Retrieving missing segments of daily temperature series: Can nonlinear methods help to improve the results?

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It is not unusual for series of meteorological measurements to contain shorter or longer periods of missing values. Using records from other locations, such gaps can often be filled, with an accuracy sufficient for a range of tasks. The presented study focuses on the possibility of capturing the respective spatial relationships among atmospheric variables, with a special emphasis to the potential of employment of nonlinear time series analysis techniques. The target variables include daily mean, minimum and maximum temperatures from several weather stations in Central Europe. Two different types of predictor data are tested: Series available for other nearby measuring sites and gridded NCEP/NCAR reanalysis data. Various approaches to the creation of transfer functions are compared, based on application of both linear (multiple linear regression, weighted spatial averaging) and nonlinear (different architectures of neural networks, local models) mappings. The preliminary results indicate that although some nonlinear techniques can offer better performance than standard linear methods on average, the degree of improvement varies with the geographical location of the target station, type of predictand and availability of other measurements in the surrounding area.