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# Probabilistic SAL - Evaluating the spatial properties of probabilistic precipitation simulations

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With the increasing development of downscaling methods and extended range forecasts with both multi-site and probabilistic characteristics, spatial verification methods able to handle probabilistic precipitation simulations are required for informing a range of applications like distributed hydrological modelling. Indeed, assessing the spatial coherence, in the sense of realistic spatial properties, of an ensemble of downscaled precipitation fields remains an open question. A probabilistic version of the spatial verification method SAL (Structure Amplitude Location) is here proposed for assessing the spatial properties of precipitation fields, notably the structure and the position of precipitation objects inside a given area. Skill scores are developed based on the structure and location components of the probabilistic SAL, allowing comparison between different ensembles of downscaled fields. The probabilistic SAL is then applied to compare several 20-year precipitation downscaling experiments from the ERA-40 reanalysis to a 8 km resolution over two catchments in France using the Stepwise ANalogue Downscaling method for HYdrology (SANDHY). The experiments correspond to different predictor domain configurations of the SANDHY method and are compared in terms of local performance and proposed structure and location skill scores. Configurations using locally optimised predictor domains lead to higher local performance, higher location skill score but lower structure skill score than the ones using the same predictor domains–and therefore the same analogue dates–over the whole catchment. Both skill scores furthermore depend on the catchment size, as do the standard SAL components. These scores appear as valuable tools for assessing the spatial properties of probabilistic downscaled fields relevant for hydrological impacts.