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Flood risk changes over centuries in Rome: an empirical study

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Over centuries, the development of the historical city of Rome -close to one of the largest Italian rivers, the Tiber- has been intertwined with the magnitude and frequency of flooding events. The ancient Rome mostly developed on the (seven) hills, while the Tiber's floodplain was mainly exploited for agricultural purposes. A few small communities did settle in the riparian areas of the Tiber, but they had a relatively peaceful relationships with the frequent occurrence of flooding events. Nowadays, numerous people live in modern districts in the Tiber's floodplain, unaware of their exposure to potentially catastrophic flooding. The main goal of this research is to explore the dynamics of changing flood risk over the centuries between these two extreme pictures of the ancient and contemporary Rome. To this end, we carried out a socio-hydrological study by exploiting long time series of physical (flooding, river morphology) and social (urbanization, population dynamics) processes together with information about human interactions with the environment (flood defense structures). This empirical analysis showed how human and physical systems have been co-evolving over time, while being abruptly altered by the occurrence of extreme events. For instance, a large flooding event occurred in 1870 and contributed to the constructions of levees, which in turn facilitated the development of new urban areas in the Tiber's floodplain, while changed the societal memory of floods as well as the communities' perception of risk. This research work was also used to test the hypotheses of recent-developed models conceptualizing the interplay between floods and societies and simulating the long-term behavior of coupled human-water systems. The outcomes of this test provided interesting insights about the dynamics of flood risk, which are expected to support a better anticipation of future changes.