



## **NowCastMIX: Automatic integrated warnings for severe weather on nowcasting timescales at Deutscher Wetterdienst**

Paul James, Bernhard Reichert, and Dirk Heizenreder  
Deutscher Wetterdienst, Offenbach, Germany (paul.james@dwd.de)

NowCastMIX is the central nowcasting guidance system at Deutscher Wetterdienst. It monitors many systems automatically to assess rapidly developing, high-impact mesoscale convective events, including 3D radar volume scans, radar-based cell tracking and extrapolation, lightning detection, calibrated precipitation extrapolations, NWP and live surface station reports. Within the context of the warning decision support process AutoWARN, NowCastMIX integrates the input data into a high-resolution analysis, based on a fuzzy logic approach for thunderstorm categorisation, to provide optimized warnings with a five-minute update cycle for lead times of up to one hour. Feature tracking is undertaken to capture storm direction, allowing individual, tangentially moving cells or cell clusters to be tracked explicitly. Clustering is deployed to reduce spatial complexity and smooth temporal variations to a manageable level for duty forecasters. Separate warnings for persistent heavy rainfall, typically with convective elements embedded within larger scale precipitation fields, are generated by combining radar extrapolations with NWP ensemble forecasts, covering an extended time-scale of up to six hours. Winter nowcasting of snowfall and freezing rain is also performed, combining in-house systems for hydrometeor classification of radar volume data with NWP forecasts. Specialized outputs are provided to civil aviation authorities to warn for severe convection, snowfall and freezing rain. Simplified warning polygons are also sent automatically in real-time for display on a public mobile phone app. Now in its ninth year of operation, a comprehensive and complete set of thunderstorm analyses, tracks and nowcasts over Germany has been created, which is of unique value for ongoing work to improve the system, as well as for addressing climatological aspects of severe convection. Verification shows that NowCastMIX helps to improve the quality of official warnings when used within the AutoWARN process.