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Ensemble Postprocessing of Vertical Temperature Profiles using Standardized Anomalies

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Statistical postprocessing of output from numerical weather prediction models has long been used for bias-removal or further downscaling—mostly for single locations or (quasi-)horizontal fields. This study ventures into the post-processing of forecasts of vertical temperature profiles. The shape of these profiles is a decisive factor for the occurrence of thunderstorms and lightning.

The standardized anomalies model output statistics (SAMOS) approach is applied to vertical temperature profiles observed with radiosondes. Basic idea of SAMOS is summarized as follows: Firstly, climatologies are estimated from the observations and the numerical weather prediction (NWP) output, respectively, in order to scale both data sets. Secondly, the statistical model is built on the scaled data.

Observations are taken from stations in Germany (Bergen, Lindenberg, Idar-Oberstein, Kümmersbruck) which launch radiosonde four times a day. The ECMWF-EPS provides the prediction data. It contains 50 perturbed members and 1 control member. ECMWF-reforecast data are used to estimate the model climatology and to train the statistical model.

The climatologies are estimated with generalized additive models (GAM). They reveal different mean vertical profiles for different launching hours, e.g., near-surface inversions are visible at 00 UTC and 06 UTC. Moreover, annual cycles are larger closer to the surface. Scaling reduces these features. Results and verification for the period of time from September 2016 to January 2017 will be shown.