

## ***Interactive comment on “Climate-induced hydrologic change in the source region of the Yellow River: a new assessment including varying permafrost” by Pan Wu et al.***

### **Anonymous Referee #3**

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The paper by Wu et al addresses an important issue for one of the world's major river systems, namely the identification of sources of change. The paper is generally clearly written, although there are numerous errors of English that need correction. The authors correctly point out that the effects of climate change are multifaceted, and can include changes to the physical properties of the hydrological system in response to changing climate. However, since some of the earlier work that they review fails to include this point, the discussion in the paper is somewhat confusing and needs clarification. The paper presents time series of permafrost maximum frozen depth (Fig 2), which are interesting and show variable response between sites. However, the authors only point to an overall decreasing trend. This seems to be a major simplification

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and the authors should consider a more detailed analysis of these data, and attempt to explain the differences, if possible, for example in terms of basin location and local climate variability. I have one important and major reservation about the extensive analysis undertaken in this paper. The authors use the Budyko relationship as a basis of their analysis of non-stationarity. The Budyko relationship is highly simplified, but extremely useful in presenting an overall global perspective on catchment behaviour – in particular, the precipitation versus energy controls on evaporation. It is however just a convenient and very approximate relationship. The authors here treat the Budyko model as correct, and use apparent differences in their parameterisation of the model as a tool to interpret change. However, inspection of Figure 5b clearly shows that, while the empirical data for the three sub-basins considered fit well within the overall envelope of response from a Budyko-type response, each has a distinct and quite different relationship, which is not captured by the overall Budyko model fit. In my opinion, this invalidates the analysis. A model of this type is so simplified that it can only be approximate and imprecise. The authors here attribute too much precision to the model and seek to identify parametric differences, which in my opinion have no physical basis – they are an artifact of the assumption of the model. I regret that in my opinion this paper is therefore not publishable. I recommend that the authors give more attention to the data as presented in Fig5b, and also consider a more physically-based modelling approach to better understand the physical controls on this system.

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