Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessment of the indirect calibration of a rainfall-runoff model for ungauged catchments in Flanders" *by* N. De Vleeschouwer and V. R. N. Pauwels

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We want to express our gratitude to the reviewer for the constructive review. The comments will be addressed below:

Answers to comments

1. As noted by all three reviewers some key references are not discussed in the literature review of the discussion paper. The following references will be added

to the paper in order to give a more accurate overview of published research in the context of parameter estimation in ungauged catchments:

- Bardossy, A.: Calibration of hydrological model parameters for ungauged catchments, 25 HYDROLOGY AND EARTH SYSTEM SCIENCES, 11, 703-710, 2007.
- Castiglioni, S., Lombardi, L., Toth, E., Castellarin, A., and Montanari, A.: Calibration of rainfall-runoff models in ungauged basins: A regional maximum likelihood approach, ADVANCES IN WATER RESOURCES, 33, 1235-1242, doi:10.1016/j.advwatres.2010.04.009, Workshop on New Frontiers of Hydrology, Rome, 30 ITALY, JUL, 2009, 2010.
- Merz, R. and Bloschl, G.: Regionalisation of catchment model parameters, JOURNAL OF HYDROLOGY, 287, 95-123, doi:10.1016/j.jhydrol.2003.09.028, 2004.
- Oudin, L., Andreassian, V., Perrin, C., Michel, C., and Le Moine, N.: Spatial proximity, physical similarity, regression and ungaged catchments: A comparison of regionalization approaches based on 913 French catchments, WATER RESOURCES RESEARCH, 44, doi:10.1029/2007WR006240, 2008.
- Parajka, J., Merz, R., and Bloschl, G.: A comparison of regionalisation methods for catchment model parameters, HYDROLOGY AND EARTH SYSTEM SCIENCES, 9, 157-171, 2005.
- Post, D. and Jakeman, A.: Relationships between catchment attributes and hydrological response characteristics in small Australian mountain ash catchments, HYDROLOGICAL PROCESSES, 10, 877-892, doi:10.1002/(SICI)1099-1085(199606)10:6h877::AID-HYP377i3.0.CO;2-T, 1996.
- Seibert, J.: Regionalisation of parameters for a conceptual rainfall-runoff model, AGRICULTURAL AND FOREST METEOROLOGY, 98-9, 279-293, doi:10.1016/S0168-1923(99)00105-7, 1999.

- Vogel, R. and Sankarasubramanian, A.: Validation of a watershed model without calibration, WATER RESOURCES RESEARCH, 39, doi:10.1029/2002WR001940, 2003.

2. The authors would prefer to keep the short exposition on optimization algorithms in the research paper. The reason is that it gives an indication that quite a bit of research has already been performed on developing new optimization algorithms. We focus on applying one of these algorithms for a new calibration setup, more specifically extrapolating data in time and in space.

3. Indeed some inconsistencies about the units of the model fluxes and parameters exist in the discussion paper. These will be corrected and all model states, fluxes and parameters will be put in SI units.

4. The authors agree that it is an interesting idea to validate the indirect calibration strategies by comparing specific discharge signatures. This is approximately what is suggested as possible future research at the end of the conclusion (page 123 line 4-6). However, this is outside the scope of the current discussion paper. Researching this issue contains enough material for at least one additional paper.

5. We prefer real data experiments in this paper because the main research goal was examining the practical utility of indirect calibration of the PDM. However, the authors acknowledge that synthetic experiments could be interesting in a different research context, e.g. to investigate how errors in the calibration data translate into errors in the parameter estimates, or to assess to what extent the extra step of calculating the spectral properties lead to additional error in the parameter estimates. However, these interesting research questions fall outside the scope of this paper.