Object-based ensemble 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). Further, we take nowcasting ensembles into account.

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.

Our contribution for the workshop will mainly be a presentation of an overview of our data basis and some verification issues we want to address. The main focus in future developments will be on object-based methods for the verification of radar reflectivities in NWP and Nowcasting, where objects are identified by the DWD-internal product KONRAD3D. Object-based methods potentially help to circumvent the well-known double-penalty problem. Among others, 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. One advantage of the MMI is that matching between certain objects, which is often unreliable, is not mandatory. It rather measures the similarity of objects derived from observation and from forecasts.

One of the biggest issues in SINFONY we hope to discuss with the community during the workshop is the applicability of present verification methods to multiple ensemble systems. As we propose to develop an area-based and an object-based nowcasting ensemble, an NWP ensemble as well as an area-based and an object-based ensemble of a seamless prediction system, we will produce a huge amount of data and, hence, also a huge number of object identifications. This fact results in a big requirement on existing spatial verification methods we have to deal with and which might not be common presently.