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Are extreme floods on the Danube River becoming more frequent? A case study of Bratislava station

Igor Leščešen [a], Biljana Basarin [a], Dragoslav Pavić [a], Manfred Mudelsee [b,c,d,e], Pavla Pekarova [f] and Minučer Mesaroš [a,*]

[a] Department of Geography, Tourism and Hotel Management, Faculty of Sciences, University of Novi Sad, Trg Dositeja Obradovića 3, Novi Sad, Serbia
[b] Climate Risk Analysis, Kreuzstrasse 27, 37581 Bad Gandersheim, Germany
[c] Advanced Climate Risk Education gUG, Kreuzstrasse 27, 37581 Bad Gandersheim, Germany
[d] Institute of Geosciences, University of Potsdam, Karl-Liebknecht-Str. 24–25, 14476 Potsdam, Germany
[e] Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Klußmannstr. 3, 27570 Bremerhaven, Germany
[f] Institute of Hydrology, Slovak Academy of Sciences, Dubravska cesta 9, 841 04 Bratislava, Slovakia
*Corresponding author. E-mail: minucer.mesaros@dgt.uns.ac.rs

IL, 0000-0001-9090-2662; BB, 0000-0002-2546-3728; DP, 0000-0002-7113-0887; MMu, 0000-0002-2364-9561; PP, 0000-0002-1180-2215; MMe, 0000-0003-2505-5633

ABSTRACT

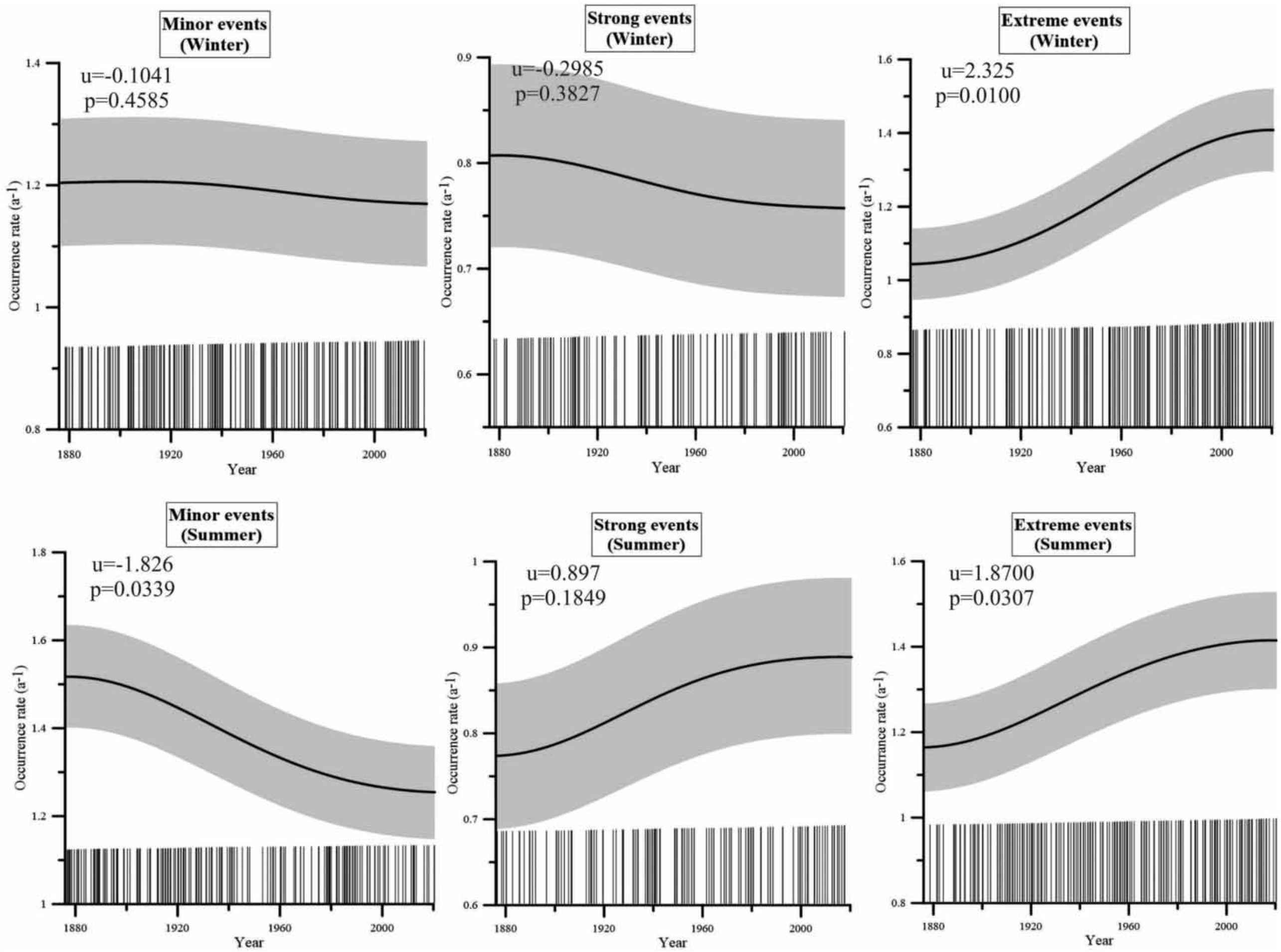
In this study, strong and extreme flood events were analysed on the basis of long-term daily runoff records of winter and summer floods in the Danube River between 1876 and 2020, using the peaks-over-threshold method. Based on the results, the following conclusions can be made: (1) There is a downward trend in strong winter floods, but it is not statistically significant. Additionally, there is an upward trend in summer floods, but this is not statistically significant. (2) There are statistically significant upward trends in extreme events for both the winter and summer seasons. The results have implications for flood protection and disaster management on the Danube River. Regulation of assets in flood-prone areas is essential for minimising economic damage. Public awareness of increasing extreme summer floods is vital for prevention. This study suggests that effective flood risk analysis requires (i) a local- to regional-scale approach to account for spatial variability and (ii) advanced statistical tools for robust detection of climate extremes and estimation of their occurrence rates.

