



## **An Australasian hockey stick and associated climate wars**

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Multiproxy warm season (September–February) temperature reconstructions are presented for the combined land–ocean region of Australasia ( $0^{\circ}$ – $50^{\circ}$ S,  $110^{\circ}$ E– $180^{\circ}$ ) covering the last millennium (1000–2001CE). Using between 2 (R2) and 28 (R28) paleoclimate records, four 1000-member ensemble reconstructions of regional temperature are developed using four different statistical methods: principal component regression (PCR), composite plus scale (CPS), Bayesian hierarchical models (LNA), and pairwise comparison (PaiCo). The reconstructions are then compared with a three-member ensemble of GISS-E2-R climate model simulations and independent paleoclimate records. Decadal fluctuations in Australasian temperatures are remarkably similar between the four reconstruction methods. There are, however, differences in the amplitude of temperature variations between the different statistical methods and proxy networks. When the largest R28 network is used, the warmest 30-yr periods occur after 1950 in 77% of ensemble members over all methods. However, reconstructions based on only the longest records (R2 and R3 networks) indicate that single 30- and 10-yr periods of similar or slightly higher temperatures than in the late twentieth century may have occurred during the first half of the millennium. Regardless, the most recent instrumental temperatures (1985–2014) are above the 90th percentile of all 12 reconstruction ensembles (four reconstruction methods based on three proxy networks — R28, R3, and R2).

An earlier manuscript describing this study and its results was accepted for publication in the *Journal of Climate* in May 2012, after two thorough rounds of review. However, as described by Gergis (2016), after the early online release of the paper, a typo in the methods section was identified. While the paper said the study had used “detrended” data – observed temperature data from which the longer-term trends had been removed – the study had in fact used raw data. Both raw and detrended data have been used in similar studies, and both are scientifically justifiable approaches. Instead of taking the easy way out and just correcting the single word in the page proof, we asked the publisher to put our paper on hold and remove the online version while we assessed the influence that the different method had on the results.

Gergis (2016) describes the saga of attacks on the study and the authors by bloggers and online experts over the next four years, until the manuscript was finally accepted and published in July 2016 following a further three rounds of peer review and four new reviewers. This is another cautionary tale of the climate wars described by Mike Mann, efforts to discredit studies showing that recent large-scale warming is very likely outside the range of natural climate variability over the last millennium.

Gergis, J., R. Neukom, A. J. E. Gallant and D. J. Karoly (2016) Australasian temperature reconstructions spanning the last millennium. *J Clim.*, 29, 5365–5392.

Gergis, J., (2016) How a single word sparked a four year saga of climate fact checking and blog backlash. *The Conversation*, 11 July 2016. <https://theconversation.com/how-a-single-word-sparked-a-four-year-saga-of-climate-fact-checking-and-blog-backlash-62174>