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Scale-consistent model for assessment of trends in precipitation extremes

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Detection of systematic changes in precipitation maxima is extremely difficult due to large year to year variability. The effects of natural variability can be reduced using spatial pooling of data from neighbouring stations over certain (homogeneous) region. Still, if the records are short, the sites are strongly dependent or only few stations are available, the estimates of the characteristics of precipitation extremes might be not very accurate. In present paper we give an example of application of non-stationary index-flood model for assessment of precipitation extremes and their changes using 30-minute data from 54 stations over the Czech Republic. It is assumed that precipitation maxima follow a Generalized extreme value (GEV) distribution with time dependent parameters and that each parameter vary with (spatially) common trend in time.
It is shown, that despite the application of regional frequency analysis, the results are not always consistent over different temporal aggregations. An extension of the model, which allows posing constrains on the scaling of the GEV model parameters with time aggregation (smooth variation, monotonic trends etc.) is proposed and the effect on the standard errors of the estimates is assessed.