Hydrol. Earth Syst. Sci. Discuss., 11, C2597–C2601, 2014
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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Uncertainty reduction and parameters estimation of a distributed hydrological model with ground and remote sensing data" *by* F. Silvestro et al.

Anonymous Referee #1

Received and published: 21 July 2014

Summary: The manuscript contains an interesting experiment to calibrate an hydrological model with observations from remote sensing in comparison with calibration based on discharge. The study is carried out for two catchments in Italy, where a brute force calibration technique is used to calibrate the model parameters. Although the study is very interesting and relevant, some major improvements could be made. The overall readability of the manuscript could be improved. Please check English and especially the construction of sentences. Please find below some Major and minor comments which could help to improve the manuscript.

Major comments Please include some of the major finding in the abstract. The abstract

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could be improved by including less information on the introduction and the necessity of the study and more about the approach and results.

A clear objective is missing from the introduction. Please indicate more clearly the objectives of this study.

Page 6220, how is the downscaling of soil moisture to DEM resolution done? Since ASCAT soil moisture observations, typically, have a much coarser resolution than a DEM.

Section 2: A Figure containing the set-up of the hydrological model would significantly help the reader to understand the text and the calibration process. Please include.

A lot of different calibration and validation periods are included and not always overlapping while performance of calibration scenarios are evaluated in different periods as well. Please provide a Table with the different scenario, basins, calibration periods and validation periods. Explain why different calibration periods are selected for different scenarios, is there a good reason or just a random selection. It seems a little bit arbretary at the moment and is rather confusing for the reader.

Please state clearly the different case studies, in the current form it is to confusing for the reader.

Are the calibration and validation period overlapping (as suggested by page 6223). Why not seperate these periods for a more fair comparison.

Page 6223 Objective 3, how is the rescaling of ASCAT handled and how do the authors deal with the low penetration depth of ASCAT compared to the model (which presumably has a thicker first soil moisture layer). Also the differences in observation times of the satellite and the model simulation times. Please clarify.

Please provide more information on the satellite data, overpass times, availability and resolution.

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It seems a exponential filter is used to convert surface soil moisture to root zone soil moisture. What delay time is used? This is not stated in the manuscript.

A sensitivity analysis is missing. Why are these parameters selected for calibration and additionally it is very difficult for the reader to see which parameter has the highest impact or the highest potential after calibration to improve discharge simulations. Please provide a sensitivity analysis, especially for the selected calibration parameters.

More literature on calibration of hydrological models with remote sensing is needed. More papers exist and should be mentioned in the manuscript, including: Crow, W.T., E.F. Wood and M. Pan, "Multiobjective calibration of land surface model evapotranspiration predictions using streamflow observations and spaceborne surface radiometric temperature retrievals," Journal of Geophysical Research - Atmospheres, 108(D23), doi:10.1029/2002JD003292, 2003. Santanello, J., C. D. Peters-Lidard, M. E. Garcia, D. M. Mocko, M. A. Tischler, M. S. Moran, and D. Thoma (2007), Using remotely-sensed estimates of soil moisture to infer soil texture and hydraulic properties across a semi-arid watershed, Remote Sensing of Environment, 110 (1), 79 – 97, doi:10.1016/j.rse.2007.02.007. Montzka, C., H. Moradkhani, L. Weihermuller, H.-J. H. Franssen, M. Canty, and H. Vereecken (2011), Hydraulic parameter estimation by remotely-sensed top soil moisture observations with the particle filter, Journal of Hydrology, 399 (34), 410 – 421, doi:10.1016/j.jhydrol.2011.01.020. Sutanudjaja, E. H., L. P. H. van Beek, S. M. de Jong, F. C. van Geer, and M. F. P. Bierkens (2013), Calibrating a large-extent high-resolution coupled groundwater-land surface model using soil moisture and discharge data, Water Resources Research, pp. n/a–n/a, doi:10.1002/2013WR013807.

Figure and Table caption are insufficient and should be more informative to provide the reader with more information on the content of the figures and results shown.

Minor comments Page 6216 Line 5: please explain "different view" what kind of different view? Line 7 -8: please explain DTM and SRTM

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Page 6217 Line 2: What is a "complete" model? Line 2-3: please improve the readability of the sentences Line 13: how do you know that the data sharing capacity is exponentially increasing? Reference maybe? Line 23: Should river size also should not be included in the hydraulic parameters? Line 28 - line 4 page 6218: Please rephrase

Page 6218 Line 2: Spatial resolution of what? Line 10-12: Incorrect reference order

Page 6223 Line 2-3: Contradicts with line 17 Line 9-10 Why a separate paragraph? Line 13: h = hour

Page 6224 Line 21: fifteen =15 Line 23: The model resolution is equal to the DEM resolution, however, the DEM resolution is not mentioned? Please state here Line 24: computational reasons, is that stability, if so please say so

Page 6225 Line 3L thirty is 30 Line 13: in -> by

Page 6226 Equation 3: is <> equal to the mean? If so please use overline Line 6-7: Please give formula's of the scores, also indicate what are good scores, high or low, maximum, minimum score and so on. Line 14: Dotty plots are just simple scatterplots and probably don't need a reference Line 17: Please give letters to the subplots. That is easier for the reader. Please also explain subplots in figure caption Line 19-22: "more complex paths" this can not be stated here. Maybe these parameters simply don't have an impact at all. Please provide sensitivities before making these kind of statements Line 23-24: Please rephrase Line 26: Why did the authors select 15% and not 10 or something else? Why not 50%? This make Figure 4 rather confusing. Is only 15% of the ensemble members between the lines? If so than a very large proportion seems to be between 15 an 90 percent.

Page 6227 Equation 5: please explain L Line 21: I believe this should be Fig 3

Page 6228 Line 7: August - September 2009, is this period not far to short for Soil Moisture simulations. Only a very short period of time is considered while dynamics

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in winter and or spring might be very different. Why are only two months selected? Please specify

Page 6230 Line 1-2: What please clarify. Why can different periods be considered, more explaination is needed. Line 26-27 "weakly related to processes that influence LST and SWI observations". How could this statement be made without a sensitivity analysis. For LST I agree that it seems natural that there is a weak relationship. However, SWI represents total soil moisture, which should than also be related to deep soil parameters... Due to the exponential filtering nature of the SWI, I agree that it is unlikely that a strong relationship exist. However a sensitivity analysis is needed to confirm this.

Page 6233 Line 12-14: Why not use one single calibration period for all observations?

Page 6234 Line 1-3: How is it possible to obtain routing parameters with Remote sensing of LST and SM? Both of these observations do not contain information on the discharge levels, nor on the routing of the discharge through the channel network.

Page 6237 Line 4-6: What kind of information can be derived from the DEM?

Figure 1: Improve this figure. Include coordinates place on the world, scale Figure 2: Include more information, which case, which time period, number panels. Figure should be self-explaining Figure 3: Please explain more, what do we see, why are the strange stripes present (undersampling?), number panel (a, b, c, d) Figure 4: Why is so much data outside the 15% and not within the 90%, please give ensemble mean, to get a better sense of the distribution Figure 11: Lower plot (please number again), around 2007-12-22, why do we see the flat soil moisture lines, is this a model artifact? Figure 12: Lower plot (please number again, a, b, c, ...) half of the timeseries can not be seen in the plot, please adjust the scale.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 6215, 2014.