



Automatic calibration of a parsimonious ecohydrological model in a sparse basin using the spatio-temporal variation of the NDVI

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Drylands are extensive, covering 30% of the Earth's land surface and 50% of Africa. In these water-controlled areas, vegetation plays a key role in the water cycle. Ecohydrological models provide a tool to investigate the relationships between vegetation and water resources. However, studies in Africa often face the problem that many ecohydrological models have quite extensive parametrical requirements, while available data are scarce. Therefore, there is a need for searching new sources of information such as satellite data.

The advantages of the use of satellite data in dry regions has been deeply demonstrated and studied. But, the use of this kind of data forces to introduce the concept of spatio-temporal information. In this context, we have to deal with the fact that there is a lack in terms of statistics and methodologies to incorporate the spatio-temporal data during the calibration and validation processes.

This research wants to be a contribution in that sense. The used ecohydrological model was calibrated in the Upper Ewaso river basin in Kenya only using NDVI (Normalized Difference Vegetation Index) data from MODIS. An automatic calibration methodology based on Singular Value Decomposition techniques was proposed in order to calibrate the model taking into account the temporal variation and, also, the spatial pattern of the observed NDVI and the simulated LAI.

The obtained results have demonstrated: (1) the satellite data is an extraordinary useful tool of information and it can be used to implement ecohydrological models in dry regions; (2) the proposed model calibrated only using satellite data is able to reproduce the vegetation dynamics (in time and in space) and, also, the observed discharge at the outlet point; and (3) the proposed automatic calibration methodology works satisfactorily and it includes spatio-temporal data, in other words, it takes into account the temporal variation and the spatial pattern of the analyzed data.