

**Review of MS: “Simulation of soil carbon dynamics in Australia under a framework that better connects spatially explicit data with Roth C “ by J. Lee *et al.***

The authors have identified a genuine (and insufficiently noted) problem, i.e. that there is a general disconnect between models and observations of soil carbon dynamics. Their approach to resolve this is pragmatic, making use of a long-standing model (RothC) whose design, and (relatively low) level of complexity, are appropriate to the task. After site-specific initialization and some calibration, they were able to show very good agreement between observations and simulations. They then used the model to answer an important practical question regarding the potential for changes in land management practice to deliver carbon sequestration benefits.

The manuscript is generally well written and clear in its statements of objectives, assumptions and methods. There are many open issues about how best to model soil carbon dynamics, given that we now know that the conceptual categories used by this generation of models do not, in fact, correspond to chemically distinct classes of compounds, but rather to different degrees of physical protection from microbial attack. However, like the authors, I am not convinced that any of the recently published alternative formulations provides a useful way forward for applications of this kind. Meanwhile, work like this needs to be done, while in practice very little of it is being done anywhere. The originality of this research thus does not lie in any particular advance in modelling or theoretical understanding, but rather in the way it uses an established modelling framework to answer pressing real-world questions underpinned by a sound observational basis.

I would like to raise just one issue about the availability of data and codes. Today, in my view, it is no longer acceptable to make the underpinnings of a scientific paper available only “on reasonable request” – which leaves it open to the authors to deny access. This information should instead be made available via a public repository, thus greatly increasing the potential utility of the research as well as making the results open to alternative analytical approaches.

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