

## 2<sup>nd</sup> Australasia2k Network workshop: Data synthesis and research planning

# AUS2K

Meeting of the PAGES Aus2k Working Group - Perth, Australia, 27–29 April 2011

JOËLLE GERGIS<sup>1</sup>, P. GRIERSON<sup>2</sup>, A. LORREY<sup>3</sup>, J. PALMER<sup>4</sup> AND S.J. PHIPPS<sup>5</sup>

<sup>1</sup>School of Earth Sciences, University of Melbourne, Australia; jgergis@unimelb.edu.au

<sup>2</sup>School of Plant Biology, University of Western Australia, Australia; <sup>3</sup>National Institute of Water and Atmospheric Research, Auckland, New Zealand; <sup>4</sup>Gondwana Tree-ring Laboratory, New Zealand; <sup>5</sup>Climate Change Research Centre, University of New South Wales, Australia

The goals of the 2<sup>nd</sup> Australasia2k (Aus2k) workshop were to discuss the feasibility of producing an Australasian-wide temperature reconstruction, and identify a series of sub-regional studies to form a special Aus2k issue of *Journal of Climate*.

The Vice-Chancellor of the University of Western Australia, Professor Alan Robson, opened the workshop highlighting the importance of understanding natural climate variability. The two sessions on the first day were an open symposium devoted to showcasing state-of-the-art research developments in each of the main high-resolution Australasian paleoarchives.

Ed Cook provided an overview of the three multi-millennial tree ring chronologies from Australia and New Zealand. He was followed by Janice Lough who reviewed the suite of Great Barrier Reef coral records and promising new work from the North West Australian coast into the Indian Ocean. Tas van Ommen then outlined the utility of using the eastern Antarctic Law Dome ice core to infer changes in Southern Ocean circulation and precipitation anomalies in southwestern Australia.

Around 120 paleoclimatologists, hydrologists, ecologists, oceanographers, agricultural scientists and various natural resources managers attended the symposium resulting in energized discussions

during the sessions and the deliciously-catered breaks.

The afternoon session was the start of the closed program for the core Aus2k group to discuss the issues associated with observational and proxy-climate data. Ed Cook reminded the group of the importance of replication wherever possible and the implications of using misdated series to infer high frequency climate variations.

Meteorologist Ailie Gallant then outlined the potential and limitations of using observational gridded datasets available in Australasia. We learned that the high spatial coherence of temperature over Australia (which takes up the majority of the Australasian domain) means that less than ten observational stations can capture over 80% of variance in mean temperature over the region, providing they are randomly and evenly distributed. This is perhaps unsurprising given that continental Australia is predominately a very flat, arid continent.

The rest of the day was spent discussing how we reassess the climate sensitivity of the existing Australian database, perhaps exploiting the clear co-variations observed between rainfall and temperature in many part of the region. This involved examining a series of spatial field correlation maps for the records identi-

fied through the compilation of the Aus2k metadatabase (see example in Fig. 1).

Day 2 of the workshop focused on a range of relevant multi proxy analyses that have been published for North America, Asia, South America, Europe (Cook et al., 2004; Cook et al., 2010; Neukom et al., 2010a; Neukom et al., 2010b) or are currently in development, to achieve the Regional 2k Network's objectives (Australia, New Zealand and the Southern Hemisphere).

The group was shown a preliminary 500-year annually resolved summer temperature reconstruction that has been developed by Joelle Gergis and others at the University of Melbourne. The group discussed the issue of proxy selection and the feasibility of developing a continuous, non-geographically biased temperature reconstruction spanning the past millennium. We will now move forward with refinements generated by the group to produce an Aus2k temperature paper to provide our regional contribution to a broader Regional 2k Consortium paper.

In recognition of the fact that most of Australasia's paleoclimate records is comprised of decadal to multi-decadal sedimentary records, Scott Mooney gave an overview of the availability of the Australian material that spans the last 2000 years.

