



Identification of changes in floods in Alpine-Carpathian European transect in the period of 1961-2010

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River floods belong among the most common and devastating natural disasters. Statistical methods such as trend analyses and circular statistics can shed more light on this problem. The main objective of this study was the detection of changes in floods in the European transect along the Alpine-Carpathian range. The length of the transect line is 1342 km and runs through the highest peaks. The analysis was performed for 309 gauging stations located in Slovakia (36), Austria (159), Switzerland (31), Germany (72), and Slovenia (11), which are not affected by known human modifications (e.g., dams or reservoirs); the length of the hydrological time series was 50 years from 1961 to 2010. The dataset consists of the dates of the annual maximum discharge and values of annual maximum discharges (based on the daily mean or instantaneous peak). A trend analysis was performed using the nonparametric Mann-Kendall test and Sen's slope estimator. The Mann-Kendall trend test showed significant trends (increasing or decreasing) for 43 gauging stations (36 stations with an annual maximum discharge based on the daily mean and 7 stations with an annual maximum discharge based on an instantaneous peak) at a 5 % significance level and for 11 gauging stations (annual maximum discharge based on the daily mean) at a 1 % significance level. Flood seasonality was determined using circular statistics (estimation of the mean dates of flood occurrences and the flood concentration index) for the whole period of 1961-2010, for recent decades (1961-1970, 1971-1980, 1981-1990, 1991-2000 and 2001-2010) and also for thirty years of observation (1961-1990, 1971-2000, 1981-2010). The relationship between the physiographic and climate characteristics of the catchments and flood concentration index (r) shows that the mean elevation of a catchment (m a.s.l.) and long-term mean temperature of 1961-2010 have the most significant effect on the flood concentration index (r). The flood concentration index (r) grows with an increase in the mean catchment elevation (m a.s.l.).