SINFONY - Tackling Convective Cell Forecasting by Combining Nowcasting and NWP

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Abstract:

The talk will give an overview on the large ongoing research-to-operations-project SINFONY (Seamless INtegrated FOrecastiNg sYstem) at DWD (which I lead) and will show that current and earlier research at IMK-TRO in the fields of radar meteorlogy, cloud physics, radar forward simulation and convective cells are important ingredients for this project.

To warn about intense summertime convective events is a major task of DWD as a National Meteorological Service, and of course a major challenge. Especially the very intense and rare events are of special interest, but the current tools and products for our forecasters are somewhat limited: while high-resolution observations in space and time like geostationary satellites, radar and lightning data are available in near realtime, there are only quite simple forecast methods like deterministic advection-based Nowcasting to exploit such data in very-short-range forecasting (the next hours). Nowcasting suffers from a lack of life cycle (no growth/decay) and uncertainty information. Our potentially more accurate but very expensive km-scale COSMO- and ICON-LAM-models do not assimilate such observations operationally yet and the initial state is too far from reality when it comes down to single cells.

Current warnings are only based on Nowcasting and are rather coarse in space and timing and short in lead time. NWP-models are only used as "outlook" on much larger temporal and spatial scales. Thus, both forecast methods are not exploited yet to their full potential.

To bridge this methodological gap, DWD currently develops the SINFONY system. If successful, it will enable more systematic and accurate warnings and forecasts tailored for different customers. At first, we target lead times up to 12 h and seamlessly combine results of new ensemble Nowcasting systems and of a new km-scale hourly Rapid Update Cycle ICON-LAM ensemble (RUC) into new precipitation- and cell-related products in observation space, to enable our forecasters to provide more flexible, more targeted and somewhat earlier warnings.

Nowcasting is enhanced by cell life cycle information, with contributions from IMK. NWP will assimilate radar reflectivity and radial wind, MSG-VIS/-IR channels and lightning data. The radar forward operator EMVORADO enables radar data assimilation, as well as model results in observation space for verification and products. For model physics, we test the Seifert-Beheng 2-moment cloud microphysical scheme.