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Compound extreme value distributions for precipitation disaggregated into predominantly convective and stratiform

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Characteristics of precipitation extremes such as design precipitation corresponding to long return periods are important in many practical applications, including hydrological modelling, design of hydraulic structures, urban planning, etc. Numerous studies have examined distributions of precipitation extremes in observed data and climate model simulations, using methods of local (at-site, grid-box) or regional frequency analysis of different complexity. Rather surprisingly, little attention has been paid to possibility of modelling probabilities of precipitation extremes using compound extreme value models developed for precipitation extremes of predominantly convective and stratiform origin. The probable reason is the lack of long-term series of precipitation data disaggregated according to their origin into convective and stratiform.

We propose an algorithm disaggregating precipitation into predominantly convective and stratiform on the basis of the SYNOP data (including present and past weather conditions such as type of clouds and weather state). Efficiency of the algorithm is tested, and disaggregated precipitation amounts are analyzed with respect to their characteristics and distributions of extremes at stations in the Czech Republic over 1982-2010. Two-component generalized extreme value (GEV) distribution is used for estimating high quantiles and design values of precipitation extremes, and its results are compared with a simple GEV distribution.

A similar approach is tested also for outputs of regional climate models which simulate convective and stratiform precipitation using different parameterizations, so the two components are separated naturally. The results from the observed data are used for validation of the climate model outputs for recent climate.