



## **Probabilistic Downscaling of Precipitation Data in a Subtropical Mountain Area: A two-step approach**

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In this study, a two-step probabilistic downscaling approach is introduced and evaluated. The method is exemplarily applied on precipitation observations in the subtropical mountain environment of the High Atlas in Morocco. The challenge is to deal with a complex terrain, heavy skewed precipitation distributions and a sparse amount of data, both spatial and temporal. In the first step of the approach, a transfer function between distributions of large-scale predictors and of local observations is derived. The aim is to forecast cumulative distribution functions with parameters from known data. In order to interpolate between sites, the second step applies multiple linear regression on distribution parameters of observed data using local topographic information. By combining both steps, a prediction at every point of the investigation area is achieved. Both steps and their combination are proved by cross-validation and by splitting the available dataset into a trainings- and a validation-period. The estimated quantiles show that both, the original distributions of precipitation amounts and the probability of zero daily precipitation can be reproduced sufficiently. This approach is found to be adequate for application even in areas with difficult topographic circumstances and low data availability.