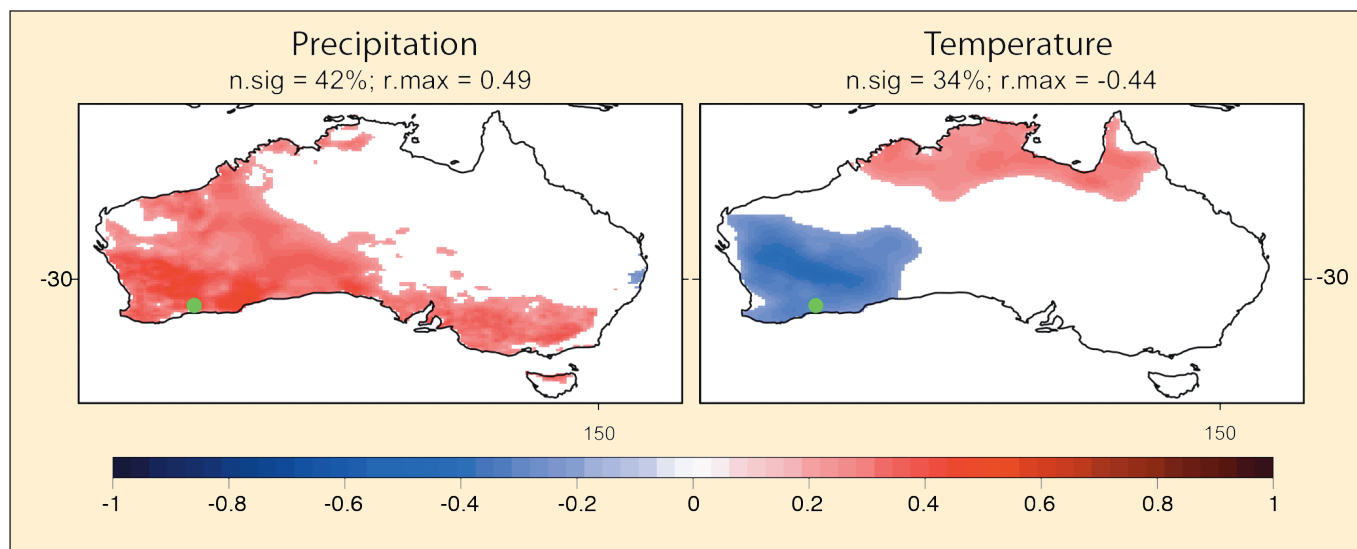


Figure 1: Spatial field correlation of the Cullen and Grierson (2009) Western Australian *Callitris columellaris* tree-ring record with the Australian Bureau of Meteorology  $0.05^\circ \times 0.05^\circ$  ( $5 \times 5$  km) Australian Water Availability Project (AWAP) temperature grid for winter half year (June–November) temperature (right) and rainfall (left). Correlations calculated over the 1911–2005 period. Green circle indicates location of tree-ring record.

Andrew Lorrey also illustrated a synoptic pressure reconstruction approach using speleothems and low resolution data. These reconstructions will form an important means of independently supporting low frequency trends and variability identified from the high-resolution material.

To round off the second day of presentations, Steven Phipps provided a thought-provoking discussion of the role of modeling in understanding the climate of the last 2000 years. He provided an example of evaluating the stability of regional teleconnections and influence

of different climate forcings using simulations from the CSIRO Mk3L model.

The workshop wrapped up on a very productive note with the development of a proposed list of 15 papers for consideration in the *Journal of Climate* Aus2k special issue, and a clear direction forward to deliver Australasia's best available science for the Regional 2k global synthesis.

### Acknowledgements

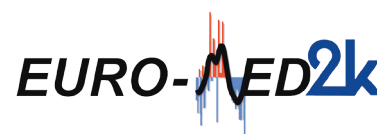
The meeting organizers would like to thank PAGES, Rio Tinto Iron Ore, the Australian Department of Climate Change and Energy Efficiency and the University of Western Australia.

### References

- Cook, E., Woodhouse, C., Eakin, M., Meko, D. and Stahle, D., 2004: Long-Term Aridity Changes in the Western United States, *Science*, **306**: 1015-1018.
- Cook, E.R., Anchukaitis, K.J., Buckley, B.M., D'Arrigo, R.D., Jacoby, G.C. and Wright, W.E., 2010: Asian Monsoon Failure and Megadrought During the Last Millennium, *Science*, **328**(5977): 486-489.
- Cullen, L. and Grierson, P., 2009: Multi-decadal scale variability in autumn-winter rainfall in south-western Australia since 1655 AD as reconstructed from tree rings of *Callitris columellaris*, *Climate Dynamics*, **33**(2-3): 433-444.
- Neukom, R., et al., 2010a: Multi-centennial summer and winter precipitation variability in southern South America, *Geophysical Research Letters*, **37**: doi: 10.1029/2010GL043680.
- Neukom, R., et al., 2010b: Multiproxy summer and winter surface air temperature field reconstructions for southern South America covering the past centuries, *Climate Dynamics*, doi:10.1007/s00382-010-0793-3.



## The first Euro-Med2k regional workshop: Review of current knowledge, available data and plans for multiproxy integration



Alcalá de Henares, Spain, 22-24 November 2010

JÜRIG LUTERBACHER<sup>1</sup>, D. MCCARROLL<sup>2</sup>, D. FLEITMANN<sup>3</sup>, F.J. GONZALEZ-ROUCO<sup>4</sup>, E. ZORITA<sup>5</sup>, S. SALCEDO<sup>6</sup> AND B. VINTHER<sup>7</sup>

<sup>1</sup>Department of Geography, Justus Liebig University of Giessen, Germany; juerg.luterbacher@geogr.uni-giessen.de

