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Spatial Variation of WRF Model Rainfall Prediction over Uganda

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Abstract : Rainfall is a major climatic parameter affecting many sectors such as health, agriculture and water resources. Its quantitative prediction remains a challenge to weather forecasters although numerical weather prediction models are increasingly being used for rainfall prediction. The performance of six convective parameterization schemes, namely the Kain-Fritsch scheme, the Betts-Miller-Janjic scheme, the Grell-Deveny scheme, the Grell-3D scheme, the Grell-Fretas scheme, the New Tiedke scheme of the weather research and forecast (WRF) model regarding quantitative rainfall prediction over Uganda is investigated using the root mean square error for the March-May (MAM) 2013 season. The MAM 2013 seasonal rainfall amount ranged from 200 mm to 900 mm over Uganda with northern region receiving comparatively lower rainfall amount (200–500 mm); western Uganda (270–550 mm); eastern Uganda (400–900 mm) and the lake Victoria basin (400–650 mm). A spatial variation in simulated rainfall amount by different convective parameterization schemes was noted with the Kain-Fritsch scheme over estimating the rainfall amount over northern Uganda (300–750 mm) but also presented comparable rainfall amounts over the eastern Uganda (400–900 mm). The Betts-Miller-Janjic, the Grell-Deveny, and the Grell-3D underestimated the rainfall amount over most parts of the country especially the eastern region (300–600 mm). The Grell-Fretas captured rainfall amount over the northern region (250–450 mm) but also underestimated rainfall over the lake Victoria Basin (150–300 mm) while the New Tiedke generally underestimated rainfall amount over many areas of Uganda. For deterministic rainfall prediction, the Grell-Fretas is recommended for rainfall prediction over northern Uganda while the Kain-Fritsch scheme is recommended over eastern region.

Keywords : convective parameterization schemes, March-May 2013 rainfall season, spatial variation of parameterization schemes over Uganda, WRF model
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