Variational bias correction for radiosonde Temperature

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Due to various causes artificial biases can be found in meteorological observations. The use of biased observations in the analysis leads to systematic errors in the resulting analysis. This is important in case of reanalysis, especially for radiosondes, which are used as "anchor" for other observations.

One method to correct biased observations is variational bias correction (VarBC), In VarBC the bias of the given observation is computed using a linear predictor model based on a small number of predefined predictors and the corresponding unknown bias parameters. The 4D-Var assimilation system is used in order to adjust the observation using the whole state described by the analysis. In this work a variational bias correction method is applied to radiosonde temperature and data.

Radiosonde temperatures tend to have a warm bias relative to the satellite data in the stratosphere and upper troposphere. In this case stations with the same radiosonde equipment can be grouped together, thereby increasing the sample size for the bias evaluation. An offline bias estimation method for radiosondes with similar equipment is implemented and used in order to find the best grouping of radiosondes.

The temperature biases are pressure dependent. At the moment we are studying a method using three different pressure layers and the solar elevation as predictor. Even more importantly we cannot assume that the assimilating model is free of systematic temperature errors. Extensive testing and intercomparison with independent data sources (such as GPS data) and bias estimation methods is needed. An overview of the results achieved so far is given.