Review report on manuscript **Characteristics and drivers of baseflow response in 183 Australian catchments** by van Dijk

In this manuscript, the author uses daily streamflow data from 260 gauging stations in Australia. Among them he first selects 226 stations, and then reduces the number of stations to 183 based on the only criterion that no less than 50 flow data pairs are available when the 10-day long quick flow window is chosen. The author aims at using both the linear and nonlinear reservoir methods for baseflow recession analysis. He finds that (although not much) the nonlinear recession better approximates the observation, but he decides to go with the linear reservoir concept as it has only one parameter to be calibrated.

Only one baseflow separation (Fig. 4) is shown in the whole paper though there are many other figures. However, Fig 4b shows clearly that also in semi-logarithmic scale flow recessions are still curve shaped and not straight lines. Thus storage is indeed nonlinear. As the paper claims to be a scientific one, this should be discussed. Of course, in a practical engineering study the linear reservoir could be adopted as is easier to be used.

The author assumes that the most first and last values of daily streamflow time series are due only to baseflow, and calculates baseflow time series by filtering the streamflow times series using linear and nonlinear reservoir models in forward and backward directions. The fundamental idea, which is empirical, behind the manuscript is given in the decision tree as follows:

For the ascension curve, use the backward filtered baseflow unless it is higher than streamflow; otherwise use the forward filtered baseflow. If both are higher than the streamflow then use the streamflow as the baseflow of the current day. For the recession curve, use the minimum of backward and forward filtered baseflows (The case when both are higher than streamflow has been left open although it is clear that baseflow will be equal to streamflow in such a case).

**General Comments:**

The title should be without the number of stations.

The manuscript is really too long. Some parts are repeated. Only as an example; Discussion is unnecessarily long and repeats number in the previous section.

It has many acronyms after a while mixed. It is not easy to keep all these in mind. There should be a solution to this.

Although it has been shown that seasonality has great importance in baseflow studies, it is not considered. Simply a statement is needed why? (See for instance papers by Wittenberg already cited by the author and Aksoy et al. (2001), Probabilistic approach to modelling of recession curves, Hydrol. Sci. J., 46(2), 269-285.)

I am concerned about the importance of the semi-variogram concept for this study. Can the study be made available without considering the semi-variogram? This concern might come due to the fact that the author has not discussed the results but only provide some numbers and percentages as they are calculated.

Figure 1 is not cited in the text. It should be cited when the data are introduced (Section 3.1).

Under section 3.2, five different examples of linear regression are listed. The author does not need these very simple things to keep in his already very long manuscript although he does not use all in the manuscript. Then there is no need to have Figure 2.

Page 5817 Line 10: It is said that "Tests showed that …." What type of test? Brief information should be provided.

Appendix A: It is too much information. Variables defined there can easily be inserted into the main text or they can simply be defined in a shorter appendix. As there are many variables, some have not even be introduced (For example; PWEP in Page 5825 Line 13).

Section 3.3: Not easy to understand what the author says. It should be shortened and put forward its aim briefly without providing general information.

Section 3.4: A simple flowchart can be provided instead of or together with the decision tree. A simple chart based on the decision tree in the manuscript is made available in this report. Two questions for the rising limb of the hydrograph: (1) why does the author prefer the backward filter? (2) In the decision tree, there is an open point. The case when neither the forward nor the backward baseflow is less than streamflow is not mentioned. Although it is physically clear that baseflow cannot exceed streamflow in the river, this should be mentioned for the completeness of the decision tree (See red part in the flow chart).

Section 3.5: Too much information again.

Section 4.3: It shows that nonlinear model fits the streamflow data better than the linear model, which is the truth of the nonlinear nature. Therefore, I don't agree with the author who says "… these findings were considered insufficient basis to prefer the more complex non-linear reservoir model ...".

Sections 4.5-4-8: They can be combined and be shortened rather than pasting the template copied from Section 4.5 for the four sections.

Section 4.3 and Section 5.2: What is/are the difference(s) between the two sections?

Section 6: The first sentence in Conclusions is not a correct statement. Because Wittenberg's nonlinear storage model is not preferred in the study. Therefore the statement should be made in a correct way.

Section 6: Numbers are repeated from previous sections where results are presented and discussed. Here, readers expect more general statements, main achievements of the study in a kind of philosophical way.

Figure 2: These figures make me confused. Either the figures itself or Figure caption is erroneous. Otherwise they are not comparable. When we consider the Figure caption is correct, then we have two figures neither their models nor their scales are identical preventing us making a comparison. Plus note that the regression line is the same y = 0.9442x.

**Specific Comments:**

Page 5813 Line 1: Check the date of Bergström 1992 or 1995?

Page 5813 Line 1: It is better to have the references in a chronological order rather than alphabetical.

Page 5814 Line 18: Avoid citation to unpublished work.

Page 5816 Line 7: Unit of streamflow ($MLd^{-1}$)?

Page 5817 Line 20: Equation (10). No need to have subscript for EPSILON (see what you have used in Equation 11, which more parsimonious in letters).

Page 5821 Line 9: Delete “was”.

Page 5821 Line 19: What is $Q_{QF}$? Is it quick flow discharge (Then, see Fig 7 where we QF).

Page 5829 Line 9: Van Dijk et al., 2007 is not in the list of references.

Page 5832 Line 3: Bureau of Meteorology, 2009 is not in the list of references.

Page 5849 Line 4 in Figure 11 caption: Insert “km” as “400 km”.