

Interactive comment on “Is the groundwater reservoir linear? Learning from data in hydrological modelling” by F. Fenicia et al.

F. Fenicia et al.

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The Anonymous referee 2 observed that three years of data are too short to draw general conclusions about the general catchment behaviour during low flows. In Luxembourg many stream gauges have been installed only recently, therefore, we do not dispose of long discharge series for all catchments. The period of three years has been selected based on the availability of data for the chosen catchments. The summer of 2003 however, for the stations where long series were available, registered the lowest discharges ever measured. Summer of 2003 was in fact probably the hottest and driest in Europe since 500 years. This observation could perhaps be an answer to the concern of short time series. We notice, however, that the fact that a work focuses on baseflow modelling does not necessarily mean that long data series are needed. Lamb and Beven (1997), for example, employ the MRC tool used in our study, to determine the S-D relation for application in Topmodel in 3 different catchments.

They use discharge data with a length ranging from 9 weeks to three years. Still they drew conclusions on the groundwater behaviour of those catchments. Moore (1997) applies several storage-outflow models to fit 6 recessions, and he draws conclusions regarding the possible physical explanations that could justify the reasons why some models performed better than others. In general we think that for the purpose of this study, the period of three years is sufficient, especially for low flow modelling, where the behaviour of the catchment is regular and well identifiable. Even if the MRC does not decrease until zero discharge, it is difficult to expect a flow behaviour below the range of observed discharges that does not resemble a consistent extrapolation of this recession.

Other comments:

- The authors could have used daily data

We used hourly data and not daily because this work does not focus on low flows only. We want to develop an optimal model that performs well also during high flows. The use of hourly data is due to the fact that the concentration times of the catchment studied are in the order of some hours.

- The authors do not say if they rejected some depletion curves when constructing MRC.

We corrected this point and we specified in the section dedicated to the development of the MRC that we did not use filters to exclude recessions associated with high rainfall or high evapotranspiration estimates, and we give reasons for this choice

- The introduction should contain more on published results on MRC from other catchments

The introduction has been rewritten and contains more references to previous works.

- The term “averaging” leading to relative simplicity on larger catchments would be enough - why to use an unexplained term “self-organisation”?

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In the course of the paper we still use the term self-organization, but we explain better what we mean and we provide appropriate references.

- Chapters 1 (Introduction), 2 (The representation of the groundwater reservoir in hydrological models), 8 (Discussion) and 9 (Conclusions) are too long and do not give relevant information about findings on other catchments.

Chapter 2 has been eliminated, the other chapters have been totally rewritten.

References:

Lamb, R., and Beven, K. J.: Using interactive recession curve analysis to specify a general catchment storage model, *Hydrol. Earth Sys. Sci.*, 1, 101-113, 1997. Moore, R. D.: Storage-outflow modelling of streamflow recessions, with application to a shallow-soil forested catchment, *J. Hydrol.*, 198: 260-270, 1997.

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