A user-targeted synthesis of 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. A key deliverable of VALUE is the development of a systematic validation framework to enable the assessment and comparison of both dynamical and statistical downscaling methods. VALUE's main approach to validation is user-focused: starting from a specific user problem, a validation tree guides the selection of relevant validation indices and performance measures. We consider different aspects: (1) marginal aspects such as mean, variance and extremes; (2) temporal aspects such as spell length characteristics; (3) spatial aspects such as the de-correlation length of precipitation extremes; and multi-variate aspects such as the interplay of temperature and precipitation or scale-interactions.

Several experiments have been designed to isolate specific points in the downscaling procedure where problems may occur. Experiment 1 (perfect predictors): what is the isolated downscaling skill? How do statistical and dynamical methods compare? How do methods perform at different spatial scales? Experiment 2 (Global climate model predictors): how is the overall representation of regional climate, including errors inherited from global climate models? Experiment 3 (pseudo reality): do methods fail in representing regional climate change?

Here, we present a user-targeted synthesis of the results of the first VALUE experiment. In this experiment, downscaling methods are driven with ERA-Interim reanalysis data to eliminate global climate model errors, over the period 1979-2008. As reference data we use, depending on the question addressed, (1) observations from 86 meteorological stations distributed across Europe; (2) gridded observations at the corresponding 86 locations or (3) gridded spatially extended observations for selected European regions. With more than 40 contributing methods, this study is the most comprehensive downscaling intercomparison project so far. The results clearly indicate that for several aspects, the downscaling skill varies considerably between different methods. For specific purposes, some methods can therefore clearly be excluded.