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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.

P. Meier et al.

philipp.meier@ifu.baug.ethz.ch

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We greatly appreciate the very detailed and very constructive review and we would like to thank the anonymous referee for the time spent on revising the manuscript. The reservations expressed by the reviewer mainly concern the structure of the article and the overall understandability. We completely agree with the reviewer that sticking to a standard structure allows to improve the clarity of the article. We thank the reviewer for the very detailed suggestions concerning this issue. The quality of the article can be improved significantly based on the reviewers comments.

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Interactive Discussion

Discussion Paper

8. We agree that the title is too general. We propose to change it to “Hydrological real-time modeling in the Zambezi river basin using satellite-based soil moisture and rainfall data”

9. The abstract will be extended as proposed by the reviewer.

10. Besides the structure of the article, which will be adapted according to the reviewers suggestion, the terminology needs further attention. The reviewer identified three groups of terms which lack proper definition:

    (1) observed system outputs, model outputs, modeled observations, system outputs: We will make sure that the distinction between the model output, the model state and the observations (measurements at gauge) is unified throughout the paper.

    (2) short-term forecast vs. long-range forecast: According to the definitions provided by the reviewer a 10 to 40 days forecast would be a long-range forecast. This will be clarified in the revised article.

    (3) adaptive mode vs. deterministic mode: The performance of the real-time model can only be assessed on the basis of historical data. We referred to this assessment as running the model in adaptive mode. As the reviewer suggests the correct technical term for this would be hindcast. In contrast to the hindcast we are running the model without real-time updating. We refer to this as deterministic mode. We agree that this distinction needs further attention and we will include a proper definition for both terms in the paper.

    – *Page 8816, line 2: “. . . rainfall is more powerful in terms of the forecast period. . . ” What does it mean? Do you mean that it can increase the lead time?*

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The phrasing of this sentence was unfortunate. The lead time of the forecast increases with the size of a watershed or if a wetland is present. The sentence will be changed, e.g. “Therefore models using only soil moisture and rainfall as input have a longer lead time in larger watersheds.”

The referee comments on various occasions about the usefulness and the overall performance of such a forecast. The usefulness as such is not in doubt. However, we completely agree with the reviewer that it has to be specified what actual purpose such a forecast can be used for considering the forecast errors can be quite large.

The following paragraph will be added to the introduction of the article:

A possible application of such a model is the implementation of ecological flow releases into the operation rules of a reservoir. For these releases the timing is of great significance (Acreman and Ferguson, 2010;Galat and Lipkin 2000). Operating a dam according to a strict rule curve without any information on future inflows leads to a very late flood pulse since the flood is attenuated until a prescribed water level is reached in the reservoir. With some information on the expected inflow ecological releases can mimic a more natrual flow.

11. We agree that proof reading by a native speaker will increase the overall quality of the article.

12. The abbreviations TDR, SAR, ERS and ASAR will be defined at their first appearance.

    We agree with the reviewer that the dimensions of the quantities used in the formulas are missing. This shortcoming will be corrected. In addition the units of the calibrated model parameters will be pointed out explicitly.

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13. Figure 5: Will be corrected as suggested, see attached figure. To improve the readability of the figure it was plotted in colors and the results of the regression model were deleted.

    Figure 6: To improve the figure it was split into 3 separate parts making the plots for each subbasin slightly bigger (see attached figures)

References

Acreman, M. C. and Ferguson, A. J. D. Environmental flows and the European Water Framework Directive, Freshwater Biology, 55, 32-48, 2010.

Galat, D. and Lipkin, R. Restoring ecological integrity of great rivers: historical hydrographs aid in defining reference conditions for the Missouri River, Hydrobiologia, 422, 29-48, 2000.

