

Interactive comment on “Why does a conceptual hydrological model fail to predict discharge changes in response to climate change?” by Doris Duethmann et al.

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General comments

The paper investigates the reasons for failure of the conceptual hydrological model predicting changes in discharge as a response to observed increases in precipitation and air temperature for 156 catchments in Austria. The authors considered three groups of possible causes, namely data problems (precipitation, temperature), problems related to the model calibration (length of calibration period, objective function), and problems of the model structure (ET calculation method, vegetation changes). Hypotheses of the possible causes were evaluated using simulations with modifications of the base-

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line model. The paper is in the scope of the journal. It is well written and structured. The data seem to be of appropriate quality. References are up to date and appropriate. There are, however, some areas that require minor corrections for further improvement.

1. Penman-Monteith method – Please, check the calculation and the equation for the net radiation at the crop surface (Eq. 4). Net radiation (R_n) is the difference between the incoming net shortwave radiation (R_{ns}) and the outgoing net longwave radiation (R_{nl}), and R_{ns} is derived from the balance between incoming and reflected global radiation (R_s) given by $(1-\alpha) \cdot R_s$ (see Allen et al., 1998).

Specific comments

1. Page 1, line 21: I would suggest being more specific in defining the size of the impact. How much is "little"? Is it negligible?

2. Page 3, line 29: Using abbreviation Merz2011 for the reference is unconventional. I would suggest to use the usual way of citing, namely Merz et al. (2011). This issue should be corrected throughout the document.

3. Page 7, line 16: Please, check equation 4. It does not seem ok to me.

4. Page 7, line 19: Modified Eref calculated using a variable surface resistance based on changes in a satellite-based vegetation index should be marked as E2 (not E3) in order to be consistent with Table 3.

5. Page 8, lines 9-10: Abbreviations E1 and E2 should be explained when first mentioned. Furthermore, correct the numbering of E1, E2 and E3 to be consistent with Table 3.

6. Page 14, Table 3: It would be useful for readers to include the exact years of the 5-year calibration period in the table or in the table caption. Is it the first 5 years of the considered data or any other? Is it the same for all model variants?

7. Page 15, lines 3-6: Analyses of simulated changes in storage should be explained

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in more detail since they are mentioned only in this paragraph.

8. Page 15, lines 13-16: As seen from Fig. 4b, an increase in model performance loss with increasing distance of evaluation periods from the calibration period could be observed in almost all cases, regardless of the calibration period. Please, rewrite the sentence.

9. Page 20, Table 5: It would be useful for readers to add a corresponding model variant to each individual result.

10. Page 21, line 3: Please add which 5 years and 25 years were used for calibration of the mentioned model variants.

11. Page 21, line 21: It would be useful for readers to add a model variant in brackets.

Technical corrections

1. Page 15, line 18: It should be “is reversed”.

2. Page 15, line 14: Correct the structure of the sentence.

3. Page 24, line 4: Bracket is missing at the end of the sentence.

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