

Interactive comment on “Convergent modeling of past soil organic carbon stocks but divergent projections” by Z. Luo et al.

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This manuscript is well-written and thoughtfully prepared. Thanks for this nice study.

I am agree that SOM models, initialization of the SOM pools can also be a major cause of divergent model projections, and I have some questions concerning “the future improvement in soil carbon modeling should focus on how microbial community and its carbon use efficiency change in response to environmental changes”:

1- The author compare APSIM to other SOM models like RothC and Century, for this reason it is necessary to classify in the section materials and methods what kind of models are used (the model is linear, non linear, using a quadratic function. . . Pansu et al 2014).

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2- Current global models do not represent direct microbial control over decomposition “a new generation is required to capture fundamental microbial mechanisms without excessive mathematical complexity” (Todd-Brown et al, 2012), for this reason can future models (conceptual pools) be based on the functional ecology of soil microbial biomass (MB) which increases by assimilation of humic organic matter, fresh organic matter and decreases by microbial respiration and mortality?

3- Published references lack mechanistic predictions of the continuous transfers of C between plants, soil compartments and the atmosphere. We believe that it is because the functional role of micro-organisms was neglected in many models which focused mainly on total C stocks, rather than on transfers within the microbial and plant OC pools with varying stabilities. Although some models are appearing that take account of microbial activity (Allison et al. 2010; Pansu et al. 2004; Schimel and Weintraub, 2003), and quantify the microbial biomass (MB), (Xu et al., 2013), the influence of detritus on stability of ecological systems (Moore et al., 2004), and “the crucial roles of microorganisms in regulating soil carbon dynamics” (Jizhong Zhou et al. 2011). Author think introduce in the future research the determination MB-C (carbon microbial biomass) using for example the fumigation-extraction method? And demonstrate a direct microbial control over decomposition?

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