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Assessing the hourly precipitation forecast skill with the fractions skill score

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Statistical methods for discrete(yes/no) forecasts (such as the threat score) are always used in the verification of precipitation forecasts, although these standard methods are affected by the so-called “double-penalty” problem caused by slight displacements in either space or time. In a point-to-point comparison, small displacements in space or time with respect to the observation inflict a double penalty on the forecast. Spatial techniques have recently been developed to help solve this problem. The fractions skill score (FSS), a neighborhood spatial verification method, directly compares the fractional coverage of events in windows surrounding the observations and forecasts. We studied the effects of the FSS in hourly precipitation verification using hourly forecast products from the GRAPES regional model and Quantitative Precipitation Estimation (QPE) products from the National Meteorological Information Center (NMIC) during July and August 2016, investigating the difference between these results and those obtained with the traditional category score. We found that the model spin-up period affected the assessment of stability. Systematic errors had an insignificant role in the fraction Brier score and could be ignored. The dispersion of observations followed a diurnal cycle and the standard deviation of the forecast had a similar pattern to the reference maximum of the fraction Brier score. The coefficient of the forecasts and the observations is similar to the FSS, that is, the FSS maybe a useful index with which to indicate correlation. Compared with the traditional skill score, the FSS has obvious advantages in distinguishing differences in precipitation during time series, especially in the assessment of heavy rainfall with the small improvement in the time series.

Keywords: neighborhood spatial verification method; fractions skill score; traditional category score; hourly precipitation; heavy rainfall