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Pseudo-proxy experiments using an annually resolved marine proxy network over the North Atlantic

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Most reconstructions of large scale climate employ Climate Field Reconstruction (CFR) approaches using proxy records, to obtain spatially resolved patterns of past climate change. We test two statistical multivariate methods to reconstruct past SSTs of the North Atlantic Ocean, namely principal component regression (PCR) and canonical correlation analysis (CCA). The locations of our pseudo proxies are based on collection sites of the annually resolved absolutely dated marine proxy Arctica islandica. The different methods are assessed for investigating differences of the CFR that arise using idealized pseudo-proxies and noise-contaminated pseudo-proxies. Moreover, the skill of the CFR was assessed according to different calibration periods and for different networks of pseudo proxy locations within the NA basin.
The results indicate that the climate model used as the basis of the pseudoproxy experiment has a more pronounced effect in the reconstruction skill than the calibration period and the method. The noise-contaminated pseudo-proxy experiments are also important for the evaluation of the methods, as larger differences in the spatial patterns of the reconstruction skill become evident. More profound changes were seen between the two statistical methods when the size of the proxy network is smaller than five, making the PCA a more appropriate method for the reconstruction of the NA SSTs. Despite these differences, the results show that the marine network of Arctica islandica can be used to reconstruct skillfully the spatial patterns of SSTs at the eastern North Atlantic basin during the last millennium.