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Interactive comment on "Hydrological model assessment for flood early warning in a tropical high mountain basin" *by* M. C. Rogelis et al.

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Response to comments Anonymous Referee 2

We would like to thank the anonymous referee for the review of our manuscript. For ease of reading we have copied the reviewer comments, as well as our response.

GENERAL COMMENTS

This study compared three models: one distributed model (TETIS), one semidistributed model (TOPMODEL) and one lumped model (HEC HMS soil

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moisture accounting) in their performance of simulating the discharge of Tunjuelo River basin. Comprehensive and detailed information were provided regarding the study area and process of experiment setup. In general, the article is well organized and the methodology was described clearly. However, it is difficult to find the scientific significance from the study, either from methodology or findings. The authors made considerable efforts to set up the experiment and perform related analysis, and concluded TOPMODEL performed better than the other two models for Tunjuelo River basin. That information alone, which cannot be applied to other basins, is not interesting enough to readers. I also could not tell any innovation in methodology from the paper. Therefore, I would suggest the authors to think more and highlight the important scientific contributions o the study, rather than providing a well-written technical report.

RESPONSE:

In order to clarify the applicability of the results, the areas where páramos exist in the world will be added in the introduction: *Páramos are highly relevant ecosystems that are present in Venezuela, Colombia, Ecuador, Peru and Costa Rica (Hofstede et al., 2003).* In addition, the following clarification will be included in the discussion: *This approach can provide an alternative in areas with sparse data such as paramos as well as other watersheds where there are specific hydrological response mechanisms, that should be properly represented by the models.*

Regarding the scientific contributions, this issue was also raised by anonymous referee No 1 in his general comment. In order to clarify the contributions of the paper, the following paragraphs will be added:

One of the innovations of this paper is the approach to exploring model uncertainty, due to structural and input uncertainty, in areas where comprehensive validation

datasets are not available. Alternative information to that traditionally used in model evaluation, such that provided by hydrological signatures can provide a viable alternative to accept or reject potential model structures. In this paper we develop this approach in páramo watersheds, but the approach can equally be applied in watersheds with other hydrological signatures.

The aim of this paper is validating the proposed model structures of differing complexity against a conceptual representation of the hydrological behaviour of the catchment, and identifying how well the proposed models represent the hydrological signatures that reflect that conceptual model. Models that better reflect the conceptual representation thereby provide an indication of the reliability.

SPECIFIC COMMENTS

1. ***Page 2, line 56: it seems no description was provided for the study area before referring to it***

   RESPONSE:

   We thank the reviewer for the comment. Pag 2 line 56 will be modified to introduce the study area, as follows:

   The study area corresponds to the Tunjuelo river basin located in Bogotá (Colombia). This basin exhibits a high degree of complexity, since the upper basin is a páramo area (tropical high montane ecosystem), characterised by soils with a high water storage capacity and high conductivity with a hydrologic behaviour for which still major gaps in knowledge exist (Sevink, 2011; Reyes,

2014; Buytaert et al., 2005b, 2006a) and where the hydrometeorological data are scarce. Most modelling efforts in páramo areas have been carried out in micro-watersheds (Buytaert et al., 2004, 2006b, 2005b; Buytaert and Beven, 2011; Buytaert et al., 2007; Crespo et al., 2011) and have focused on advancing the understanding of hydrological processes and anthropogenic impacts. While these studies provide an important input in establishing the conceptual representation of the behaviour of the catchment, there is a need to model larger páramo watersheds (Crespo et al., 2012), ,and advance in the challenge to produce forecasts for flood early warning to downstream communities. Previous modelling efforts include the use of the AvSWAT model (Diaz-Granados et al., 2005), ,the use of the linear reservoir model to study land-use changes (Buytaert et al., 2004), a combination of linear reservoirs and TOPMODEL to assess the hydrological functioning of the páramo ecosystem (Buytaert and Beven, 2011) and, the analysis of climate change impacts through the use of the WEAP model (Vergara et al., 2011).

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