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Analysis of Predictor Fields in Non-Linear Statistical Downscaling Approaches

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During the Project Virtual Alpine Observatory (VAO) a Statistical Downscaling (SD) framework was developed to simulate local target variables with hydrological background, for example temperature or precipitation, at two high mountainous alpine weather stations, the Zugspitze in Germany and Hoher Sonnblick in Austria. Within the SD-framework methodological focus lies on non-linear approaches like Circulation Type Classification (CTC) or Artificial Neural Networks (ANN). In this contribution an evaluation of how the SD-Models handle the large-scale predictor variables will be given. On the one hand resulting weather types of the CTC approach are analyzed. On the other hand insight in weights optimized by ANNs shall be given. In addition centers of variance within the used predictor variable setups will be derived from principal component analyses (PCA) and autoencoders. An autoencoder represents a special ANN configuration, which can be used for dimension reduction in a similar way like a PCA, but in contrast works in a non-linear manner. As a result more explained variance can be derived from autoencoders using a set of hidden neurons compared to PCA when considering an equal amount of principal components. The temporal development of resulting time series of predictor variablity and their spatial representation in the observation period are finally used to achieve insight in the synoptic scale dynamics which are responsible for the variability of the target variables.