Key words: Danube, discharge, floods, seasonality, Slovakia

HIGHLIGHTS

- Study of seasonal variability and trends of floods and discharge on the Danube using the peaks-over-threshold method.
- Daily discharge data analysed for Bratislava for the period 1876–2020.
- Results show increasing trends of extreme events in the future in the summer and winter.
- The findings are relevant for flood risk analysis and prevention.
- This study shows directions for future research.

GRAPHICAL ABSTRACT



NOMENCLATURE

CC	Clausius–Clapeyron
ESG	Environmental, Social, and Governance
IPCC	Intergovernmental Panel on Climate Change
LOWESS	locally weighted scatter point smoothing
MK	Mann–Kendall test
masl	metres above sea level
POT	peaks-over-threshold
SRES	Special Report on Emissions Scenarios
WMO	World Meteorological Organisation

1. INTRODUCTION

In Europe, floods remain a significant problem even with extensive efforts to reduce the risk and high expenses on structural defences. They cause considerable material damage and loss of life. Despite the implementation of flood risk reduction measures (EC 2000), recent flood events have resulted in material damages exceeding billions of euros (Dottori *et al.* 2023). Although the 1990s were a flood-prone decade with disastrous flood events in Europe, the 21st century has continued to experience many destructive floods. The evidence suggests that the damage from river flooding is increasing.

Climate change and its consequences are the subject of wide discussion in scientific and mass-media circles. The current report of the Intergovernmental Panel on Climate Change (IPCC) highlights the acceleration of climate warming at the beginning of the 21st century and the consequences it has for hydrology and economy (IPCC 2021). Extreme river floods are not new, as they have been a substantial natural hazard in Europe over the past centuries. The growing concern among European nations about flood damage has led to a heightened focus on research into non-stationarity in extreme precipitation and high river discharge caused by climate change. This topic has become a top priority in the research agendas of both the European Union (EU) and individual EU member countries, with a wealth of recent research projects and publications dedicated to it (Kundzewicz *et al.* 2018). This study contributes significantly to this agenda by exploring the non-stationarity of extreme river discharge. The unique focus on the Danube River basin fills a critical research gap, providing valuable insights into the temporal and seasonal dynamics of extreme floods. Recent changes in atmospheric composition caused by anthropogenic influence are causing climate changes and enhancements of the hydrological cycle as well, leading to an increased flood risk (Christensen & Christensen 2003; Kundzewicz *et al.* 2014). However, for the past few decades, observations from Europe do not show a clear trend of increase in flood occurrence rate (Disse & Engel 2001).

Seemingly, every year new record-breaking hydrological extremes affect some part of Europe, further fuelling the discussion between climate change and natural climate variability. With the increasing availability of long time-series of hydrological and meteorological observations it is possible to identify clear and statistically significant anthropogenic changes of atmospheric and climatic variables such as CO_2 concentration and air temperature. The Clausius–Clapeyron (CC) equation indicates that warmer air temperature is connected to increasing atmospheric water vapour content, which in turn determines the total precipitable water (Alfieri *et al.* 2015). This indicates that as a consequence of CC relation, frequency of flooding may increase in response to climate change (Wasko *et al.* 2019; Martinkova & Kysely 2020).

The study of the Special Report on Emissions Scenarios (SRES) A2 and B2 emission scenarios indicate an increase in extreme flood levels for the Danube at Bratislava. Also, in numerous major European rivers (Loire, Po, Elbe, Oder, Danube), the return period of 100-year floods has decreased to 50 years or less, sometimes even to 20 years (Dankers & Feyen 2008). The latter study presented that more and more intense hydrological extremes are likely to occur under different climate scenario conditions. More frequent occurrences of higher floods can be expected in the future (Hattermann *et al.* 2018; Euronews 2023).

Seasonality in hydrology is presented as a regular cyclical change of hydrological elements, in this study as river discharge, during the hydrological year. The seasonality of hydrological characteristics is one of the crucial factors controlling the development and stability of natural ecosystems. From a hydrological perspective, seasonality analysis of river discharge is an interesting method for deducing flood generation mechanisms. In recent years, a renewed interest in the assessment of hydrological seasonality and regime stability can be noted, especially in connection with climate change, engineering design, water resources management and land-cover assessment studies (Milano *et al.* 2015; Rössler *et al.* 2019; Halmová & Pekárová 2020).

Determining the frequency and occurrence rate of floods is crucial for effective flood management and mitigation strategies. Floods can cause significant damage to infrastructure, property, and even lead to loss of human lives. The Danube River is the second largest river in Europe and is prone to flooding, which makes it essential to monitor changes in flood frequency and occurrence. By studying these changes, better flood-prediction models and flood management plans can be developed (Kuriqi & Ardiçlioğlu 2018).

