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Title :
Quantification of Land Surface Albedo Impacts in a Tropical Urban Environment

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The emergence of various climate campaigns and the establishment of numerous climate variables have been the backbone of this research framework. One of the Essential Climate Variables (ECV) called albedo was reported to be insufficiently recorded and documented in terms of its spatial scale and temporal resolution. Thus, the intensity of this variable towards the simulation of climate change effects needs to be quantified. This research aims to investigate and examine albedo pattern changes as a physical parameter to urban climate change effects generated through remote sensing and discover the functional relation with respect to the urban heat island (UHI) phenomenon. Therefore, the objectives are, to characterise the albedo pattern changes and their relationship with other biophysical, land cover and air quality parameters and their effects upon urban surface temperature; to explore and formulate a model and factorise the albedo of urban features based on selected variables (continuous air quality monitoring station (CAQMs) data and remote sensing biophysical parameters); to modify localised albedo for weather research forecasting (WRF) the Advance Research WRF (WRF-ARW) configuration; and to synthesize the impacts of localised land surface albedo towards urban heat island phenomenon. This research adopted a hybrid scientific approach combining inductive and deductive logic methodologies. The independent variables were induced based on literature, existing theories and problems and further deduced from observations using Multiple Linear Regression (MLR), the model was quantified and evaluated using Mean Area Error (MAE), Relative Standard Error (RSE) and Root Mean Square (RMSE). The importance of quantifying LSA in accordance to land use land cover was tested using Anova Single Way Post-Hoc (Tukey's HSD) and finally the impacts of localised albedo were quantitatively analysed using WRF-ARW dynamic solver. The novelty of this research lies in the establishment of statistical models to depict land surface albedo based on climatic variables and air quality parameters. This model utilises remotely sensed land surface albedo and in situ albedo for verification processes. While the spatial distribution of Continuous Air Quality Monitoring station (CAQMs) was used for validating archive remote sensing images used for this study as its continuous data capturing ability allows for temporal flexibility in validation process. The research advancement is comprehended through the profound relationship of land surface albedo with remotely sensed biophysical properties and indices. The innovation is achieved by developing an improved scale of land surface albedo which ultimately solves the spatial and temporal issues. Based on the modification of land surface albedo, it shows that the sophisticated model WRF-ARW simulation of surface and near surface temperature can be improved if the values of land use and land cover albedo are captured based on the exact on-site values of land surface albedo and its significance is discovered through comparative analyses where localised land surface albedo values were used as an input parameters in WRF-ARW.