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Statistical correction of daily precipitation data from the climate models

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It is well known that the raw climate model data need to be corrected before its application in impact studies. A coarse spatial resolution of the climate models leads to a systematic deviation of the model outputs from the observed values. A daily precipitation time series suffer substantially from the fact that the both altitude and orography are captured inadequately. The distortion includes an unrealistically high number of precipitation days, low average precipitation amounts, and a lack of high events. A statistical approach to the bias correction consists in deriving an empirical relation between the model and observed data and in subsequent applying of the retrieved relation to the model data in a future period.

In this study a statistical procedure for the bias correction of the climate model precipitation outputs is presented. It is based on the fact, that the daily precipitation amount is a gamma distributed random variable. The first step of a procedure consists in obtaining the threshold value to reduce the high number of precipitation days of the model data. Subsequently a numerical procedure is required to obtain coefficients of a linear function, which minimizes the differences between the probability distribution functions of the model and observed data.

To test developed procedure, a daily precipitation data from the REMO climate model are transformed to observed data in the Malse river basin in the Czech Republic. For the calibration a six years period 1961 – 1966 is used. Obtained correction coefficients are then applied to model data from the period 1992 – 1997 and the corrected and observed values are subsequently compared. The results indicate a good efficiency of the proposed technique. Probability distribution parameters of the corrected data drift substantially towards realistic values and a fraction of dry days and its distribution in time also improve.