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Interactive comment on "RRAWFLOW: Rainfall-Response Aquifer and Watershed Flow Model (v1.11)" *by* A. J. Long

Anonymous Referee #3

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In this paper, a new code for convolution modeling of hydrological or mass transport response of hydrosystems is proposed. The code is written in R language and as such is made available for the wide increasing R-users community.

The paper is very well written and organized, the methods and mathematics used for the modeling approach are well described and the rationale supporting the overall approach is very accurately discussed. The model introduces new interesting concepts such as the spline smoothing approach applied to the IRF in order to reduce over-fitting (hence reducing computation time as well).

The paper is suitable and deserves publication in GMD, as it clearly is beneficial to the scientific hydrological community. However, the differences between the previous Long and Mahler (2013) paper should be clearly highlighted (technical description of

the code, methodologies and approaches, applicability and versatility...).

Below are a few comments, suggestions and questions that (for some of them) could be discussed or included in a possible final version of the article.

p.5928, l.15: Maybe mention that such terms are sometimes used improperly since for instance the transfer function actually refers to the Fourier transform of the IRF and that other terms are related to continuous-time instead of discrete-time functions.

p.5928, l.20: I would remove these lines: I don't see the point of comparing convolution with spectral analysis. Convolution is one of many tools (like cross-correlation, autocorrelation, etc.) used in digital signal processing.

p.5931, l.10: Since this is a methodological paper, it would be better to briefly describe the method used for determining the IRF by model calibration as employed by the same author in Long and Mahler (2013).

p.5931, l.13-18: Fourier transform-based deconvolution induces over-fitting because of the spectral signature of errors. Do the author think that filtering out high frequencies in the Fourier space previous to inverse transform be a good alternative to the spline-interpolation approach in order to smooth the IRF by removing oscillations related to Fourier transform of the errors? Wouldn't such a Fourier filtering approach also lead to a good and consistent estimation of the IRF?

p.5931, l.24: Since optimization is based on a very limited number of points and spline (or linear) interpolating functions are used afterward to assess ordinates other then control points, what would be the influence of the interpolation sheme used (different spline functions, spline vs linear interpolation) on the result of the modeling? Is there an appropriate minimum number of control points to consider?

p.5935, l.5: Was 95% of the total area of the curve chosen arbitrarily or was it supported by some other criterion?

p.5938, l.12-16: There are lots of packages devoted to optimization in CRAN repositories. The RRAWFLOW program would benefit using them in the future instead of external software like PEST.

p.5942, l.9-13: Could a threshold value of the ratio Eval/Ecal be proposed to assess overfitting? I understand overfitting may result from the choice of, say, a double-gamma instead of a single-gamma IFR. But what if the double-gamma makes more physical meaning owing to experiencing or knowledge about the site tested?

p.5943, "code availability" section: Will the software be made available as a package through the comprehensive R archive network (CRAN)?

Interactive comment on Geosci. Model Dev. Discuss., 7, 5919, 2014.