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Heat-exposure Information for the Hazard Impact Forecasting of Urban Heat-wave

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In this study, the BRT (building-scale resolved air temperature) model was developed to improve the detail and accuracy of air temperature data of UM LDAPS (Unified Model, Local Data Assimilation and Prediction System), which is an operational model of the Korea Meteorological Administration. The Urban air temperature near surface with building resolution from numerical model show few performances as comparing with observation data since it is not reflected in urban surface characteristics for numerical models. In order to apply urban surface characteristic to air temperature near urban surface, and to insert observation information with irregular points to building resolution spatial air temperature, the BRT model was developed. The BRT model estimates the air temperature at the height of a pedestrian. Surface parameters reflecting the urban environment at the building-scale and street-level are calculated and entered into the model. A temperature distribution of 25 m resolution was determined for the Seoul area, and spatial information was processed using SVM (support vector machine) and LM (linear regression model) methods. The SVM method, in which selective variables were applied, showed higher accuracy than the LM method, in which fixed variables were applied. Nevertheless, the accuracy was lower on days of precipitation, precipitation days were excepted in the training process in SVM_BRT. In order to estimate air temperature accurately, various weather variables (e.g., cloud quantity, wind speed, solar radiation, radiation flux, precipitation) and time series weight (monthly characteristics, temporal characteristics) should be necessary.
With the dense population, the spatial distribution of heat sensitive individuals in Seoul, such as the elderly, infants, residents of villages over 30 years including constructions sensitive to heat exposure, should be considered comparably. For the management of vulnerable groups in the summer, priorities can be selected on a detailed regional basis, for example, the minimum administrative unit. For example, detailed information on potential local air temperature can be obtained using the BRT model even during non-heat-wave periods. Such information will enable direct management regarding the corresponding heat exposure sensitive group. In the long term, thermal reduction activities are required for areas with thermal stress in order to improve urban sustainability and resilience. Air temperature information provided as heat exposure for pedestrians can be used to manage the response to heat-waves/tropical-nights in the administrative districts of urban areas. The BRT model developed in this study can be used to mitigate the heat stress of citizens due to heat exposure. Improvements in the short-term response to the urban heat-waves and long-term response to urban heat island can be achieved through this local weather information. This work was funded by the Korea Meteorological Administration Research and Development Program under Grant KMI(KMI2018-01410).