

# **Skill of Predicting Heavy Rainfall over India: Improvement in Recent Years Using UKMO Global Model**

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Pure and Applied Geophysics, 174(11), 4241-4250

**Abstract:** The quantitative precipitation forecast (QPF) performance for heavy rains is still a challenge, even for the most advanced state-of-art high-resolution Numerical Weather Prediction (NWP) modeling systems. This study aims to evaluate the performance of UK Met Office Unified Model (UKMO) over India for prediction of high rainfall amounts ( $\geq 2$  and  $\geq 5$  cm/day) during the monsoon period (JJAS) from 2007 to 2015 in short range forecast up to Day 3. Among the various modeling upgrades and improvements in the parameterizations during this period, the model horizontal resolution has seen an improvement from 40 km in 2007 to 17 km in 2015. Skill of short range rainfall forecast has improved in UKMO model in recent years mainly due to increased horizontal and vertical resolution along with improved physics schemes. Categorical verification carried out using the four verification metrics, namely, probability of detection (POD), false alarm ratio (FAR), frequency bias (Bias) and Critical Success Index, indicates that QPF has improved by 29 and 24% in case of POD and FAR. Additionally, verification scores like EDS (Extreme Dependency Score), EDI (Extremal Dependence Index) and SEDI (Symmetric EDI) are used with special emphasis on verification of extreme and rare rainfall events. These scores also show an improvement by 60% (EDS) and 34% (EDI and SEDI) during the period of study, suggesting an improved skill of predicting heavy rains.

**Key words:** Unified model, categorical verification, extreme rain, rainfall forecast, NWP.