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Evaluating hydrological response to climate change projections over small Appennine's catchments in Central Italy

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Global warming is supposed to seriously impact the hydrological cycle, leading to an increase of severe weather events occurrence, such as floods and droughts. Changes in the precipitation pattern are expected to have a large impact on the river discharge regime of small Appennine's catchments of Central Italy, which represent vulnerable systems to both dry and wet extremes. However, high resolution climate projections over this area are scanty and hydrological cycle response to global warming is still poorly investigated. In this work, we take advantage of 5 high-resolution (12.5 km) Regional Climate Model (RCM) 3-hourly runs from the EURO-CORDEX project, to study the response of hydrological cycle to the expected 21st century climate change over the Aterno-Pescara catchment (Abruzzo region, Central Italy). Climate simulations consider two radiative forcing fields as conceived in the two Representative Concentration Pathways (RCPs) 4.5 and 8.5. To properly connect climate simulations to the hydrological modeling phase, precipitation and temperature simulations have been post-processed through widely used statistical bias correction/downscaling technique (Empirical Quantile Mapping) to reduce systematic RCM errors and increasing the spatial resolution as well. Statistical post-processing techniques are calibrated considering point-scale weather station observational time series, provided by the Abruzzo Region Hydro-graphic service bureau. Once post-processed, climate simulations will be used to force the CETEMPS distributed hydrological model ChyM, which is operationally used over Abruzzo region to predict flood occurrences on river segments. Future trends of flood events occurrences in the Aterno-Pescara catchment and surrounding areas are assessed through two different alarm indices, able to detect segments of the drainage network that are most likely to be stressed by weather extremes. Furthermore, the impact of the climate simulations post-processing technique will be investigated by comparing indices change signal by using original and post-processed climate simulations. Finally, the possibility to use this integrated approach to map flood risk future scenarios in the whole Europe will be explored.