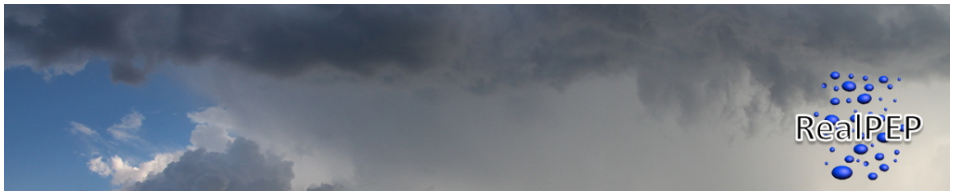

Contribution ID: **59** Type: **Oral presentation**

Radar-based Nowcasting: Spatio-Temporal Analysis of the STEPS Methodology

Tuesday, October 6, 2020 10:20 AM (20 minutes)

Conventional extrapolation nowcasting methods assume that the precipitation fields do not evolve during the lead-time period. In recent years, nowcasting approaches have been developed addressing this limitation. One of those approaches is the short-term ensemble prediction system (STEPS). Based on the assumption that smaller precipitation structures have a shorter lifetime and lower predictability than larger structures, STEPS decomposes the precipitation field into different spatial scales and filters those having a short lifetime and low predictability. The latter is achieved by controlling the observation memory using an auto-regressive (AR) model. Next, STEPS replaces the filtered scales associated with low predictability by a realization of a stochastic noise field.

In this work, the configuration, implementation, and performance of STEPS are studied for its radar-based nowcasting application in Germany. Attention is given to the parameters that control the spatio-temporal evolution of precipitation. Furthermore, the spatial variability of the precipitation field is considered to locally weight the stochastic noise field. Preliminary analysis shows that the performance of STEPS is in particular sensitive to the chosen memory order of the AR model, the resolution scales at which observed precipitation is decomposed, and the spatial integration of predicted precipitation at different scales during the lead-time period. It is also seen that by weighting the noise field according to the local precipitation variability, the skills of the nowcast improve. Moreover, the spatial and temporal structures of the nowcast fields are consistent with observed precipitation fields.

Our preliminary results highlight aspects needed in the configuration of STEPS such as the spatio-temporal properties of the nowcast fields, thereby serving as a basis for an improved nowcasting system in Germany.

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Session Classification: Quantitative Precipitation Nowcasting (QPN)