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Stochastic ensemble simulation of precipitation fields for data assimilation applications

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A common approach for hydrological forecasts is data assimilation, which often requires large ensembles of precipitation fields as input data. The member size of precipitation field ensembles generated by atmospheric models is often limited due to the required computational resources. As an alternative we stochastically generate ensembles of precipitation fields which are conditioned on different precipitation observations, e. g. rain gauge observations, path-averaged rain rates estimated using Commercial Microwave Links, and radar measurements. Following the Random Mixing approach we generate precipitation fields as a linear combination of unconditional spatial random fields, where the spatial dependence structure is described by copulas. The weights of the linear combination are chosen in such a way that the observations and the spatial structure of precipitation are reproduced. This construction enables creating arbitrarily large ensembles relatively fast and requires relatively low computational power, which is an advantage given by the method. We will generate such ensembles of precipitation fields utilizing a synthetic data set, which allows an evaluation against a known reference. In preliminary studies, we will investigate if we can extend the ensemble spread in precipitation by using the stochastically generated precipitation field ensembles.