Anonymous Referee #1
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This manuscript by Maxwell et al. seeks to address one of the grand challenges in the field of hydrology by simulation of surface-subsurface flow across a very large area of North America at high spatial resolution. The simulation results demonstrate an ability to capture the general features of the surface and subsurface system as compared to the observed streamflow and head data. Whilst the results are expected, a quantitative demonstration of such with a mechanistic model is quite powerful. This model of a large part of the US is a nice advancement from the proof of concept for ParFlow at very large cell numbers (Kollet et al 2010). This paper is a good fit for GMD and I have only some minor comments on the manuscript, which should be addressed before publication.

We thank the reviewer for this constructive review and for recognizing the importance of this work. We have addressed each of the reviewer's comments below.

Pg 7320 Ln 11: "scale" should be "scales".

This change was made to revised manuscript.

Pg 7320 Ln 23: delete superfluous "6,300,000 or"

This change was made to the revised manuscript.

Pg 7321 Ln 21: Is this sentence saying that ParFlow can simulate variable density and viscosity, but you have chosen not too? This assumption is fine, it is just a little unclear.

Yes, we do mean that ParFlow can simulate variable density / viscosity flow but we have chosen to leave those as constant in this simulation. This phrasing was revised to "although ParFlow can simulate density and viscosity-dependent flow" for clarity.

Pg 7323 Ln 6: These well-known mechanisms of infiltration excess and saturation excess should have a reference to aid the reader if they would like to know more, e.g. Dunne 1983 .

This is a useful suggestion. In addition to the Dunne reference, Horton 1933 and two discussion articles of these prior works have been added to the revised manuscript.

Pg 7323 Ln 21: Please give details for the robust numerical solvers or provide a reference here.

Three references were provided.

Pg 7326 Ln 27: I am not sure "novelly" is appropriate here, or at least needs further qualifying. ParFlow and other models such as HGS have demonstrated this already. Is the novel aspect the very large scale model using such an approach to naturally generate streams? If so then this could be specified.

We feel this is a novel feature at this large extent. However, given that this point is described in the text above we felt the sentence read better with the word "novelly" removed.

Pg 7325 Ln 15: Rather than “good” can the authors be quantitative here.
We have added the quantifier “(better than 60% efficiency)” to support this assertion.

Pg 7327 Ln 12-15: This is important because I assume all of the observational data is post-development. This requires more discussion, e.g. How does this play into to the goodness of fit for the model? Given that Parflow has the capability for all of these anthropogenic stresses, is it likely that they will be added? This is most likely future work that could be eluded to in the conclusions.
We thank the reviewer for mentioning this important point. Additional discussion has been added to this section and to the conclusions.

Pg 7327 Ln 24: “ the goodness of fit may be obscured” Why is this?
We have clarified this statement to say “driven by the underlying topography” instead of just “obscured.”

Pg 7327 Ln 27: “ and may be due”, change to “are likely”?
This change was made to the revised manuscript.

Pg 7329 Ln 1: Delete “the” before Colorado
This was referring to the basin, not to the state. However as we see this was unclear, we have added “watershed” to the end of this phrase to help the reader.

Pg 7329 Ln 24: I don’t think this is counter intuitive at all, I would expect that in areas with larger K that recharge would be greater and stream density would decrease due to decreased runoff.
We appreciate the reviewer’s insight here. The phrase “somewhat counterintuitively,” has been removed for clarity.

Pg 7329 Ln 26: Insert “is” after “This” . . . => “This is more clearly “
This change was made to the revised manuscript.

Pg 7330 Ln 15-29: Figure 10 is being referenced where it should be Figure 11.
This correction was made to the revised manuscript, we appreciate the reviewer catching this typo.