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Evaluation of different concepts of spatially distributed hydrological models in the Upper Blue Nile river basin using remote sensing data

The present research aimed to do the evaluation of new developments of the quasi-distributed physically based hydrological modelling software SWAT (Soil and Water Assessment Tool): SWAT-WB (White et al., 2011), and SWAT-DW. SWAT-WB new conceptual assumption is expected to lead to a better performance of the software and an improvement on the spatial resolution of the outputs. The main difference versus the former version is how runoff is computed. The traditional SWAT uses the Curve Number approach, which assumes an infiltration excess of the soil in order to compute runoff. In contrast, in SWAT-WB the storage availability of the soil profile is computed in each time step. If the rainfall during the time step exceeds this storage capacity then runoff is generated. SWAT-DW uses a distributed weather input by applying Kriging interpolation to provide inputs for each Hydrological Response Unit in SWAT, whereas the original model uses inputs that are lumped for the sub-basin, and was develop with the goal to seek for a better way to improve the spatial resolution of SWAT results. Both ways of providing weather input in SWAT modelling (lumped to subcatchment or to HRU scale) have been compared using again Remote Sensing data. The case study is the Gumera catchment, located in the Upper Blue Nile Basin. The assessment of both models has been implemented using Remote Sensing Data, allowing a distributed analysis of the hydrological parameters with space-born imagery.

The results show no correlation between Remote Sensing data and SWAT models for the parameters assessed, Evapotranspiration and Leaf Area Index. A strong influence between subcatchment delineation and SWAT outputs has been observed in the graphical representation of the different data sources. This effect, which is more evident in SWAT-CN than in SWAT-WB, is not improved at all after the implementation of distributed weather input, driving to the conclusion that the sensitivity of subcatchment delineation is caused by the way HRUs geometry is defined rather than how the weather input distribution is based, either on the subcatchment or on the HRU scale.