

Interactive comment on “Distributive rainfall/runoff modelling to determine runoff to baseflow proportioning and its impact on the determination of the ecological reserve” by Andrew Watson et al.

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On behalf of myself and all the co-authors I would like to thank all the reviewers for commenting on our manuscript, your comments are much appreciated and will aid in improving our paper. The reviewers have highlighted a few concerns and additions that we can address in a revised version and this response aids in describing the changes that will be made. Both reviewers highlighted the need to improve the structure of the paper to make it clearer, as well as making it more concise and highlighting its novelty. We agree that the references are somewhat out of date, which was also a comment

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from the first reviewer, which we will revise. While Figure 1 shows the MAP of the study catchment we agree that there might be some additional representations that could help the readership understand the catchment conditions better. While a comprehensive breakdown of the environmental setting exists in another, cited paper in Journal of Hydrology (Watson et al., 2018) we agree that more background information is required so that this paper can be a standalone contribution and not require the reader to review to previous papers. As such we will address this by improving this section, including more information which is relevant to understand the catchment conditions. Similar to the study catchment comment, the description of the model in this contribution is somewhat reliant on the previous Journal of Hydrology paper, which was also a concern for the first reviewer and which will be addressed. In terms of abstraction, while this inclusion is possible in the case of MODFLOW, it is not possible with the coupled J2000 setup at present and is a future interest for us. As such we will make this clearer in the model description, outlining this limitation. There is enough information to include the sub-catchment irrigation and this will be included with a description of the method as well as the impact on the water balance. We agree that a more up to date landcover dataset would be more representative if an active gauging structure existed, although as the gauging data is between 1987-2008, the 2007 landcover dataset is better for the model calibration. A 2013/2014 National Land Cover dataset exists for South Africa, which we will incorporate in future models once the initial model approach has been completed. The evaporation from the lake was initially not included as the sea water influx from the coast is unquantifiable at present, making it difficult to separate out the fresh water evaporation in the model. Although, with remote sensing data and measured lake water levels, lake evaporation processes can be represented in J2000, improving the lake ET estimates and thereby quantifying how frequently the influx from the feeding tributaries meets the freshwater evaporation demand. As such the revised version will incorporate the lake ET package for estimating the evaporation off the lake, as well as simulating riparian reed ET which could also have an impact on lake water levels. The J2000 was calibrated between 1987-1994 for the Kruismans tributary, as

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the gauging station existed on this tributary. The groundwater validation was applied to the Krom Antonies as it was initially believed the most dominant source of baseflow. We accept that this has not come out clear enough in the paper and adjustments will be made. The J2000-MODFLOW was used as opposed to other models as the J2000 has the capability to simulate and represent certain processes required to understand the tributary river flow regime as well as it being a fully distributed model. In addition to this, as the Verlorenvlei is somewhat partially gauged, we used parameter values that were determined for an adjacent sub-catchment (Sandspruit), which helped to narrow the J2000 calibration values. We agree that this information is required for the readership and will be revised. One reviewer has some concerns about how the results have been presented, in particular to the graphs presented, we accept that as there was quite a large amount of data to present, it might be a bit confusing to the reader and we will revise this. There remain some additions that can be applied to the discussion and conclusion which the reviewer has highlighted, where the application to other regions is important for the readership. We accept that there are some minor technical corrections required to the paper, which we will address in the revised version. In conclusion, the revisions outlined above will not substantially change the findings of the paper, therefore this contribution should be suitable for publication in HESS.

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