Geophysical Research Abstracts
Vol. 17, EGU2015-9077, 2015
EGU General Assembly 2015

A way towards a new precipitation calibration data set for climate reconstructions

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The focus of spatial climate reconstructions or climate field reconstructions (CFRs) is currently shifting away from temperatures towards precipitation [Kaufman et al. 2014], since (especially reduced) moisture availability poses a bigger challenge to societies [IPCC]. However, precipitation is a variable that is notoriously difficult to reconstruct with the limited data availability in the past [Gomez-Navarro et al. 2014], due to its complex spatial covariance structure and short decorrelation length. A second factor hindering a good reconstruction is the short length of the data sets that are commonly used for calibrating the reconstruction, such as the CRU data or the GPCC data which go back to 1900.

We present an attempt to use BARCAST, a method originally developed by [Tingley and Huybers 2010] for CFRs, to generate a probabilistic ensemble of instrumental observation based precipitation data reaching back into the 19th century. The aim is to 1) use such a data set as the calibration input as well as a sensible estimator for the covariance structures in precipitation CFRs and 2) to test the ability of BARCAST to generate correct precipitation reconstructions. Apart from quality issues with early precipitation data, which should be corrected for in the used input data (GHCN V3), there were technical and computational challenges to overcome, as the original BARCAST was used with much less input data and code efficiency played a less important role than readability.

We compare the results using a "prediction run" to current reanalysis data as well as the gridded GHCN (V2) gridded data set. While our attempt shows some promising results, the observed mismatch shows the shortcomings of the used spatio-temporal model in BARCAST and the changes necessary to adapt BARCAST for use in precipitation reconstructions.

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