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Millennial temperature reconstruction intercomparison and evaluation

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Abstract. There has been considerable recent interest in paleoclimate reconstructions of the temperature history of the last millennium. A wide variety of techniques have been used. The interrelation among the techniques is sometimes unclear, as different studies often use distinct data sources as well as distinct methodologies. Here recent work is reviewed and some new calculations performed with an aim to clarifying the consequences of the different approaches used. A range of proxy data collections introduced by different authors is used to estimate Northern Hemispheric annual mean temperatures with two reconstruction algorithms: (1) inverse regression and, (2) compositing followed by variance matching (CVM). It is found that inverse regression tends to give large weighting to a small number of proxies and that the second approach (CVM) is more robust to varying proxy input. The choice of proxy records is one reason why different reconstructions show different ranges. A reconstruction using 13 proxy records extending back to AD 1000 shows a maximum pre-industrial temperature of 0.25 K (relative to the 1866 to 1970 mean). The standard error on this estimate, based on the residual in the calibration period, is 0.14 K. Instrumental temperatures for two recent years (1998 and 2005) have exceeded the pre-industrial estimated maximum by more than 4 standard deviations of the calibration period residual.

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