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Visualization and Nowcasting for Aviation using online verified ensemble weather radar extrapolation.

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Nowcasting of precipitation events, especially thunderstorm events or winter storms, has high impact on flight safety and efficiency for air traffic management. Future strategic planning by air traffic control will result in circumnavigation of potential hazardous areas, reduction of load around efficiency hot spots by offering alternatives, increase of handling capacity, anticipation of avoidance manoeuvres and increase of awareness before dangerous areas are entered by aircraft. To facilitate this rapid update forecasts of location, intensity, size, movement and development of local storms are necessary.

Weather radar data deliver precipitation analysis of high temporal and spatial resolution close to real time by using clever scanning strategies. These data are the basis to generate rapid update forecasts in a time frame up to 2 hours and more for applications in aviation meteorological service provision, such as optimizing safety and economic impact in the context of sub-scale phenomena.

On the basis of tracking radar echoes by correlation the movement vectors of successive weather radar images are calculated. For every new successive radar image a set of ensemble precipitation fields is collected by using different parameter sets like pattern match size, different time steps, filter methods and an implementation of history of tracking vectors and plausibility checks. This method considers the uncertainty in rain field displacement and different scales in time and space.

By validating manually a set of case studies, the best verification method and skill score is defined and implemented into an online-verification scheme which calculates the optimized forecasts for different time steps and different areas by using different extrapolation ensemble members.

To get information about the quality and reliability of the extrapolation process additional information of data quality (e.g. shielding in Alpine areas) is extrapolated and combined with an extrapolation-quality-index. Subsequently the probability and quality information of the forecast ensemble is available and flexible blending to numerical prediction model for each subarea is possible.

Simultaneously with automatic processing the ensemble nowcasting product is visualized in a new innovative way which combines the intensity, probability and quality information for different subareas in one forecast image.