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Object-based verification of radar reflectivities on the convective scale

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Germany is exposed to various kinds of high impact weather (HIW) phenomena. Strong impacts are expected from convective events during summer time which happen to be especially hard to predict. The pilot project SINFONY at DWD has the goal to improve forecasts of such events in the short range up to 12h. On one hand, predictions of convective cells from Nowcasting systems currently outperform NWP systems for very-short range weather forecasts. On the other hand, NWP forecasts are superior to Nowcasting predictions after a few hours of forecast lead time. Therefore, the goal is to optimally integrate both approaches in a seamless prediction system. On the observation side, high-resolution reflectivities from the German radar network are used. Such reflectivities give the instantaneous state of the current hydrometeor situation, where HIW is correlated with high reflectivities. On the model side (COSMO-DE-EPS) reflectivities are derived from the forward operator EMVORADO (Zeng et al. (2016), Quarterly Journal of the Royal Meteorological Society, 142, 701, 3234-3256).
Our investigations focus on radar reflectivities in a selected case study period of four weeks in summer 2016 with strong convective activity in which small and large convective cells could be identified. We propose to consider object-based methods for the verification of radar reflectivities in NWP and Nowcasting. Such methods potentially help to circumvent the well-known double-penalty problem. Especially, we will make use of the Median of Maximum Interest (MMI), an object-based verification method from Davis et al. (2009), Weather and Forecasting, 24, 1252-1267. An advantage of the MMI is that matching between certain objects, which is often unreliable, is not mandatory. It rather measures the similarity of objects from observation and forecasts. In return, the MMI requires a careful parameter tuning. We will present results of a systematical study to find reasonable parameter set for our verification problem. To highlight the capabilities of the verification approach, we will compare nowcasts with forecasts using the 1-moment and the 2-moment convection scheme.