



Sensitivity of PBL and Cumulus schemes for Thunderstorm prediction over an Indian Region

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The cloud processes play an important role in all forms of precipitation. Its proper representation is one of the challenging tasks in mesoscale numerical simulation. Studies have revealed that mesoscale feature require proper initialization which may likely to improve the convective system rainfall forecasts. Understanding the precipitation process, model initial condition accuracy and resolved/sub grid-scale precipitation processes representation, are the important areas which needed to improve in order to represent the mesoscale features properly. Various attempts have been done in order to improve the model performance through grid resolution, physical parameterizations, etc. But it is the physical parameterizations which provide a convective atmosphere for the development and intensification of convective events. Further, physical parameterizations consist of cumulus convection, surface fluxes of heat, moisture, momentum, and vertical mixing in the planetary boundary layer (PBL). How PBL and Cumulus schemes capture the evolution of thunderstorm have been analysed by taking thunderstorm cases occurred over Kolkata, India in the year 2011. PBL and cumulus schemes were customized for WSM-6 microphysics because WSM series has been widely used in operational forecast. Results have shown that KF (PBL scheme) and WSM-6 (Cumulus Scheme) have reproduced the evolution of surface variable such as CAPE, temperature and rainfall very much like observation. Further, KF and WSM-6 scheme also provided the increased moisture availability in the lower atmosphere which was taken to higher level by strong vertical velocities providing a platform to initiate a thunderstorm much better. Overestimation of rain in WSM-6 occurs primarily because of occurrence of melting and freezing process within a deeper layer in WSM-6 scheme. These Schemes have reproduced the spatial pattern and peak rainfall coverage closer to TRMM observation. It is the the combination of WSM-6, and KF schemes which have preformed reasonably well to reproduce the right atmospheric condition for a thunderstorm leading to improved spatial and temporal rainfall over the study domain. Thus the parameterization schemes of WMS-6 and KF have shown significant improvement by capturing the location, intensity and surface meteorological parameters closer to observed details.

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