



How does urbanization shape the record-breaking temperatures in Izmir, Turkey ?

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The urban heat island effect, denoting the temperature difference between urban and rural areas, has become more widely recognized due to the increasing urbanization over the years. Recent studies related to the urban heat island effect mainly focus on changes in atmospheric changes and their role in triggering significant weather phenomena. Understanding these dynamics is crucial for making future projections. This research is motivated by the need to understand how the urban heat island intensity affects the boundary layer and temperature structure of İzmir, Türkiye during a record-breaking temperature period, in July 2023. Temperatures in the Aegean region for July 2023 are above season normals of the 1991-2020 period by 1.7°C. To investigate how urbanization contributed to the temperature changes the chosen timeframe is modeled using the Weather Research and Forecasting (WRF) Model (version 4.3). To enhance spatial resolution, we integrated the Coordination of Information on the Environment (CORINE) land cover data into the model, employing a nested domain setup ranging from outer to inner domains with resolutions of 9-3-1 km. ERA5 Reanalysis was chosen as the initial condition to force the model throughout the selected period. Following the simulations using the parameterizations set optimized for the Izmir region in July 2023, the obtained results were scrutinized through a comparison with data from meteorological observation stations to analyze the accuracy and performance of the simulations. Then, to examine how urban areas affect atmospheric behavior under record-breaking conditions, atmospheric conditions of July 2003 were simulated by utilizing the same parameterizations and boundary conditions with altered land use categories. The urban land-use categories within the domain were changed to the most dominant rural land-use category. In evaluating the city's influence on record-breaking temperatures, the analysis focused on changes in the atmospheric boundary layer and its associated parameters by comparing the simulations with urbanizations and without urbanization in İzmir.