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Current status of SINFONY –The combination of nowcasting and numerical weather prediction for forecasting convective events at DWD

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DWD's new Seamless Integrated Forecasting system (SINFONY) is targeted to improve very-short-range forecasting of intense convective events from observation time up to 12 h ahead for Germany. Weather radar is at the heart of it.
The goal is to produce seamless ensemble forecast products in observation space, i.e., radar reflectivity composites, precipitation fields and convective cell objects, as well as informations on the probability of hazards like heavy precipitation, hail, wind gusts and lightning. These products will hopefully serve as basis to improve DWD's meteorological warnings (forecasters, automated systems) as well as the warnings of the German flood forecasting authorities.

There are different optimal forecast methods for different forecast lead times, and the idea is to improve and combine them in an optimal way. Focusing on convective events and their related hazards up to several hours, we developed in the last seven years in an interdisciplinary team

1) radar Nowcasting ensembles for areal precipitation, reflectivity (STEPS-DWD) and convective cell objects including hail and life cycle information (KONRAD3D-EPS) with good forecast quality up to 1-2 hours,

2) a new regional NWP ICON-ensemble model (ICON-RUC-EPS) with assimilation of 3D radar volumes, cell objects, Meteosat VIS and IR channels and hourly new forecasts on the km-scale, whose quality exceeds Nowcasting after forecast hour 1-2,

3) and to get the best of both worlds for our customers, an optimal combinations ("blending") of Nowcasting and NWP ensemble forecasts in observation space, which constitute the seamless forecasts of the SINFONY. Gridded combined precipitation and reflectivity ensembles are targeted towards hydrologic warnings. Combined Nowcasting- and NWP cell object ensembles help evolve DWD's warning process for convective hazards towards flexible "warn-on-objects.

4) Common Nowcasting and NWP verification systems for precipitation, reflectivity and cell objects help to continuously improve the SINFONY components.

For 2), efficient forward operators for radar volumes (EMVORADO) and visible/infrared satellite data enable direct operational assimilation of these data in an LETKF framework. Advanced model physics (2-moment bulk microphysics with prognostic hail) contribute to an improved forecast of convective clouds, whose simulated life-cycle proofed to be surprisingly realistic.

For 3), the ICON-RUC-EPS forecasts output simulated reflectivity volume can ensembles of the German radar network every 5'. Radar composites and KONRAD3D cell objects and their tracks are generated by the exact same methods as in the Nowcasting. These are seamlessly combined with the STEPS-DWD- and KONRAD3D-EPS Nowcasts with encouraging quality - resting upon the improvements for Nowcasting (1) and NWP (2).

Meanwhile the system has matured and is in the process of operational installation. A number of its components have been run continuously during the last four convective seasons. This presentation will give a short overview on the system components and its performance during the last years.

VAT

Session

Seamless Prediction: Blending and probabilistic techniques based on nowcasting and NWP ensembles

Preferred Contribution Type

Oral Presentation

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