A TEMPERATURE RECORD FOR SOUTHEASTERN AUSTRALIA 1860–1910

Linden Ashcroft, David Karoly and Joëlle Gergis
School of Earth Sciences, University of Melbourne, Australia

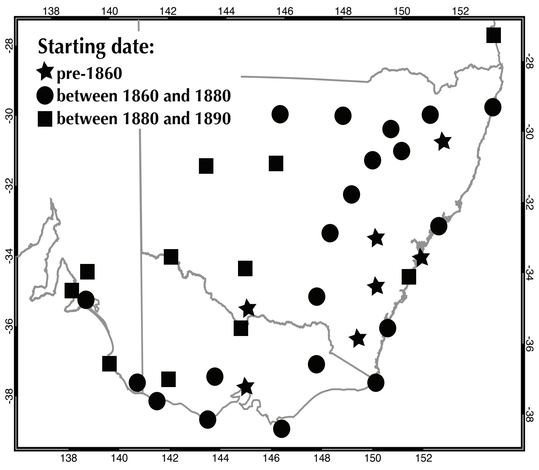
Introduction

- The current high-quality temperature data for Australia begin in 1910.
- Earlier data exist, but are often ignored due to questions of quality, and a systematic change from Glaisher thermometer stands to Stevenson screens at the start of the 1900s.
- These data are valuable for examining long-term temperature variations across southeastern Australia, the county's most highly populated region.

How can we improve the quality of these early observations?

Step 1. Identify long-term temperature stations

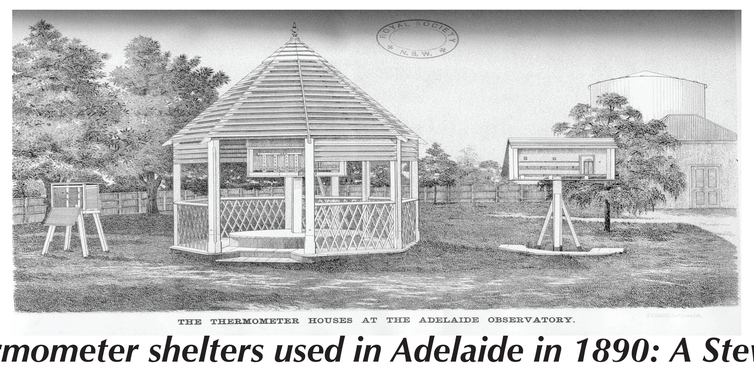
- Looking for stations with monthly maximum (Tmax) and minimum (Tmin) temperature pre-1890.
- 38 locations identified, 16 represented by the same station for the whole period. Others are made of composite stations.
- Starting date of data gets generally later as you move inland.



Locations of long-term temperature observations in southeastern Australia.

Step 2. Find important metadata

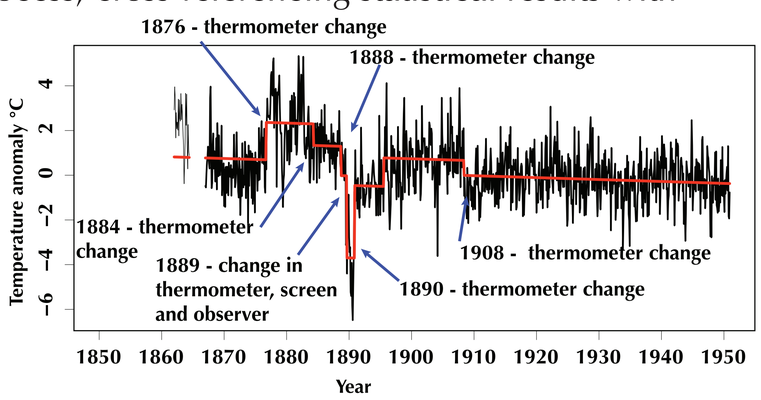
- Detailed search through physical and digital station history files.
- Note site changes, instrument changes, shelter changes and observer changes that may influence the temperature record.