As it is expected for extreme floods in the Danube River to occur more frequently with climate change, this study concentrates on the estimation of extreme river discharges. First, the research area is described with emphasis on the Danube River basin. Next, the data are presented and methods are applied. In the discussion, the results are compared with those obtained in similar studies.

This study pursues two main objectives: the first objective involves a comprehensive analysis of temporal trends in extreme flood occurrence over the observed period. By quantifying changes in the occurrence rate of extreme floods, the aim is to discern whether there is an observable increase in their frequency. The second objective focuses on investigating the seasonality of extreme floods by assessing variations in flood occurrence rates during the winter (October–March) and summer (April–September) seasons. Through the application of the kernel estimation method and trend analysis, the goal is to identify statistically significant seasonal fluctuations in extreme flood occurrences. These objectives contribute to a nuanced understanding of the temporal and seasonal dynamics of extreme floods in the Danube River basin, offering valuable insights for effective flood management and mitigation strategies and implementation of novel approaches that are based on nature-based solutions (NBS) (Kuriqi & Hysa 2022).

This study holds practical significance because it provides crucial insights for effective flood management and policy formulation in the middle part of the Danube River. The results of this study will offer practical guidance for refining flood prediction models, developing robust management plans, and informing infrastructure design to mitigate the economic and human impact of climate-change-induced floods.

The focus of the study on the unique characteristics of the Danube River in this specific region addresses a research gap, making it valuable for local and regional authorities responsible for safeguarding communities along the riverbanks.

1.1. Study area and dataset

The Danube River is the second largest river in Europe, following the Volga, with a basin area spanning 817,000 km^2. Originating from the Black Forest in Germany at the confluence of the Brigach and the Breg streams, the Danube flows southeast for 2,872 km, passing through four Central European capitals before reaching the Black Sea via the Danube Delta in Romania and Ukraine. The Danube River basin landscape exhibits a diversity of morphological patterns, with its territory being one of the most flood-prone regions in Europe (Bačová-Mitková *et al.* 2021).

The Danube River is a crucial hydrological and hydrographic system, comprising numerous important tributaries. In the upper Danube basin, peak runoff occurs in June. The Danube is directly joined by over 120 major rivers, many of which have their own notable tributaries. The section of the Danube River that flows through Slovakia spans from river-km 1,708.2 to river-km 1,880 (Bačová-Mitková 2021). The data were separated into hydrological summer (April–October) floods that are caused by heavy rainfall, and in the winter (November–March) floods caused by precipitation and thawing snow (Table 1). It is important to distinguish between winter and summer floods, owing to their distinct meteorological and hydrological causes. This kind of analysis can offer explanations and insights into the regimes and factors behind extreme flood events since floods are typically not restricted to a particular season. As indicated by several studies, the evaluation of flood seasonality in the Carpathian region reveals that although floods in the Alps are mainly concentrated in the summer, floods in the northern upper tributaries of the Danube River primarily occur during the winter (Jeneiová *et al.* 2016; Zabolotnia *et al.* 2021).

The input data for this study, comprising mean daily discharges for the Danube River at Bratislava (Figure 1) from 1876 to 2020, were obtained from the Slovak Hydrometeorological Institute. The prevalence of significant inter-annual and inter-decadal variability in the records of maximum river flow in Europe has been reported (Kundzewicz *et al.* 2005). However, accurately quantifying such variabilities in short time-series (spanning just a few decades) can be challenging. As a result, trends in these records are often not robust and are heavily influenced by the choice of the start and end years for analysis (Kundzewicz *et al.* 2018). That is why the long time-series applied in this study is crucial in determining if there is any kind of trend that can be observed on the Danube River.

2. METHODS

In this study, the daily discharge values for the 1876–2020 period for the Danube River at Bratislava station were used (Figure 2). The extraordinary length of available time series data of 145 years makes it possible to produce dependable and trustworthy results. It is significantly longer than the standard recommended by the World Meteorological Organisation (WMO), which is a record length of 30 years. For the extraction of high discharge values, the peaks-over-threshold (POT)

Table 1 | Descriptive statistics of mean daily streamflows (m^3/s) for hydrological seasons (the number of data points for summer is 509 and for winter 461)

	Hydrological summer	Hydrological winter
Mean (m^3/s)	4,207.13	3,379.61
Median (m^3/s)	3,799.5	2,889
Standard dev (m^3/s)	1,275.18	1,233.25
Kurtosis	0.90	0.85
Skewness	2.16	1.64
Minimum discharge (m^3/s)	3,050	2,139
Maximum discharge (m^3/s)	10,810	8,770

Figure 1 | The location of Bratislava station in the Danube basin.

method was applied with the threshold levels set at the 80th empirical percentile. A minimum time-span of 15 days between two consecutive peaks was applied to achieve independence between two successive events, as presented in Figure 3, and see also Mallakpour & Villarini (2015). Locally weighted scatter point smoothing (LOWESS) was used to smooth variability in the raw data. LOWESS was applied in order to visually identify the presence of the trend. This nonparametric method relaxes the linearity assumptions of conventional regression methods. For this algorithm, local linear polynomial fit was used

