would be useful for practical applications to know how the inversion performs when the other parameters are not fixed.*

The standard values of ROTHC model parameters are not usually changed when C4010

applying the model (Coleman et al. 1997, Geoderma 81:29-44). For this reason we considered them as constants rather than variables in the discussion paper. We admit, however, that this approach has led us to conclusions that were overoptimistic because they do not include model parameter uncertainty. In the revised manuscript, we will present results from simultaneous estimation of pools and decomposition rate constants to account for part of model parameter uncertainty on the estimation process. The results show that this seriously affects the identifiability of the various pools (again most pronounced for the more slowly decomposing pools). This, in fact, has changed our conclusions about the feasibility of the inverse approach.

*(2) Thirdly, some real-world test (i.e. the use of actual measured data) would greatly improve the practical significance of the paper. In this context I found the use of “observed” and/or “measured” for the actually simulated synthetic data very misleading – please clearly distinguish between the two.*

One message from our feasibility study was that reliable identification of all pools considered in ROTHC requires prohibitively long incubation times. This is especially true in the light of the new results we will present in the revised manuscript. We will therefore come to the conclusion that the inverse approach is not a viable alternative to SOC fractionation methods. Additionally, the misleading formulations concerning the nature of the data used in the study will be modified.

*(3) Finally, the suggestion by Thomas Wutzler of giving also the cumulative uncertainties of the pools after certain simulation times would be interesting.*

See reply to comment by T. Wutzler.