WRF Simulations on the Impacts and Responses of Extreme Weather Events: From the Perspectives of Climate Change and Urbanisation over UK Cities

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In the twenty-first century, extreme weather events leading to flooding and heat waves, have become one of the most severe challenges in urban areas, especially under the circumstances of local climate change and rapid urbanisation. In the future, cities are going to encounter more severe natural disaster risks and understanding how these could combine with modification of the urban environment (for example through adoption of green infrastructure) is critical for decisions relating to mitigation and adaptation to climate change. Green infrastructure is a subset of resilient infrastructure, which may mitigate the adverse effects caused by extreme weather and contribute to regulating urban climate. In addition, high-performing green spaces bring additional benefits for society in terms of health and wellbeing. The Weather Research and Forecasting (WRF) model is a numerical weather prediction system supporting both atmospheric research and operational forecasting. Within this modelling system, there is the possibility to modify parameters according to various urban areas within the WRF-Urban configuration. In this study, Newcastle upon Tyne (a UK city with the benefit of a lot of observational sensor data) is selected as an initial target city for identifying the optimal WRF configuration by varying the model resolution, domain size and nesting strategy. Future work will explore the influence of implementing green infrastructure in the context of climate change and urbanisation, then extending this analysis to London.