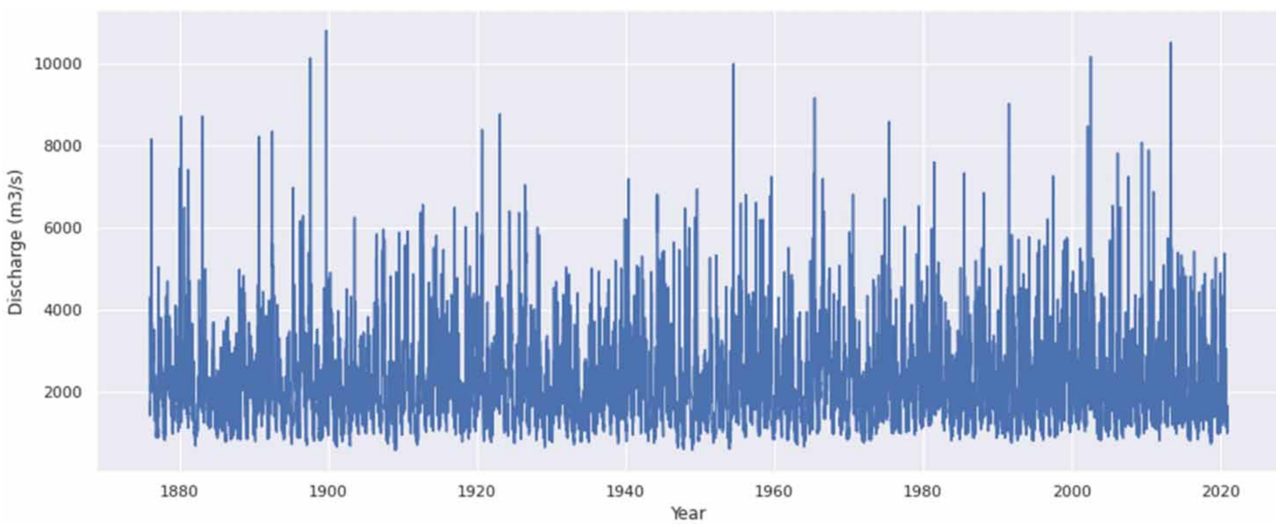


Figure 2 | The mean daily discharges of the Danube River at Bratislava (1876–2020).

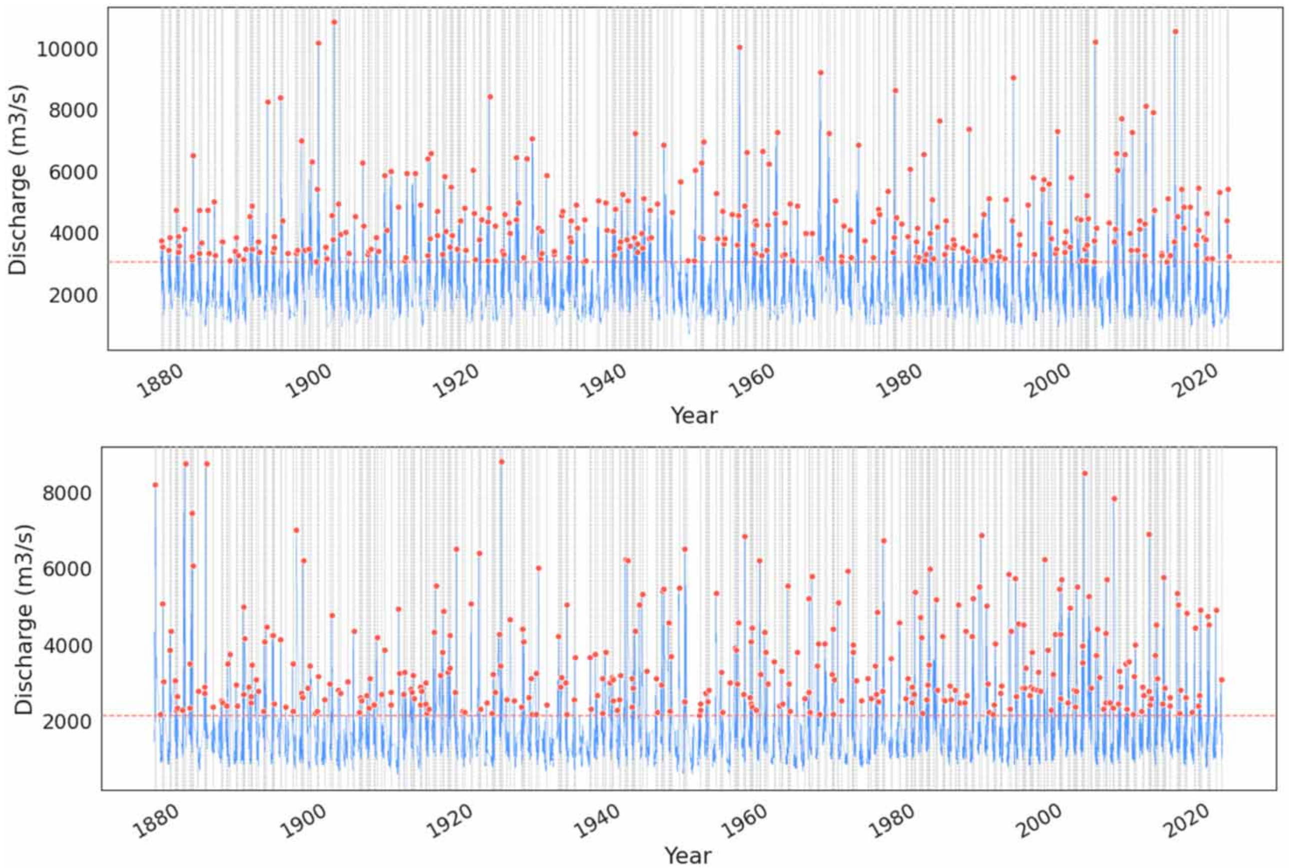


Figure 3 | Observed peaks (dots) above 80 percentiles (dotted line) with 15-day criteria applied for summer (upper graph) and winter (lower graph) season.