Three thermometer shelters used in Adelaide in 1890: A Stevenson screen (left), a thermometer shed (centre) and a Glaisher stand (right).

Step 3. First round adjustments

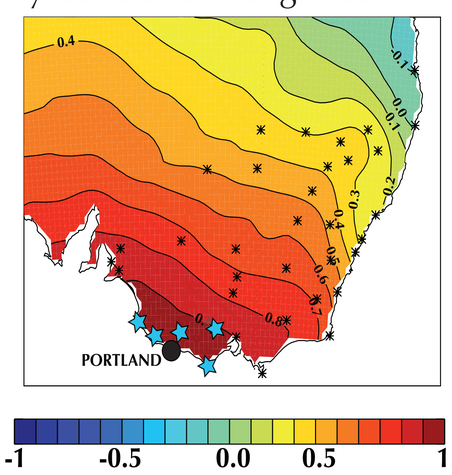
- Using the penalized maximal *F* test from the RHtestsV3 package to identify changepoints that are significant, and those significant with metadata support.
- This was an iterative process, cross-referencing statistical results with metadata until all changepoints were significant and plausible.
- More than half the changepoints in both Tmax and Tmin were supported by metdata.



Adjustments made to monthly Newcastle Tmax anomalies, with supporting metadata marked.

Step 4. Second round adjustments using a reference series

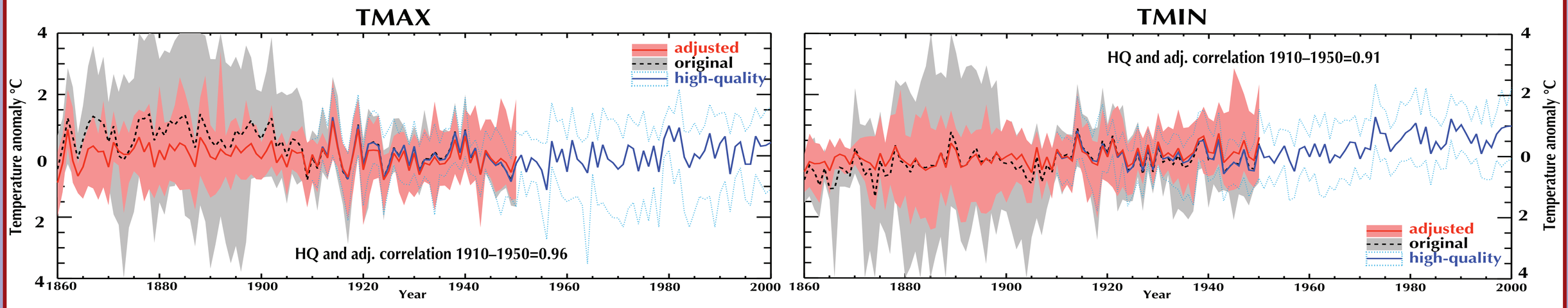
- Neighbouring stations identified using monthly correlations of gridded temperature anomalies.
- A reference series was developed for each location using the sum of weighted monthly anomalies.
- At least 3 neighbouring stations with a correlation of 0.5 or more were needed to make a reference series.
- Using the penalized maximal *t* test, results from Step 3 were tested against the reference series for each location.



Correlations between Portland Tmax monthly anomalies and surrounding region. Portland reference series stations are marked with a star.

Results

- A decrease in the variance from 1860–1910.
- Step change associated with the change of screen has been reduced.
- Good correlation with high-quality data for overlapping period.
- There are earlier historical records that could extend this back to 1828.



Averaged observations of original data (1860–1950), adjusted data (1860–1950) and high-quality data (1910–2000) for Tmax and Tmin. The maximum and minimum anomalies for each year from each dataset are also plotted.

SEARCH
South Eastern Australian Recent Climate History

More info? Visit **www.climatehistory.com.au** or please email **l.ashcroft@student.unimelb.edu.au**. Thank you!

Australian Government
Australian Research Council