

***Interactive comment on “Assessing hydrological model behaviors by intercomparison of the simulated stream flow compositions: case study in a steep forest watershed in Taiwan” by J.-C. Huang et al.***

**Anonymous Referee #1**

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In this discussion paper an interesting link between hydrological model structures/parametrisations and responses (stream flow composition) is examined. Overall This paper is well organised and the research strategy and conclusions are clearly understandable. The visual presentation of the results is good, however, there are still a lot of errors and unclear sentences in the text. The detailed and technical comments on this paper are addressed below:

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## detailed comments

1. section 2.1: As one of the conclusion you stated that the HBV model could be more suitable for catchments characterised by thin or highly permeable soils than the TOPMODEL (cfr. p.873 lines 17-19). Therefore it should be interesting to indicate in this section which soil types are dominant in the study catchment. This information could be linked to the calibration and validation results in sections 4.1 and 4.3, respectively, in order to check whether the assertion is correct for this catchment.
2. p.859 line 13: Using the drainage area of 105 km<sup>2</sup> (see line 4) an annual discharge of 1816.9 mm doesn't lead to a mean daily discharge of 7.94 m<sup>3</sup>s<sup>-1</sup>.
3. section 2.2.1 and 2.2.2: The evapotranspiration modules are turned out because it is assumed that this flux is negligible compared to the rainfall. This sounds very plausible in this study because of the high mean rainfall intensities in the selected events. To be complete I suggest to also give quantitative information to indicate that this assumption is realistic.
4. p.861 line 7: 'The soil moisture that received rainfall', do you mean the soil moisture status of the grid cells that receive rainfall or do you want to emphasize the temporal evolution of the soil moisture status within one grid cell?
5. eq. 4: Doesn't the second equation describe infiltration capacity based runoff, and not saturation excess runoff (cfr. line 2)?
6. p.865 line 14: Could you be more precise about the distributions used to sample the parameter sets. E.g. Could you provide the chosen intervals for the different parameters used in this study.
7. section 2.4: It is clear there does not exist a pareto front for the chosen calibration performance measures. Maybe it would have been interesting to incorporate an

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- extra performance measure like the bias in the multi-objective calibration in order to distinguish between the well performing parameter sets, as considered in this study.
8. p.866 line 9: what is exactly meant by an awl shape?
  9. fig. 4: Isn't the event with the smallest observed runoff volume in fig.4a.1 also characterised by rather low Nash EC's (cfr. p.867 line 26)? Quite often the performance of the TOPMODEL is not good for small rainstorms in fig.4b1. Therefore I would not conclude that TOPMODEL outperformed in the small rainstorms (cfr. 868 line 1).
  10. section 4.1: I would suggest to describe the modeling performance analysis of both models more in relative terms. E.g. instead of 'By contrast, the TOP-derived simulations held the run-off volume estimation well and remained consistent.' you could write 'the TOP-derived simulations estimated the run-off volume better and remained more consistent compared to the HBV model'.
  11. 868 line 25: Real watershed responses do follow the mass balance. Could you be more precise about what you really want to indicate.
  12. 869 line 6-7: What is exactly meant by 'the ranges of parameters  $S_{rmax}$ ,  $K_s$ ,  $L$  and  $K_b$  are limited in revealing the importance and sensitivity of these parameters in the HBV model'?

## Technical comments

1. Incorrect sentence structures are not uncommon in this paper. This issue should be thoroughly addressed before considering publication. e.g.:

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- p.856 lines 17-18
  - p.856 line 8
  - p.858 line 25
  - p.859 lines 8-9
  - p.859 lines 18-19
  - p.860 lines 16-17
  - p.861 lines 14-16
  - p.862 lines 8-9
  - p.864 lines 19-20
  - p.868 lines 13
  - p.869 lines 11-15
2. p.858 line 9: 'Hydrologiska byrans vattenbalansavdelning' instead of 'Hydrologiskabyransvattenbalansavdelning'
  3. p.858 line 17: 'to calibrate the parameter sets' instead of 'to calibrate the well-performed parameter sets'.
  4. p.858 line 19: 'in terms of the Nash efficiency coefficient' instead of 'in terms of efficiency coefficient'.
  5. p.859 line 10: 'varies with distinct seasonality' should refer to the 'annual precipitation' and not the 'average annual precipitation'.
  6. p.859 line 22: It is probably better to consequently use the same units for a certain variable (cfr. line 13).
  7. eq. 1: SM and FC should be put in italics.

8. fig 2: I suggest to alter the left panel. For the moment it cannot be deduced from the figure that  $Q_i$  is also modelled as a linear reservoir output.
9. p.862 line 2: I would recommend to always use the same variable names for  $K_s$ ,  $K_i$  and  $K_b$  (cfr. p.861 lines 20-21)
10. p.862 line 5: 'L<sup>2</sup>' instead of 'L2', 'discharge' instead of 'runoff'.
11. p.862 line 10: It would be better to give the exact equation of the topographic index like in p. 863 line 11 instead of giving a brief description that is not complete in the context of the TOPMODEL.
12. p.862 line 19-24: The units of the variables are missing in this part.
13. p.862 line 14, 22, 24: To avoid confusion it would be better to consistently use one term for the first layer: 'upper layer' (cfr. line 14), 'root zone' (cfr. line 24), 'root zone storage' (cfr. line 22).
14. p.863 line 1: The units for variable  $T_d$  should be added.
15. p.863 line 13: 'a' should be ' $\alpha$ '.
16. p.863 line 17: 'flow' instead of 'runoff'.
17. eq. 4: The condition of the second equation should be reversed
18. p.864 line 1-2: I suggest using the previously used terminology for  $S_b$  and  $K_b$ .
19. p.865 line 17: 'selected for' instead of 'selectedfor'
20. eq. 8:  $Nash_{EC}$  should be in italics.  $Q_{sim,i}$  in the denominator should become  $Q_{obs,i}$ .
21. p.865 line 21: 'the total of time steps' instead of 'the total time step'

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22. p.870 lines 15: 'average soil deficit' instead of 'average soil deficit decreases'
23. fig. 10, 11: In the figure labels events 21 and 23 are mentioned. Shouldn't these be 15 and 17?

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