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Towards the attribution of patterns of flood regime change in Europe to decadal oscillations of atmospheric, catchment and river system drivers

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Recent studies reveal spatially coherent patterns of flood regime changes over Europe. For example, Blöschl et al. (2017, 2019) use a newly available pan-European database, consisting of more than 5000 sites, to detect trends in flood magnitude and frequency and shifts in timing of floods. They analyse physiographic characteristics of the catchments exhibiting significant trends and investigate the causes of these changes by analysing the temporal evolution precipitation, snowmelt and soil moisture time-series for selected hot-spots, compared to floods.
This work aims to formally and systematically attribute these detected changes in the flood frequency curve over Europe to their driving processes through a regional data-based attribution approach, which uses local and regional covariates. In a preliminary phase of the analysis we select and extract time series of possible (local and regional) covariates, belonging to the three potential drivers of flood change (i.e. atmospheric, catchment and river system processes), and consider their decadal oscillations. Regional driver-informed models, linking changes in the flood frequency curve to the long-term evolution of the covariates/drivers, will be fitted to flood and covariate data over spatial sub-domains and compared through information criteria. A Bayesian Monte Carlo Markov Chain (MCMC) approach will be used for parameter estimation, where prior information from the existing literature will be included, making the attribution robust to spurious correlations.

Blöschl, G. et al. Changing climate shifts timing of European floods. Science 357, 588–590 (2017).
Blöschl, G. et al. Changing climate both increases and decreases European river floods, Under review (2019).