Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06431, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06431
EGU General Assembly 2008

Probabilistic regional envelope curves in Saxony/Germany using two methods to form homogeneous regions

B. Guse (1), A. H. Thieken (1), A. Castellarin (2) and B. Merz (1)

(1) GeoForschungsZentrum Potsdam, Section Engineering Hydrology, Telegrafenberg, D-14473 Potsdam, Germany

(2) DISTART – University of Bologna, I-40136 Bologna, Italy

(bguse@gfz-potsdam.de / Fax: +49 331 288 1570 / Phone: +49 331 288 1896)

For flood risk analyses and for the determination of design floods at a given site it is important to quantify the magnitude of the probable maximum flood that may occur. Due to limited observations, upper bounds are difficult to estimate. Besides rainfall-runoff-modelling, upper bounds of flooding have been assessed by regional envelope curves, which illustrate the relationship between the catchment size and the maximum observed flood. Recently, the research on envelope curves has been expanded so that it is now possible to assign a regionally consistent exceedance probability to the floods of record (Castellarin et al., 2005). Probabilistic regional envelope curves are based on the index-flood method and are associated with a recurrence interval which depends on the overall sample-years of data and intersite correlation between gauging stations. In this study, this approach is applied to the German federal state of Saxony using about one hundred gauging stations with record length between 24 and 156 years.

In order to get realistic estimates of the exceedance probability, envelope curves should only be constructed for homogeneous regions, which are also required for the application of the index-flood method. Two different approaches are compared in this study: First, the research area was divided in fixed homogeneous regions. Due to the heterogeneity of the research area and site-specific effects not all gauging stations could be assigned to one of these homogeneous regions. For this reason, the

region-of-influence (ROI) method was applied as a second approach. On the basis of predictor variables, the ROI-method estimates a distinct homogeneous region for each gauging station. As predictor variables precipitation parameters and the portion of the contributing area of fast runoff types in the catchment were used. Then, a regional envelope curve was derived for each ROI.

Recurrence intervals T were estimated for regional envelope curves. T-year flood quantiles were then retrieved from the curves. These quantiles were then compared with the results of traditional at-site and regional flood frequency analysis. Both methods for deriving homogeneous regions show that for regional representative gauging sites the recurrence interval of the probabilistic regional envelope curve seems to be a realistic. The limits of the fixed homogeneous regions could not be improved by the region-of-influence approach.

Castellarin, A., Vogel, R.M. and Matalas, N.C. (2005), Probabilistic behaviour of a regional envelope curve, Water Resour. Res., 41, W06018, doi:10.10129/2004WR003042.