

Interactive comment on “Models of soil organic matter decomposition: the SOILR package, version 1.0” by C. A.Sierra et al.

Anonymous Referee #2

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General Opinion

The paper describes the implementation and numerical solution of matter turnover models in soil science using differential equations. This is an interesting topic and particularly relevant for global change research (and maybe even agriculture). The paper is mostly well written and understandable, though the scientific background is apart from my field of competence. Therefore, I would recommend to ask an additional reviewer from the field of geocology or soil science.

The authors created an add-on package for the statistical programming language R using the S4 class system, and it seemed to be well designed (but see issue concerning non-linear models). Unfortunately, the name of the package is somewhat misleading, because "SoilR" suggests more general tools for soil scientists and not "only" a collec-

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tion of differential equation models and accompanying functions. The applied models and used software are appropriately cited, but the discussion and comparison with comparable/similar/other software systems needs restructuring and complete rewrite.

The Limitations section is somewhat frustrating, especially as I cannot understand why SoilR is regarded "incompatible ... for representing the decomposition ... as a non-linear system". This is completely surprising, because deSolve is explicitly suited for non-linear equations, so it may be either a design-flaw of SoilR or just a misunderstanding.

In summary it is a good example on how R can be used for an efficient treatment of geocological models, so it has the potential for follow-up work and reasonable citations. Nevertheless, several things can be made better, dependent on the intended audience and the style of the journal:

- the manuscript contains several redundancies and descriptions of basics in modeling and R that can be shortened,
- the discussion needs restructuring, should include essential design principles of SoilR, a more detailed evaluation of other systems and should end with a motivating non-trivial outlook.
- the R code of the package is not very easy to read, because the applied method of literate programming (in general a good idea) was used together with non-standard code formatting.
- p997 L 5ff sounds like an "excuse" that R is less efficient, but this is (1) the price for efficient and flexible programming and (2) there are also methods to overcome this disadvantage, e.g. matrices (as used by the authors) or compiled code (cf. benchmarks in Soetaert et al. 2012). Furthermore, I would prefer a term like "ease of use", "efficient programming" or "availability of powerful algorithms" instead of "simplicity" here.

Details:

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p 998: this is mostly redundant

p 1004 L 6: time/s/ series

p 1007 L 2 an/d/ ODE ...

L 6: why a specific Isoda wrapper and not a more general interface?

L 23: I don't understand this.

Sections 3.3 and 3.4: I would omit this from the scientific paper and put this into a technical documentation ("vignette" or appendix) instead.

p 1010 L 22: "some of the" -> "the most essential"

p 1012 L 22: No need to explain R basics

p 1013 L 29: the "attr()" method is quite technical. It should be encapsulated in an S4 method.

p 1020 L 5: program_m_ing

Section 5: again an excuse for "problems in computational efficiency"

- Instead of a section "Limitations" I would suggest a more positive final section in the "Discussion".

p 1021 L 18: I cannot understand this. deSolve is a non-linear DE solver package, so why do you propose to provide a "framework to linearize non-linear systems"? Please explain!

p 1021 L 24ff:

- The three last sentences are trivial. Please add a more positive outlook.

p 1022 L 10: avoid "only"

Package:

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- ?SoilR should open the main help page of the package, - code readability should be improved.

References:

Please use either DOI or permanent (!) Weblink.

Interactive comment on Geosci. Model Dev. Discuss., 5, 993, 2012.

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