

General comments

This ms tried to improve the WEP-COR model by adding two parameters (gravel and snow cover), and model the water cycle on the QTP. This improved model seems reasonable and the observed results fit well with the modelled data. However, some important discussions were not fully addressed. Especially, the scientific gaps you proposed in the abstract were not presented in the discussion. In addition, the scientific hypothesis seems inappropriate. Thus, I think it is not suitable for publication in the current version. I suggest rewritten it carefully before it can be published.

Abstract

I don't think that the dominant lithology of the whole QTP is thick gravel layers. The Quaternary deposit is prevalent on the QTP. Thus, you should define the thickness of the gravel layer and the depth. If the gravel layer occurred at depth as deep as 50m or more, how can it affect the hydrological processes? Importantly, the hydrological and water cycles on the QTP differed due to the remarkable spatial heterogeneity of precipitation, the topography, and the atmospheric circulation, even in a small watershed. For example, maybe the shallow gravel layers generally occurred in the river valley and at the foot of valley, however, it may be buried in deep layer on the mountain slope. Accordingly, how can you determine the mechanism of water cycle on the entire QTP by only modelling one site? In addition, due to the occurrence of permafrost, although the high permeability of the gravel, the sub-permafrost water is hard to involve the surface

water cycle.

Line 18: If I can understand, you tried to study the water cycle mechanism of the Qinghai–Tibet Plateau via a local study in the southeast QTP, I don't think it is a good idea. As you mentioned, the geological and climatic characteristics varied on the QTP, including the distribution of cryosphere, the precipitation regimes, as well as the lithology, so how did you achieve your goal via the investigation at only one site?

non-freeze–thaw period: please define it, did you mean the absolutely freeze period? Or completely thaw period?

freeze–thaw period: the same question. How did you define it?

Introduction

1. I suggest that the authors should reconsider the hypothesis: the lithology on the QTP differed significantly, not what you said, the gravel layer only occurred in some special conditions, e.g. the low river valley or some fluvial alluvial landform. The Quaternary deposits is important. Especially when you investigate the water cycle.

2. From the title, I suggest that the first section should be focused on the importance of water cycle on the QTP. And the influence of lithology is discussed to propose the knowledge gap.

Thus, the introduction section should be rewritten.

Study area

Lack of the geological data and the lithology characteristics in this basin.

Results and discussion: the contents in this section didn't fit with what you have presented in the abstract and the title.

1. As you mentioned, the ice in the embedded in the soil pore is important, so I think the ice conditions should be considered.

2. I do not see the discussions of the influence of gravel content on the model, as well as on the water cycle.

3. The discussion section is insufficient. The authors only presented the applications of model in the flow process, the moisture, etc. However, it was absolutely lack of some important things. I suggest discuss the influences of gravel layer and snow cover on the water cycle, which you aimed to address in the abstract. I think what you presented in the result section was just the model result. How you determined the water cycle using your improved model on the QTP is important.

Special suggestions

Page 2 line 42: change "permanent" to "permafrost"

Page 3 line 66-67: the geological structure of the Qinghai-Tibet Plateau is special, with a thick gravel layer under the thin soil layer. How did you draw this conclusion?

As I suggested, I don't think the gravel layer is thick over the whole QTP.

Page 7 line 179: how did you set the thickness of the soil layer at different depth?

Page 8 How deep did you model?

Page 19 415-416, how did you obtained the snow cover period in this area?

Page 21 the differences between the modelled moisture by using two different models are big, how did you explain it?

Please check the grammars and expressions by inviting a native English speaker.

Page 23 line 476: I can not understand the expression " ...the WEP-QTP model can recharged groundwater more quickly during heavy rains...". May be "...the groundwater recharged more quickly in the WEP-QTP model..."

Page 24 line 479; the same question, the expression is hard to follow, please improve the ms by inviting a native English speaker.

Page 24 line 485: what do you mean the area of WEP-COR? I think the area of frozen soil in the WEP-COR model is correct.