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

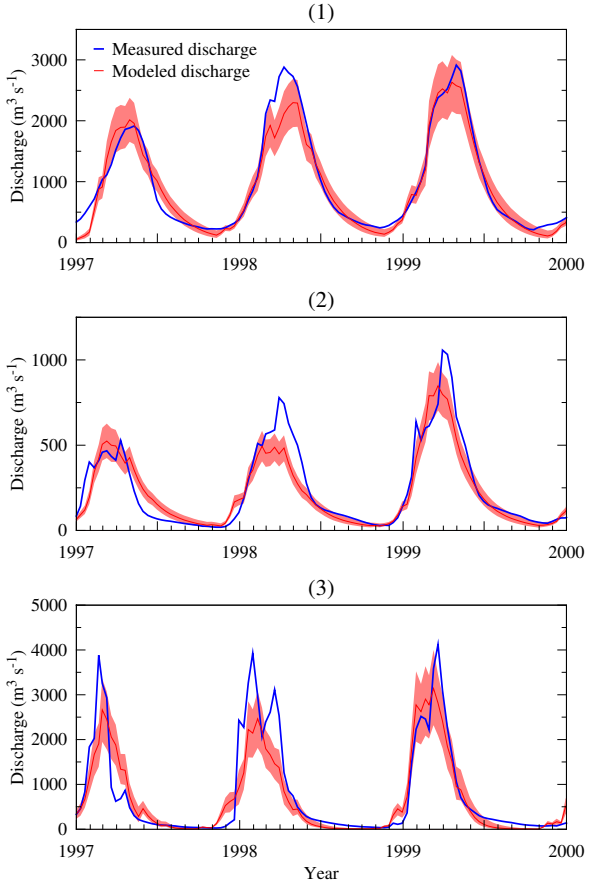

Fig. 1. The modeled discharge (red) including the 95% confidence inteerval compared to the measured discharge (blue line) for the three watersheds Upper Zambezi (1), Kafue River (2) and Luangwa River (3).

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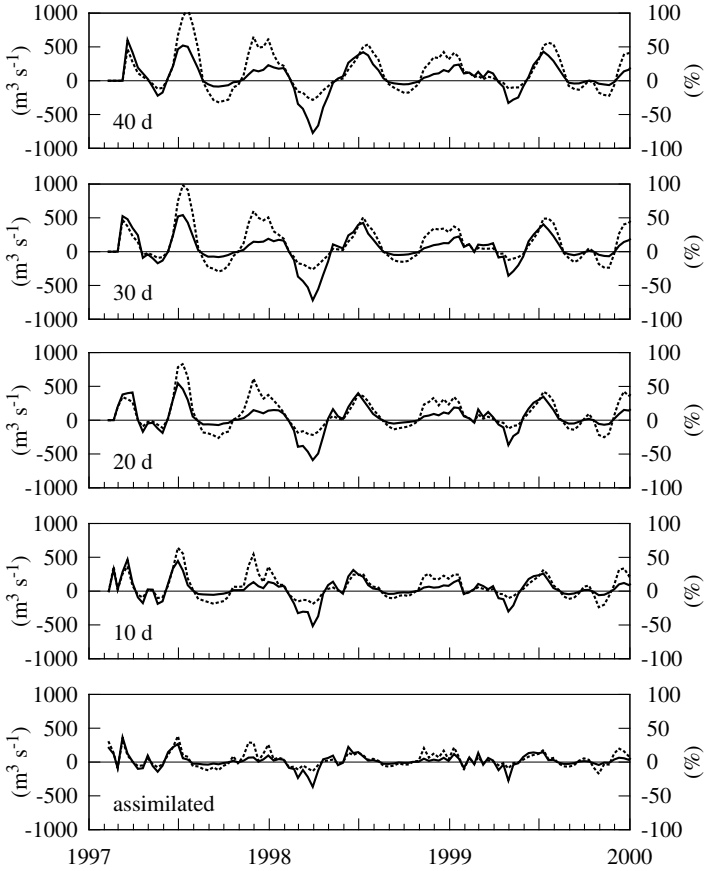

Fig. 2. Absolute (solid line) and relative (dashed line) forecast error for the upper Zambezi basin for the different forecast periods and the assimilation step.

