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Development of Generalized Least Squares Procedures for Estimating Regional Models of Austrian Flood Series

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Generalized Least Squares (GLS) Regression for estimation of quantiles of annual maxima flood series was developed in the 1980s by Stedinger and Tasker. More recent Bayesian GLS procedures have focused on estimating LP3 regional skew, and L-CS and L-CV for GEV flood distributions. GLS procedures seek relationships between relevant physiographic variables (such as drainage area or mean annual precipitation) and flood characteristics such as product-moments, L-moments or quantiles. Whereas basic regression procedures assume the dependent variables are observed (quantiles, skews, CV among others), the GLS approach reflects the variance and covariance of the at-site estimators, the dependent variable, as well as the underlying model error. GLS can also provide a range of diagnostic statistics, including a pseudo-Analysis of Variance(ANOVA). The United Stated Geological Survey uses GLS algorithms to estimate flood quantiles and to model regional skew for the LP3 distribution. A new R program supports GLS analyses for both the LP3 distribution and the GEV distribution, a model often used for annual maxima flood series in Austria and other parts of the world. A regional Bayesian-GLS analysis of Austrian catchments is presented focusing on the GEV shape parameter kappa, coefficient of variation and the mean average peak flood. Drainage area, basin average precipitation, elevation, and snow cover statistics are all considered as explanatory variables.