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Observed trends in extreme precipitation and the effect of the urban heat island and aerosols

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The rate of extreme precipitation is increasing rapidly with global warming. Highly populated regions are particularly vulnerable to these changes, due to ill-adapted infrastructure, and studies indicate that the rate of change in extreme events may differ in rural and urban areas. In this work, we investigate the role of two processes that may influence this discrepancy in rural versus urban behavior, namely (i) the urban heat island (UHI) effect and (ii) changing concentrations of atmospheric aerosols. The UHI effect increases the temperature in urban areas, which may destabilize the boundary layer, enhance convection and strengthen extreme precipitation. Aerosol concentrations are suggested to correlate negatively to precipitation due to their role as cloud-condensation and ice nuclei. Here, we use meteorological station observations of daily precipitation from the European Climate Assessment & Dataset project to study how urbanization influences trends in daily extreme precipitation over Europe, also considering that Europe has experienced a large decrease in the atmospheric aerosol concentrations over the last decades. Preliminary results over the Netherlands indicate that there is a historical difference in the observed trends in daily extreme precipitation between urban and rural stations.