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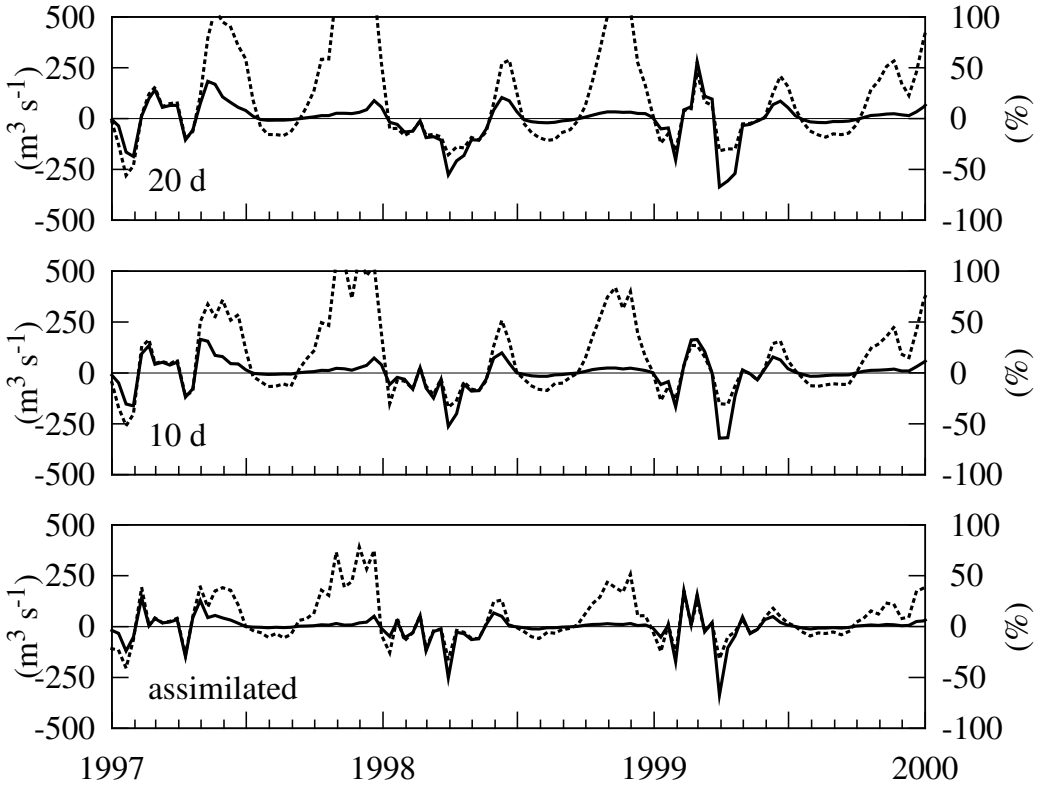

Fig. 3. Absolute (solid line) and relative (dashed line) forecast error for the Kafue basin for the different forecast periods and the assimilation step

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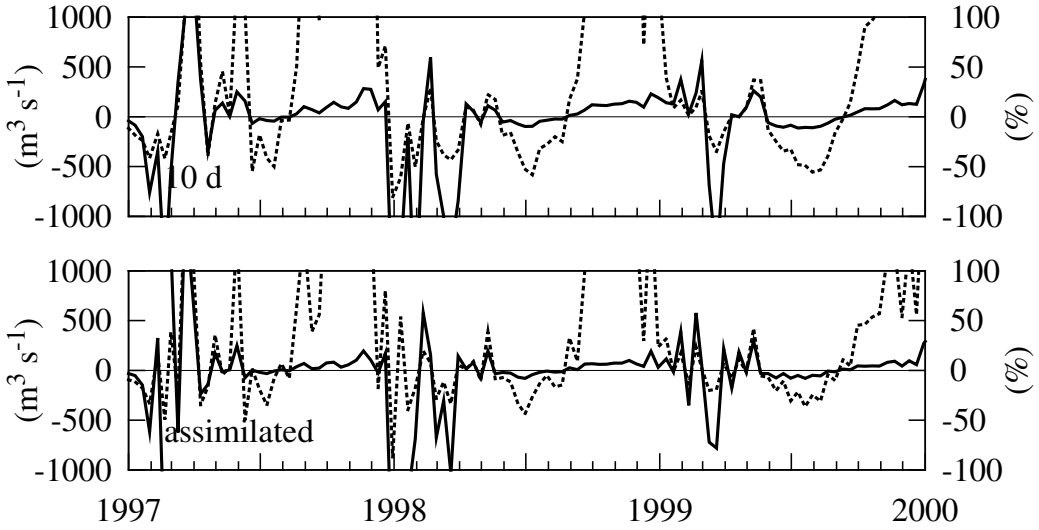

Fig. 4. Absolute (solid line) and relative (dashed line) forecast error for the Luangwa basin for the different forecast periods and the assimilation step

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