Sensitivity of WRF model estimates to choice of Land use Land cover and Reanalysis dataset over India

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In mesoscale meteorological modeling accurate input data plays a critical role in the model performance. Due to anthropogenic and developmental activities, there are rapid changes in Land Use Land Cover (LULC) across India. Albedo, emissivity and surface roughness are the three important parameters influenced by the LULC. The physical characteristics of LULC govern the moisture and energy fluxes between the land and the atmosphere. Global Reanalysis are gridded dataset ingested with myriad data from global circulation models (GCM’ s) and observational data (like radiosonde, buoy, satellite etc.) using different data assimilation techniques to represent the atmospheric state. The model requires LULC dataset to explicitly represent surface characteristics, and high resolution global reanalysis dataset to initialize the model topography and other static atmospheric and surface fields. In this study WRF model evaluation has been carried out under different LULC data and initial/boundary forcing conditions over India. The study shows a comparative assessment of U.S. Geological Survey (USGS), Moderate Resolution Imaging Spectroradiometer (MODIS) and Indian Remote-Sensing Satellite-P6 (IRS-P6) Advanced Wide Field Sensor (AWiFS) derived LULC data; National Centers for Environmental Prediction (NCEP) Final Analyses (FNL) and ERA/Interim global reanalysis forcings over Indian region for 2008, 2010 summer and winter period. Model performance has been evaluated for meteorological parameters like temperature, wind speed, wind direction, relative humidity and planetary boundary layer height using statistical measures. WRF model has a general tendency to overestimate wind and it is known that accurate representation of wind speed is important for reliable weather and air quality forecasting systems. The model results in this study shows improvements in simulations driven with AWiFS LULC and ERA-Interim reanalysis dataset especially for wind. Detailed results will be presented. The study highlights the significance of impact of LULC in atmospheric processes, and the need for updated accurate and comprehensive LULC and atmospheric reanalysis for meteorological modeling.

Keywords: WRF Model, Land Use Land Cover, Mesoscale Modeling

