

CORRESPONDENCE

Climatic change in Australia - can it be documented by
temperature records?

In the discussion about the evidence of climatic change in Australia and specially of secular variations of temperature (Australian Meteorological Magazine No.21, June 1958, pages 76-77, Joint Colloquia 20 March 1958), the possibility of an effect of the exposure of the instruments is mentioned. Therefore, it may be interesting to draw attention to the following passage in the introduction to Appendix 1 of the publication of the Commonwealth Bureau of Meteorology, 1918, (Rainfall Observations made in South Australia and Northern Territories); this appendix contains the first part of the long series of temperature values for Adelaide:

"...Later on, in 1869, duplicate instruments were mounted on a skeleton stand of the Greenwich pattern, and in 1887 a Stevenson screen of the usual pattern was erected. Still later, in 1898, an enlarged Stevenson screen similar to the pattern now adopted by the Commonwealth Meteorological Bureau, was added. Comparisons of the different modes of exposure with the Greenwich stand show that, as may be expected, the thermometers in the house and Stevenson screen as a rule read higher than the Greenwich stand during the night, and lower during the day. This is specially noticeable in the summer,⁺ when the thermometers on the Greenwich stand will occasionally read as much as 2° higher than the others. The Greenwich stand records which are those given in the tables⁺ are probably a little too high during the day, and a little too low at night."

As a matter of fact, the differences between the mean temperature of summer (November-February), t_s , and winter (May-August), t_w , at Adelaide show a well pronounced decrease which seems to have taken place in the first or second decade of the present century:

difference $t_s - t_w$ (1857-1909): 9.8°C, $\delta_m = .13$ °C,

difference $t_s - t_w$ (1910-1957): 8.8°C, $\delta_m = .12$ °C

The mean values corresponding to the generally quoted 30 year periods 1881-1910 and 1911-1940 are 9.8 and 9.0°C, respectively. Within the first 59 years of the whole record there are 12 with values 10.5°C, in the following 42 years none.

+ The underlining is the writer's

These figures were computed in order to see if there was a secular variation in the "continentality" ($t_s - t_w$) which could be a good argument in favour of the view that a climatic change had occurred. Variations of the same sign and magnitude were indeed found for Alice Springs and Sydney. Considering the cited remarks, however, it must be concluded that there is no evidence of a variation of the true temperature regime.

This statement is valid in the first instance for Adelaide, but even without checking the details (which is beyond the possibilities of the writer of these lines), it must be regarded as extremely likely that similar changes in the housing of the thermometers have been introduced, within the first decades of our century, in other long-established meteorological stations. Therefore, unless their homogeneity can be proved beyond reasonable doubt, temperature series had better not be used as evidence of climatic change.

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REPLY

I agree with Dr.Schwerdtfeger that one cannot put over-much reliance on the earlier temperature records when searching for evidence of climatic change. For that reason among others I went on to consider the changes in distribution of precipitation and pressure which I regard as much more significant.

As to the apparent decrease in the range between summer and winter mean temperatures, Dr. Schwerdtfeger's conclusion, that effects of change in type of thermometer screen are such that there is no evidence of any true variation, may possibly be true for Alice Springs and Sydney where changes of screen and site have occurred. But I am puzzled as to why he should say this applies to Adelaide. According to the notes given in World Weather Records (Smithsonian Miscellaneous Collections, Vols. 79, 90 and 105) it appears that from May 1860 until the end of 1940 at least, the exposure throughout of these thermometers was "a modified improved form of the thermometer stand used at Greenwich" i.e. a form of Glaisher screen (Shaw, Manual of Meteorology, Vol. 1, p.193). The site of the screen in the Observatory grounds also remained unchanged over this period. As regards siting, exposure and quality of personnel, I suppose this Adelaide temperature record to be the most homogeneous in Australia.

Doubt as to the climatic significance of temperature changes recorded at Adelaide may still arise, of course, owing to the growth of the city. Apart from the increasing warmth of cities in winter associated with increasing use of heating, there may also be an appreciable effect in summer of the increasing use of water on gardens, etc. owing to the consequent evaporational cooling.

It appears there exist both for Adelaide and Sydney records for a number of years during which the old screens were run in parallel with the Stevenson pattern. It seems that these data might be valuable in establishing corrections to the older data which might be useful at other less built-up places in the region, provided the history as to screen types and changes could be ascertained reliably. At least it would be useful to have a better idea of the magnitude of uncertainties introduced by the changes in screen.

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