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A minimally-adjusted (not homogenised), historical temperature profile for south-eastern Australia
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Marohasy & Abbot's South-East Australian Historical Temperature Reconstruction, 1887-2013.

Surface air temperatures as measured at weather stations around the world are routinely homogenised before they are used to report climate variability and change. The adjustment methodology relies on algorithms that determine homogeneity relative to other locations, and typically results in significant remodeling of individual temperature series. In a just-published book chapter[1], Jennifer Marohasy and John Abbot produce a temperature reconstruction for south-east Australia – free of homogenisation.

It begins in 1887, ends in 2013, and indicates a rate of warming of 0.3 degree Celsius per century – shown by the blue line in Chart 1. A linear trend, however, is a poor representation of the data. Marohasy and Abbot suggest the temperature profile for this region is better described as comprising significant inter-annual variability, with statistically significant cooling from 1887 to 1949 of 1.5 degree Celsius per century, followed by statistically significant warming of 1.9 degree Celsius to 2013.

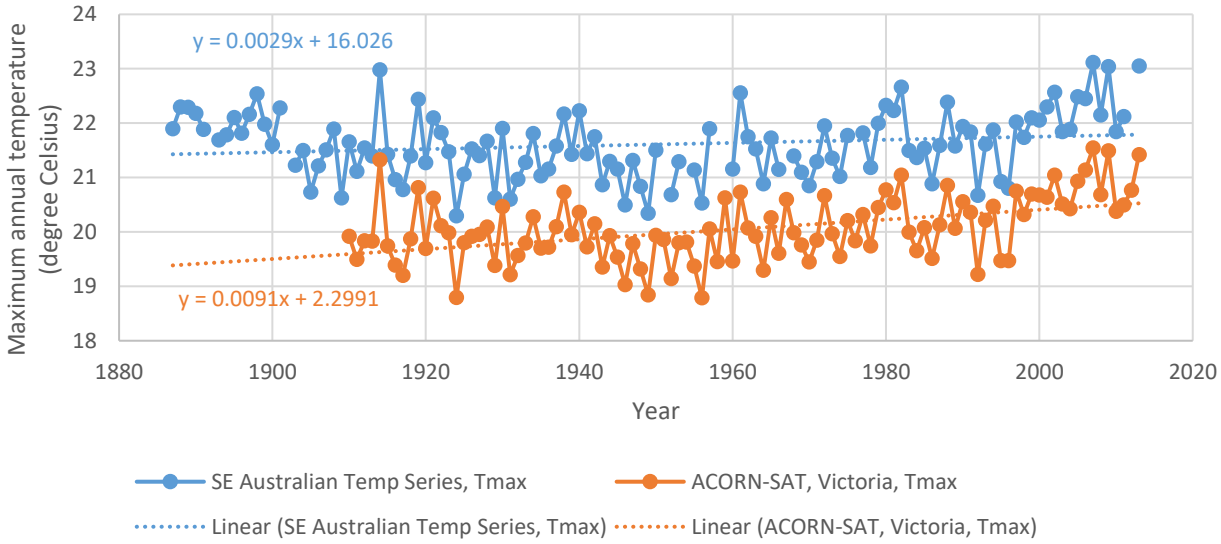

Chart 1. Marohasy and Abbot's SE Australian Temperature reconstruction (1887-2013), and the official ACORN-SAT homogenised reconstruction for Victoria (1910-2013) – blue and orange series respectively.

The overall rate of warming of 0.3 degree Celsius is significantly less than the official rate of 0.9 degree Celsius per century in the ACORN-SAT reconstruction for Victoria – also plotted in Chart 1. The ACORN-

[1] Southeast Australian Maximum Temperature Trends, 1887–2013: An Evidence-Based Reappraisal. In Evidence-Based Climate Science (Second Edition), 2016, Pages 83-99. http://dx.doi.org/10.1016/B978-0-12-804588-6.00005-7

SAT dataset was used in the recent CSIRO and Bureau of Meteorology's State of the Climate 2016 report, which suggests an overall rate of warming for the entire continent of 1 degree Celsius per century[2].

