Hydrol. Earth Syst. Sci. Discuss., 10, C6665–C6671, 2013
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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Senstitivity of water balance components to environmental changes in a mountainous watershed: uncertainty assessment based on models comparison" *by* E. Morán-Tejeda et al.

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General comments:
In this paper, the authors compare the results of two physically based hydrological models, for the current situation and for changes in meteorological forcing and land use. I think the authors made a relevant comparison with multiple variables (models, climate scenarios and land use scenarios). The analyses for this comparison are thorough and broad.

I think that especially considering different models is very relevant. From a hydrological modelling point of view, however, I miss some relevant information in the paper, as well as a discussion on the suitability of both models for this catchment. On the other hand, some of the presented information seems redundant or less relevant to me. In the Specific comments below I will point out which information I miss and which I think is redundant. Further, from a hydrological point of view, there are no losses. Although I understand that water availability in the rivers is the main concern of the authors, I would not use the words yield or loss.

Finally, I do not fully agree with the other referees that the paper is written in clear English. I think that the paper would become more clear if the authors have another look at the length, word order and structure of certain sentences and the length of most of the paragraphs (see Specific comments for some examples).

Specific comments:
All of the comments below are suggestions, it is up to the authors to use them or not.

- 11983, 4: I would change models comparison to model comparison
- 11984, 25: I would use mountain areas or mountain ranges, or in some cases upstream areas.
- 11985, 9-12: This sentence is very long.
- 11986, 6: Now it seems that hydrological models do not require observed data.
- 11986, 12: I do not agree that physically based models are required when spatial heterogeneities are investigated. Conceptual models applied in a distributed way can be very useful as well (see for example: Uhlenbrook et al., 2004; Winsemius et al., 2008; Gao et al.,2013). It might be good to also point out the disadvantages of physically based models. Especially the large data requirements:

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physically based models require much more input data than conceptual models. For example, in the response to anonymous referee #2 the authors state that three important variables to determine the evaporation were not available and, therefore, generated by the model itself. How does this influence the results and are physically based models still more useful than conceptual models in case of limited data availability?

- 11987, 17: Or because the authors want to model the inflow in the reservoir and not the reservoir itself?
- 11987, 21: How approximate?
- 11988, first paragraph: Is this paragraph relevant for the study?
- 11988, 19: 'to make the comparison of results possible'
- 11989, 21: The authors might consider adding a table here, with for each process the variable name, the abbreviation used in RHESSys and the abbreviation used in SWAT. This prevents the list of variable explanations after each equation. In addition, the differences between the models can be observed more easily.
- 11989, 25: Why is there only snow melt when the snow pack is mature?
- 11990, 6: Is the daily temperature of the snow pack known?
- 11990, 9-11: This information is known by hydrological modellers.
- 11991, 6-7: Information in this subordinate clause is known by hydrological modellers.
- 11991, 16: Are these daily temperatures?
- 11993, 12-16: This sentence is not relevant.

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- 11994, 9: Why are literature values used as reference? Is there no data about LAI available?
- 11994, 11-25: This is a description of the model, not of the calibration procedure.
- 11995, 5: How many and which parameters were calibrated during each phase and which value was selected for each parameter (maybe present the calibration results in a table)?
- 11995, 5: Was the calibration based on daily or monthly data, if it was based on daily data, why does fig. 2 show monthly data?
- 11995, 17-23: The information in this sentence is known by hydrological modellers.
- 11995, 28-2: This sentence is redundant.
- 11996, 9-10: Are these NSE values for daily or monthly data?
- 11996, 19: 'keeping the calibrated parameters constant'
- 11997, 9: Include a reference to the construction of a Taylor diagram.
- 11998, 10: Maybe also add that the separate influence of temperature and rainfall is investigated.
- 11999, 2: From the graph, it seems that REHSSys has a decrease of 11%.
- 11999, 17: Why is it a pessimistic scenario? 'most extreme scenario' is more objective.
- 11999, 18: When is a shift dramatic?
- 11999, 21: I would replace always by 'for these scenarios'.

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- 11999, 25: Change 'water losses' into 'decrease in runoff'.
- 12000, 22-25: This elaboration does not seem to match with figure 5.
- 12001, 1: Why are these scenarios not described in the method section?
- 12001,3-8: This sentence is too long.
- 12002, 27: The comment between brackets is redundant.
- 12003, 29: The text between brackets is redundant.
- 12004, 7: Why is this experiment not described in the method section?
- 12004, 7: From a modelling perspective this is an experiment, so I would not change it into 'set of runs' or run.
- 12008, 9: This sentence is not correct.
- 12009, 11-13: I think that it is important to know the behaviour and uncertainties of your own model (not necessary hydrological modelling), before using it to make predictions.
- 12009, 19: It is maybe better to quantify the decrease instead of calling it dramatic.
- 12021: I find the axis labels confusing, maybe change to 'change in river discharge'. What is the time span of the change (20 yrs or per year)?
- 12021: I would give the figures with annual results the same scale.
- 12022: I find the legend of this graph confusing.
- 12024: I find again the axis labels and the units of the axes confusing.

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- 12024: relative difference in respect to which discharge?
- 12024: Something went wrong with the lines forming the axes.
- 12024, line 2 of caption: change 'figures' into 'numbers' for clarity
- 12025: The axis labels are again confusing: eg. mean snow pack cannot be negative.
- 12025, b+c: A flux has a L/T dimension, so mm/day or mm/year.
- 12025, c: The REHSSys graph has yearly ET as label instead of yearly runoff.
- 12026, b: I would keep the scale the same and leave out the negative part of the scale.

Technical comments:

- 11984, 15: used
- 11984, 26: they produce more than
- 11986, 1: For this,
- 11988, 18: conceptualisation
- 11995, 18: $\pm$ 10% and $\pm$ 15%
- 11996, 24: These comprise
- 12003, 26: (6 %)

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References

Gao, H., Hrachowitz, M., Fenicia, F., Gharari, S., and Savenije, H.H.G.: Testing the realism of a topography driven model (FLEX-Topo) in the nested catchments of the Upper Heihe, China, Hydrology and Earth System Sciences Discussions, 10, 12663-12716, 2013.

Uhlenbrook, S., Roser, S., and Tilch, N.: Hydrological process representation at the meso-scale: the potential of a distributed, conceptual catchment model, Journal of Hydrology, 291, 278-296, 2004.

Winsemius, H.C., Savenije, H.H.G., and Bastiaanssen, W.G.M.: Constraining model parameters on remotely sensed evaporation: justification for distribution in ungauged basins?, Hydrology and Earth System Sciences, 12, 1403-1413, 2008.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 11983, 2013.