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Estimation of the Effects of Regional Climate Change Scenarios on the Water Balance of a Basin in the Middle Magdalena Valley

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Hydrological cycle dynamics can be simulated through continuous numerical modelling in order to estimate a water budget at different time and spatial scales, taking a specific importance when considering climate change effects on the various processes that take place on a basin. With the purpose of estimating potential impacts of climate change on the basin water balance, the present study takes place on the catchment area of the Carare-Minero river, a basin located in the Middle Magdalena Valley (Colombia), a zone in which important economic activities unfold such as stockbreeding and agriculture, where regional climate change scenarios were made for the precipitation and temperature variables, along with a continuous hydrological modeling of the basin using the HEC-HMS software. The regional scenarios for the precipitation and temperature were developed through statistical downscaling based on General Circulation Models (GCM) of the sixth phase of the Coupled Intercomparison Project (CMIP6), with projections to 2100 for seven of the new set of CO2 emission scenarios, the Shared Socioeconomic Pathways (SSP), that take into account different socioeconomic assumptions for climate policies, with a baseline of 25 years between 1990 and 2014; the emission scenarios evaluated from lowest to highest CO2 emission were SSP1-1.9, SSP1-2.6, SSP4-3.4, SSP2-4.5, SSP4-6.0, SSP3-7.0 and SSP5-8.5. The obtained data were used as an input for the model of the basin in HEC-HMS obtaining a new water balance for each scenario comparing the results with the baseline case for current conditions, resulting in an evapotranspiration increase due to higher temperatures that, alongside changes in precipitation, produces lower flows for the higher SSP's of SSP5-8.5 and SSP3-7.0, in contrast with the low emission scenarios of SSP1-1.9 and SSP1-2.6 were the changes in temperature and precipitation are less drastic generating minor alterations in the hydrological balance.

Key words: Hydrological modeling, Middle Magdalena Valley, regional climate change scenarios, water balance.