INTERNATIONAL JOURNAL OF CLIMATOLOGY, VOL. 17, 197–199 (1997)

COMMENT ON 'HISTORICAL THERMOMETER EXPOSURES IN AUSTRALIA' BY N. NICHOLLS *ET AL*.

WARWICK S. HUGHES
Tasman Institute, Melbourne, Australia
email: whughes@tasman.com.au

Received 27 November 1995
Revised 22 April 1996
Accepted 20 May 1996

ABSTRACT

This short note presents seasonal time series for the 1888−1946 period of Adelaide temperature records comparing Glaisher stand and Stevenson screen data, as examined by Nicholls *et al.*. Site changes and a station move may account for discontinuities in the seasonal trends, which make the data unrepresentative as a test of comparative thermometer exposure. Research directions are suggested that may cast light on these problems in the data.

KEY WORDS : Australia; Adelaide; Glaisher stand; Stevenson screen; climate change.

INTRODUCTION

Nicholls *et al.* (1996) have brought to light records pertaining to meteorological equipment from colonial times for Western Australia, Queensland, and South Australia. They give a brief account of the 1887−1948 comparison of temperatures measured in a Glaisher stand against those from a Stevenson screen and conclude that, 'Over the year, the mean temperatures were about 0·2°C warmer in the Glaisher stand, relative to the Stevenson screen.' For their source data they rely on two unpublished reports, by Richards *et al.* (1992, 1993), which essentially are records of numerous statistical exercises carried out on the Glaisher and Stevenson data by students at Swinburne University of Technology in Melbourne. These reports do not contain an adequate analysis of the possible causes of significant discontinuities in the time series, despite Richards *et al.* (1993) containing a summary detailing at least six screen changes and a station move, events which in most cases correspond with breaks in trends.

It is this writer's view that the Richards *et al.* (1992, 1993) reports are not adequate supporting references under the circumstances and that Nicholls *et al.* (1996) should have submitted their data for review as a new project.

ADELAIDE THERMOMETER EXPOSURE COMPARISON

Dual readings commenced in 1887 and multiple records exist until 1948, which leads Nicholls *et al.* (1996) to make the point that 'This period of comparison far exceeds other comparisons between stands and screens, as reported in Parker (1994).' Perhaps the long period of this comparison is less of an advantage given the numerous equipment and site changes. It is possible that interest in the comparison only lasted a decade or so and then it simply 'ran on' because nobody took a decision to cease the dual readings. Factors such as differential equipment deterioration could have set in, causing some of the trends seen in the difference time series. Nicholls *et al.* (1996) present no time series showing trends over the 61-year period and make no mention of equipment changes or site variations.

Richards *et al.* (1993), in Appendix 5, record a four page summary of station history supplied by Dr N. Nicholls and compiled from Bureau of Meteorology records and archives, which details as best as the old records will permit, at least six screen changes over the period, with at times more than two sets of instruments recording

CCC 0899-8418/97/020197-03 $17.50

concurrently and a site change to new offices in 1944. In this summary the old style thermometer enclosure is referred to as a 'Greenwich stand'. Richards *et al.* (1993, p. 14), refer to the four page summary as '. . . vague and ambiguous, and did not make clear when and where equipment was moved.' Climatologists who have researched 100-year-old records would not be surprised at this. However, readers of Nicholls *et al.* (1996) are provided with no hint of the inhomogeneities related to these site changes, which can be seen in both the maxima and minima difference seasonal time series shown in Figure 1.

The maxima graph shown in Figure 1 reveals discontinuities in the data at the time of four of the instrument changes, which might have been enough to impress the Richards *et al.* (1993) team that external non-climatic forces were impacting on their data at specific times. Field-book entries summarized in Richards *et al.* (1993) indicate five screens operating at various times over the 1887−1944 period, sometimes with parallel operation. Changes are indicated in January 1898, October 1901, May 1910 (missing readings), November 1925, October 1938, July 1939, June 1940, November 1940 (these 1940 installations were 45 m north), and July 1943 (possible site change), and in February 1944 a continuous series of readings since 1925 ceased, and the 1940 installations continued at a new site. Several of these dates appear to be reflected in abrupt changes in the course of some of the seasonal traces. However, Richards *et al.* (1993) concluded that the variations in monthly maximum differences could '. . . be seen as randomly scattered.'

