Verification of heavy rainfall in NWP models : A case study

Kuldeep Sharma, Raghavendra Ashrit, R. Bhatla, R. Rakhi, G. R. Iyengar and E. N. Rajagopal,
Mausam, 68(4), 699-712

Abstract: Forecasting of heavy rainfall events is still a challenge even for the most advanced state-of-art high resolution NWP modelling systems. Very often the models fail to accurately predict the track and movement of the low pressure systems leading to large spatial errors in the predicted rain. Quantification of errors in forecast rainfall location and amounts is important for forecasters (to choose a forecast and interpret) and modelers for monitoring the impact of changes and improvements in model physics and dynamics configurations. This study aims to quantify and summarize errors in rainfall forecast for heavy rains associated with a Bay of Bengal (BOB) low pressure systems. The verification analysis is based on three heavy rain events during June to September (JJAS) 2015. The performance of the three deterministic models, NCMRWFôs Global Forecast Systems (NGFS), NCMRWFôs Unified Model (NCUM) and Australian Community Climate and Earth-System Simulator ï Global (ACCESS-G) in predicting these heavy rainfall events has been analysed. In addition to standard verification metrics like RMSE, ETS, POD and HK Score, this paper also uses new family of scores like EDS (Extreme Dependency Score), EDI (Extremal Dependence Index) and Symmetric EDI with special emphasis on verification of extreme rainfall to bring out the relative performance of the models for these three rainfall events. The results indicate that Unified modeling framework in NCUM and ACCESS-G by and large performs better than NGFS in rainfall forecasts over India specially at higher lead times. Relatively improved skill in NCUM forecasts can be attributed to (i) improved resolution (~17 km) and (ii) END Game dynamics of NCUM.

Keywords: NCUM, NGFS, ACCESS-G, EDI, EDS and Symmetric EDI. 1. Introduction Rainfall during the monsoon season is characterized by active and weak spells associated with the movement of monsoon trough and intra-seasonal