Improvements of the object-based nowcasting system TRT for automatic thunderstorm and hail warnings in the Alpine area

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TRT (Thunderstorms Radar Tracking) is the operational real-time thunderstorm nowcasting and warning system of MeteoSwiss. We present and discuss the latest improvements. These include an enhanced computation of cell severity, which now gives a specific additional weight to the radar-based, operational hail parameters POH (Probability Of Hail) and MESHS (Maximum Expected Severe Hail Size) for the real-time hail warnings. The specific warning for heavy precipitation is newly computed by using an independent severity parameter. It combines the precipitation accumulation in the cell's footprint, measured by the volumetric radar network in the last 30 minutes, with the 60 minutes forecast for the same cell computed by the operational NowPrecip/NowPAL nowcasting systems and provides an early warning of the risk of heavy precipitation. The issued fully automatic warning is then triggered by the highest of the two warning levels. ZDR-columns detected within thunderstorm cells also have the potential to improve the nowcast of severe convection and hail. The separately computed grid-based ZDR-column area and maximum height are included in the TRT cell properties as additional real-time severe weather information for the forecasters. Finally, TRT also includes an automatic, operational lightning jump detection module for each identified storm cell with a time resolution of 2.5 minutes, as an additional parameter for severe thunderstorms. The improved algorithm will be integrated into the convection nowcasting and warning systems already in use at MeteoSwiss, such as TRT, NowPrecip, NowPAL, COALITION and INCA. It provides the basis for the fully automated thunderstorm and hail warning chain in Switzerland.