The manuscript deals with hydrological modeling using a modified WEP-QTP distributed hydrological model, in its application to Niyang River basin in the named region. In the Abstract, early in the MS text, the authors state that their main enhancements of the original model are, (a) separating gravel layer from the 'soil' layer, whatever the soil layer is, and (b) the addition of the overland snow cover on top of the soil layer during 'freeze-thaw period'.

My overall impression is that this manuscript be rejected with encouragement to resubmit after substantial reworking.

Introduction is chaotically written and poorly referenced. Hydrological processes in permafrost environment are only vaguely explained, so that the readership might not adequately reflect on the correctness and scientific soundness of the proposed model formulation. In the future submissions, I would suggest better referencing sections concerning permafrost hydrology, show hydrology, and cold region hydrology modeling. It is unclear, quite early in the manuscript (MS), what are the 'freeze-thaw' and 'non-freeze-thaw' periods? This is unclear, because in seasonally frozen soils thaw period can be extended long into summer period, and in permafrost, phase state changes in the soil profile occur continuously.

The description of the Study region should be separated from the Materials and Methods section. In the Data description, some datasets seem to be irrelevant to the distributed model setting proposed in the MS. Rainfall stations, as noted in the description, were all situated in the river valley. I would expect, here or later in the MS, that a typical rainfall distribution over the area would be given. Also, in principle, since the WEP-QTP is a distributed model, we would need to see the distribution of major hydrologically-relevant features across the watershed, and a sort of 'hydrological response units' distribution, or subcatchments having a meaning similar to HRU conceptually.

We would need to understand how the daily precipitation signal processes across the catchment, especially where only one downstream weather station is operational in the catchment. Since the introduction of snow layer was done in the distributed model setting, we would like to know how the snow cover distribution was estimated, and how snow meltdown was assessed (in spatial terms). Typical snow cover thickness in different parts of the catchment must also be presented. Permafrost/seasonal frost distribution in the catchment is essential since it was already presented in the Introduction that permafrost affects the hydrological processes at the QTP, and it needs to be presented on a separate figure along with glacier distribution.

Experimental data were used in this research (see cf. Lines 160-166). Experimental monitoring site, program, methods and data description need to be explained, if these data are used in the MS.

In the Introduction to WEP-COR section, it is unclear whether this version of the model has already had a permafrost hydrology routine implemented or not. From Lines 190-193, I can assume this, but it is unclear how phase state transitions control water distribution across the soil layers: when soil surface is all frozen; when the residual frozen layer separates surficial soils from groundwater (seasonal frost situation).

In the Model Improvement section, ‘the widespread dualistic soil–gravel structure’ is once again being referred, though neither geological sections were presented nor spatial distribution of gravel thickness was given. Overall soil thickness down to transitional layer was 200 cm, first two layers were 10 cm thick and lower lying layers, 20 cm thick. What was then the transitional layer thickness? Is it constant or variable? It can be imagined from the Figure 2 that gravel layer thickness above the groundwater table could easily exceed 2 m, and reach or even exceed 5 m. No information is given in the MS concerning this particularity of the vertical model structure. Still, no explanations on how permafrost is affecting lateral routing in the subsurface. If at one point, e.g., ground temperatures were observed, these data could be presented in the respective MS section to explain permafrost/seasonal frost dynamics. It is known that clastic sediments are mostly cryotic, i.e., with low temperature and low ice content. Also, since the presence of permafrost/seasonal frost is implied, I would like to know how the convective heat exchange in gravels affects the ground temperature in the model.

In snow cover model description, was snow sublimation assessed? What was the phase separation temperature, or air temperature at which precipitation falls as snow or rain? This parameter is important for the catchment in question, since owing to the great difference in altitude, precipitation may fall as rain at lower altitudes but as snow at higher altitudes. If the model does not account for this effect, it must be stated explicitly.

For the model, it is useful to show explicitly the number of calibrated parameters, and their values: either calibrated from the model runs/sensitivity analysis or taken from the literature.

In the experimental data analysis, I am particularly surprised to see no signs of the ‘zero curtain’ effect during phase transitions in soils. Does this mean that soil moisture content finally is low enough to not affect the ground temperature dynamics? Also, from the experimental site data I would assume there is no permafrost, but only seasonal ground freezing, which has only limited effect on cold regions hydrology. In the same lines, I has started wondering how exactly the model treats phase state changes and latent heat release/absorbtion.

There are numerous other remarks along the text flow which I preferred to not pick up all, but rather generalize as a poor English usage, and lack of explanations/references. I do not believe the manuscript can be published in HESS in the present form.