

Review of “Hydrological functioning of West-African inland valleys explored with a critical zone model” by Hector et al. (2018)

General comments

This manuscript studies the hydrology of an inland valley in West Africa. The impact of LULC changes on such hydrological systems has also been assessed. This work is of interest to the broad readership of HESS. The manuscript is well-written. The authors have also made a commendable effort of using observations to validate the model results. However, there are some issues that must be addressed before publication (please see the specific comments section below).

Specific comments

The manuscript aims to answer the following questions: 1) what are the main characteristics of the hydrological functioning of inland valleys in the Sudanian area of West Africa? 2) What is the impact of LULC changes of such systems? In order to answer these questions, the authors have presented simulations from a tilted-v catchment, which is forced using the atmospheric variables from the AMMA-CATCH observatory. The subsurface hydrogeology of the area has been represented using data from the previous literature. The tilted-v catchment is being used as the representative of the real catchment area in West Africa. However, it is not clear from the manuscript how the slopes of the tilted-v catchment (4% and 2% in Y- and X-directions, respectively) are representative of the real topography? This is important because the authors are using ParFlow, which is a 3D variably saturated surface water/groundwater flow model. The water flow in this model is dominated by topography.

The authors presented the comparisons between observations and simulation results. How much does the representation of the topographic slopes contribute to the differences between the observed and simulated fluxes? Moreover, without a comprehensive representation of the real topography or justification of the considered topographic slopes, how can this be assured that the hydrological processes of the simulated tilted-v are representative of those of the actual catchment? Reasonable agreements between the observations and simulation results do not answer all these questions. Is it worthwhile to consider the real topography (which is very possible as ParFlow-CLM is a distributed model) of the area rather than a tilted-v catchment with arbitrary slopes? These issues should be clarified in the manuscript before publication.