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Impact of river training on flood trends along the Rhine

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Trends in hydrological time series can be driven by climate change or climate variability, or other agents of change such as land use changes and river training measures. Separating and quantifying the impact of various drivers is a challenging task which remains in its infancy in hydrologic research. In this contribution, we address the question of how strongly the river training measures on the Upper Rhine have contributed to the positive flood trends detected for a number of Rhine gauges over the past decades. Based on the model-based analyses from the Federal Institute of Hydrology, relationships for discharge homogenization were applied to reconstruct river flows as they would have been without river and floodplain modifications. Trend analyses suggest that the river training contributed about 5-20% to the relative increase in annual maximum daily discharge. Moreover, when applied to the homogenized time-series, flood trends at several gauges appear to be no longer statistically significant. Additional analyses of discharge trends in the main channel and Rhine tributaries proves that river training aggravated the flood hazard along the main channel by enhancing the superposition of the Rhine and Neckar flood waves.