Hydrol. Earth Syst. Sci. Discuss., 7, C3644–C3649, 2010
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Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydrological real-time modeling using remote sensing data" *by* P. Meier et al.

Anonymous Referee #1

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the format of this evaluation might be confusing. Better open the SUPPLEMENT file

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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? Yes. The use of radar derived soil moisture data for real-time hydrological modeling is quite novel.

3. Are substantial conclusions reached? Yes, I think so.

4. Are the scientific methods and assumptions valid and clearly outlined? Not clearly

outlined. This part of the paper needs the most attention during the review period. (please check answer 10)

5. Are the results sufficient to support the interpretations and conclusions? - Yes most of the time. - One statement that is not supported by the results is: "These results show clearly that the model presented is capable of providing useful discharge forecasts in semi-arid river basins" (Page 8822, lines 11-12) o Looking at figure 5 and 6 this statement cannot be supported. Figure 6 shows clearly that there are over- and underestimations of up to 600 m^3/s (and even more in the Lugangwa watershed). o This statement has to be mitigated. It has to be stated clearly for what this information is useful, because it is surely not useful to issue e.g. a flood forecast (the time step is 10-daily)

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? No not completely outlined. The description of how the forecasts are calculated is almost missing. Further details will be given in answer 10.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes, I think so.

8. Does the title clearly reflect the contents of the paper? - Title too general - Help the reader to find your article; recommended to extend it with "soil-moisture" and "Zambezi (River Basin)".

9. Does the abstract provide a concise and complete summary? Yes, with little changes: - the reason why this study has been executed could be clarified more (give motivation and specific advantages that can result out of this study) - page 8810, line 18/19: Please write that the lead-time of the hydrological forecast depends on the specific time lags of each catchment, and varies between 10 and 40 days. - keywords are missing (they would also help finding a better title)

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10. Is the overall presentation well structured and clear? No - please help the reader to understand your research by sticking to the standard structure: 1. Introduction 2. (Study area) 3. Data 2.1 Soil moisture 2.2 Rainfall 2.3 Discharge 3. Methodology 3.1 Soil water column content 3.1 Soil moisture – runoff model 3.2 Real-time modeling 4. Results and discussion 5. Conclusions

- 1. Introduction o In general almost all important parts of the article are addressed in the introduction which is good but they are presented too detailed for an introduction, please shorten them ïĆğ Page 8811, lines 10 – 22: move the explanation of the data assimilation problem and the Ensemble Kalman Filter to chapter 3.2 and write only one or two sentences in the introduction ïĆğ Page 8812, lines 14 – 27: transfer the part with the description of the study area into chapter 2. Only mention in which catchment area you are going to apply your analysis to o Better start the introduction with stressing the reason why you executed this study, why it is important, and what is the use and then how you are going to tackle your task (the advantages of distributed physical models and of conceptional models can come later in section 3.2) o Page 8812, line 3: ... to retrieve soil moisture information using radar techniques. o Add a last paragraph in which you give a preview of what will be found in which part of the following article o Terminology (please correct consistently for the whole article): ïĆğ "observed system outputs" → it's correct, but clearer would be to only use "system outputs" or "model outputs" ïĆğ "modeled observations" → is confusing, better "modeled output" ïĆğ "short-term forecast" → if you calculate forecasts with a lead time of up to 40 days then we are talking about "long-term forecasts" or also "seasonal forecasts" and not "short term forecasts"

- 2. Study area (← can theoretically also remain in the introduction, but the article gets a clearer structure it you make an own section for it) o Page 8812, lines 14 – 27: transfer the part with the description of the study area into chapter 2 o Include figure 1 (I don't know if that was already planned, but I wouldn't keep the table and figures at the end of this article, present them in the paper when the topic comes up) o Page

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8812, line 15: Zambezi River Basin o Page 8812, line 15+: maybe the numbers of the sub-catchments can be referred in brackets. Example: The three watersheds are [1] the Upper Zambezi. . ., [2] the Kafue River where. . . and [3] the Luangwa River . . .

