The Impact of Urban Land Use On the Springtime Frontal Precipitation Event in Ankara: A Case Study of 5 May 2014

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Studies concerning the effects of urbanization on heavy precipitation events mostly focused on the summertime convective precipitation events. In these studies, the Urban Heat Island (UHI) effect was prominent over the urbanized region before the event, changing the spatial and temporal distribution of the precipitation. We aim to reveal the impact of urbanization over Ankara on the springtime frontal precipitation event of 5 May 2014, when the ground heating and UHI effects are not as strong as those in the summertime. We performed two different simulations based on the land-use scenarios with urban (URBAN) and without urban areas (NOURBAN) over Ankara, integrating the CORINE Land Use dataset into the Weather Research and Forecasting Model (WRF v3.8) and replacing the urban areas with the dominant land use category over the region. Four sub-regions with the identical area coverages corresponding to the upwind, central, and downwind parts of the city center are defined to have a lucid spatial and temporal representation of the event. The two simulation results agreed reasonably with the observations. In the simulation (URBAN) with the urban land use included, the spatial average of the daily rainfall amounts over the predefined sub-regions slightly decreased, especially the sub-regions to the upwind and downwind of the highly urbanized area. However, the difference in precipitation amount in the vicinity of the urbanized area between the two different simulations is not of significance in comparison to what was observed in other summertime precipitation studies. On the other hand, the UHI effect might be crucial in determining the impact of urban land use on the distribution and magnitude of the heavy springtime rainfall. To support this idea, we performed a similar analysis for a summertime convective precipitation event over Ankara and compared the results.