<sup>2</sup>School of the Environment and Society, Swansea University, Wales, UK; <sup>3</sup>Oeschger Centre for Climate Change Research and Institute of Geological Sciences, University of Bern, Switzerland; <sup>4</sup>Department of Astrophysics and Atmospheric Sciences, Complutense University-IGEO, Madrid, Spain; <sup>5</sup>Helmholtz Centre for Materials and Coastal Research, Germany; <sup>6</sup>Superior Polytechnic School, University of Alcalá, Madrid, Spain; <sup>7</sup>Centre for Ice and Climate, Niels Bohr Institute, University of Copenhagen, Denmark

Focus 2 (Regional Climate Dynamics) of PAGES places a strong emphasis on regional climate studies that consider past climate dynamics on seasonal to millennial timescales and (sub-) continental or ocean-basin spatial scales (PAGES, 2009).

The first Europe/Mediterranean 2k (Euro-Med2k) regional meeting was held in Alcalá de Henares, close to Madrid, and brought together specialists working in different fields related to proxy data, statistical climate reconstructions and data

modeling comparison. Discussions focused firstly on current knowledge and availability of documentary sources as well as on seasonally to multidecadally resolved terrestrial and marine archives (Fig. 1) covering the past 2000 years (2 ka) in

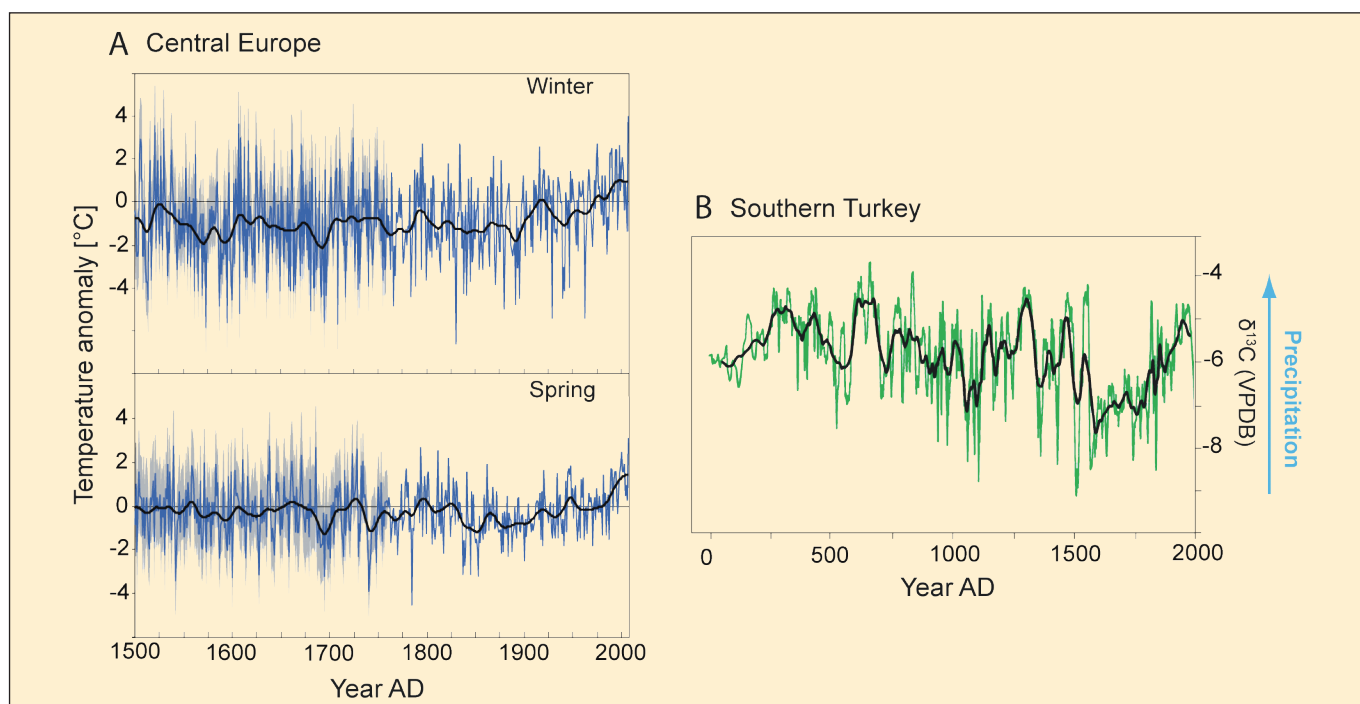


Figure 1: **A)** Winter and Spring Central European temperature reconstructions AD 1500-2007 based on documentary indices 1500-1759 and instrumental measurements 1760-2007 (Dobrovolný et al., 2010). Temperatures are expressed as anomalies from the 1961-1990 average and completed with Gaussian low-pass filter (30 years window). The error bands are approximate 95% confidence intervals. **B)** Stalagmite  $\delta^{13}\text{C}$  record of effective moisture from Kocain Cave in Southern Turkey (Göktürk et al., submitted).