EGU21-1071
https://doi.org/10.5194/egusphere-egu21-1071
EGU General Assembly 2021

Understanding change in hydrometeorological extremes with statistical models - the importance of model parametrization

Ilaria Prosdocimi[1] and Thomas Kjeldsen[2]
[1]Ca Foscari University of Venice, Venezia Mestre, Italy (ilaria.prosdocimi@unive.it)
[2]University of Bath, Bath, United Kingdom

The potential for changes in hydrometeorological extremes is routinely investigated by fitting change-permitting extreme value models to long-term observations, allowing one or more distribution parameters to change as a function of time or some physically-motivated covariate. In most practical extreme value analyses, the main quantity of interest though is the upper quantiles of the distribution, rather than the parameters' values. This study focuses on the changes in quantile estimates under different change-permitting models. First, metrics which measure the impact of changes in parameters on changes in quantiles are introduced. The mathematical structure of these change metrics is investigated for several models based on the Generalised Extreme Value (GEV) distribution. It is shown that for the most commonly used models, the predicted changes in the quantiles are a non-intuitive function of the distribution parameters, leading to results which are difficult to interpret. Next, it is posited that commonly used change-permitting GEV models do not preserve a constant coefficient of variation, a property that is typically assumed to hold and that is related to the scaling properties of extremes. To address these shortcomings a new (parsimonious) model is proposed: the model assumes a constant coefficient of variation, allowing the location and scale parameters to change simultaneously. The proposed model results in more interpretable changes in the quantile function. The consequences of the different modelling choices on quantile estimates are exemplified using a dataset of extreme peak river flow measurements.