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# Spatio-temporal Consistent Post-Processing of Daily Mean Temperature Projections

## – Application in Troendelag of Norway

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In many applications, coarse-resolution climate projections need to be downscaled to a finer spatial resolution. However, current approaches are unable to model the sub-grid spatio-temporal variability, and thus cannot correct the possible biases in spatial and/or temporal structure of the climate projections. We propose a procedure that carries out bias correction and downscaling in two steps. In the first step, we identify and correct the biases at model scale. We upscale gridded observations to the grid of the climate model. We then correct the errors in the first two moments that relate to spatial features such as latitude, longitude and elevation, as well as the errors in the linear trend and seasonality. In the second step, we model the spatio-temporal residual variability at observation scale using a statistical model. With this model, we can draw a set of pseudo-observations and use these as a base to stochastically downscale the bias-corrected climate projections from the first step to the observation scale.

We employed the daily mean surface temperature projections from two EUR11 CORDEX data sets based on different GCM-RCM combinations, and the gridded observation data set (SeNorge version 2.1) at $1\times1$ km resolution. We applied the method to data from Troendelag, a region in the central part of Norway. We estimated the statistical models in the control period from 1970 to 2005, and produced adjusted projections at a resolution of $1\times1$ km from 2065 to 2100. We found that compared to empirical quantile mapping, the proposed method generates results that have more consistency in space and time.