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Interactive comment on "Combined assimilation of streamflow and snow water equivalent for mid-term ensemble streamflow forecasts in snow-dominated regions" *by* J. M. Bergeron et al.

Anonymous Referee #2

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The manuscript titled Combined assimilation of stream flow and snow water equivalent for mid-term ensemble stream flow forecasts in snow-dominated regions is an attempt to apply the Ensemble Kalman Filter to the application of stream flow prediction in regions where the majority of the water involved comes from snow.

The manuscript undertakes a set of studies, the first is to ascertain which of the 7 possible state variables they consider are sensitive to the assimilation of the 3 observation types they consider. They indicate that snow cover appears to not be an important factor in the forecasts that they seek.

The manuscript is well written and upon a second reading easy to follow. However, i do have a couple of points that need to be addressed before i can sign off on publication.

Major Comments: 1) My first concern relates to the generation of the ensemble perturbations and the perturbations to the observations. You indicate that you use Gamma, lognormal of beta distributions yet the EnKF is highly reliant on these perturbations, and hence the errors being Gaussian distributed. My query, and i am requesting graphs of these, is to see the distributions plots for the distributions that you mentions with the parameters in the manuscript. My hunch is that these will look quite close to a Gaussian distribution of some form and as such is why you obtain the results, which are great results, but it could be misleading to have these distributions when really they are close to a Gaussian.

2) You need to provide a better justification to the use of these distributions on page 7.

3) You need to rewrite the paragraph starting on page 6 at line 14 as it is confusing as it would appear that it looks like you are referring to equations.

4) The statement on page 17, line 30 does not make sense and is confusing about the need for linear relationships which you really should have with the EnKF.

5) On page 9 you are finishing the details about the localization but i am concerned that because you achieve this wrt the true state that this may not be the case in the real data situation and you need some sort of disclaimer here as you are kind of using the true localization which would not be the case in reality.

Minor comments: 1) Page 3, line 27 remove to 2) Page 5, line 17, you mention the gain yet you have not defined it. 3) Page 11, line 33, remove the first that 4) Page 15, line 15, sits is not a very scientific way to describe where the site is. 5) General comment. you use both Gaussian and normal please be consistent and only use one of them

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-166, 2016.