4–8 November 2019, Kraków, Poland
ECSS2019-171

Generation of an Object-based Nowcasting Ensemble

Robert Feger, Manuel Werner, Rafael Posada, Kathrin Wapler, and Ulrich Blahak
Deutscher Wetterdienst, Offenbach, Germany

The pilot project SINFONY (Seamless INtegrated FOrecastiNg sYstem) at the Deutscher Wetterdienst (DWD) aims at integrating numerical weather prediction (NWP) and nowcasting techniques into a new ensemble-based forecasting system. The current focus is on summertime convective precipitation events with a forecast range up to 12 hours.

The object-based nowcasting system at DWD, called KONRAD3D, is a newly developed deterministic cell detection, tracking and forecasting system operating on observed, quality assured radar reflectivity data, using an adaptive-threshold detection technique as well as a Kalman filter for the cell tracking and forecasting.

As part of the SINFONY project, the generation of an object-based nowcasting ensemble with KONRAD3D ought to correctly assess the uncertainty of tracking and forecasting cell positions and cell evolution in a probabilistic manner. A large part of the uncertainty in object-based nowcasting with KONRAD3D stems from the range of suitable algorithm parameters. This uncertainty is captured by clustering cells from runs with varied parameters, namely the adaptive detection thresholds as well as the Kalman-filter process noise. An object-based ensemble is generated from the according probability distribution of cell positions. The cell evolution, as the other major source of nowcasting uncertainty, is taken into account by assuming a parabola shape opening down for the cell area over time with the maximum size and the cell lifetime as parameter. The presented object-based nowcasting ensemble system filters cell positions and cell life cycle information in an Ensemble Transform Kalman Filter for a stable track and forecast including an estimate of the cell evolution and the associated uncertainty. Case studies involving severe convective events in Germany during May and June 2016 are presented.