Geosci. Model Dev. Discuss., 7, C981–C982, 2014
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Geoscientific Model Development Discussions
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Interactive comment on "Modeling radiocarbon dynamics in soils: SoilR version 1.1" *by* C. A. Sierra et al.

Anonymous Referee #2

Received and published: 25 June 2014

General Comments: The authors developed a useful R package for modeling radiocarbon dynamics in soils. They also compiled the valuable radiocarbon datasets. My major concern is the lack of illustration/discussion of relation among the three major topics: "General radiocarbon model" (Section 2.1), "Mean transit time" (Section 2.3), and "Atmospheric radiocarbon datasets" (Section 2.4.2). Pertaining to current description (Section 2.3), I did not see the necessity to include radiocarbon modeling for the estimation of mean transit time. In addition, the feedback from atmospheric radiocarbon to soil radiocarbon through plant absorption of CO2 was not fully elucidated.

Specific Comments: Page 3169, the following statement confused me, "the transit time density distribution ψ(T)... is identical to the output O (T) observed at time T ...". ψ(T) is a PDF (probability density function), while O(T) is "the cumulative output" (see your

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definition on page 3168) , I could not understand why they could be identical to each other?

Page 3169, Eq. 15, please further explain Sr(I/I, 0, T)? Does it mean that “Sr” is a function of I/I with the period from t = 0 to t = T? How to construct this function? Please give an example if possible.

Page 3175, the authors reported the results for the mean residence time (MRT). However, it’s unclear how to practically compute the MRT since the PDF for residence time (T) was not clearly defined in section 2.3.

Page 3170, please explain the meaning of the non-zero eigenvalues of the matrix A.

Page 3171: lambda, the “-” sign for the parameter value is not necessary since the “-” sign has been indicated in Eq. 4.

Page 3172: what’s the difference between datasets “IntCal09” and “IntCal13”? temporal resolution? It seems that the latter one has a finer temporal resolution than the former one. Can we generate “IntCal09” from “IntCal13”? Is it necessary to keep both?

Page 3172: what are the “uncertainty values” for datasets “IntCal09” and “IntCal13”?

Fig.5: based on the values for k1, k2, and k3, i.e., negative values, I presume these are log-transformed values, which was not indicated in the fig caption.

Fig. 6: what are the “prediction intervals”? standard deviations or 95% (90%?) confidence intervals?

Technical Corrections: Page 3166: 13C -> 14C Page 3179, Line 5, “in or calculations”->”in our calculations” Fig. 5, “p3->k4”->”p3->k3”

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