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Statistical modeling of the extremes in the Danube lower basin discharge levels in spring time

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In the first part of this study the extreme value theory is applied for studying daily maximum discharges in springtime at Orsova (Danube lower basin), incorporating some covariates. Two methods are applied for fitting the data to an extreme - value distribution: block maxima and peaks over thresholds (POT). From the Generalized Extreme Values (GEV) analysis of the maximum daily discharges for March, April and May, it resulted that these ones are fitted best to a Weibull distribution. By testing through different methods the peak over threshold for the daily discharges during spring time over the period 1900-2005, a value of 10000 mc/s was found. The values exceeding this threshold analyzed through Generalized Pareto Distribution (GPD) are well fitted by using a beta-type distribution. In order to find the atmospheric circulation influence over Atlantic - European region on the occurrence of extreme events in the lower Danube basin, the period 1958-2001 was analyzed (ERA-40). The vortex values for the daily sea level pressure (SLP) were calculated for two regions centered on the Danube upper and middle basins. These vortex values, together with the maximum temperature at Vienna, have been incorporating as covariates in location parameter of the GEV distribution of the daily maximum discharge (selected from 7-day period) at Orsova. The best result was obtained incorporating the information concerning SLP from the Danube middle basin and maximum temperature at Vienna. This result reflects also the temperature influence on the melting snow cover and implicit on the state of the Danube discharge level in spring time. In second part of the paper, a modeling by Hidden Markov Model (HMM) is achieved for the discharge levels at Orsova, taking into account the influence of atmospheric circulation over Europe region. The HMM has seven states. The first and seven states can be considered extreme events, namely very low and very high values in discharge levels. Observed atmospheric cir-

culation is classified in three classes (cyclonic, anticyclonic and transition circulation) by means of the regional vortex, centered on Danube upper and middle basin. In order to eliminate the very high persistence in discharge time series, analysis is carried out for daily values averaged on the 7, 10 or 15 days. After simulations of states of the hidden Markov model and of the atmospheric states, an the improvement of the information on the sequences of states in the Danube lower basin, associated with atmospheric circulation, is obtained.