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Ensemble nowcasting from INCA and AROME-EPS

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The latest radar observations are widely used as the main source for deterministic nowcasting techniques, such as INCA, in operational and research centers. However, this approach does not take into account other sources of information such as Ensemble Prediction Systems (EPS) from the Numerical Weather Prediction (NWP) models such as AROME-EPS. These systems, even though do not outperform the Lagrangian extrapolation for several hours, can provide information of errors in the motion vectors or errors due to growth and decay of precipitation.

INCA is a deterministic Quantitative Precipitation Nowcasting (QPN) system so that the uncertainties and errors in the precipitation prediction can be introduced, an ensemble generator is needed. The created ensembles have to reproduce the temporal and spatial statistical properties of a real rainfall field. Mainly, two existing techniques have been combined: Short Space Fast Fourier Transform (ssFFT) to introduce noise with the proper spatial (and local) correlation and a Conditional Auto-regressive Model (CAR) to keep the temporal decorrelation of each ensemble. Other properties of the rainfall field such as the Wetted Area Ratio (WAR) or the Intensity Mean Flux (IMF) are also used to generate realistic rainfall distribution of the ensemble. Consequently, few parameters are needed in this technique: local spatial decorrelation, anisotropy, temporal decorrelation, Probability of Rain, WAR and IMF.

These parameters can be obtained from the latest radar observation in order to generate ensemble QPN. However, the main goal of this presentation is to introduce the information from AROME-EPS. With this aim, these parameters are also computed for each ensemble member, such as the local spatial decorrelation distance. They are merged with the INCA nowcasting parameters by a temporal and case-dependent weight and then used to provide realistic ensembles of different meteorological situations, narrowing the spread among members to the variance provided by AROME-EPS.

The final EnQPN is probabilistically verified for two different periods; July 2016 and January 2017. Finally, some statistical spatial and temporal properties of the final set of ensembles have also been verified to determine if the methodology introduces enough uncertainty while keeping some properties from the original field and the EPS system.