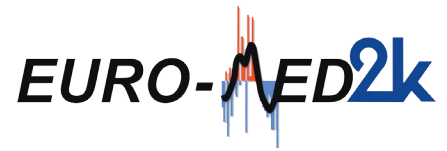


# Synthesizing paleoclimatic data to reconstruct 2000 years of European/Mediterranean temperature change



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The PAGES Euro-Med2k Working Group was initiated to reconstruct and analyze the climate of the European/Mediterranean region within the past 2000 years. To date, the Working Group's efforts have been focused on collecting proxies with high spatio-temporal resolution from natural and documentary archives. This meeting was attended by 20 participants and focused on discussing new proxy evidence for summer temperatures in the Euro-Med region, with annual resolution and continuous sampling over time. Eleven annually-resolved tree-ring chronologies that preserve low-frequency variability and documentary records from 10 European countries/regions were selected for the subsequent European scale reconstructions to be developed (Figure 1 shows the two longest series from the Alps and Northern

Scandinavia; Büntgen et al. 2011; Esper et al. 2012).

During the second part of the meeting the strengths and weaknesses of different statistical methods to reconstruct temperature variations over the past 2000 years were discussed. Composite-Plus-Scaling (CPS) and Bayesian Hierarchical Modeling (BHM) were considered as options for the mean European estimates and BHM for the gridded reconstructions over the last 1200 years. BHM has recently been proposed as a method suitable to overcome the known loss-of-variance problems of conventional multivariate statistical reconstruction methods (Tingley and Huybers 2010; Werner et al. 2012). One of the advantages of BHM is the possibility to form models for the underlying processes and the system response (instrumental measurements and proxies) and to assess

different contributions to uncertainties. Discussions also included questions concerning the representation of low and high frequency variability in the proxy-based reconstructions, calibration/verification issues, uncertainty estimation, spatial dependence and autocorrelation. The third and final part of the workshop was devoted to discussing the approaches for model-data comparisons at continental scale. Results from a large multi-model archive, including simulations prior to Fernández-Donado et al. (2012) and those belonging to the CMIP5/PMIP3 initiative were considered.

The Group submitted peer-reviewed papers on two new European summer temperature reconstructions: a 2100 year CPS and BHM-based mean European and a 1200 year BHM-based gridded reconstruction. The workshop outputs will be used to address the extreme character of the recent decades in the context of the last two millennia and the comparisons of reconstructions with the ensemble of simulations for key climate periods related to the medieval period and the "Little Ice Age". This will allow us to assess the degree of consistency between the mutually independent model and paleo proxy histories at regional scales, involving the ability of climate models to reproduce the continental summer temperature response to external forcings and to generate realistically the low-frequency internal variability at these spatial scales.

## References

- Büntgen U et al. (2011) *Science* 331: 578-582  
 Esper J et al. (2012) *Nature Climate Change*, doi: 10.1038/nclimate1589  
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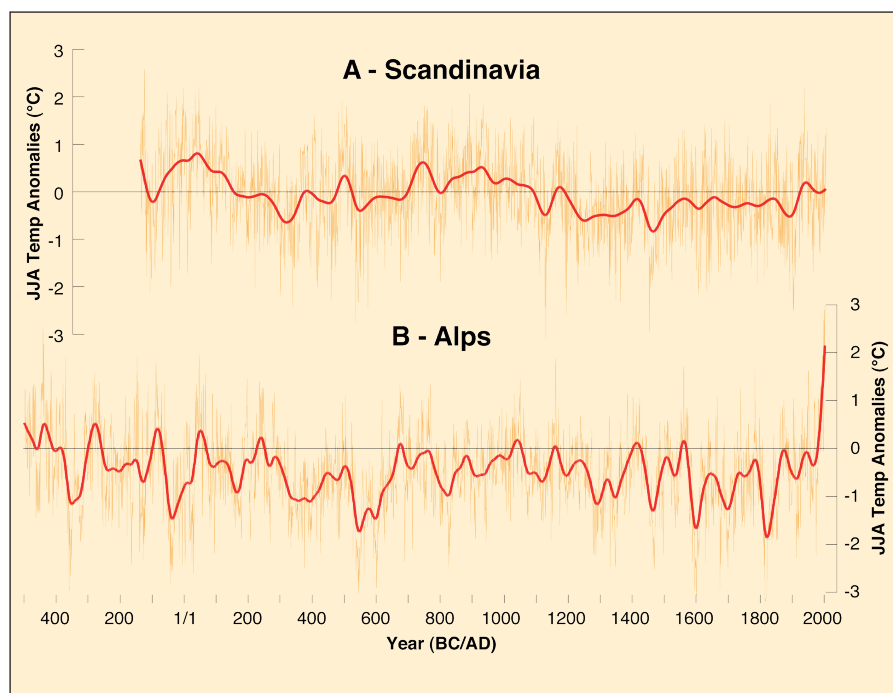


Figure 1: Reconstructed 2000 years of Northern Scandinavian (A) and Alpine (B) summer temperatures based on tree-ring data (Büntgen et al. 2011; Esper et al. 2012)

