Technical note on incorporating natural variability in master recession curves

This technical note develops a procedure for constructing probabilistic master recession curves (MRCs) to account for variable antecedent conditions and heterogeneous aquifer characteristics in the catchment, and analyses observed recessions in this context. The introduction of aleatory uncertainty in constructing MRCs is certainly welcome, and therefore I find this technical note relevant for the hydrological community. In my opinion, there are few issues that should be resolved before final acceptance of the note, in addition to minor comments listed below.

1. After constructing probabilistic MRCs, the authors superimposed observed recessions on the MRCs by shifting them (manually) along the time axis until they matched one of the five MRCs. In this way they obtained many allocated and several unallocated observed recessions. It is hard to understand why the observed recessions have to lie on one of the five MRCs. Each recession is a result of unique catchment conditions and it is more likely that they should be allocated to an MRC for some very specific percentile (e.g., 37%) rather than the five ones used to present a family of MRCs. This procedure in the paper should therefore be better justified, as well as the need to compute NSE and correlation coefficients to support allocation to one of the five MRCs. The idea of allocating observed recessions to five discrete conditions also reflects the discussion about the seasonal variations (how the observed seasonal recessions group on specific MRCs).
2. I believe that the authors could be more precise with the terminology when stating that they "hypothesize that the MRC is a continuum rather than a single average curve", and in similar sentences. In my opinion, there is natural variability in recession in general, while an MRC represents aggregated information from all recessions. Historically, MRC is an average curve, while in this paper recessions are aggregated into several MRCs in probabilistic terms after statistical treatment. An analogue of this is probabilistic representation of flow duration curves vs. the average flow duration curve (Vogel & Fennessey, 1994). Therefore, I think that it would be more precise to say that there is a continuum of recession curves, while their representation by an MRC could be either with a single (average) curve or with a family of percentile curves.
3. The paper conveys relatively well the idea of introducing this aleatory uncertainty into the analysis, and I also like the part that shows that epistemic uncertainty is smaller than aleatory one. However, the paper still fails to provide wider context for researchers and practitioners and explain what are the benefits from constructing probabilistic MRCs using the described procedure. Since the percentile MRCs could also be constructed using other approaches than the correlation method, it would be

useful to provide some kind of recommendations for future works. This can be done by amending the Conclusion section with a sentence or two.

Minor comments

- Consider not using "preceding climate" ((L9, L122, L317) for antecedent wetness/moisture catchment conditions, as these are a consequence of weather conditions, while the climate is defined as the average weather conditions over a long period of time.
- L69: "structure approach" should be "structured approach"?
- L106-108: Repetition of what was said in L31-34.
- L138-142: This paragraph mentions the maximum recession constant as an important parameter associated with MRC. However, it does not provide any explanation why is this parameter important.
- L144-149: Limited availability of "pure" recessions is understandable and I do not see why the authors describe and discuss the content of a figure from another paper. If the point of this paragraph is to underline the problem of having equal daily discharges in two consecutive days, maybe it is worth mentioning that this may be a result of coarser measurement resolution and not only of the physical processes in the catchment. Maybe it would also be appropriate to explain how these equal discharges were treated in the proposed methodology.
- L158: "using constant bin sizes varying between 50 and 200 items" is not precise. Is the bin size constant in terms of constant discharge intervals or constant number of items? Also, Figure 2 shows bin intervals not covering the whole range of observed daily flows. How was the range of discharges selected for binning?
- Captions of Figures 3, S1, S2, S3: "modelled recessions" may imply that the recessions come from simulations with a hydrological model, so it should be replaced by something else (computed or similar).
- L257-266 and Figure 5: It is not instantly clear that MRCs in two plots in Figure 5 are the same MRCs, while the observed recessions are separated for wet and dry seasons, so this should somehow be clarified. Text in the figure caption, "Comparison of seasonal daily MRCs" adds to this confusion.
- L291-297: This paragraph discusses seasonal variation of recessions for Gibbo River in Figure 4. I think it would be beneficial to discuss this also for the other three streams, or at least for Northern Arthur River with the seasonal recessions in Figure 5. For example, observed recessions during the wet season for Northern Arthur River are also plotted on 25% to 90% MRCs, but for the dry season the conclusion is not the same for the two rivers.

Reference

Vogel, R. M., & Fennessey, N. M. (1994). Flow-Duration Curves. I: New Interpretation and Confidence Intervals. *Journal of Water Resources Planning and Management*, *120*(4), 485–504. https://doi.org/10.1061/(ASCE)0733-9496(1994)120:4(485)