Verification of Ensemble Rainfall Forecasts over India: Application of CRA method

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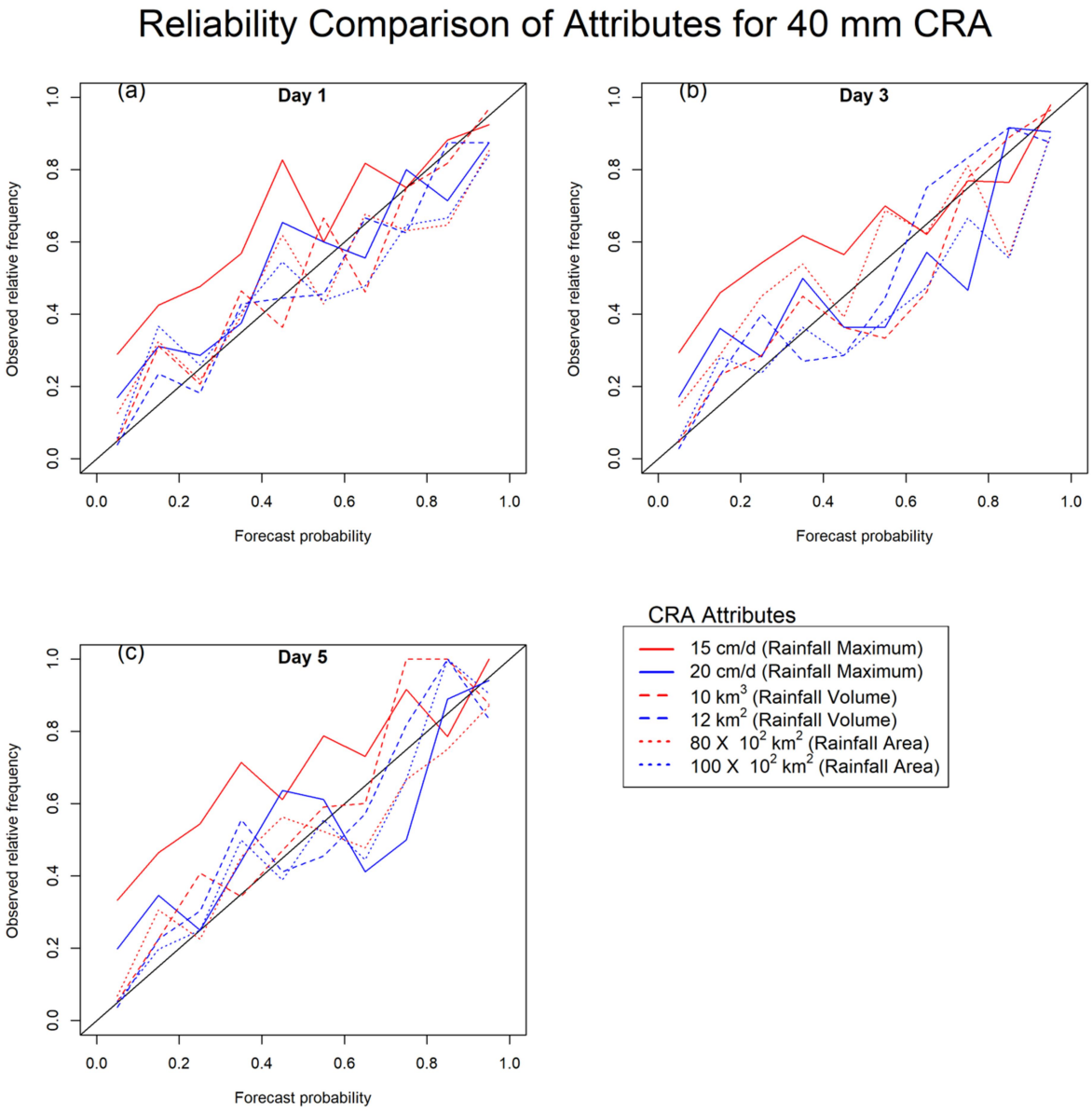
Increased resolution of Numerical Weather Prediction (NWP) models often leads to improved prediction of heavy rains; however, the forecasts often suffer from location mismatch and intensity errors which ultimately result in poor verification scores. Spatial verification methods provide a more realistic statistics to ascertain the quality of forecasts. Contiguous rain areas (CRA) is one such method that is applied for verifying the high resolution rainfall forecasts over Australia (Ebert and McBride 2000). CRA method is an intuitive approach that quantifies the results of "eyeball verification. It focuses on individual weather systems as opposed to the entire domain, enabling the errors in each event to be separately assessed. It verifies the properties of the forecast entities ("objects") against the properties of the corresponding observed entities. A big advantage of this approach over more traditional verification methods is that the location error of the forecast objects can be quantified.

Application of CRA verification method, to evaluate ensemble rainfall forecasts provides unique opportunity to *(a) to quantify the spatial errors and contribution from error components (displacement, volume and pattern errors) which is achieved by the analysis of results from rainfall forecasts during three monsoon seasons over India*; *(b)* to *determine if spread-skill relationship observed using traditional measures is also evident in all or some of the object parameters / forecast attributes (following Gallus, 2010); (c) to assess the skill of probabilistic forecast of the object parameters / forecast attributes.*
At NCMRWF a very high resolution (12km grid) 22 member Global Ensemble Prediction System (NEPS-G) is operational since 2018. NEPS-G is based on the Met Office Unified Model framework. Current research compiled the results of CRA verification applied to NEPS-G rainfall forecasts over Indian land region for recent three monsoon seasons (2018-2020). Detailed discussion of the results can be found in Dube et al (2022). Spatial verification results indicate that rainfall area and volume demonstrate higher reliability and skill in the forecasts which points to potential for developing applications where skillful attributes can be used.



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