



Are extreme floods on Danube getting more frequent? Case study Bratislava station

Igor Leščešen¹, Biljana Basarin¹, Dragoslav Pavić¹, Minučer Mesaroš¹, Manfred Mudelsee²,
Pavla Pekarova³

¹*Department of Geography, Tourism and Hotel Management, Faculty of Sciences, University of
Novi Sad, Serbia*

²*Climate Risk Analysis, Germany*

³*Institute of Hydrology, Slovak Academy of Sciences, Slovak Republic
igorlescesen@yahoo.com

Floods occur naturally and can transform into calamities that result in extensive destruction, health concerns, and fatalities. This is especially true when rivers are obstructed from their inherent floodplains and confined by embankments, or when residential and industrial structures are erected in regions that are naturally susceptible to flooding. Despite this, recent flood records across various European regions do not indicate a distinct rise in flood frequency during the last few decades. In this paper we present longer-term records of winter and summer floods in the Danube River for the 1876-2020 period. By applying threshold level method, we analyzed two group of events, strong and extreme floods. By applying this data and approach, we can conclude the following for the Danube River: (1) downward but not significant trend in strong winter floods and upward but not statistically not significant trend of summer floods, (2) Upward and statistically significant trends of extreme events both in winter and summer season. Based on our study, several conclusions can be drawn regarding flood protection and disaster management on the Danube River. Firstly, there has been a noticeable decrease in the frequency of strong events during winter season. Secondly, it is crucial to regulate the number of assets located in flood-prone regions to minimize economic damages. Thirdly, raising awareness about the growing incidence of extreme floods during both summer and winter seasons can aid in preventing future floods. Overall, our study indicates that key to a better understanding of flood risk analysis involves (A) the application of a local to regional scale in order to take in account the considerable spatial variability and (B) the usage of advanced statistical estimation tools (e.g., Mudelsee, 2020, *Statistical Analysis of Climate Extremes*, Cambridge Univ. Press) in order to robustly detect climate extremes and estimate their rate of occurrence.