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Analysis of the high water wave volume for the Sava River near Zagreb

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The paper analyses volumes of the Sava River high water waves near Zagreb during the period: 1926-2008 (N = 83 years), which is needed for more efficient control of high and flood waters. The primary Sava flood control structures in the City of Zagreb are dikes built on both riverbanks, and the Odra Relief Canal with lateral spillway upstream from the City of Zagreb. Intensive morphological changes in the greater Sava area near Zagreb, and anthropological and climate variations and changes at the Sava catchment up to the Zagreb area require detailed analysis of the water wave characteristics. In one analysis, maximum annual volumes are calculated for high water waves with constant duration of: 10, 20, 30, 40, 50 and 60 days. Such calculations encompass total quantity of water (basic and surface runoff). The log Pearson III distribution is adapted for this series of maximum annual volumes. Based on the results obtained, the interrelations are established between the wave volume as function of duration and occurrence probability. In addition to the analysis of maximum volumes of constant duration, it is interesting to carry out the analyses of maximum volume in excess of the reference discharge since it is very important for the flood control. To determine the reference discharges, a discharge of specific duration is used from an average discharge duration curve. The adopted reference discharges have durations of 50, 40, 30, 20 and 10%. Like in the previous case, log Pearson III distribution is adapted to the maximum wave data series. For reference discharge Q = 604 m^3/s (duration 10%), a linear trend is calculated of maximum annual volumes exceeding the reference discharge for the Sava near Zagreb during the analyzed period.

The analysis results show a significant decrease trend. A similar analysis is carried out for the following three reference discharges: regular flood control measures at the Sava near Zagreb, which are proclaimed when the water level is 350 cm (Q = 2114 m^3/s), extraordinary flood control measures taken when the water level is 450 cm (Q = 2648 m^3/s), and the discharge at the deterministic inlet into the Odra Canal of approximately Q = 2300 m^3/s. The results of these analyses have shown that water wave volumes higher than the reference discharges occurred in a comparatively small number of years, and that their duration was one to two days.