

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

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We thank the reviewer for providing important comments on our manuscript, the model, and its implementation in R. We have made important changes in the manuscript and the source code based on his/her review. A point by point answer to all comments is provided below.

1 Response to general opinion

- Package name: We are aware that the name of the package is too general for what it currently does. However, our long-term goal is to produce a package for

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the mathematical representation of different processes within soils such as the cycling of carbon, nutrients and their isotopes, microbial dynamics, temperature and water movement across the soil profile, and the nature of organo-mineral associations. We think the package name represents well this long-term goal and motivates future developments.

- Non-linear systems: The limitation for representing nonlinear system is not a technical limitation but rather a conceptual one. We choose a conceptual model based on linear dynamical systems to represent the process of soil organic matter decomposition, generalizing a large number of models already proposed. However, nonlinear models can not be easily incorporated in our theoretical model even though they can be easily implemented in R.

We made some changes in this section, clarifying that the limitation is in the theoretical framework, but nonlinear models can still be implemented in R using `deSolve`.

- Redundancies: The reviewer points out that there are redundancies in our text, but does not explicitly tell us where those redundancies are, with the exception of the section Development Philosophy. We removed this section from the text and made minor edits in other sections to avoid redundancies.
- Discussion restructuring: We included a section in the appendix discussing issues of package design, object orientation, and a comparison with package `Simecol`, as suggested by reviewer 1. This discussion was too technical to include in the Discussion section, however, we made some changes to give a more positive outlook as suggested.
- Code formatting: We will use package `formatR` in a future release to improve the code format in a standard way.

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- Efficiency/simplicity: Perhaps this is a misunderstanding. We do not mean here that R is simple in the sense it cannot do complex tasks. We meant the use of this term here with respect to the user, meaning R is simple to use relative to low-level programming languages. However, we changed the term here as suggested by the reviewer to avoid possible misunderstandings.

2 Response to specific points

- p 998. The section Development Philosophy was removed to avoid redundancies.
- p 1004 L6. Change made.
- p 1007 L2. Change made.
- p 1007 L6. We want to give the user the flexibility to use any ODE solver. We only provide a wrapper to lsoda, but the user can implement any other ODE solver as long as the interface is the same.
- p 1007 L 23. The class `Timemap` in SOILR was implemented for consistency of the time range of all time-dependent arguments and avoid extrapolations if one or various arguments are outside the specified time range. We updated the description of the model implementation and provide a better description of the `Timemap` class. A more detailed explanation is also provided in the newly added appendix.
- sections 3.3. and 3.4. Model description papers in Geoscientific Model Development are supposed to consist of three parts: main paper, user manual, and source code. Because R packages already provide all tools to release documentation and source code, we do not need to include them with this publication.

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Instead, we prefer to give the reader instructions on how to access documentation and source code. For this reason, we prefer to keep the sections 3.3. and 3.4 within the main body of the paper.

- p 1010 L 22. The *most essential* function in SOILR is actually `GeneralModel`, and examples on how to use it are provided in the accompanying vignette. This section only provides examples on *some of the models*. Therefore, no change made.
- p 1012 L 22. R basics deleted.
- p 1013 L 29. The `example()` function is less technical than `attr()`, so we changed it in the text.
- p 1020 L 5. We are consistently using american English in this manuscript, therefore *programming* should be the right spelling.
- Section 5. Algorithms in R run very fast, and for many applications, computational efficiency is usually not a problem. However, for some other applications such as repeated simulations over large grids or for Monte-Carlo applications, pure R code can be 20 times slower as similar code written in Fortran. For this reason we mention this as a potential limitation.
- Limitations section. We prepared our manuscript following the instructions for authors and description of manuscript types for Geoscientific Model Development. These instructions encourage: *the inclusion of discussion of the scope of applicability and limitations of the approach adopted*. For this reason we included a section on limitations. So, to avoid a negative tone in this last part of the discussion we changed the section title to Scope and Limitations, and changed some of the wording.

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- p 1021 L 18. As we explained above, the limitation is in our conceptual model and not in R or `DESOLVE` capabilities to solve non-linear systems. We rephrased this point better in the text.
- p 1021 L 24ff. Sentences deleted as suggested.
- Package: We added the help file of the package and can now be accessed by `?SoilR`. Code readability will be improved in future releases.

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