Regional Flood-Duration-Frequency Models for Norway

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Abstract : Design flood values give estimates of flood magnitude within a given return period and are essential to making adaptive decisions around land use planning, infrastructure design, and disaster mitigation. Often design flood values are needed at locations with insufficient data. Additionally, in hydrologic applications where flood retention is important (e.g., floodplain management and reservoir design), design flood values are required at different flood durations. A statistical approach to this problem is a development of a regression model for extremes where some of the parameters are dependent on flood duration in addition to being covariate-dependent. In hydrology, this is called a regional flood-duration-frequency (regional-QDF) model. Typically, the underlying statistical distribution is chosen to be the Generalized Extreme Value (GEV) distribution. However, as the support of the GEV distribution depends on both its parameters and the range of the data, special care must be taken with the development of the regional model. In particular, we find that the GEV is problematic when developing a GAMLSS-type analysis due to the difficulty of proposing a link function that is independent of the unknown parameters and the observed data. We discuss these challenges in the context of developing a regional QDF model for Norway.

Keywords : design flood values, bayesian statistics, regression modeling of extremes, extreme value analysis, GEV

Conference Title : ICNHEW 2023 : International Conference on Natural Hazards and Extreme Weather

Conference Location : Vienna, Austria

Conference Dates : June 19-20, 2023