Review by Ezio Todini of Manuscript HESS-2016-531
Cascade of submerged reservoirs as a rainfall-runoff model
by Jacek Kurnatowski

In this work, the author presents an alternative linear model to the Nash cascade, which he calls "cascade of submerged reservoirs" (SC), in the case of the last reservoir two times the others (SC2). The work is interesting and worthwhile publishing. Nonetheless, a number of issues should be clarified or expanded in order to improve readers appeal.

The main issue is that the author should make clear is the field of application of this model. The author applies it to the recession curves of 12 catchments in the Vistula and Oder basins and I agree that it is an interesting field of application for this model, but a more detailed discussion on the type of problems that can be dealt with the SC2 model. The Nash cascade was developed and successfully applied to represent surface waters dynamics because the recession of the surface waters, after eliminating soil and groundwater contributions, tend to rapidly decay, which is generally well represented by a negative exponential. On the contrary, Nash cascade is less capable of well describing recessions incorporating soil drainage and/or groundwater components, because they usually decay in a much slower fashion, which can probably be better represented by SC2.
A discussion on these aspects of potential use of the SC2 model, also considering the fact that the solution is a bit more complex than that of the Nash cascade, is felt necessary.

Moreover, because the given example shows only the results of the SC2 model on the decay of recession curves, the author should also demonstrate the behavior of the model under precipitation forcing. I think this necessary for the sake of completeness, given that the author is introducing a new model approach.

As a final overall comment, given the panorama of readers of HESS I suggest the author to underline more the physical aspects instead of the mathematical ones, as the manuscript seems now to put more emphasis on the mathematical derivation than on the description of the real cases on which it has or on which it should be useful applying it.

From the editorial point of view I have only a limited number of points to raise.

1) Figure 1 is obviously valid a time t=0 and should be complemented by another figure showing the content of the reservoirs at t=t* when the steady state has been reached. It is in fact impossible, for $k \neq 0$ that all the reservoirs are equally full, namely $S_1 = S_2 = S_3 = \ldots = S_n$ because it would imply that $Q_1 = Q_2 = Q_3 = \ldots = Q_{n-1} = 0$ or, if k = 0, that all the volumes participates in a large one reservoir Nash model.
2) Please represent determinants either using the double vertical line "|| ||" or, better for a generic public, the notation "det ( )" or "det | |".
3) Please use the lower case π to represent "pi" instead of the uppercase Π, because the latter can be confused with the "product of a sequence" symbol.
4) Maybe setting into an appendix the algebraic derivation of the eigenvalues and the IUH would improve readability since not all readers my be interested in those aspects.