https://doi.org/10.22498/pages.25.3.161

The Pollen-Climate Methods Intercomparison Project (PC-MIP)

Basil Davis

Caux, Switzerland, 12-15 June 2017

Fossil pollen provide one of the most widely available sources of proxy climate data for the Quaternary period. Quantitative climate reconstructions from pollen data were first pioneered over 70 years ago (Iversen 1944) and since then the number of different methods has expanded greatly. The PC-MIP workshop was organized with a view to improving collaboration and coordination within the pollen-climate community, to compare and review the main methods currently in use, and to make recommendations for best practice and future development. The first PC-MIP cross-community workshop was attended by 28 researchers from 15 countries, including 14 early-career scientists.

The workshop comes at a time of new methodological innovations such as Bayesian statistics, and the rapidly increasing availability of fossil and modern pollen datasets through public pollen databases such as neotomadb.org. At the same time, we are also increasingly asking more from pollen data such as reconstructions from new regions and earlier time periods, seasonally resolved reconstructions, and always better assessment of uncertainties and potential errors.

The workshop

The first half of the workshop focused on general issues related to all or most methods. Background was provided by invited speakers on the history of pollen–climate transfer functions, common criticisms and problems, and alternative perspectives from non-pollen proxies in the marine and terrestrial domains.

This was then followed by breakout groups looking at a variety of issues, including questions related to which climate variables can be reconstructed, non-analogue vegetation and climate problems, modern calibration data, multi-model and multi-proxy approaches, spatial autocorrelation, pollen productivity and long-distance transport. The uniformitarianism assumption was also discussed in relation to novel climates (such as low CO_2 during glacial periods) and the changing influence of human activity, as well as other taphonomic, laboratory and sampling issues.

The second half of the workshop focused on issues specific to certain methods or families of methods. Background was provided by talks on Regression Methods (WA, WA-PLS), Assemblage Methods (MAT, ANN, Response Surfaces), Inverse Modeling, Indicator Methods (PDF, MCR) and Bayesian frameworks (see also Fig. 1). This was then followed by breakout groups to review the various strengths and weaknesses of each method, current and future developments and potential improvements, and the availability of training sets, software and other resources for each method.

Final discussions included development of standardized fossil and modern pollen datasets that will allow a direct "bench-test" comparison between current methods, as well as providing reference datasets to evaluate future methodological improvements. Datasets have already begun to be selected from different time periods and locations, with a particular emphasis on datasets that can be compared with other proxies.

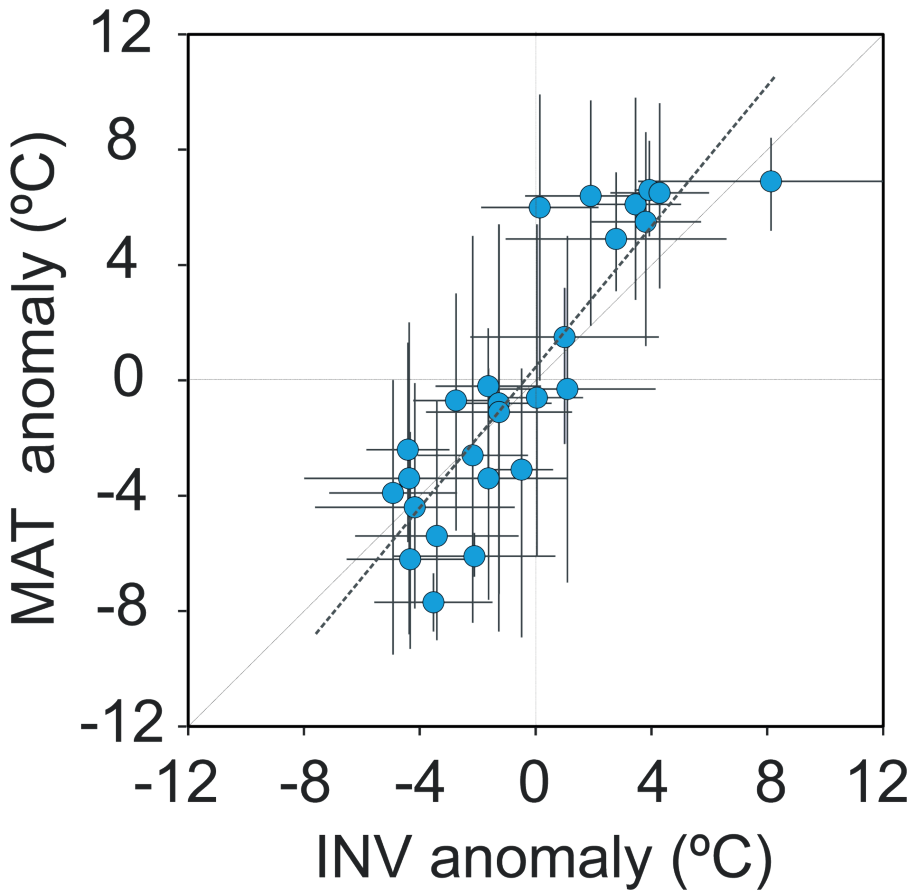

Figure 1: The use of the Modern Analogue Technique (MAT) in the Mediterranean region has been criticized because of potential bias caused by human impact and the possible dominance of precipitation over temperature as a control on vegetation. The Inverse Modeling (INV) method uses a process-based vegetation model to reconstruct the most likely climate to explain a fossil pollen assemblage, independent of the proposed sources of error with MAT. The figure shows a comparison of MAT and INV methods on the same mid-Holocene samples in the region (data from Davis et al. 2003 and Wu et al. 2007). The close agreement between the methods indicates little of the proposed bias in the MAT.

Future plans

The results of the workshop are currently being condensed into a co-authored manuscript that will be submitted in early 2018. A dedicated PC-MIP website will be online soon to provide a guide to current resources for anyone interested in pollen-climate reconstructions. Further smaller, follow-up workshops are planned to complete the standardized test datasets and bench-test evaluation of current methods.

ACKNOWLEDGEMENTS

The workshop was supported by the Swiss National Science Foundation, PAGES, INQUA and the University of Lausanne.

AFFILIATIONS

Institute of Earth Surface Dynamics (IDYST), University of Lausanne, Switzerland

CONTACT

Basil Davis: basil.davis@unil.ch

REFERENCES

Davis B et al. (2003) Quat Sci Rev 22: 1701-1716

Iversen J (1944) Geol Fören Förhandl 66: 463-483

Wu H et al. (2007) Clim Dyn 29: 211-229