(Basarin *et al.* 2016). For the inspection of time-dependent flood occurrence rates and assessment of significant changes, a kernel estimation was applied with confidence bands. A Gaussian kernel function, K, was applied to weight observed flood dates, $T(i)$, $i = 1,\ldots, N$ (number of floods), and estimate the occurrence rate, λ, at time t as:

$$\lambda_{(t)} = \sum_i K\left(\frac{(t - T_{(i)})}{h}\right). \tag{1}$$

Cross-validation (i.e., the search for an optimal compromise between bias and variance) was used to select the bandwidth ($h = 40$ years). Confidence bands (90%) around $\lambda(t)$ were determined using a bootstrap resampling technique. This procedure was repeated 2,000 times, and a 90th percentile t-confidence band calculated. Kernel estimation, using a Gaussian kernel function, allows for a smooth estimation of the occurrence rate of extreme events per time. The nonstationary analysis framework, supported by bootstrap confidence band construction, enables the assessment of time-dependent occurrence rates, considering the evolving nature of flood events. To assess the significance of the occurrence rate estimation curves, the Cox–Lewis test was applied (Mudelsee *et al.* 2004). The selection of the Cox–Lewis test over the Mann–Kendall (MK) method for trend detection in this study is based on its suitability for extreme events. Unlike the MK test, which is commonly used for detecting general trends based on mean values, the Cox–Lewis test is specifically designed for extremes. This makes it more appropriate for assessing the significance of trends in rate of extreme flood events, which is the primary focus of the study. The Cox–Lewis test is particularly effective in determining whether there is an upward or downward trend in the occurrence of extreme events, aligning with the research objectives aimed at understanding changes in the frequency of high-magnitude floods in the Danube River. In this study three magnitudes of events were analysed that were based on different threshold levels. The initial threshold that was used for separating high discharge values was set at the 80th percentile for summer (April–September) and winter (October–March) seasons respectively and only the data above the set threshold was used for further analysis. Three magnitudes of floods were set as follows: magnitude one, minor events, from 80th percentile to 90th percentile; magnitude two, severe events, between 90th and 95th percentiles; and magnitude three, extreme events, all values above 95th percentile. This stratification – from minor to extreme events – enhances the study's ability to capture the diversity of flood occurrences. See Mudelsee (2020), a current textbook, for an accessible description of the full nonstationary flood frequency analysis method.

The most extreme floods on the Danube River occurred in 1899, 1954 (this flood caused major damage along the entire Upper Danube), 2002, 2006 and 2013 (this major flood hit the Upper Danube basin causing heavy damage along the Danube and numerous tributaries) (Bačová-Mitková & Halmová 2021). These floods were triggered by heavy precipitation caused by a typical atmospheric condition that often leads to flooding in the Upper Danube. This condition was characterised by stationary behaviour in the planetary waves of the large-scale atmospheric flow in the Northern Hemisphere. This occurred because the eastward zonal flow, which normally exceeds the westward propagation of Rossby waves produced by the latitude-varying Coriolis effect, decelerated. This stationary behaviour disrupted normal weather patterns, leading to prolonged and intense weather conditions with heavy rainfall. Over time, these conditions led to increased river flows and ultimately to severe flooding events (Blöschl *et al.* 2013).

3. RESULTS AND DISCUSSION

Floods on the Danube at Bratislava station mainly occurred during summer (July and August) while the lowest number of occurrences were in November (Figure 4). The occurrence of floods on the Danube River is influenced by seasonal changes, with winter floods mostly occurring in March due to snow melting in higher parts of the basin and rainfall in lower parts. Meanwhile, summer floods occur mainly in May and June. This pattern is demonstrated in Figure 4.

The analysis of the number of floods in each month of the year from 1876 to 2020 shows that the number of floods varies by season. Specifically, the number of winter floods increased from January to March, and then decreased towards the end of the year. On the other hand, the number of summer floods peaked in May and July, and then decreased towards the end of the summer season. The discharge increase in March can be attributed to the earlier snowmelt in the Alps caused by air-temperature increase (Pekárová *et al.* 2007).

The occurrence of summer floods is dominant in the high-pressure-system area, especially during fall and winter, while westerly, north-westerly and south-westerly circulation types are less frequent.

Time series of decadal discharge values of the Danube show considerable inter-annual variability. It is apparent from the LOWESS curves that discharge sites rose from the start of the 1980s during the summer season while winter discharge values started to rise earlier, from the 1950s to the end of the observed period (Figure 5).

