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Development of a new seamless integrated forecasting system (SINFONY) at DWD

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At Deutscher Wetterdienst (DWD), the pilot project SINFONY has been set up in 2017 to develop a seamless ensemble prediction system for convective-scale forecasting with forecast ranges of 6 up to 12 hours, which integrates nowcasting techniques with numerical model prediction (NWP) in a more or less seamless way. The focus is on severe summertime convective events with associated hazards such as heavy precipitation, hail and wind gusts.

So far, the storm-scale forecasting for the first 2 hours and warning rely mostly on observation-based nowcasting products with frequent updates (typically with 5-min intervals) that are available within a few minutes. New NWP forecasts with the convection-allowing ensemble system COSMO-D2-EPS are started only every 3 h and can outperform the quality of nowcasting only at later forecast times. Moreover, nowcasting and ensemble NWP are treated as two separate and independent methods, and there are only few common products available for the forecasters.

The goal of SINFONY is to narrow down this gap and to provide new products for the forecasters from observation time up to +6 h / +12 h, combining nowcasting and NWP. Therefore, efforts are undertaken on the one hand by enhancements to both nowcasting and NWP separately and on the other hand by mutual information exchange and combination between these two methods.

The nowcasting system, which is currently purely deterministic, is expanded to an ensemble approach, both in terms of gridded reflectivity (elements of the STEPS approach) and of cell objects (KONRAD-3D). Compared to the classical pure advection approach, cell life-cycle information is taken into account for cell objects.

For the NWP system, a rapid update cycle (RUC) is under development, with hourly ensemble forecast on the km-scale using the new limited area version of the ICON model (ICON-LAM). Efforts are done to further improve the model physics (2-moment microphysics). Additional high-resolution observational data including 3D-radar-data, Meteosat SEVIRI satellite data and lightning densities are added to the existing LETKF based assimilation system, as well as the assimilation of nowcast cell objects. A thorough comparative verification of nowcasting ensemble and NWP ensemble is another prerequisite for the optimal combination of these systems.

The poster will give an overview of the goal and the concept of the SINFONY project and its progress during its first 2 years.