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Extreme flood analysis on the Garonne river at Agen, using historical information since 1435

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The safety of nuclear power plants in France is assessed based on 1000-year flood estimates, with a safety factor accounting for uncertainty. Previous studies on the Garonne River near Agen, France, used threshold exceedance values from a continuous 85 year-long series at two hydrometric stations: Malause (1915-1966) and Lamagistère (1967-2000), and historical data at Agen since 1770. The estimate of the design flood was very sensitive to the choice of an Exponential or of a Generalized Pareto distribution, yielding 12 600 and 16 000 m³/s, respectively. This communication presents a more comprehensive study based on a GEV distribution fitted from the annual maximum values of a continuous series since 1852 (adding Agen 1852-1914) and historical data at Agen since 1435. The statistical framework accounts for both discharge and sampling uncertainty components. The first uncertainty component is about 3% for the recent years and 35% for the oldest years. The statistical framework is able to account for a multiplicative error on rating curves. This leads to corrections in peak discharge values, with better agreement between historical data at Agen and hydrometric data at Malause-Lamagistère. The final estimate of the design flood is around 10 500-11 600 m³/s, without or with the largest known historical flood of 1435. It confirms the safety of the nuclear plant, based on extensive historical information.