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Diagnostic object-oriented verification of very short-range mesoscale precipitation forecasts. Part 1: Methodology and computational algorithms with application to object size / Muravev A.V., Kiktev D.B., Bundel A.Yu., Smirnov A.V., Blinov D.V. // Hydrometeorological research and forecasts. 2026, no. 3 (401), pp. 6-40.

The paper describes object-oriented verification methods used to evaluate very short-range mesoscale precipitation field forecasts generated by the COSMO-Ru2By model (Hydrometeorological Research Centre of the Russian Federation) over European Russia for the period of May–September 2025. The reference fields consist of initial composites from the pySTEPS precipitation nowcasting system derived from data provided by the DMRL-C radar network in the same region. Reference is also made to previously obtained point-based and spatial forecast skill scores based on comparisons with weather station data.

Definitions of “object”, “attributes of the first category”, “attributes of the second category” and their examples are given. The calculation algorithms of the used mathematical packages are discussed. A description of important statistical features of order values and sample quantiles is provided, including their asymptotic properties, and the application of the theory to the most important attribute of an object, namely its size, is explored.

Diagnostic verification of object forecasts for a certain lead time consists of two stages. At the first stage, the individual attributes of all objects in “forecast – observation” pairs of synchronized fields are cross-compared, and a complete matrix of values of the corresponding quality metric is constructed. At the second stage, instead of a complex procedure for “pairing” objects, the following operations are performed. Namely, from each complete matrix, “the best available” values are extracted in an amount equal to the smallest number of objects in any of the synchronized fields, and these values collected over the entire period of the experiment are presented as deciles of the distribution. Object-oriented diagnostics of the model and, in particular, its radar information assimilation system presupposes interpreting the tables of these quantiles for all lead times.

Keywords: object-oriented verification, order values and sample quantiles, diagnostics of a forecast system

Tab. 7. Fig. 5. Ref. 50.