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Mapping, monitoring and modelling past, present and potential future channel changes in an Alpine River system in Austria

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A flooding event in 2014 caused a prominent bank erosion along the Salza River in Styria, Austria. The bank became instable and its further development was uncertain, which raised concern for further progressing bank erosion at this location, as well as in other sections in the entire studied river reach. The major aim of this study was to monitor bank erosion rates at this specific bank erosion hotspot as well as to survey the entire study area for past, present and potential future channel changes. Past river changes have been mapped using historical maps and orthophotos. For a geomorphological evaluation of the current system state field mapping has been applied using the approach developed by Wheaton et al. 2015. Bank erosion monitoring was done by using erosion pins and photogrammetry, while potential future channel changes have been assessed via landscape evolution modelling using CAESAR-Lisflood developed by Coulthard et al. 2013.

Historical map (1678 - 1887) and orthophoto (2004 - 2017) analyses have shown that the Salza River has altered noticeably throughout the past through anthropogenic impacts and natural processes, with two prominent natural changes in the recent years one being the prominent bank erosion which initiated this study. Mapping the river course in the field in May 2017 has shown, that the most common in-channel river shapes are in descending order transition zones, planar, concave and convex. Monitoring the bank erosion hotspot using erosion pins has shown a mean change of the whole bank of -1.63 cm from 15.06.2017 - 11.07.2017. The photogrammetric approach, a 2D distance analysis to the erosion hotspot for the timeframe 06.05.2017 - 11.06.2018, resulted a mean change of roughly -2 m for the whole bank, while a 2.5D volume change analysis for the same timeframe has shown an eroded volume of 319 m³. Modelling the Salza River using four different discharge scenarios with the landscape evolution model CAESAR-Lisflood has shown four potential hot spot areas for a lateral shift of 20 m to 130 m from 2019 to 2050.