Geophysical Research Abstracts
Vol. 15, EGU2013-13078, 2013
EGU General Assembly 2013

Pan-European flood frequency distributions and hydrological controls

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The choice of an adequate frequency distribution is a crucial step in flood regionalisation studies. In some cases it is even based on traditional practice or familiarity to some kind of function and not on the comparison of the statistical properties of the theoretical curve and the flood peaks sample. This study reports the analysis of a new database of higher order L moment ratios from more than 4000 individual annual maximum series (AMS) of flood flow, compiled by joining national datasets among 15 European countries. The position of this dataset on an L-moment-ratio diagram together with other recommended flood frequency distributions is discussed, resulting the Generalised Extreme Value (GEV) distribution the closest one to the sample Weighted Moving Average (WMA). This suggested its potential use as a pan-European flood frequency distribution. However, a more detailed investigation of a subset of the database (Austria, Italy and Slovakia) with catchment area and mean annual precipitation (MAP) as hydrologic controls was conducted through a novel representation on L-moment-ratio diagrams. This investigation confirmed the usefulness of the GEV distribution, but also showed that for dry (low MAP) medium sized catchments, the three parameter log normal (LN3) distribution is a more appropriate choice. Two parameter distributions were found not to provide a representation of the dataset as good as the three parameter ones. In this study, lower L-Cv and L-Cs for bigger catchments was found due to the smoothing effect of non-linearities in flood generation with increasing catchment area. Also, for drier catchments (lower MAP), bigger L-Cv and L-Cs was reported due to the higher variability of annual flood peaks in more arid regions; both of these results are coherent with previous data-based studies on a country scale, which extracted similar relationships of catchment size and precipitation with product moments.