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Urban Climate Change – Heat events and their spatial characteristics in the city of Augsburg, Germany

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With an ongoing urbanization and population growth the United Nations project that in the mid of the 21st century two third of the global population will live in cities. Thus, along with global climate change more and more people are exposed to negative impacts of climatic risks since, for example, the urban heat island effect reinforces heat related extremes with regards to number and duration of those events. But during a heat event not all parts of a city are equally charged since many climatic (e.g. temperature, humidity, wind speed or radiation) and non-climatic (soil sealing, building heights or proportion of green space) factors influence the spatial and temporal structure of heat events within a city. For that reason, it is indispensable to take as many of those factors into account for assessing heat events since only then reliable statements can lead to reasonable adaption strategies with regards to climate change in urban areas.
For long-term analysis, two weather stations in Augsburg are available for the period 1979-2017 on a sub-daily scale. By means of these time series relationships between large-scale circulation and heat events within the city of Augsburg are analyzed. Furthermore, four minute interval data of over 80 logger stations all across the urban area of Augsburg are regarded for the period 2013-2017. Overall, about 33 logger stations exhibit data where more than 80% of all days are available. The logger stations are used to interpolate heat events into space.
In a first step, different absolute (e.g. T-MAX>30°C and/or T-MIN>20°) and relative (e.g. day-specific Q90) thresholds were determined in order to characterize heat events. For this purpose, daily heat-related data of Augsburg-Mühlhausen weather station of the German Weather Service (DWD) were analyzed with regards to number and duration of events. Subsequently, events within the period 2013-2017 were examined in detail and compared with the data of the 33 logger in order to find matches or mismatches, respectively. Furthermore, by means of the determined thresholds and the matches between weather station and logger as well as the present atmospheric weather patterns during heat events a grouping of the different loggers was performed to reproduce to some extent an existing local climate zones classification by means of climatological variables, only.