Validation of spatial variability in downscaling results from the VALUE perfect predictor experiment

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VALUE is an open European network to validate and compare downscaling methods for climate change research. Within VALUE a systematic validation framework to enable the assessment and comparison of both dynamical and statistical downscaling methods has been developed. In the first validation experiment the downscaling methods are validated in a setup with perfect predictors taken from the ERA-interim reanalysis for the period 1997 – 2008. This allows to investigate the isolated skill of downscaling methods without further error contributions from the large-scale predictors.

One aspect of the validation is the representation of spatial variability. As part of the VALUE validation we have compared various properties of the spatial variability of downscaled daily temperature and precipitation with the corresponding properties in observations. We have used two test validation datasets, one European-wide set of 86 stations, and one higher-density network of 50 stations in Germany.

Here we present results based on three approaches, namely the analysis of i.) correlation matrices, ii.) pairwise joint threshold exceedances, and iii.) regions of similar variability. We summarise the information contained in correlation matrices by calculating the dependence of the correlations on distance and deriving decorrelation lengths, as well as by determining the independent degrees of freedom. Probabilities for joint threshold exceedances and (where appropriate) non-exceedances are calculated for various user-relevant thresholds related for instance to extreme precipitation or frost and heat days. The dependence of these probabilities on distance is again characterised by calculating typical length scales that separate dependent from independent exceedances. Regionalisation is based on rotated Principal Component Analysis. The results indicate which downscaling methods are preferable if the dependency of variability at different locations is relevant for the user.