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Statistical Downscaling Of Local Climate In The Alpine Region

Severin Kaspar, Andreas Philipp, and Jucundus Jacobeit
Augsburg, Augsburg, Germany (severin.kaspar@geo.uni-augsburg.de)

The impact of climate change on the alpine region was disproportional strong in the past decades compared to the surrounding areas, which becomes manifest in a higher increase in surface air temperature. Beside the thermal changes also implications for the hydrological cycle may be expected, acting as a very important factor not only for the ecosystem but also for mankind, in the form of water security or considering economical aspects like winter tourism etc. Therefore, in climate impact studies, it is necessary to focus on variables with high influence on the hydrological cycle, for example temperature, precipitation, wind, humidity and radiation. The aim of this study is to build statistical downscaling models which are able to reproduce temperature and precipitation at the mountainous alpine weather stations Zugspitze and Sonnblick and to further project these models into the future to identify possible changes in the behavior of these climate variables and with that in the hydrological cycle. Beside facing a in general very complex terrain in this high elevated regions, we have the advantage of a more direct atmospheric influence on the meteorology of the exposed weather stations from the large scale circulation. Two nonlinear statistical methods are developed to model the station-data series on a daily basis: On the one hand a conditional classification approach was used and on the other hand a model based on artificial neural networks (ANNs) was built. The latter is in focus of this presentation. One of the important steps of developing a new model approach is to find a reliable predictor setup with e.g. informative predictor variables or adequate location and size of the spatial domain. The question is: Can we include synoptic background knowledge to identify an optimal domain for an ANN approach? The yet developed ANN setups and configurations show promising results in downscaling both, temperature (up to 80 % of explained variance) and precipitation (up to 60 % of explained variance).