To estimate trends in flood occurrence, the study used continuous daily runoff records for the Danube River dating back to 1876. The Cox and Lewis method was used to test these trends, and the results were confirmed using measured runoff data from Bratislava station (1876–2020), with the statistical test confirming these results at the 95% level, as shown in Figure 6. The occurrence rate of winter floods steadily decreased during the observed period, while the occurrence rate

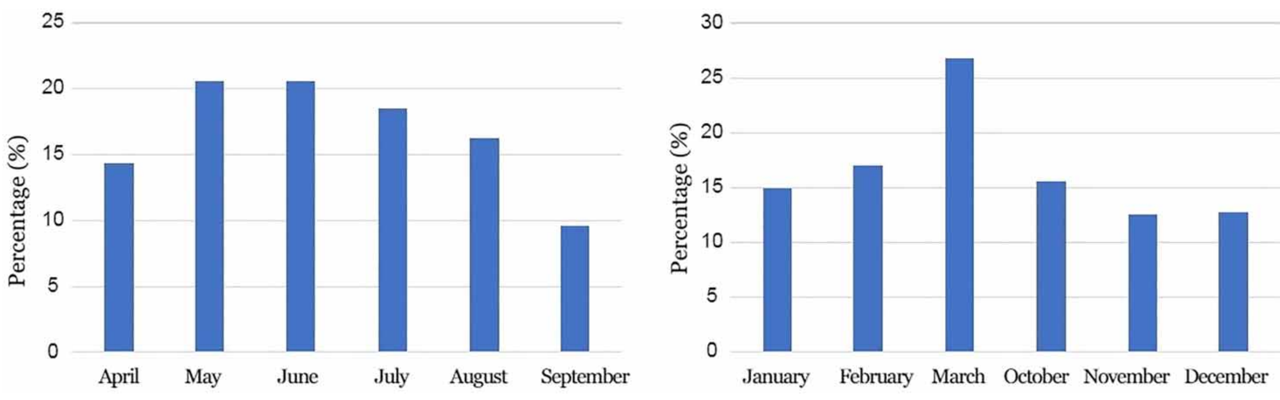


Figure 4 | Percentage of floods per months for summer (left) and winter season (right).

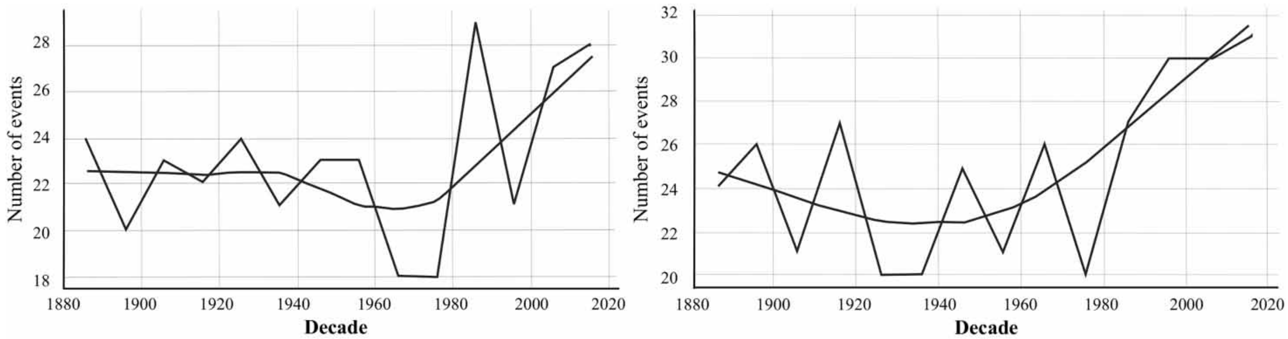


Figure 5 | Time series of discharge values per decade at Bratislava station with fitted LOWESS curves, for the summer season (left) and the winter season (right).

