

Interactive comment on “Improvement, calibration and validation of a distributed hydrological model over France” by P. Quintana Seguí et al.

Anonymous Referee #1

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General Comments

In this paper, the authors present the effect of introducing an exponential profile of hydraulic conductivity to an existing model SIM and calibration of its parameters on the model performance. They carried out a sensitivity analysis of parameters of the newly introduced component and performed an inter-comparison of the model performance by calibrating the model using different strategies.

The paper is reasonable in its scientific content. However, there are some major issues I believe the authors should address before it is published. See detailed comments below:

Specific Comments

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- The paper is unduly long and the authors have spent a lot of effort in reviewing the evolution of the model structure. I suggest that the authors remove this section and present the model structure in its present state and only focus on the need for the new addition they introduced.

- It is mentioned on page 1329, lines 5-10 that the model has a clear structural problem. The authors have mentioned that in the present state of the model structure, water that should be taken from the aquifer is artificially taken from the soil reservoir. They have also suggested possible remedies to this problem but have not addressed it. The question is: what is the point of introducing an improvement to the representation of the hydraulic conductivity in the soil zone when it is known that the model has the mentioned structural problem in handling the interaction between the soil zone and the aquifer? Why not first address the known structural problem using the approach suggested by the authors?

- Section 6.1, last paragraph: Model calibration is performed for parameters f and d_c leaving the other parameter b out first and a second round of calibration is performed by tuning parameter b . Why did not the authors calibrate the model for all the three parameters simultaneously? I do not understand why the authors left this parameter out based on its sensitivity to evaporation. Calibration was done based only on runoff data. I think the authors should clarify this point.

- In their conclusion, the authors have suggested a need for the introduction of more parameters to understand the role of interaction between the parameters. The interaction could have been studied using the present parameterisation. What is the point of adding more parameters and how would that help to understand the role of parameter interaction?

Minor Comments

- What does the compacted depth d_c mean physically?

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- Section 5.1, last paragraph: What is the cause of the seasonal pattern of the sensitivity of evaporation and drainage to hydraulic conductivity? I think this should be discussed.
- Section 5.2: Why not include a figure to show the influence of b on the annual cycle of drainage and runoff?
- Section 6.4, last paragraph is not necessary. The objective functions have already been defined in section 6.1.
- Section 7.1: Why not include a figure to show that the model performance in terms of reproducing the water balance is similar in the two periods?

Technical Corrections:

- Section 2.2, line 26: 'momentum' instead of 'moment'
- Equation 1: Shouldn't the subscript of w be 1?
- Section 3.3, line 19: remove the question mark and put the appropriate citation. Also on first line of section 4.1 and on line 9 of page 1337.
- The authors should also revise their grammar. For instance on line 7 of page 1326: "The values of d_2 and d_3 were set in function of the vegetation type ..." can be rewritten as: "...as functions of ...". Also, I don't see the need for the comma on line 7 of page 1334. The statement on lines 23-25 of page 1335 can be rewritten. There are many similar incidents in the text where sometimes it is difficult to grasp what the authors intend to say.

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