Climate change is generally reported by CSIRO and the Bureau as the average of the minima and maxima: that is as a mean temperature. Marohasy and Abbot have used only the maximum temperatures as a measure of climate variability and change as this reduces the potential for time series to be contaminated with local urban heat island (UHI) effects, and generally gives a better indication of regional climate variability because of the higher rate of turbulent mixing of the lower atmosphere in the day-time (maximum temperatures are a measure of afternoon temperatures).

Despite the very different methodologies used in their construction, the Marohasy and Abbot series for south-east Australia is surprisingly similar to the ACORN-SAT series for Victoria: both exhibit considerable inter-annual variability, with almost synchronous peaks and troughs, as shown in Chart 1. In both series, 2007 is the hottest recent year, though temperatures in both series were almost as hot back in 1914. The apparently very different rates of warming (linear trends of 0.3 versus 0.9), is in part a consequence of the different start date – with the ACORN-SAT series truncated to begin in 1910.

Monthly data from the five individual series used to produce the Marohasy and Abbot reconstruction were assessed for quality assurance using I-MR-R/S control charts. This is detailed in the book chapter. Adjustments were made to the Cape Otway and Deniliquin series only: associated with discontinuities in the two individual series coincident with the installation of Stevenson screens. No adjustments were made for the very obvious Urban Heat Island (UHI) effect in the Melbourne record – as this is real. The Echuca and Wilson's Promontory lighthouse record are considered the superior records in terms of quality – with no discontinuities associated with site moves or equipment changes, and both apparently free of UHI. A transparent weighting system was applied to all series to produce the overall southeast Australian temperature reconstruction based on topography and land use, as detailed in the book chapter.

Table 1. Annual maximum temperature series for south-east Australia derived from the monthly values as detailed in Chapter 5 of Evidence-Based Climate Science (Second Edition), 2016, Pages 83-99. http://dx.doi.org/10.1016/B978-0-12-804588-6.00005-7

Year	SE Australian Temp Series
1887	21.9
1888	22.3
1889	22.3
1890	22.2
1891	21.9
1892	
1893	21.7
1894	21.8
1895	22.1
1896	21.8
1897	22.2
1898	22.5
1899	22.0
1900	21.6
1901	22.3
1902	

[2] Bureau of Meteorology and CSIRO, State of the Climate 2016 http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2016.pdf

1903	21.2
1904	21.5
1905	20.7
1906	21.2
1907	21.5
1908	21.9
1909	20.6
1910	21.7
1911	21.1
1912	21.5
1913	21.4
1914	23.0
1915	21.4
1916	21.0
1917	20.8
1918	21.4
1919	22.4
1920	21.3
1921	22.1
1922	21.8
1923	21.5
1924	20.3
1925	21.1
1926	21.5
1927	21.4
1928	21.7
1929	20.6
1930	21.9
1931	20.6
1932	21.0
1933	21.3
1934	21.8
1935	21.0
1936	21.2
1937	21.6
1938	22.2
1939	21.4
1940	22.2
1941	21.4
1942	21.7
1943	20.9
1944	21.3
1945	21.2
1946	20.5
1947	21.3
1948	20.8
1949	20.3
1950	21.5
1951	

1952	20.7
1953	21.3
1954	
1955	21.1
1956	20.5
1957	21.9
1958	
1959	
1960	21.2
1961	22.6
1962	21.7
1963	21.5
1964	20.9
1965	21.7
1966	21.1
1967	
1968	21.4
1969	21.1
1970	20.8
1971	21.3
1972	21.9
1973	21.4
1974	21.0
1975	21.8
1976	
1977	21.8
1978	21.2
1979	22.0
1980	22.3
1981	22.2
1982	22.7
1983	21.5
1984	21.4
1985	21.5
1986	20.9
1987	21.6
1988	22.4
1989	21.6
1990	21.9
1991	21.8
1992	20.7
1993	21.6
1994	21.9
1995	20.9
1996	20.8
1997	22.0
1998	21.7
1999	22.1
2000	22.1

2001	22.3
2002	22.6
2003	21.8
2004	21.9
2005	22.5
2006	22.5
2007	23.1
2008	22.2
2009	23.0
2010	21.8
2011	22.1
2012	
2013	23.0