

Joint modelling of flood characteristics in Çoruh Basin, Turkey

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Abstract. Flood peak, flood volume and flood duration are the main characteristics of floods to be considered in the design and management of water resources systems. Since these characteristics are mutually correlated random variables, joint modelling of these are required. In this study, copulas, which are still new and very powerful methods, are applied to derive joint distribution of flood peak-flood volume and flood volume-flood duration pairs. The procedure is applied to the case study of the Çoruh Basin, Turkey, where a number of highly critical power plants are either under construction or already constructed. Flood characteristics are extracted from daily streamflow using threshold level method. Various univariate distributions are then fitted to the peak, volume and duration series and Akaike Information Criteria indicated that Generalized extreme value, Loglogistic and Lognormal distributions are the best fitted marginal distributions for the peak, volume and duration series, respectively. After then, bivariate Archimedean copulas, namely Clayton, Frank and Gumbel-Hougaard, are applied to model dependence structure of flood pairs. Furthermore, the most suitable copulas are employed to derive the conditional and joint return periods of flood characteristics which will be very important in designing and management of water resources structures in the basin.

Keywords: Copulas, Çoruh Basin, Flood characteristics, Joint modelling, Turkey