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A Study on Statistical Downscaling of UM LDAPS for Urban High-Resolution Temperature Prediction

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Due to global warming and urbanization, various weather phenomena (urban heat island, change of precipitation patterns) are observed as microclimate in urban areas is being formed. More dense high-resolution temperature prediction information is needed to predict and prevent the damage caused heat-waves, which are different in spatial and temporal due to the complex urban structure and surface characteristics. In this study, the urban high-resolution air temperature was predicted by applying the urban structure and surface characteristics affecting the microclimate composition in the urban area to the Local Data Assimilation and Prediction System (LDAPS) results using the Analog Method (AM) and statistical downscaling methods. Based on the predicted atmospheric state from the LDAPS, the date of the most similar past atmospheric state was selected by AM. The meteorological observation data of the extracted date and the surface characteristic data of the Climate Analysis System (CAS) were used as input data for the high-resolution temperature prediction model. In this study, we developed the model that uses the Support Vector Machine (SVM) technique to downscale the local resolution (1.5km) to a more dense high resolution (25m) and predicted the high resolution temperature for Seoul area from July to August 2017. As a result, prediction error decreased and the explanation of spatial variation was higher than that of LDAPS, and it was confirmed that the spatial and temporal deviation of temperature varies depending on the urban structure and surface characteristics. The method proposed in this study is expected to be useful for elucidating the vulnerable areas for summer heat-waves and tropical nights.
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