The Impact of Land Use/Land Cover on WRF Model Performance in a Sub-Tropical Urban Environment

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Delhi, the capital city of India has witnessed immense urban growth in past few decades. Many agricultural and green areas have transformed into built-up areas. The default 24 category USGS land use data used in Weather Research and Forecasting (WRF) model for mapping land use to model domain is inadequate in terms of current land use representation. Consequently, there is a substantial mismatch between land use data that is inputted to the model and actual land use especially for Delhi region. An updated land use data, thus, provides a scope in improvement of model performance. Present study is aimed at analyzing impact of change in input land cover on model outputs of some surface meteorological parameters. Three different types of land use data have been applied to the model viz. USGS land use data, MODIS based land use data and user-modified USGS land use data. Model performance has been evaluated for surface meteorological parameters like temperature, wind speed and direction and relative humidity using statistical measures. Spatial urban heat island intensities (UHI) have also been analyzed with respect to those observed in a field campaign conducted earlier. The study highlights the significance of impact of land use/land cover in atmospheric processes and the need for updated LULC for meteorological modeling.