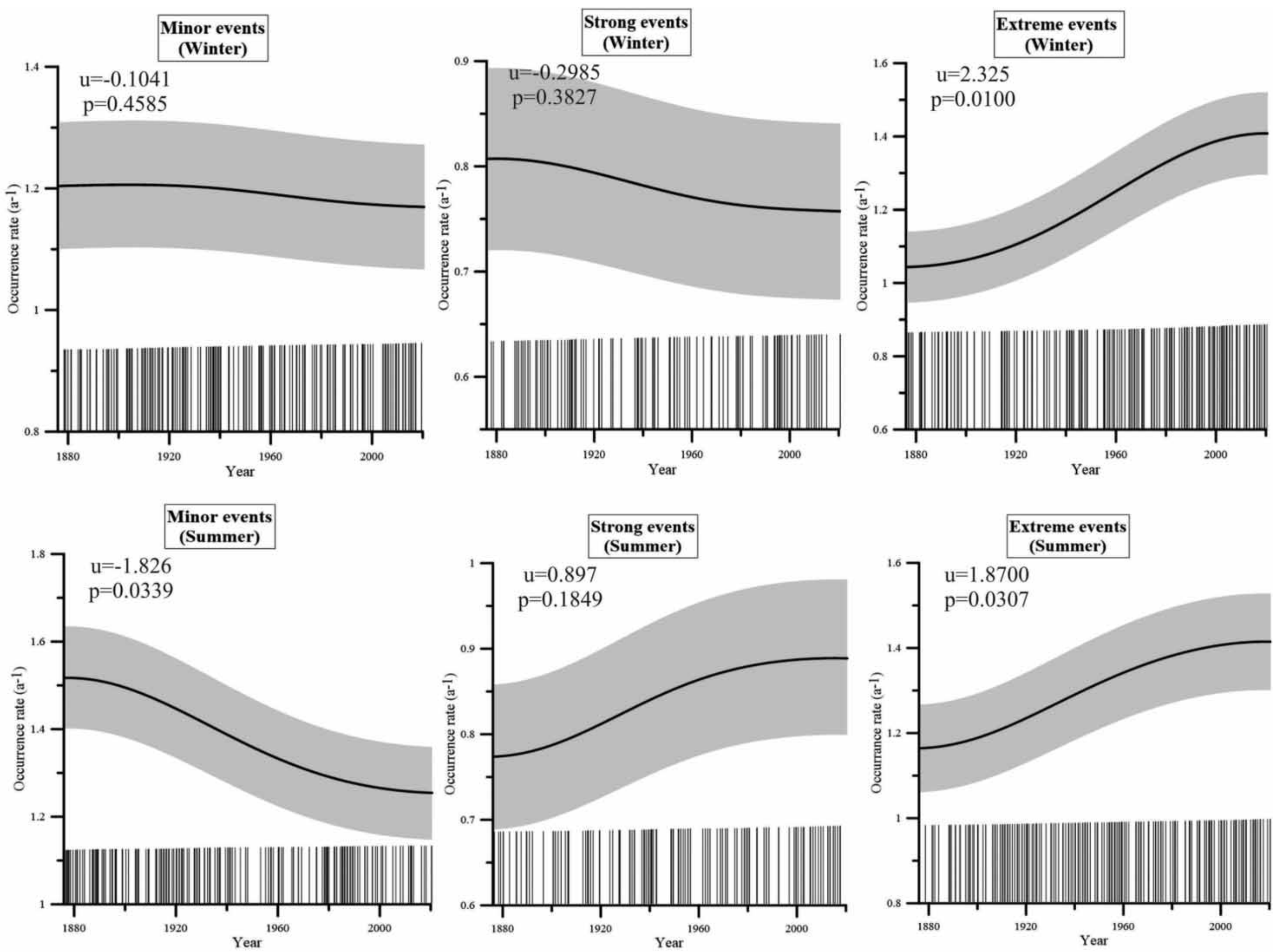


Figure 6 | Occurrence rates (solid lines) of Danube River floods at Bratislava station for three flood magnitudes with bootstrap 90% confidence band (shaded). Kernel estimation using bandwidth of 40 years is applied to the flood dates, with the results of the Cox–Lewis test (*u*, statistics; *p*, one-sided *p*-value) (upper left corner of each graph). For more details on the statistical methodology, see Mudelsee (2020).

of extreme flood events significantly increased. Conversely, there was no significant trend observed in the occurrence rate of strong summer floods, but there was a significant decrease in minor flood events while there was a statistically significant increase in extreme summer flood events. Pekárová *et al.* (2008) reported that during the 1976–2005 period, the seasonal discharge distribution changed significantly. During the winter period the discharges increased, while during the summer period they decreased. The reasons for these changes were identified as basin-wide precipitation change (lower summer precipitation) and reservoir construction throughout the Danube River basin. Similarly, the decrease of mean summer discharges was previously reported by Miklánek *et al.* (2010) and it was stated that in the 65-year period of 1941–2005, an earlier spring-runoff start by 13 days was detected (as compared with the period 1876–1940). This divergence in the trends can be attributed to the complex interplay of various factors influencing flood dynamics, including precipitation patterns, increasing temperatures that lead to increased evapotranspiration (especially during summer season), and alterations in hydrological regimes. This all demonstrates the nuanced and multifaceted nature of climate-induced impacts on seasonal flooding (Sassi *et al.* 2019; Tadić *et al.* 2022).

Future changes in flood hazard in the Danube basin generally point to increases in peak discharges across the basin (Schröter *et al.* 2021), but studies conducted on Bratislava station reported that Danube River discharge has not changed significantly over the last almost 145 years (Bačová-Mitková 2021; Bačová-Mitková *et al.* 2021; Bačová-Mitková & Halmová 2021). In these studies, for trend detection the MK test was applied. The MK test is a nonparametric test for trend detection that does not take into account the underlying distribution of the data or changes in its variance over time, while the Cox–Lewis test is specifically designed to test for non-stationarity in the extremal component of the system that generated a time series, which is often a key concern in hydroclimatic data analysis. As was pointed out by Kundzewicz *et al.* (2018) and earlier by Mudelsee *et al.* (2004), the assumption of stationarity is not applicable due to changes in climate and hydrological regime. That is why changes to design rules have been introduced in some EU countries, based on the precautionary principle of taking non-stationarity into account. That is why we applied the Cox–Lewis test for studying trends in seasonal occurrence of extreme events (Figure 6). The analysis of seasonal data demonstrated that winter extreme events underwent more significant changes than summer events. Considering the Austrian part of the Danube River, results presented by Haslinger *et al.* (2022) indicate that Austria will experience generally wetter conditions throughout the 21st century compared with the reference period of 1981–2010. Regarding the Slovak part of the Danube River, the Fourier harmonic model and integrated mixed ARIMA model predicted that after 2020, a moderate increase will set in of the Danube River discharge at Bratislava station in the future decades (Pekárová *et al.* 2023).

