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Comparing the simulated extreme runoff characteristics for the past and the future in a small Hungarian catchment

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Extreme hydrological phenomena (e.g. high and low flows) are caused by specific meteorological conditions. Therefore, climate change affecting these conditions may have a substantial influence on hydrological processes, and also, on associated droughts and floods, which can result in severe economical and ecosystems consequences. In order to mitigate these hazards, it is essential to prepare model-based estimations for future tendencies and build appropriate adaptation strategies in time.

In this paper, we address the potential impacts of global climate change on hydrological extremes, considering the ∼5700 km2 size catchment of Zagyva-Tarna, located in the northern part of Central Hungary. First, the spatially distributed, physically-based hydrological model (DIWA) is calibrated for the Zagyva-Tarna basin, using two-year long historical meteorological and runoff data. To analysing the past, the calibrated DIWA has been run for 1983–2003 using meteorological data provided by observations, the CarpatClim gridded database, and the RegCM4 regional climate model (taking into account new RCP scenarios). Then we compared the simulated runoff characteristics, and it could be concluded that RegCM4 substantially differs from observations. Thus, in order to eliminate these systematic errors, a percentile-based bias-correction method was applied to the raw RCM data, for which the CarpatClim database served as a reference. Finally, we compared the runoff characteristics of the past and the future, considering the observations, the CarpatClim database as well, as the raw and the bias-corrected RCM data.