



Extending limited in situ mountain weather observations to the baseline climate: A true verification case study

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Climate records, with twenty years of data or more, are virtually absent in high mountain regions. While global atmospheric model-based products (e.g., reanalysis data) provide an important complement to available observations by offering long-term data sets for the entire globe, their spatial resolution is generally too coarse to correctly represent complex orography and thus mountain weather.

This study presents the statistical downscaling method sDoG that combines the completeness of reanalysis data with the accuracy of in situ observational records, to obtain longer-term yet high-resolution mountain weather information for the past. The ability of sDoG to extend short-term daily air temperature records to a baseline climate period is evaluated at the example of the Vernagtbachstation in the European Alps. Namely, sDoG is trained using observations from 2002 to 2012 and evaluated over the remaining 23 years from 2001 back to 1979. Uncertainty estimates provided by cross validation within the training period are then compared to the true uncertainties found for the evaluation period.

sDoG is shown to outperform a set of reference models in terms of day-to-day, year-to-year and seasonal variability. Yet, we pinpoint an important limitation of the stationarity assumption underlying sDoG - and statistical downscaling in general - as a particular challenge regarding the estimation of summer air temperature trends in mountain regions and invite to discuss possible remedies.