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Interactive comment on "How well can we predict soil respiration with climate indicators, now and in the future?" *by* C. T. Berridge et al.

C. T. Berridge et al.

c.t.berridge@vu.nl

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'But the standard model does not assume equilibrium. It simply allows a part of NPP to be transferred to SOM each year, and a fraction of SOM (the decay constant) to be removed.'

The decay constant assumes equilibrium of inputs and outputs. The mean residence time (turnover time of an amount of substrate at steady state equivalent in size to the starting amount) for first-order reactions is equal to 1/k (Paul, 2007). Perhaps confusion has arisen due to the casual and multifarious use of the term 'model'. Unfortunately, 'model' has numerous meanings. It could refer to a regression line drawn to interpolate a trend between two variables, a conceptual framework or a mathematical programme used to simulate observations or predict change. We are certainly guilty of propagating

this confusion in the manuscript, which we aim to address. We have casually used 'model' to refer to the rate constant (because this can be calculated from a regression on a graph), which is then used in a computer model, which accumulates NPP and sends it to different SOM pools (for decay at a rate set by the other 'model'). But it is specifically the statistical model (the temperature-moisture-dependent decay rate) to which we refer (but as used by all IPCC computer models). The k (sensitivity) in this instance does assume steady state when calculating turnover time, an assumption that remains poorly evaluated for transient simulations (Wieder et al., 2014).

References

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Wieder, W.R., Boehnert, J. and Bonan, G.B.: Evaluating soil biogeochemistry parameterizations in Earth system models with observations, Global Biogeochemical Cycles, 2014.

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