Regional low flow and drought frequency analysis

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An assessment of extreme hydrological low flow and drought events is of vital importance to water resources management. One way to reduce the uncertainty in the estimate of the extreme events and their return periods is to use a regional data set with observations from several sites. Hence, uncertainty reduction by introducing more data can be viewed as space substituting time to compensate for short records. This procedure is commonly applied for floods, and is therefore often referred to as the 'index-flood' method. The index-method is also applicable to drought, but few examples exist. In this study the index method is applied for various low flow and drought characteristics. Annual minimum 7-day and 30-day series as well as annual drought deficit duration and volume are analysed. The study region in southern Norway includes 67 series with a record length between 20 and 100 years. For some stations the low flow period is in the summer season as a result of low precipitation and high evaporation losses. Most of the stations have, however, winter low flow caused by precipitation being stored as snow and ice, and a distinction between the summer and winter low flow events has to be made. L-moments are used to test the regional homogeneity and for determination of a regional distribution. Homogeneous regions are defined based on a split sample regionalisation procedure, and the variability measure used for grouping of the series obtained as a function of catchment characteristics. The latter enables ungauged sites to be assigned to a region. The results are presented and discussed with respect to the specific low flow or drought characteristic under study.