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Future trends of precipitation-related extremes in Central/Eastern Europe based on regional climate model simulations

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For building adequate regional adaptation and mitigation strategies, global climate model (GCM) simulation results must be downscaled. Local-scale analysis requires regional climate models (RCMs) embedded in GCMs providing finer spatial and temporal resolutions, which can better serve end-users' needs. This is especially important in case of precipitation due to the large temporal and spatial variability. Furthermore, the high potential risks of drought events on agricultural production and the possible flood events in the Central/Eastern European area also highlight the importance of this issue.
On the base of evaluating raw RCM precipitation outputs of ENSEMBLES model experiments for 1951-2000, simulated values usually significantly overestimate the observations in Central/Eastern Europe, except in summer when mostly underestimations were found. These biases of the raw RCM outputs are corrected using quantile matching technique when the monthly empirical distribution functions of each grid point are fitted to the observed distribution (represented by gridded E-OBS data). Then, the calculated bias correcting factors are applied to the outputs of RCM experiments for the future 2000-2100 period taking into account the SRES A1B emission scenario, according to which CO_2 concentration by 2100 is estimated to exceed 700 ppm, i.e. more than twice of the preindustrial level.
In order to assess precipitation tendencies in the region, several precipitation-related indices (including the number of wet days using several threshold values, e.g. 5 mm, 10 mm, 20 mm; CDD - the maximum number of consecutive dry days; RX1 - the highest 1-day precipitation amount; RX5 - the greatest 5-day rainfall total; etc.) are analyzed both on annual and seasonal scales. The results clearly suggest that consecutive dry periods in the region are likely to lengthen in the future, especially in summer. Furthermore, extreme precipitation is projected to increase in winter and autumn, especially in the northern part of the selected domain.