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ASSOCIATION BETWEEN URBANIZATION AND AIR TEMPERATURE FROM A 3-D PERSPECTIVE USING REMOTE SENSING

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ABSTRACT:

To improve the understanding between ambient air temperature and built-up factors is important for establishing public health adaption and hazard prevention strategies under climate change impacts. While building constructions formed a 3-D street canyon structure, there is limited data on the estimations of building heights or volumes, particularly in metropolis. In this study we applied an innovated three-dimensional Urbanization Index (3DUI) with a 5-m spatial resolution to estimate the building volume for assessing the spatial variability of urbanization within Taipei metropolis from a 3-D perspective. In addition, air temperature observations at 32 on-site monitoring stations of Central Weather Bureau were obtained from 2004 to 2007. Circular buffers of 5, 10, 25, 50, 100, 250, 500, 1000, 1500, and 2000-m were generated around the outside of the 32 meteorological stations in the Taipei metropolis. Spatial average of air temperature and 3DUI within each buffer zone was calculated. Spearman's rank correlation was then employed to assess the correlations between 3DUI and air temperature by year and by season. The results showed that, correlation coefficients obtained from the 5-m buffer zone was about 0.41 to 0.5, the values were then increased gradually while the buffer sizes enlarged. The maximum of the estimations with the values from 0.83 to 0.85 always accompanies with the use of the 1000-m buffer zone. Overcome the peak, the estimated coefficients were slightly decreased to around 0.6 while 1500-m or 2000-m buffer distance were adopted. When we stratified the data by season, the closest association was consistently observed in the 1000-m buffer zone as well with a value ranged from 0.83 to 0.85. The aforementioned findings demonstrate that 3DUI is a good indicator to assess the thermal environment in the urban areas and has consistently good performance regardless the seasons.

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