General comments

This paper is the revised version of the manuscript "On constraining a lumped hydrological model with both piezometry and streamflow: results of a large sample evaluation" by Pelletier and Andréassian.

Specific comments

I read through the replies to reviewers' comments, and the revised manuscript and found the authors made efforts to improve their manuscript. However, I am afraid I have the impression my major concerns/comments have not been adequately addressed. More specifically:

The main aim of using additional data, not only streamflow, to calibrate a hydrological model (regardless whether it is a physically based or conceptual one) is to make the model more capable of reproducing reality, i.e. to simulate runoff well for the right reasons, to simulate not only runoff but other fluxes and model states more efficiently/realistically, to improve process consistency, etc. Now if the authors argue that their model "The GR6J model which is used in the study is a macro-scale conceptual model, describes macro-scale hydrological processes but does not intend to reproduce the meso-scale or laboratory-scale physical processes. Thus, it does not enable us to know what happens in reality in the catchments of the test dataset, in particular regarding the local river-aquifer interactions." – then I am confused why piezometer data measured at one single or a few points within a catchment are used in the study to calibrate their model? I find this contradictory. The study seems to lack any hydrological reasoning based conclusions (e.g. physically based reasoning, understanding what happens in each catchment, why the streamflow and groundwater level simulations are satisfactory or not on certain catchments, etc.). The main point of using additional data is to avoid calibrating hydrological models machinelike, without knowing what is happening in the models (and in the catchments).

I still find the study interesting, valuable, however, I think that substantial revision might be necessary to avoid contradictions mentioned above.

Technical corrections

-Generally: please shorten and simplify sentences, e.g. splitting very long sentences into more, shorter ones – it is hard to follow and understand very long sentences (i.e. several lines long).

-The manuscript could be potentially shortened.

-Please avoid mixing past and present tense (in methods, results, etc.).

-Line 15: "sub-soil"? Suggestion: subsurface

-Line 17: "whose complexity is not straightforward to describe" – please consider to revise, e.g. subsurface hydrological processes are complex, and therefore the modelling of these processes is also a complex (or challenging) task

-Line 29: please replace can with could

-Line 64: "while conceptual models develop their own empirical equations" –

please revise, e.g. conceptual models are based on/use/consist of empirical equations

-Line 123: "observation function"? Objective function?

-Line 125: "in-field measurements are often used", please add what are often used?

-Line 143: "glacier state" – but which type of measurement? Snowmelt, snow accumulation?

-Line 170: the new model structure also does not explicitly simulate groundwater levels.

-Line 214: please replace exposed below with shown below.

-Line 225: please explain here what wrong side means.

-Line 246: please revise this sentence, the meaning is not clear: "However, the average altitude remains low enough not to overtake 10% of solid precipitation".

-Line 247: please remove neither (or does not)

-Line 248: or

-Line 263: this has been already mentioned above.

-Line 266: please remove comma

-Figure 4: please move this figure to Appendix A considering that all the variables are explained there – or move the model description to the main text from the appendix.

-Line 274, 275: 2 or 3?

-Line 279: please remove RMSE if this was not used in the study, otherwise it may be confusing for a reader.

-Line 292: please split the sentence into two.

-Line 370: sensibility?

-Line 385: please remove "as seen in figure 17" considering that the results are not presented/introduced here.

-Line 502: shown in section…

-Line 504-505: please revise this sentence, i.e. difficulty? Well instrumented catchments

-Line 510: bringing new information