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Application of extreme value models with time-dependent parameters in climate change studies

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One of the challenging ideas of recent advances in the field of statistical modelling of extremes is the development of models with time-dependent parameters under the point process representation. Such models may be applied not only into the (non-stationary) observed data, but also utilized in generating scenarios of their future changes using climate model outputs. The method combines the usage of the 'Generalized Extreme Value' distribution with the 'peaks-over-threshold' approach, and leads to a likelihood function that can be treated in a usual way to obtain maximum likelihood estimates, standard errors and confidence intervals of model parameters. The models enable to estimate frequencies of extremes under conditions for which trends or long-term variability have been detected and/or where it is reasonable to assume that such trends/variability will continue towards the future. In the present study, extreme value models with time-dependent parameters are applied to model probabilities of maximum daily air temperatures in central and western Europe in transient climate change simulations over 1961-2100, assuming an increase in greenhouse gas concentrations according to the SRES-A2 emission scenario, from two global climate models: CGCM2 and CM2. A comparison with 'classical' block maxima and 'peaks-over-threshold' methods is performed, and results of the point process models of extreme values are also compared with scenarios of changes in extreme temperature events based on climate model outputs. The study is supported by the Czech Science Foundation under project 205/06/1535.