

Interactive comment on “Hydrological impact of rainwater harvesting in the Modder river basin of central South Africa” by W. A. Welderufael et al.

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Responses to reviewer #3

1. The model setup and configuration is inadequately described. 1.1. How is the catchment discretized for modeling? Response: this is addressed under the model setup (see Section 2.3, pages 9-10) in the revised manuscript. 1.2. How were the land use and soils considered in this process? Response: This comment has been addressed under section 2.3 for the land use and section 2.2 for the soils on pages 7-10 in the revised manuscript. 1.3. How many HRUs? Response: The total number of HRUs in the six sub-basins was 18. However, we thought that it is not relevant to mention this in the manuscript. 1.4. Three rainfall stations are mentioned – but how

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are these used? Is a driver station allocated to each HRU, or was a daily surface created and applied across the HRUs? Response: The rainfall depth corresponding to each sub-basin within the catchment was computed by the SWAT (see section 2.2 on page 8 of the revised manuscript). 1.5. How was ET estimated across the catchment? Response: ET was estimated using the Penman-Monteith method, which is one of the ET estimation techniques inbuilt in the SWAT model. 1.6. Once the initial configuration was done, how were the major land uses in the different scenarios simulated? E.g. Be specific about the CN modifications made to account for in-field RWH and justify these. Response: Please see sections 2.3 and 2.5 on the revised manuscript for scenario definition and CN modifications. 1.7. In the Agri-Con scenario, how is maize simulated. What assumptions in terms of planting date, ET controls etc were made? Response: Please see section 2.3 on page 10 of the revised manuscript. 1.8. There are several papers that do address both the application of SWAT as well as adjustment of Curve Numbers to address agricultural practices that the authors need to address. Some of these are listed below. Response: The suggested and other relevant reference materials have been reviewed in the revised manuscript.

2. The calibration is inadequate. 2.1. Apart from the limited time period used, there are clear problems with the simulation results shown in Figure 5. See my comments in the annotated document that has been uploaded. 2.1.1. Rainfall is discrete not continuous, so cannot be plotted like this. It should be plotted as bars, not a continuous line. Response: The graph is re-plotted in the revised manuscript (see figure 5). 2.1.2. There is a systematic error of some sort which causes the model to oversimulate streamflows. Response: Model performance (in terms of statistical errors) is summarized in Table 4 and in depth analyses are given in section 3.2 of the revised manuscript. 2.1.3. The model is responding to rainfall events that the catchment does not. It raises the question of the reliability and representativeness of the rainfall stations used. Response: Figure 5 clearly indicates that both the model (simulated) and the catchment (observed) are responding to the rainfall events even though there are some discrepancies between the two, which is to be expected in

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any modeling exercise. 2.1.4. The model responds more quickly than the catchment indicating that there is a lag from the catchment (or perhaps channel routing) that the model does not simulate adequately. Response: Since our analysis uses the daily (not hourly) time resolution, it would be difficult for the model to simulate the time lag between the observed and simulated streamflows. Simulation of the time lag between the observed and simulated streamflows requires meteorological input data on hourly time steps which is not available for this particular study catchment. Other probable reasons for this time lag have also been mentioned by the referee under section 2.3 below. 2.1.5. The text states that calibration was performed for 2000 - but here it seems that it was only done for 200 days of that year - and only started on Jan1 which is half way through the wet season! Rather use the hydrological year and extend the calibration period. Response: In deciding the calibration period for the calendar year, we considered the rainy season in the study catchment which normally starts in the month of January (on average). 2.2. Without having any more detail on the mode setup, it is difficult to interpret this, but to me there seems to be a clear problem with the way the rainfall input has been configured resulting in simulated events where there are none and vice versa. This is a well known problem in areas where convective events occur – the authors need to refer to the appropriate literature and address this. Response: Please refer to the revised manuscript (see Section 2.3, pages 9-10) for the detail explanation of the model setup. 2.3. There also seems to be a lag between simulated and observed runoff. This could be the result of catchment lag not being simulated, but could also be the result of a timing problem between rainfall and runoff. For example, runoff is often measured midnight to midnight, while rainfall is often measured/accumulated at 8am each morning. Response: Please refer to our response above (section 2.1.4) 3. For me, the interpretation of the simulated results needs more depth of analysis – both in terms of errors that may be induced by the model setup, as well as in what the model results are telling us. Response: In the revised manuscript, results are analyzed in depth. 4. Technical corrections and other comments: There are several of these in the annotated manuscript uploaded. Response: All technical

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corrections and comments have been addressed in the revised manuscript. Please refer to the text in red color font. 5. Suggested Reading: Response: Relevant reference materials have been reviewed in the revised manuscript.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/8/C4734/2011/hessd-8-C4734-2011-supplement.pdf>

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