Comment 1. Authors have developed a distributed parsimonious hydrologic model to represent surface water-groundwater interactions and channel transmission losses in dryland environments. The modeling package is written in Python and provides some flexibility in terms of implementing a variable time step for different hydrologic processes and using different equations to represent infiltration. The new modeling package was set-up over the Walnut Gulch experimental watershed in Arizona and results were validated using observed streamflow, soil moisture and actual evapotranspiration data. Despite a relatively simple structure, the model was able to capture the main hydrologic processes of the studied catchment. The paper is well written and authors have performed robust model evaluation using synthetic and real numerical experiments. I provide a few comments below to further clarify some of the points discussed in the paper.

Response 1. We greatly thank the reviewer for taking the time to review the article and provide useful comments that will certainly improve the manuscript. We have addressed your comments in the text below.

Comment 2: Line 75- Could you please explain which "hard-coded parameterization" you refer to here.

Response 2: We refer here to any physical and numerical parameter used for ensuring the stability and convergence of numerical solutions, particularly when using highly non-linear approaches such as the Richard's equation. We will clarify this statement in the revised version of the manuscript.

Comment 3: Line 145- How do you represent the streams? Is width of a stream equal to the width of a grid cell or do you have flexibility in representing the streams using different geometries? While this information is added later in the text, it would be more useful to state it earlier in the manuscript.

Response 3: Stream width and length can vary if the user provides these values. We have restricted the stream cross-sections to rectangular shapes to reduce the computational demand when using cross-sections with different shapes. A simple cross-section also prevents the use of an implicit scheme to solve water partitioning on the channel.

We will make these points clearer in the revised manuscript.

Comment 4: Line 335- Do you assume the subsurface is homogenous for both saturated and unsaturated zones?

Response 4: Yes, it is assumed that each compartment is homogenous, however, each compartment has its own hydraulic properties.

Comment 5: In Equation 20- Do you assume a constant specific yield across the entire subsurface?

Response 5: The specific yield is constant for each cell for saturated conditions. For unsaturated conditions, storage is controlled by soil storage capacity. Therefore, when the water table is below the rooting depth the model uses Sy, but when the water table is above the rooting depth elevation, the soil storage capacity is considered in the model. It is described in section 4.1, but we will clarify it in the revised manuscript.

Comment 6: How do you define the riparian unsaturated zone? does the extent of the riparian zone variable or fixed?

Response 6: The riparian zone uses a similar approach as the soil unsaturated zone. It is defined as a region parallel to the stream, and its extent can be specified by using a raster file. A value of 20m has

been specified as a default condition. The hydraulic conductivity in the riparian zone is specified by the hydraulic conductivity of the channel streambed.

We will clarify the riparian zone characteristics in the corresponding section of the revised manuscript and the user control which is possible for this aspect.

Comment 7: Do you implement an iterative scheme to consider the two-way coupling between the saturated and unsaturated zones? Please clarify.

Response 7: The model uses a non-iterative scheme as described in section 2.1, lines 132-135. We have implemented a non-iterative scheme in order to reduce the computational demand that is required when using iterative schemes. We will make sure that it is clearly stated in the corresponding section in the revised manuscript.

Comment 8: I suggest to move section 2.6 after section 2.1. to first describe the model inputs and then explain the equations.

Response 8: Thanks for the suggestion, we will move section 2.6 to the place that helps the reader to better understand the manuscript.

Comment 9: What are the vegetation specific parameters in the model? It seems only the rooting depth is set depending on the landcover type.

Response 9: Three parameters control the vegetation in the model: the rooting depth, the crop factor *k,* and water stress fraction, *c*. It is currently described in section 2.3, lines 360-378. However, we will make sure that it is better described in the revised paper.

Comment 10: Line 635- Since the model resolution is 300 m, it means the width of the stream cell is 300 m as well. This width is too large to represent the width of streams in arid regions.

Response 10: As noted above the stream width and length can be set by the user in each cell of the model. Here, stream width is specified as 10m based on the average channel width of the main channels of the WGEW. We will make sure that it is better described in the revised version of the paper.

Comment 11: Figure 9- Why do you show uncertainty bounds for the simulated soil moisture and AET and not the runoff? does the “red” simulated line represent the best model run in Figure 9?

Response 11: We will add the uncertainty band for the streamflow figures. Regarding the plotted values, yes, we are showing results for the best simulation. We will clarify it in the corresponding section of the revised paper as well as in the figure caption.

Comment 12: Please discuss the limitations of the current model and future development plans.

Response 12: We will extend the discussion section to include future model development plans. In short, we will improve the soil-vegetation interaction in the unsaturated zone to capture the temporal variation of plant water demand. We are planning to extend the model to regional scales. We are also looking at the integration of the model with weather stochastic tools to enhance the ability of the model to test long-term variations of climatic conditions on water partitioning.

Minor Comments:

Comment 13. Line 21- Add “distributed” to the model to provide this important information to the reader upfront.

Many thanks for the suggestion, we will add it in the revised version.

Comment 14. Line 118 – Remove “(a la” from the reference

Thanks, we will remove it.

Comment 15. Line 120- Replace “streambed” with “stream stage”.

Thanks for finding this error, we will change it in the revised version.

Comment 16. Line 131 – Replace “an” with “a”

Thanks, we will change it.

Comment 17. Line 275 – Add “runoff” to the next downstream cell

Thanks, we will add it to the revised version.

Comment 18. Line 355- Replace “relative water content” with “volumetric water content” .

Thanks, we will change it.

Comment 19. Line 823 – Change “Fig. 9a” to “Fig. 9b”.

Thanks, we will fix it in the revised version.

Comment 20. Line 832 – Change “Fig. 9b” to “Fig. 9c”.

Thanks, we will fix it in the revised version.

Comment 21. Line 841- Change “Fig. 9c” to “Fig. 9f”.

Thanks, we will fix it in the revised version.