

Combined use of local and global hydrometeorological data with regional and global hydrological models in the Magdalena - Cauca river basin, Colombia

Erasmus Rodriguez (1), Ines Sanchez (1), Nicolas Duque (1), Patricia Lopez (2), Alexander Kaune (3), Micha Werner (2,3), and Pedro Arboleda (1)

(1) Universidad Nacional de Colombia, Civil and Agricultural Department, Bogota, Colombia, (2) Deltares – The Netherlands, (3) UNESCO – IHE Delft. The Netherlands

The Magdalena Cauca Macrobasin (MCMB) in Colombia, with an area of about 257,000 km², is the largest and most important water resources system in the country. With almost 80% of the Colombian population (46 million people) settled in the basin, it is the main source of water for demands including human consumption, agriculture, hydropower generation, industrial activities and ecosystems. Despite its importance, the basin has witnessed enormous changes in land-cover and extensive deforestation during the last three decades. To make things more complicated, the MCMB currently lacks a set of tools to support planning and decision making processes at scale of the whole watershed.

Considering this, the MCMB has been selected as one of the six different regional case studies in the earth2Observe research project, in which hydrological and meteorological reanalysis products are being validated for the period 1980-2012. The combined use of the hydrological and meteorological reanalysis data, with local hydrometeorological data (precipitation, temperature and streamflow) provided by the National Hydrometeorological Agency (IDEAM), has given us the opportunity to implement and test three hydrological models (VIC, WFLOW and a Water Balance Model based on the Budyko framework) at the basin scale. Additionally, results from the global models in the earth2Observe hydrological reanalysis have been used to evaluate their performance against the observed streamflow data. This paper discusses the comparison between streamflow observations and simulations from the global hydrological models forced with the WFDEI data, and regional models forced with a combination of observed and meteorological reanalysis data, in the whole domain of the MCMB.

For the three regional models analysed results show good performances for some sub-basins and poor performances for others. This can be due to the smoothing of the precipitation fields, interpolated from point daily rainfall data, the effect of horizontal precipitation (not included in the models) and weaknesses in the models structures; for example the poor performance of the VIC model in base flow dominated basins. In order to improve these simulations a strategy based on a hydrological model ensemble is currently being developed in the case study.

Results from the global models, show that these consistently tend to overestimate runoff. This may be due to the coarse resolution used (50 km), biases in the ERA-Interim precipitation forcing, and the different partitioning within the global models of the precipitation into evapotranspiration and runoff. It is expected that within the Tier II hydrological reanalysis, where the models will produce outputs at 25 km resolution, some improvements may be identified.