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Interactive comment on "Stream flow recession patterns can help unravel the role of climate and humans in landscape co-evolution" *by* P. W. Bogaart et al.

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Subject: On the interaction of the Brutsaert and Nieber model parameters

I'm impressed by both the extensive geographical coverage of Swedish catchments and the bold synthesis, from an anthropogenic, a climatic as well as a physiographic prospective, of reams of results from streamflow recession data analysis. For the Brutsaert-Nieber model fitting, the authors use a logarithmic time-derivative transform method expressed by Equation (6), log(-dQ/dt) = log(a) + b log(Q).

In my view, the Discussion Paper can benefit from additional insights into the interaction

of exponent 'b' and coefficient 'a' from a different perspective of a linearized exact solution below.

The source differential equation shown in Equation (2), -dQ/dt = aQˆb, has an exact solution. No references need be cited to prior work, mine included, to show how to solve it. This can be done here, and the solution is: Qˆ(-(b-1))(t) = Qˆ(-(b-1))(0) + (b-1)at, if b <> 1.

This form of a linear relationship between a power transformed discharge, Qˆ(-(b-1))(t), and its elapsed time t, is free of a time-step-size term (dt), thus temporal scale invariant.

The power transform of the discharge data depends solely on -(b-1). On a recession data plot of the transformed discharge versus time, the product of (b-1) and 'a' reflects the slope of the data points. In the context of the power transform solution method, exponent 'b' will have to be defined before coefficient 'a'.

This is in contrast to the conventional method followed by the Discussion Paper, by which both parameters are determined simultaneously, their values valid for the chosen size of the computational time step, which is one day therein. On the latter point, two most recent examples on exponent 'b' increasing from daily to hourly values are shown in Figure 9 in Westerberg and McMillan (2015), a reference cited by the latter named Referee.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 9865, 2015.