Probability Distributions of river water temperature in Switzerland

Zina Souaissi[1], Taha B.M.J. Ouarda[1] and André St-Hilaire[1]

(1) Canada Research Chair in Statistical Hydro-Climatology, Institut national de la recherche scientifique, Centre Eau Terre Environnement. INRS-ETE, 490 De la Couronne, Québec City, QC, Canada.

Stream temperature can be a limiting factor for aquatic habitats. In order to quantify extreme river temperatures, a local frequency analysis is conducted at 25 independent and identically distributed stations in Switzerland. Probability distributions are fitted to extreme water temperature series to estimate quantiles corresponding to different return periods. The goodness-of-fit of candidate statistical distributions is evaluated using the Akaike and the Bayesian information criteria. L-moment ratio diagrams are also used to validate the selection of suitable candidate distributions. The Weibull distribution (W2) is found to be best suited for high altitude stations, while the normal (N) and inverse gamma (IG) distributions are adequate at low altitudes. L-moment ratio diagrams are found to be in good agreement with the results of information criteria. The study results suggest the existence of a level of regional homogeneity in the thermal regimes of the study area. River temperature quantiles are compared to thresholds above which thermal stress occurs for common salmonid species in Europe (brown trout). A model for the regional estimation of river water thermal quantiles at ungauged locations is also developed and validates based on the 25-station data base.