Geophysical Research Abstracts
Vol. 21, EGU2019-4320, 2019
EGU General Assembly 2019

Confidence Distributions for change point estimates: parametric versus empirical likelihood

Changrang Zhou, Ronald van Noijen, Nick van de Giesen, and Alla Kolechkina
Delft University of Technology, Delft, Netherlands (c.zhou-1@tudelft.nl)

Change point detection is an indispensable component of non-stationary hydrological frequency analysis. Current studies only provide a specific time of the change, and it is noteworthy that different start and end years of the observations will lead to different estimates of the positions of change points. It is crucial that change point detection should be accompanied by a representation of the uncertainties in the result and, for this purpose, Confidence Distributions (CDs) for a change point have been constructed in this study. The likelihood ratio provides one way to obtain a CD, but in hydrology it is not always obvious to distinguish which distribution family to use to obtain the likelihood. Therefore, a new procedure based on an empirical likelihood ratio, using a bootstrap procedure to construct CDs, is developed and compared with parametric analysis. To be more specific, CDs for a single change point are constructed by Parametric Likelihood Ratios (PLRs) and Empirical Likelihood Ratio (ELR) principles. The performances of different CDs for a change point are justified by accuracy and the so-called Overlap (OVL) coefficient. In the simulation part, the accuracy is determined by the fraction of simulations where the median of CDs and the actual change point coincide, and the OVL coefficient is used to present the similarity between two confidence density distributions. In addition to the computer experiments, the methods were applied to Annual Maximum Runoff series from Europe provided by the Global Runoff Data Centre. The results show that CDs for a single change point based on ELR have comparable performances as those based on PLRs in uncertainty analysis, and furthermore, the simplicity of ELR-based CD makes it more attractive.