4–8 November 2019, Kraków, Poland
ECSS2019-76

Combining ensembles of NWP and observation-based nowcasting at DWD to improve convective precipitation forecasts

Martin Rempel
Deutscher Wetterdienst, Offenbach, Germany (martin.rempel@dwd.de)

Hazards originating from summerly deep convection—such as heavy precipitation, hail and wind gusts—affect many sectors in daily life. To improve forecasts of these events, the internal project SINFONY (Seamless INtegrated FOrecastiNg sYstem) at Deutscher Wetterdienst (DWD) develops an integrated ensemble prediction system for seamless forecasts on a convective scale from observation time up to +12 h. The system combines observation-based nowcasting and numerical weather prediction (NWP) in a spatio-temporal seamless way.

Up to now, nowcasting is mainly used for the initial 2 h of storm-scale forecasting, whereas NWP systems are only able to reach or outperform the quality of nowcasting at later times. The primary goal of SINFONY is to narrow down this gap by enhancing both systems—nowcasting and NWP—separately as well as by exchanging information between both techniques to serve as a basis for reliable combined products.
To reach this goal, the operational deterministic radar-based nowcasting system will be extended by an ensemble approach to provide probabilistic forecasts. Furthermore, simulated environmental conditions will be included to assess further convective development. The current NWP model-chain will be broadened by a rapid-update-cycle (RUC) ensemble with hourly updates. Since radar network observations serve as data basis for nowcasting, NWP output is transformed into the observational space by a forward operator simulating radar reflectivities.

The SINFONY framework pursues among others the development of an area-based combined product, which provides area-wide precipitation fields and respective probabilities. For this, a probabilistic and a Bayesian combination approach have been applied. The probabilistic method according to Kober et al. (2012) utilizes a weighting function based on a long-term comparative verification of nowcasting and NWP. The Bayesian method according to Nerini et al. (2019) uses the ensemble Kalman filter and is, thus, based on the ensemble spread.

A case study period from May to June 2016 has been selected which include several heavy precipitation events. For this period, a comparison study between both applied methods will be presented.