9.8 A BAYESIAN COMBINATION OF RADAR-BASED NOWCASTS WITH COSMO-E PRECIPITATION FORECASTS

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The radar-based nowcasting of precipitation employs real-time data from a network of weather radars to produce an extrapolation forecast for the coming few hours. The main assumption relates to the persistence of observed precipitation echoes in moving coordinates, which eventually determines the predictability and uncertainty of the nowcast. One important task of nowcasting is thus to correctly quantify such uncertainty and use that information to optimally blend the radar extrapolation with the forecast from a numerical weather prediction (NPW) model.

Typically, nowcasting systems have based their blending schemes on empirical rules using fixed linear weights pre-calculated with some long-term forecast error statistics. More sophisticated systems have tried to assess in real-time the relative skill of nowcast and NWP forecast in order to introduce some flow-dependency in the merging of the two.

In this study, we propose a nowcasting blending scheme based on the ensemble Kalman filter approach. The prediction step of the filter is implemented as a standard radar extrapolation technique, while the update step uses the spread of the NWP ensemble (COSMO-E, in this study) to integrate the radar nowcast with the NWP forecast in a Bayesian fashion.

Results for several precipitation events over the Swiss Alps are presented, while a number of implementation issues are discussed. In particular, we propose to perform the update step of the ensemble Kalman filter in the Principal Component subspace in order to simplify the task of computing and inverting the error covariance matrices with high-resolution precipitation fields.