A temperature record for southeastern Australia, 1840 to 1910

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Australia's high guality temperature dataset extends from 1910 to present. However, many earlier temperature records exist in government sources and historical collections, dating back to first European settlement in 1788. This study is the first large-scale effort in the Australian region to use early instrumental data to develop a 19th century temperature record for southeastern Australia. It aims to fill a significant gap in the understanding of pre-20th century climate variations in the Australian region. Monthly temperature data from 38 stations are the basis of a newly developed historical temperature network for southeastern Australia. These locations were chosen for their spatial coverage and data availability from 1860 to the present. The statistical penalised maximal Fand t-tests (Wang et al., 2007; Wang, 2008) were used in conjunction with detailed station history reports to identify and adjust inhomogeneities. The F-test identifies changepoints in a time series on its own, while the t-test uses a reference series to identify discontinuities in the record of interest. Both tests were applied to establish an 'optimal' temperature network for the region. Cluster analysis determined highly-correlated neighbours for each location, allowing reference series to be calculated using weighted monthly anomalies. The majority of statistically identified inhomogeneities were supported by documented changes in instrumentation or location, highlighting the importance of consulting station history information to confirm the veracity of any statistically significant change. Additional records from historical sources were then used to extend the temperature record back to at least 1840 for several key locations. Some of these records were kept by convicts trained in meteorological observing, while others come from amateur observers in early settlements. Each source is handled differently, with a range of adjustments and uncertainty estimates applied depending on the available metadata. The network was then used to assess temperature variations in southeastern Australia from 1840-1910. The influence of global circulation features like the El Niño-Southern Oscillation (ENSO) on relative temperature variations in the 19th century were compared to modern temperature fluctuations. In particular, the stability of the ENSO-southeastern Australian temperature relationship was examined to verify an apparent weakening of the regional ENSO teleconnection in the mid-1800s suggested by recently developed palaeoclimate reconstructions for the region. References Wang, X. L., Wen, Q. H. and Wu, Y. (2007). Penalized Maximal t Test for Detecting Undocumented Mean Change in Climate Data Series. Journal of Applied Meteorology and Climatology, 46(6): 916-931. doi:10.1175/JAM2504.1. Wang, X. L. (2008). Penalized Maximal F Test for Detecting Undocumented Mean Shift without Trend Change. Journal of Atmospheric and Oceanic Technology, 25(3): 368-384. doi:10.1175/2007JTECHA982.1.