



Exploring links between precipitation extremes and land use types through the UK Convection-Permitting Model

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Precipitation extremes are commonly linked with land use types. The UKCP18 Convection-Permitting Model (CPM) Projections at 5km high resolution simulation provide opportunities to investigate probable relationships between precipitation extremes and land use types. Changes in the duration and severity of extreme precipitation events can be linked to landscape characteristics, which affect the risk of rapid and local hydrological hazards.

Based on publicly accessible data and a standard approach, Local Climate Zones (LCZs) provide coherent descriptions of the form and function of urban landscapes. From the World Urban Database and Access Portal, the LCZ is used to translate relevant land attributes to urban canopy parameters for climate and weather modelling applications at appropriate scales. Using the Severn River Basin as a case study, we use LCZ data to calculate urban fractions to investigate the roles of urban land types to the extreme distribution parameters.

In conjunction with the LCZ data, the Corine Land Cover (CLC) and the Moderate Resolution Imaging Spectroradiometer (MODIS) datasets are used to benchmark how future changes in rainfall intensities and seasonal patterns might be related to land use. The results are used to generate possible hypotheses to run different CPM models based on the LCZ data.

Based on these findings, we present a novel land-use-based approach for water hazard management addressing hydrological risk connected to regional climate resilience. For management authorities and infrastructure owners, precipitation extreme risk related to land use is critical for their long-term investment planning. The proposed methodology would be advantageous to many UK water regulators and stakeholders in generating more informative precipitation extreme estimations based on land use, for the high greenhouse gas emissions scenario RCP8.5.