

NON-STATIONARY FLOOD FREQUENCY ANALYSIS IN CONTINENTAL SPANISH RIVERS USING CLIMATE AND RESERVOIR INDEXES AS EXTERNAL COVARIATES.

By

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Traditionally, most of the applications of Flood Frequency Analysis (FFA) have assumed that the statistical properties of the process do not change over time. However, in the last years there are evidences suggesting that the occurrence of extreme events is a not stationary process. According with our previous results, the nonstationarity in the flood records in continental Spanish rivers can be associated with two main factors: climate variability and the effect of reservoir regulation. In this study, a FFA under nonstationary conditions is developed based on the Generalized Additive Models for Location, Scale and Shape parameters (GAMLSS). This tool is applied to modeling 20 annual maximum daily peak discharge records. Climatic (NAO, AO, MO and WeMO oscillations) and reservoir indexes were employed in the covariate analyses to highlight the important role of these variables in the characterization of the interannual variability of floods. The results exhibited that GAMLSS is able to describe properly the variability in the mean and variance of the annual maximum daily peak discharge through parametric and no parametric representations. It was found the clear influence of the climatic indexes in the occurrence of floods in natural rivers, as well as the reservoir index (RI) on the flood-frequency in time series under regulated regime. In most situations with significant differences compared with the stationary hypothesis. Finally, concerning the different possibilities for the introduction of climatic indexes, the principal component approach gave the best results.

KEYWORDS: nonstationarity, floods, climatic oscillations, reservoir impact, GAMLSS