- Data: o soil moisture: ïĆğ Only from page 8813, line 5 till page 8814, line 19 ïĆğ Page 8813, line 11: What is meant with “correlation length”? Is it the “spatial precision of measuring points” o then make single sections for rainfall and discharge data

- 3. Methodology o 3.1 Soil column water content (page 8814, line 20 - end), you can maybe put an introduction sentence saying something like: While the surface soil moisture data can be directly derived from radar scatterometer of the ERS satellite, the soil column water content for large depth has to be estimated. This is due to limited abilities of the electromagnetic waves that are only capable to penetrate the top few centimeters of the soil. Wagner et al. . . . ïĆğ Page 8814, line 26: “declined by one half” → What is meant? Declined by 0.5 [unit] or the declined by 50 % of the measurement? ïĆğ Page 8815, 3rd paragraph: response time of the Luangwa is stated to be very short. Okay, but if it needs to be set to zero, isn’t it unrealistic? o 3.2 soil moisture- runoff modeling ïĆğ 3.2.1 simple conceptual model (from page 8816, line 20 to page 8818, line 14) âĂć At the beginning of this section you can copy the first paragraph of the introduction here (it fits better here): In hydrological forecasts, fully distributed, physically based models . . . this can be an advantage. → Don’t forget to correct the short-term forecasts into long-term or seasonal forecasts (please for the whole article!). ïĆğ 3.2.2 regression model (from page 8818 to end of section) o 3.3 Real-time modeling ïĆğ Page 8819, line 3: Terminology: “measured observations” → is double, better only “observation” ïĆğ Page 8819, line 9-10: The rainfall data ensemble . . . gamma distribution on the FEWS NET rainfall data. ïĆğ page 8820, line 1-2: Not understandable how this is meant. If you calculate a forecast in a retroperspective than it is called hindcast. Apart of this please explain the procedure more in detail, it took me quite some time to figure out what you meant with “adaptive mode” (important)

- 4. Results o 4.1 Soil moisture (page 8815, completely) ïĆğ Page 8816, line 2: “. . .

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rainfall is more powerful in terms of the forecast period. . .” → What does it mean? Do you mean that it can increase the lead time? o 4.2 Real-time modeling ïĆğ Page 8821, line 25. That means no validation has been done, correct? If so please erase the word “full” o One statement that is not supported by the results is: “These results show clearly that the model presented is capable of providing useful discharge forecasts in semi-arid river basins” (Page 8822, lines 11-12) ïĆğ Looking at figure 5 and 6 this statement cannot be supported. Figure 6 shows clearly that there are over- and underestimations of up to 600 m^3/s (and even more in the Lugangwa watershed). ïĆğ This statement has to be mitigated. It has to be stated clearly for what this information is useful, because it is surely not useful to issue e.g. a flood forecast. o page 8822, line 14: insert line break at the end o page 8822, line 15: SWI is enough, it has already been fully written once

- 5. Conclusion o Page 8824, line 4: “. . . shows a good performance. . .” → I have commented already on this beforehand; please mitigate it to “. . . shows a fairly good performance. . .” o Page 8824, line 13: “distant future” → I think you mean everything exceeding the catchment-specific time lag, right? In case that is right please write it also like this.

11. Is the language fluent and precise? Proof reading by a native speaker would surely enhance the understandability of this paper.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? - Abbreviations need to be written out once: o Page 8813, line 9: TDR o Page 8813, line 27: SAR o Page 8814, line 11: ERS o Page 8823, line 5: ASAR - Units have been forgotten in all formulas. They need to be added

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? - Figure 5, caption: please explain the used symbols from the figure in the caption - Figure 6: Please enlarge these figures. It is almost not possible to recognize the different graphs within the plots - Figure 6, caption: instead of (a), (b)

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and (c), I would use (1), (2) and (3) as it can be seen in figure 1

14. Are the number and quality of references appropriate? Yes.

15. Is the amount and quality of supplementary material appropriate? Yes.

Terminology

Short- term forecast like in meteorology: A weather forecast made for a time period generally not greater than 48 hours in advance. (source: McGraw-Hill Dictionary of Scientific & Technical Terms, 6E, Copyright © 2003 by The McGraw-Hill Companies, Inc.)

long-range forecast A forecast for a period greater than seven days in advance, although there are no absolute limits to the period embraced by the definition. (http://amsglossary.allenpress.com/glossary/search?id=long-range-forecast1)

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/7/C3644/2010/hessd-7-C3644-2010-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 8809, 2010.