

## ***Interactive comment on “Assessment of surface water resources availability using catchment modeling and the results of tracer studies in the meso-scale Migina Catchment, Rwanda” by O. Munyaneza et al.***

**O. Munyaneza et al.**

munyoma2000@yahoo.fr

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Referring to your helpful comments on our paper: Ref. No.: hessd-15375-2013 Title: Assessment of surface water resources availability using catchment modeling and the results of tracer studies in the meso-scale Migina Catchment, Rwanda

We really appreciated the comments of the editor Prof. Dr. Nadia Ursino who raised some valuable 3 points for the improvement of our revised manuscript. All suggested comments have been addressed in the revised manuscript.

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## General comments

Issue 1: Editor: The two Reviewers both pointed at the lack of an effective Introduction Authors: The whole introduction has been rewritten in the revised manuscript.

Issue 2: Editor: The two Reviewers both pointed at the lack of a complete model description Authors: We have rewritten the whole manuscript and made a double check, and beyond that all possible edits were addressed in the revised manuscript, much editing have been done based on specific comments raised by Referee #2.

Issue 3: Editor: The two Reviewers both pointed at the lack of a comprehensive analysis of the results (including a comparison with previous literature results that could evidence the relevance of your study). Authors: We have made this correction in the revised manuscript and more recent literature on the same study area (e.g. SHER, 2003, Nahayo et al., 2010, van den Berg and Bolt, 2010, Munyaneza et al., 2010, 2012a,b) has been added in the revised manuscript, especially in the introduction and discussion parts. We have also addressed this through the specific comments from referee#2 and the revised manuscript was improved. The results analysis was undertaken by carrying out statistical analysis of flow results and basin parameters, comparing parameter values of calibrated adjacent sub-catchments, and comparing the simulated values of water budget components with the tracer method results.

## Specific comments

Major issue 1: Editor: I believe that it is extremely important that you clearly state in your reply: what is your relevant research question.

Authors: The main aim has been revised as well as the whole introduction. The main aim was reformulated in the revised manuscript as follows: "The main objective of this study is to analyse spatial variation of runoff generation characteristics of the Migina catchment using a semi-distributed hydrological model. The model is expected to assist as a tool for water resources planning and decision making processes in this catch-

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ment". The conclusion shows how the results of the tool will be useful for decision making on P394, L2-7 as follow: "Lumping the entire Migina catchment would lead to missing important aspects of some of the sub-catchments and, subsequently, potentially misinforming the planning and decision making processes. Depending on the purpose of the assessment and the intended use of the information to be generated, individual units at an appropriate scale may require particular attentions even in very small catchments" (see major issue i on the response of referee#2).

Major issue 2: Editor: I believe that it is extremely important that you clearly state in your reply: what is new in the way you are going to answer the question.

Authors: The novelty of the paper was shown in the revised manuscript: "This piece of work went beyond the standard calibration of the model to the total flow to verify estimated values of one runoff components, i.e. baseflow. Baseflow contribution estimates cannot be validated using the standard method (comparison with records). This paper called for a new approach with which the baseflow results by the Rainfall-Runoff model were verified using the results of tracer investigations. This is not a classical model validation (like a split sample test as recommended by Klemes, 1986), however, it provided further insights into the model behavior and the model performance" (see major issue3 on the response of referee#1 and major issue i point 3 on the response of referee#2).

Major issue 3: Editor: I believe that it is extremely important that you clearly state in your reply: to which extent your answer could advance our scientific comprehension of meso-scale catchment hydrology in Rwanda.

Authors: While assessing the water resources availability, the paper determined the different water budget components: ET, percolation, direct runoff, and baseflow using a rainfall-runoff modeling tool. For rainfall-runoff models, only the total flow generated could be verified using the measured flow records. There are no or limited ways to verify simulated values of the different components than there are for the total flow. This

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piece of work went beyond the standard calibration of the total flow to verify estimated values of one component, i.e. baseflow. Baseflow contribution estimates cannot be validated using the standard method, but this paper introduced a new approach with which the baseflow results by the rainfall-runoff model were verified using the results of tracer investigations. This is not a strict model validation (like a split sample test as recommended by Klemes, 1986), but, it provides insights into the model behavior and the model performance (see major issue 1 on the response of referee#1).

We have been addressing all the comments from referee#1 and #2 in the revised manuscript. Thank you very much for your contribution to the quality improvement of this paper.

On behalf of the authors, Omar Munyaneza, Kigali, Rwanda June 2014

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