



WxFUSION

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This study presents the concept and application of WxFUSION, the Weather Forecast User Oriented System Including Object Nowcasting, an integrated system using observations and numerical model data to nowcast and forecast weather threats. WxFUSION is under continuous development at the Institute of Atmospheric Physics at DLR, the German Aerospace Center.

WxFUSION aims at combining data from real-time observations with nowcasting tools and numerical model forecasts in order to detect, nowcast (0-1 hrs) and forecast (1-24 hrs) target weather objects (TWO) which are pre-defined and specified by user requirements. These TWOs represent severe weather areas like e.g. thunderstorms or heavy rain. The former are detected from space by satellite while the latter are detected by radar. The system's central element for nowcasting TWOs is the fusion of the different data sources by using fuzzy logic, a method that deals with parameter ranges instead of fixed thresholds and allows to account for imprecise observations and forecasts. Based on conceptual models and expert knowledge mathematical functions are defined in order to characterize the influence of a particular data source on the TWO. The functionality of the method is demonstrated in case studies of thunderstorms. The use of numerical model forecasts for the time range one to several hours is accounted for by another part of WxFUSION called forecast validation, where the quality of the forecasts is checked against observations. In a user-defined window in space and time overlapping synthetic (forecast) and real TWOs are searched for. If a synthetic object overlaps an observed object, specific attributes like size, moving speed, moving direction, trend and history are compared and the quality of the forecasted TWO is assessed. This method enables the selection of the best forecast out of an ensemble which can then be used for further predictions of the observed patterns beyond the nowcasting horizon.