Three changes in the dimensions and volume of the Stevenson screens are recorded. The first screen measured 38·1 × 55.9 × 45·7 cm (0·097 m^3), from January 1898 a larger unit measured 61 × 69 × 38·1 cm (0·16 m^3) and in October 1901 this increased to 61 × 78·7 × 40·6 (0·19 m^3).

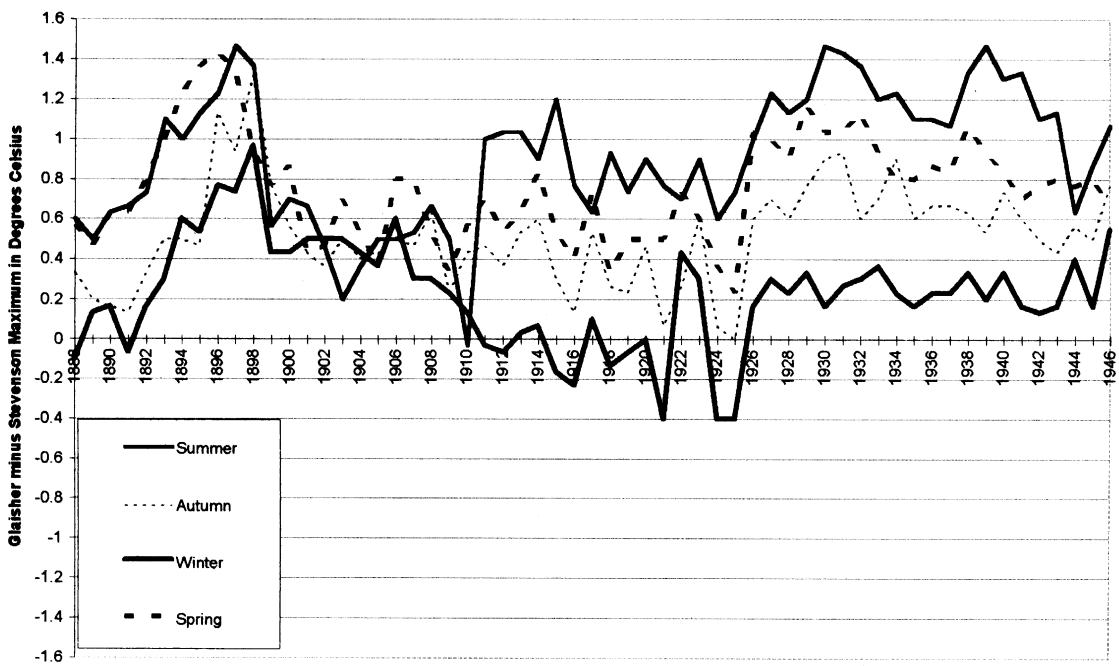

Figure 1. Glaisher stand maximum temperatures minus Stevenson screen maximum temperatures recorded at Adelaide from 1888 to 1946, for the four seasons.

