I appreciate the effort that the authors have made to consider my comments to the previous version of this manuscript. The following issues remain:

Major comments

One of my previous comments was about the error bars in the high-variance case for Figure 2 and why they mostly do not cover the true "rho". In the revised version of this manuscript, the error bars have been removed and it is not possible anymore to see if they contain the true mixing ratio. The error bars should be added again, and if the true "rhos" are not contained within, an explanation is needed. If the true "rho" are contained within, then this comment is just a minor one and the issue is resolved. I do acknowledge that limited sample size and overlapping distributions can lead to a bias (i.e. the maximum posterior estimate for "rho" is different from the true one, as visible in Fig. 2a). I do not see, however, why HydroMix would predict that the true mixing ratio is completely impossible (judging from the error bars shown in the previous version of the manuscript). If the amount of information contained in the data is rather low (as in the high-variance case) any consistent Bayesian approach would give rather broad posteriors (since we did not learn much from the data) that would still contain the true value. This deficiency potentially underpins the abiblity of HydroMix to provide reasonable uncertainty estimates of mixing ratios, which is one of its primary goals.

This means that the conclusion on p. 22 line 31: "The uncertainty in mixing ratio estimates increases with increasing variance in source tracer compositions" is not supported by the results. What increases is the bias, not the uncertainty (the uncertainty is the posterior distribution of the mixing ratio, which we cannot see in Figure 2a, we can only see the bias, which is present for high and low mixing ratios).

On p.14 line 7-8 referring to Figure 2b, the authors argue that the error decreases with increasing sample size for the high-variance case. In the caption of Figure 2b, it is written that the presented data is for the low-variance case, however. Which one is true? Is the error also decreasing for the high-variance case?

p.22 line 18-19. "For data scarce environments, this represents an advance over existing probabilistic mixing models that compute mixing ratios […]" This conclusion is not supported by the results. You should either remove that sentence, compare your results to another study that used the existing mixing models which you aim to improve (including a reference to that study), or include such a conventional approach in your synthetic case study and compare the results to your approach. The latter option would be preferable, as it is relatively quickly implemented and does not make the paper much longer in my oppinion. The results could be shown in Figure 2, so no new figure would be needed.

Minor comments

Eq. (2): The sources can end up in the target mixture with different time lags. To account for this, Eq. (2) could be written as:

Rho*S1(t-tau1) + (1-rho)*S2(t-tau2)=Y(t)

This could then also be adapted in the text at the corresponding locations and added in the list of difficulties at the bottom of p.4.

A formula for ^Yij is missing (i.e. for the modelled target concentration). I assume it is dependent on the measurements p', not on the process S. In that case, the dependence on S1, S2 has to be removed in Eq. (8,9,10,11, etc.) and replaced by a dependence on p'.

p.5 line 31: sigma is the standard deviation, not the variance. Same on p.5 line 46.

Eq. (9) is wrong. It is correct in the code you made available on github, make sure that the equation in the paper agrees with the code.

p.6 line 23: replace “infer the” by “obtain a sample from the”

p.9 line 13-14: G_C does not avoid zero flow, it avoids zero water in the reservoir. If you reach zero flow or not depends largely how you integrate the differential equations presented in section 3. How do you integrate them from timestep to timestep? This is an important information for any hydrological bucket model. The appendix lists the integration scheme for the isotopic ratios, but not the one for the reservoir levels.

p.9 line 31: “all the rainfall and snowmelt samples”: which are they? They have not been mentioned so far.

Eq. (24): can “R” be replaced by M_S? Is it the same?

p. 12 line 21: Is it appropriate to cite this study here? Try to give original reference.

Figure2: (a) replace “lambda” by “rho” in figure caption. Replace “Original” by “True” in figure caption. Why where the uncertainty estimates removed from this figure? (b): The sum of the absolute error is a strange measure to use, as it increases with the number of samples. I assume you used the mean error not the sum?

p.20 line 3-5: what do you mean by “ this makes the comparison more informative than definitive”? Why is it necessary to have a mechanistic interpretation of a parameter in order to infer that parameter in HydroMix?

p.20 line 11: which uncertainty of the mixing ratio is more realistic, 0.005 or 0.2? If 0.2 is more realistic, then change the value you mentioned in the abstract accordingly.

Typos

p.2, line27: “series” instead of “serious”

p.9 line 24: full stop is missing.