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Abstract

The extent and location of impervious surfaces within urban areas due to past and present city development strongly affects the amount and velocity of run-off during high-intensity precipitation and consequently influences the exposure of cities towards flooding. The frequency and intensity of extreme precipitation are expected to increase in many places due to climate change and thus further exacerbate the risk of pluvial flooding. Improved knowledge of the individual and combined impacts of urban land cover changes and climate change towards the risk of flooding is critically needed for city administrations and local governments when planning for climate proof cities. This paper presents a methodology for examining the influence of recent observed changes in urban land cover for European cities for the exposure to flooding under present and future climatic conditions. A combined hydrological-hydrodynamic modelling and remote sensing approach is used to simulate the occurrence of (and related flooding during) a range of extreme rainfall events under current and expected future climatic conditions, and for different levels of urbanisation, which corresponds to historical (1984) and current (2014) urban land cover conditions. The approach is applied for eight European cities, representing different climatic conditions and historical urbanisation trends within Europe. Remotely sensed Landsat moderate resolution (30m) satellite imagery are analysed using a regression modelling approach to quantify historical changes in impervious surfaces. The outputs of the remote sensing analyses are combined with regionally downscaled estimates of current and expected future rainfall extremes to enable 2D overland flow simulations and flood hazard assessments, and to compare the relative influence of land cover changes with that of expected climate change. Preliminary results show that the influence of recent land cover changes for flood

exposure in European cities are in the same order of magnitude as what can be expected as a result of 2 degrees global warming (RCP4.5), and thus that urban planning play a central role for the vulnerability to flooding within urban areas.