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Using Urban Climate Modelling to Support Climate Change Adaptation in Small- to Medium-sized Cities in Austria

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Cities are particularly vulnerable to increasing temperatures due to climate change and the Urban Heat Island (UHI) effect. Much attention has focused on UHI analysis in larger cities; however, research dealing with smaller cities is very rare. Within the project ADAPT-UHI, future scenarios of the UHI have been developed for three small- to medium-sized cities in Austria (Klagenfurt am Wörthersee, Salzburg and Mödling) to identify hot spots and support urban planners in their decision making for the development of strategies and action plans for UHI mitigation measures. To accomplish this, we use the urban climate model MUKLIMO_3 developed by the German Meteorological Service (DWD). The grid cell resolution of the model varies from 20 to 100 m, covering each city and the surrounding areas. In order to provide the local climate characteristics, data sets with the latest land use (URBAN ATLAS*) and land cover (LISA**) classifications are used to provide an accurate analysis of the individual building and vegetation structures.

Future climate scenarios are simulated based on six EURO-CORDEX*** projections for Representative Concentration Pathways (RCPs) 4.5 and 8.5 over the time periods 2021-2050 and 2071-2100. Our results for Klagenfurt show that the number of summer days (Tmax >= 25 °C) can increase by more than one month on average per year in the period 2071-2100 (for RCP 8.5) compared to the reference (1971-2000). To analyze the effectiveness of possible adaptation measures in different areas of the cities, modifications in the land use parameterization (current and future urban structures) were made. Our aim is to change the energy balance near the surface by considering interventions such as increasing the percentage of buildings with green roofs, increasing the roof or street albedo, unsealing parts of public areas and increasing the amount of trees, possibly all of which can contribute to mitigating the effects of the UHI.

The main outcome from ADAPT-UHI is the development of strategies to support cities in climate change adaptation. These strategies will include different types of adaptation measures that can be implemented, which decrease the number of summer or hot days per year and increase the life quality of the cities' inhabitants. The project is also intended to transfer these methods to other (small, growing) cities and create awareness of the importance of climate change and its effect on cities.

References

*Copernicus Urban Atlas: https://land.copernicus.eu/local/urban-atlas
**Land Information System Austria, GeoVille GmbH: https://www.landinformationsystem.at/#/lisa/overview
***Coordinated Downscaling Experiment - European Domain: https://www.euro-cordex.net/