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Danube floods, low flows and flood resilience at Bratislava in 1435-1595:Analysis of daily/weekly resolution flood-related evidence in a European context

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Written mainly in German and partly in Latin, the chamberlain accounts of historical Pozsony/Pressburg (present-day Bratislava), almost continuously available between 1434 and 1595 and 1595, contain daily/weekly resolution data on Danube floods, low flows, ice cover and various weather phenomena. Analysed and presented for the first time, the 176 volumes of the accounts provide systematic, annual accounts of incomes and expenses, with only occasional gaps: flood- and weather-related reports are mainly included in the bridge masters', the ferrymen's, the ice-cutters', the town messengers', and the road and wall maintenance accounts. Furthermore, water-level related information occasionally was also identified in other sections of the accounts, regarding smaller bridges, river transportation, fishing, meadows and hayfields, woods, and other utilities of the nearby island area. With applying additional information available in the broader Bratislava area and the Carpathian Basin in other contemporary sources such as charters, letters, diaries and other narratives, it is possible to provide unusually high resolution, (quasi-)systematic three-scaled index-based quantitative reconstructions of the frequency, intensity, types (incl. ice-jam floods) and seasonality of Danube floods, and occasionally also of low water-levels.

The greatest floods usually occurred during flood-rich periods; unique great (ice-jam) floods outside of the flood-rich decades happened, for example, in 1454 and 1458. Flood-rich periods were identified during the 1430s-1440s, around the 1480s-1510s and in the mid- and late 16th century – while the first anomaly was also a period of a more frequent water-level variability including memorable low flows, the latter three periods coincide with major European flood-rich periods identified in the last 500 years (see Blöschl et al. 2020). As floods in Bratislava mainly reflect on the hydroclimatic conditions of the Upper-Danube and partly those of the Middle-Danube area, the dataset also provides exceptionally valuable, systematic information to the analysis of 15th-16th century (covering the famous, long Spörer solar minimum) climate variability in Central Europe. Furthermore, major groups of contemporary flood response, prevention and mitigation methods, especially detectable during flood-rich and low-flow periods, are also presented and analysed in the paper in comparison with the available other Middle-Danube (documentary and archaeological data based) evidence, in a broader Danube and Central European context.