

A Comparative Analysis of the Performance of COSMO and WRF Models in Quantitative Rainfall Prediction

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Abstract : The Numerical weather prediction (NWP) models are considered powerful tools for guiding quantitative rainfall prediction. A couple of NWP models exist and are used at many operational weather prediction centers. This study considers two models namely the Consortium for Small-scale Modeling (COSMO) model and the Weather Research and Forecasting (WRF) model. It compares the models' ability to predict rainfall over Uganda for the period 21st April 2013 to 10th May 2013 using the root mean square (RMSE) and the mean error (ME). In comparing the performance of the models, this study assesses their ability to predict light rainfall events and extreme rainfall events. All the experiments used the default parameterization configurations and with same horizontal resolution (7 Km). The results show that COSMO model had a tendency of largely predicting no rain which explained its under-prediction. The COSMO model (RMSE: 14.16; ME: -5.91) presented a significantly ($p = 0.014$) higher magnitude of error compared to the WRF model (RMSE: 11.86; ME: -1.09). However the COSMO model (RMSE: 3.85; ME: 1.39) performed significantly ($p = 0.003$) better than the WRF model (RMSE: 8.14; ME: 5.30) in simulating light rainfall events. All the models under-predicted extreme rainfall events with the COSMO model (RMSE: 43.63; ME: -39.58) presenting significantly higher error magnitudes than the WRF model (RMSE: 35.14; ME: -26.95). This study recommends additional diagnosis of the models' treatment of deep convection over the tropics.

Keywords : comparative performance, the COSMO model, the WRF model, light rainfall events, extreme rainfall events

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