When taking into account seasonal variations, winter and spring will become wetter due to a rise in precipitation by 20% caused by higher temperatures (CC equation). These findings suggest that climate is the driving force behind the observed alterations in flood events as both winter and summer precipitations have also shown statistically significant increasing trends of precipitation over Slovakia (Zeleňáková *et al.* 2016; Kundzewicz *et al.* 2018). Further, according to the findings of Čimo *et al.* (2020), Slovakia is expected to experience a temperature rise of 1.5–2.0 °C, and this increase will likely lead to more intense precipitation as warmer air can hold more moisture (Čimo *et al.* 2020). The CC relationship suggests that the intensity of daily precipitation increases at a rate of approximately 7% per °C of ambient temperature (Blöschl *et al.* 2019). This is further confirmed both by observational data (Westra *et al.* 2013) and modelling experiments (O'Gorman 2015). Both studies have tested this CC-scaling hypothesis across various spatial and temporal scales. As from the beginning of 21st century, cyclonic activity increased in Europe, causing heavy rains to become more frequent (Mikhailova *et al.* 2012). For example, during winter 2012–2013 and the early spring of 2013, an anomalously large number of Mediterranean cyclones was observed in the Carpathian basin (Zsilinszki *et al.* 2019). These cyclonic situations led to floods in the southern half of Slovakia (Mészáros *et al.* 2022). Thus, any changes in these circulation patterns are likely to impact rainfall totals, leading to significant effects on river discharge and water levels. Further research is required to examine the relationship between circulation patterns, flood frequency, flood magnitude and topography. The outcomes of this study emphasise the importance of carefully analysing changes in flood behaviour when conducting estimates for flood design and risk management purposes (Petrow & Merz 2009). Beside precipitation, snowmelt has a great influence on Danube River discharge in Bratislava. Decrease in snowfall and changes in the duration of snow cover at elevations below 1,000–1,500 m above sea level (masl) in Slovakia were observed and attributed to higher air-temperatures (Vojtek *et al.* 2003). Air temperatures have critical impact on changes in snow-cover duration in catchments with mid-range elevations (Blahušiaková & Matoušková 2015). Furthermore, acceleration of warming at higher elevations in Slovakia (above 2,000 masl) compared with lower elevations in the 21st century was also reported (Labudová *et al.* 2015). The higher air-temperatures resulting from climate change have a significant impact on snowmelt (Ledvinka 2015), which occurs earlier, particularly at mid and high elevations.

The presented findings hold significant relevance to various domains. In terms of engineering, the identification of temporal trends and seasonality in extreme flood occurrences provides valuable insights for designing infrastructure that can withstand and adapt to changing flood patterns. Regulations related to flood risk management and infrastructure resilience can benefit from the nuanced understanding of extreme flood dynamics presented in this research. Energy systems, particularly those situated along the Danube River, may face challenges related to changing flood frequencies. The study's findings can inform energy infrastructure planning and design to enhance resilience against floods. Policymakers can utilise the insights to formulate effective flood management policies, considering the increased occurrence of extreme flood events. The financial sector (insurance companies and investors) can benefit from understanding the changing landscape of flood risk, guiding investment decisions and risk assessments. Considering Environmental, Social, and Governance (ESG) policies, the study provides better understanding of the environmental impact of climate-change-induced floods. The findings offer a basis for developing sustainable strategies that align with ESG principles. Overall, this research bridges the gap between scientific insights and practical applications, providing a foundation for informed decision-making across diverse sectors and contributing to the broader discourse on climate resilience and sustainability.

While this study contributes valuable insights to the understanding of extreme flood occurrences in the Danube River basin, it is essential to acknowledge certain limitations. Firstly, the study focuses on the Danube River at Bratislava station, and the results may not be directly extrapolated to other sections of the river or different geographical locations. The use of statistical methods, such as kernel estimation and trend analysis, introduces assumptions and uncertainties, and the choice of specific parameters (e.g., bandwidth in kernel estimation) may impact the results. Furthermore, while the study provides insights into temporal and seasonal trends, it does not delve into the detailed mechanisms or causes behind the observed changes in extreme floods. Finally, projections and implications for future flood events are not explicitly addressed, and caution should be exercised when generalising the findings to anticipate future hydrological scenarios. Despite these limitations, the study lays a foundation for further research and emphasises the need for a nuanced understanding of extreme flood dynamics in the context of climate change.

4. CONCLUSION

This study has investigated the seasonal variability of floods in the Danube River and their trends using continuous, daily runoff records dating back to 1876. The hypothesis revolved around the expectation that extreme floods in the Danube River would occur more frequently due to climate change. The study stands out for its novelty as it has introduced a unique approach by utilising advanced statistical methods, including the POT method, kernel estimation, and the Cox–Lewis test. The study systematically tested and validated the presented hypothesis, providing a nuanced understanding of the temporal trends and seasonality of extreme flood events in the specific geographical context of the middle part of the river. The findings suggest that floods in this region are strongly influenced by precipitation and snowmelt, with winter floods occurring mainly during March and summer floods mainly occurring in May and June. The data reveals that the number of floods in the months of January, February, December, and March is higher than in other months. The study also suggests that the occurrence of extreme flood events has increased significantly during the observed period, while the occurrence rate of minor floods during summer has significantly decreased.

The primary contributions of the research include identifying temporal trends in extreme flood occurrence, assessing variations during winter and summer seasons, and placing a spotlight on the practical significance of its findings for effective flood management, policy formulation and infrastructure design in the face of climate-change-induced floods. These contributions collectively enhance the field of hydrology and climate science, providing valuable insights for evidence-based decision-making in flood risk management amidst our evolving climate. Furthermore, the findings inform energy-systems planning along the Danube River and offer valuable input to the financial sector for informed investment decisions and risk assessments, aligning with ESG principles.

Moreover, this study highlights the importance of further research into the relationship between circulation patterns, flood frequency and magnitude and topography. The findings suggest that changes in these patterns are likely to impact rainfall totals, leading to significant effects on river discharge and water levels. Therefore, future studies should examine the impact of these changes on flood behaviour, taking into account regional differences and the potential impact of anthropogenic activities on the environment.

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DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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