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Towards European wide maps of climatologic homogeneous regions for rainfall

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In this study homogeneous regions for regional frequency analysis of rainfall are delineated for Western Europe, with the aim of extending the methodology to application on continental scale.

To inform climate adaptation policy, scenarios of future climate change are explored with climate model simulations. Simulations from Global Climate Models are often downscaled using nested Regional Climate Models. These models are becoming increasingly finer in resolution; the latest generation models are employed at the kilometer scale, which enables the explicit simulation of convective storms. Therefore these simulations improve the representation of changes in summer rainfall intensity & duration, and summer rainfall extremes (Kendon et al., 2017). However, the computational burden limits the simulation length.
The output of these climate models is used to study hydroclimatic change and variability for climate change impact assessments, notably the estimation of future return periods of extreme rainfall. In order to estimate return periods larger than the record or simulation length, the (short) time series from different locations can be pooled (Hosking & Wallis, 2009; Li et al., 2017). For this method to be valid, the pooled rainfall events should be independent and fall within the same hydroclimatic region. Sampling neighbouring model gridcells has the drawback of the timeseries being dependent, therefore the delineation of larger homogeneous regions from which to sample is crucial.
Such regions are often defined based on both region characteristics and statistics from rain gauge records (Hosking & Wallis, 2009). This limits continental scale application due to data availability differences. The methodology applied for Italy by Gabriele & Chiaravalloti (2013) circumvents this problem by using meteorological reanalysis data to find regions with a similar moisture transport during extreme rainfall events. This study aims to extend the work of Gabriele & Chiaravalloti (2013) in order to determine homogeneous rainfall regions on a continental scale to provide more robust estimations of hydroclimatic change.
The study is embedded in the EU H2020 project EUCP (EUropean Climate Prediction system) (https://www.eucp-project.eu/), which aims to develop a regional climate prediction and projection system based on high-resolution climate models for Europe, to support climate adaptation and mitigation decisions for the coming decades.

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