Traditional statistical hydrological analyses of the runoff processes on three important rivers along the border area of Hungary and Croatia

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The Danube river is the second largest river of Europe. It constitutes the most important freshwater resource of the largest lowland basin of Central Europe, the Carpathian Basin. One of the most important tributaries of the Danube is the Drava river. The most significant tributary of the Drava is the Mura river. UNESCO has designated the Mura-Drava-Danube Transboundary Biosphere Reserve in 2021 along these three rivers, extending on 631,460.71 ha (395,860.71 ha in Croatia and 235,600 ha in Hungary). The water regime of the rivers basically determines biodiversity and human uses as well. The authors have set the goal to investigate the regime of the three rivers in order to better understand the ongoing anthropogenic and natural processes that are likely to influence the welfare of not only plant and animal communities but human societies and settlements alike.

The authors collected available literature on the runoff processes and have found that there are numerous scientific research articles on the decreasing trend of waterlevels along the lowland alluvial reaches of these rivers, which is mostly attributed to the sediment deficit (e.g. Goda et al. 2007, Bonacci & Oskorus 2010, Tadić & Brleković 2019, Tamás et al. 2021). However, there are no recent thorough statistical analyses on the discharges. The authors' main aim in the presented study was to assess discharge trends, frequencies and lengths of floods and eventual shifts in the annual regime of the rivers.

For the investigations, three gauging stations (one for each river) were selected along the lowland reach with long enough daily time series of both waterlevels and discharges. After the assessment of linear trends the basic analyses, e.g. homogeneity tests were executed (SHNT and Smirnov-Kolmogorov tests alike), empirical discharge distributions were calculated, plotted and evaluated for the whole period and in ten years intervals, for each month of the year as well. The analyses of flood lengths and the average non-exceeding frequencies of different flood events were as well carried out.

Among the conclusions it is worth mentioning that although the discharge trends, when assessed based on yearly characteristic values, show no significant changes, based on the analysis of the daily values a characteristic shift can be observed towards smaller discharges, mainly in the summer months. In the presentation the methods and time series, as well as the results of the statistical analyses are summarized, and possible further steps are outlined.

References

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