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Hydrology and Earth System Sciences Discussions

Interactive comment on "Multi-objective calibration of a surface water-groundwater flow model in an irrigated agricultural region: Yaqui Valley, Sonora, Mexico" *by* G. Schoups et al.

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The paper deals with the application of a regional water-groundwater model in the semi-arid irrigated agricultural region (Yaqui Valley, Mexico). A multi-objective optimization procedure is presented in order to analyze, in details, both parameter and model structural uncertainty. The procedure has allowed the authors to select the optimal solution identified as the "best" model; this model has been used to simulate the water balance components and to estimate the main discharge mechanisms in the Valley.

The subject of the paper lies within the score of the journal. The scientific approach

and applied methods seem to be valid. The paper is well written and the discussion is sound.

The paper can be accepted for publication after the following minor corrections.

1. Both in the Abstract and in the Conclusions sections, the authors write that the developed model could be used “in future work to identify optimal groundwater management strategies.” This conclusion sounds as if the model performance was tested additionally to the calibration experiments. However, the presented results do not allow the authors to make such a conclusion. The test of the model through a calibration procedure, even though the latter is very detailed and careful, does not permit one to evaluate the capability of the model beyond the conditions of the calibration period. The results of the model validation by the data, which are not utilized in the calibration procedure, should be shown for such an evaluation. Otherwise, it should be stressed in the paper that the model validation is not carried out in the current stage of the study and, consequently, the conclusions should be more moderate.

2. It would be interesting for a reader to obtain information on the uncertainty of the simulated water balance components in the Section 3.2.

3. It is not clear enough from the text, what is the time-step of the model. A reader can suppose from Section 2.2.1 that it is close to 1 month but, anyway, it should be clarified. As far as the spatial resolution of the model is 2 km and the maximum assigned horizontal hydraulic conductivities can exceed 100 m/day, the time-step seems to be too large. Some remarks on the concordance between time and space resolutions of the model (taking into account typical values of soil conductivities) are needed in the paper.

Most of needed technical corrections are listed in the Referee’s Comments. Additionally, the following corrections are needed: 4. The term “Ss” in the Eq. 1 should read “S” 5. The 1st sentence in the Section 2.2.6 and the 3rd sentence in the Conclusions should be corrected

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1. Does the paper address relevant scientific questions within the scope of HESS? YES 2. Does the paper present novel concepts, ideas, tools or data? NEW APPLICATION OF THE KNOWN APPROACHES 3. Are substantial conclusions reached? YES 4. Are the scientific methods and assumptions valid and clearly outlined? YES 5. Are the results sufficient to support the interpretations and conclusions? NOT COMPLETELY (see comment #1) 6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientific (traceability of results)? YES 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? YES 8. Does the title clearly reflect the contents of the paper? YES 9. Does the abstract provide a concise and complete summary? YES 10. Is the overall presentation well structured and clear? YES 11. Is the language fluent and precise? YES 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? NOT COMPLETELY (see comment #3 and Referee's Comments) 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? NO 14. Are the number and quality of references appropriate? YES 15. Is the amount and quality of supplementary material appropriate? YES

Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 2061, 2005.