

# 2nd Aus2K Regional Network Workshop: data synthesis and research planning

27–29th April 2011, University of Western Australia, Perth Australia

Joelle Gergis, Pauline Grierson, Andrew Lorrey, Jonathan Palmer and Steven J. Phipps

Joelle Gergis: School of Earth Sciences, University of Melbourne, Australia  
Pauline Grierson: School of Plant Biology, University of Western Australia, Australia  
Andrew Lorrey: National Institute of Water and Atmospheric Research, Auckland, New Zealand  
Jonathan Palmer: Gondwana Tree-ring Laboratory, New Zealand  
Steven J. Phipps: Climate Change Research Centre, University of New South Wales, Australia.

The goals of the 2nd 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 palaeoarchives.

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 south-western Australia.

Around 120 palaeoclimatologists, hydrologists, ecologists, oceanographers, agricultural scientists and various natural resources managers attended the symposium resulting in very energizing debate during the sessions and the deliciously-catered breaks. The scale of the event was only possible thanks to PAGES funding and the generous support from Rio Tinto Iron Ore and the University of Western Australia.

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.

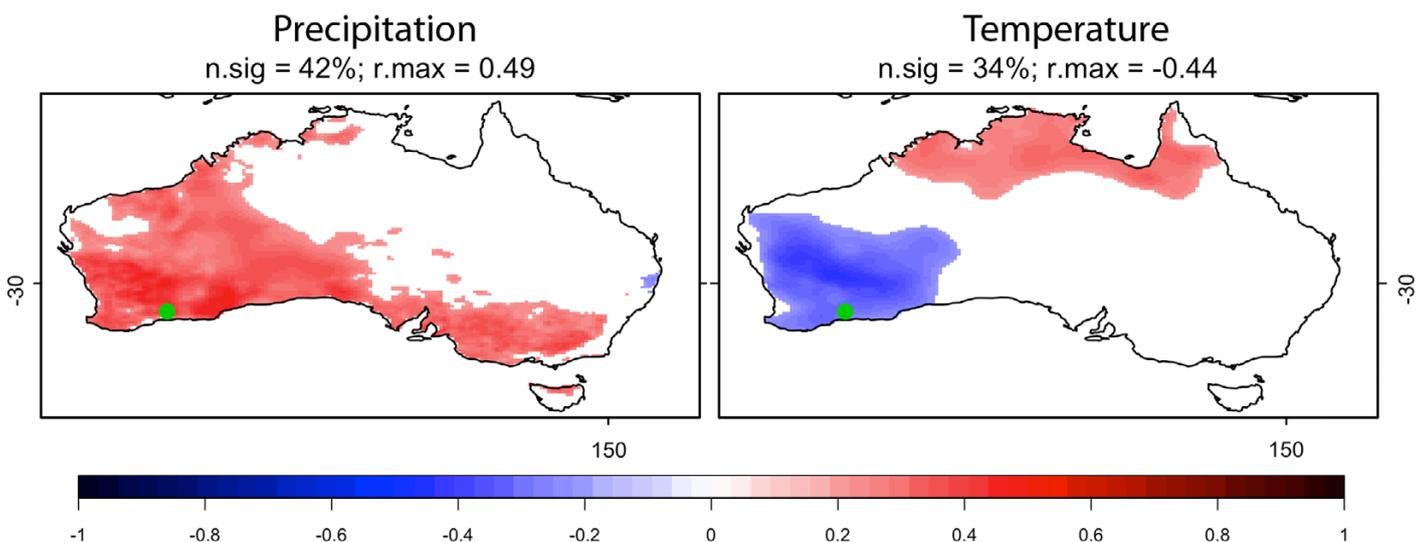


Figure 1. Spatial field correlation of the Cullen and Grierson (2009) Western Australian *Callitris columellaris* tree ring record with the Australian Bureau of Meteorology 0.050 x 0.050 (5kmx5km) Australian Water Availability Project (AWAP) temperature grid for winter half year (June–November) temperature (right) and rainfall (left). Correlations calculated over the 1911–2005 period. Green circle indicates record location.

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 identified through the compilation of the Aus2K metadatabase (see example in Figure 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 the broader Regional 2K network's consortium paper.

In recognition of the fact that most of the Australasia's palaeoclimate records comprise decadal–multi-decadal sedimentary records, Scott Mooney gave an overview of the availability of the Australian material that spans the last 2000 years. 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 modelling in 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.

#### 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: 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: 433–444.
- Neukom, R., Luterbacher, J., Villalba, R., Küttel, M., Frank, D., Jones, P. D., Grosjean, M., Esper, J., Lopez, L. and Wanner, H., 2010a. Multi-centennial summer and winter precipitation variability in southern South America. *Geophysical Research Letters* 37 (L14708): 10.1029/2010GL043680.
- Neukom, R., Luterbacher, J., Villalba, R., Küttel, M., Frank, D., Jones, P. D., Grosjean, M., Wanner, H., Aravena, J. C., Black, D. E., Christie, D. A., D'Arrigo, R., Lara, A., Morales, M., Soliz-Gamboa, C., Srur, A., Urrutia, R. and von Gunten, L., 2010b. Multiproxy summer and winter surface air temperature field reconstructions for southern South America covering the past centuries. *Climate Dynamics*: 10.1007/s00382-010-0793-3.