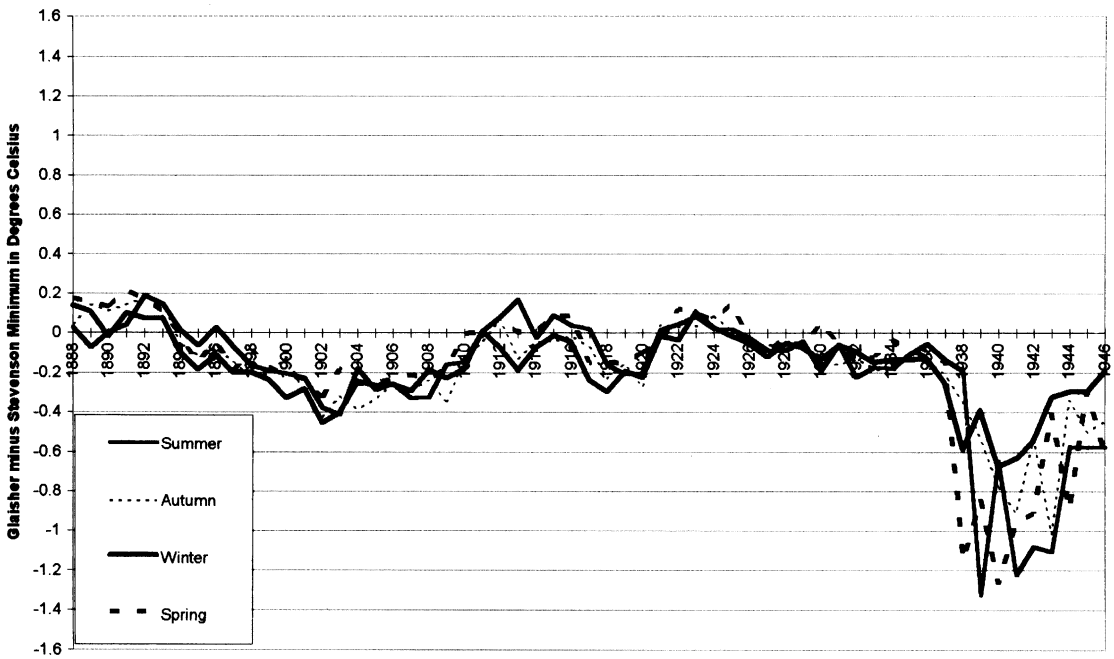

Figure 2. Glaisher stand minimum temperatures minus Stevenson screen minimum temperatures recorded at Adelaide from 1888 to 1946, for the four seasons.

In the case of the minima differences Figure 2, Richards *et al.* (1993) are able to draw attention to the gross aberration in the traces ca. 1937–1947, which as they point out is due to a drastic decline in the Glaisher readings from August 1938 and relate this to '. . . some unknown influence . . . '.

CONCLUSIONS

Nicholls *et al.* (1996) have not presented the data and associated historical records that would be required to support valid conclusions as to the Glaisher–Stevenson difference revealed by the Adelaide dual temperature readings.

The onus is on Nicholls *et al.* to do more with this data and related records if their findings are to be considered along with those of Parker (1994). At the very least there is a need to compare these data with other temperature records from the Observatory, as well as nearby records from other sites.

REFERENCES

Hughes, W. S. 1995. 'Comment on D. E. Parker, ''Effects of Changing Exposure of Thermometers at Land Stations'' ', *Int. J. Climatology*, **15**, 231–234.

Nicholls, N., Tapp, R., Burrows, K. and Richards, D., 1996. 'Historical thermometer exposures in Australia,' *Int. J. Climatology*, **16**, 705–710.

Parker, D. E. 1994. 'Effects of changing exposure of thermometers at land stations', *Int. J. Climtology*, **14**, 1–31.

Parker, D. E. 1995. 'Effects of changing exposures of thermometers at land and stations; a reply', *Int. J. Climatology*, **15**, 235.

Richards, D., Wilson, G., Sheng How, K., Kang, S., Tan, A. and Chueng, S. 1992. *Comparison of Temperature Measures*, Report for Bureau of Meteorology Research Centre, Swinburne University of Technology, November 1992, 176 pp.

Richards, D., Nind, G., Ramchand, K. and Keyhoe, P. 1993. *Differences in Temperature Recordings between the Glaisher Stand and Stevenson Screen*, Report for Bureau of Meteorology Research Centre, Swinburne University of Technology, October 1993, 123 pp.