Probabilistic regional envelope curves of floods in Europe

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Regional envelope curves of flood flows represent the current level of information about the most extreme flood events observed in a region.

In this study, we analyze the spatial variation of parameters of the regional envelope curves across the European continent. A large flood database, containing more than 7000 annual maximum discharge series from hydrometric gauges located all over Europe and covering the period 1810-2021, is used for the analysis. For the analysis, we split the study domain into multiple tiles with different sizes, depending on the density of available observations. In each tile, we estimate the slope of the regional envelope curve and the envelope flood, with a robust method based on quantile regression.

Results show that the slope of the regional envelope curves varies substantially across European regions. The slope is highest in southern Europe and lowest in regions with Atlantic influence and Eastern Europe. Based on the framework of probabilistic envelope curves (Castellarin et al., 2005; Castellarin, 2007), we also make a probabilistic statement about the regional envelope curves in terms of its return period.

References

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