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Projected changes in the hydrological cycle over small catchments of Central Italy in response to the 21st century climate change

Lorenzo Sangelantoni[1*], Annalina Lombardi[1], Valentina Colaiuda[1], Barbara Tomassetti[1], Marco Verdecchia[2], Gianluca Redaelli[1,2] and Rossella Ferretti[1,2]

[1] *CETEMPS, Center of Excellence, University of L'Aquila, L'Aquila, 67100*

[2] *Department of Physical and Chemical Sciences, University of L'Aquila, L'Aquila, 67100*

** Lorenzo Sangelantoni. Tel: +39 3337351924, E-mail: lorenzo.sangelantoni@aquila.infn.it*

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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 assess the response of hydrological cycle to the expected 21st century climate change, connecting simulations of 5 high-resolution Regional Climate Models (RCMs), from EURO-CORDEX project, to the CETEMPS operational hydrological model ChyM, used over Abruzzo region (Central Italy) to predict flood occurrences. Such analysis has been performed considering two different radiative forcing scenarios as conceived in the two Representative Concentration Pathways (RCPs) 4.5 and 8.5. To properly connect climate simulations to the hydrological modeling phase, climate simulations have been post-processed through a statistical bias correction technique (Quantile Mapping), in order to reduce RCM systematic errors. Bias correction functions were calibrated considering point-scale weather station observational time series, provided by the Abruzzo Region Hydrographic service bureau. The 21st century trends of flood events occurrence in the Aterno-Pescara (Abruzzo region, Central Italy) catchment have been 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 bias correction has been investigated by comparing indices change signal by using original and bias-corrected climate simulations. Finally, the possibility to use this integrated approach to map flood risk future scenarios in the whole Europe will be explored.