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Geoscientific Model Development Discussions

Interactive comment on "Modeling radiocarbon dynamics in soils: SoilR version 1.1" *by* C. A. Sierra et al.

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The manuscript "Modeling radiocarbon dynamics in soils: SoilR version 1.1" by Carlos Sierra et al. is a follow-up of their paper "Models of soil organic matter decomposition: the SOILR package, version 1.0" published in GMD two years ago. In the new study, they provide a modeling framework which embraces existing linear models of soil carbon dynamics with a focus on radiocarbon flows through the soil compartments. Provided numerical package is of practical use, because it could be easily used for evaluation of simulated dynamics of soil organic carbon using available soil 14C measurements. The package also includes radiocarbon datasets necessary for the 14C evaluation.

The manuscript provides a good description of a current state of the soil radiocarbon

research, of the equations used in the analysis, and of the programs applied for simulating dynamics of radiocarbon in soils. There are, of course, limitations of methods used in the study: for example, provided numerical package is based on linear and equilibrium assumptions. These assumptions, of course, do not cover all possible types of equations for soil carbon turnover, but provide a good start for the 14C modelling. The author plans to expand the package by using non-equilibrium assumptions. I found the package useful and manuscript acceptable for publication in GMD after following minor comments are taken into account.

I found notations in the equations in the section 2.3 confusing. In particular, I am confused with usage of term "T" (it is used in section 2.3.1, but formally defined in section 2.3.2). T stays for the "transit time" (p.3168, l. 14; p. 3169, l. 6), but also just for "time" (p. 3169, l. 7). I would suggest always using small letter "t" for "time". Since the transit time T could be time-dependent, it would make sense to note it as T(t), e.g. T(t_0), and not use time as a lower index as in p. 3168, l. 14.

Eq. 13: please either provide an equation for calculating the transit time density psi_t_0 or explain it in words, because it is defined only in the next section.

Eq.13: This form of integral notation confuses me. The right part is a function of t (time), but t is absent in the left part of the equation. Also, why the integral boundaries are from 0 to t-t_start? Should not they be from t_start to t_0? What is changing from 0 to t –t0: T or t? Should not it be psi_t and not psi_t_0?

p.3169, l. 7: "I/I" is confusing, because symbols "I" and "I" look very similar. Could you use another symbol for the sum?

p.3169, l. 9: "Translated to the language of an ODE solver, an impulsive input becomes a vector of initial conditions I/I at time T = 0, and Sr the release flux of the solution of the initial value problem observed at time T" – I cannot understand this sentence. See my comment on using T as time above.

P. 3172, l. 17: Where is Table S3? I miss it in supplementary.

p. 3172, l 14 – replace “form” with “from”

P. 3178, l. 14: Fig. 5 needs better explanation in the figure caption and more discussion in the text. E.g., what are units on axis? What do numbers in the matrix mean and what is a meaning of dots in the scatter diagrams?

Interactive comment on Geosci. Model Dev. Discuss., 7, 3161, 2014.