

ACORN-SAT station adjustment summary—Amberley (as at 24 September 2014)

Amberley is one of 112 ACORN-SAT stations used by the Bureau of Meteorology to assess changes in Australia's climate. The official long-term temperature record for Amberley is defined by the Bureau as the record for site number 40004.

Observations at Amberley began in 1941. Comparison of the Amberley data with surrounding stations (neighbours), 18 of which have been used at various times, combined with the use of documentary records, reveals that there have been two significant breaks in the data. The first of these is associated with a change to the time of recording observations. The source of the second is unclear but the size of the change is consistent with a site move. The raw data series is a combination of several data series that must be adjusted to derive a single, consistent and accurate representation of temperature changes over time.

The ACORN-SAT record contains daily records of minimum (night-time) temperature (Min T) and maximum (daytime) temperature (Max T). The charts in this fact sheet show annual average values of Min T and Max T. The impacts of the daily adjustments on the annual average values are shown in the table below.

The changes that occurred at Amberley and the resulting impacts are summarised as follows:

1. 1 January 1964—standard observation time at this site changed from midnight to 9 am.
 - Mean temperatures remain similar with respect to surrounding stations, but some indication of changes in extremes.
 - Min T adjusted by -0.02 °C on an annual basis but larger adjustments to some extremes. No detectable impact on Max T so no adjustments made.
2. 1 January 1980—breakpoint detected by statistical methods.
 - Night-time temperatures started to appear much cooler relative to surrounding stations.
 - No accessible documentation for Amberley in 1980, but a breakpoint of this size would normally be associated with a site move.
 - Min T adjusted by -1.28 °C; no detectable impact on Max T so no adjustments made.

An automatic weather station (AWS) was installed at Amberley on 3 July 1997 (in the same instrument enclosure as the manual site that existed at the time). This had no detectable impact on either Max T or Min T and no adjustments were made.

Charts 1 and 2 compare raw and adjusted data for annual average Min T and Max T when all relevant factors from 1941 onwards are included.

In Chart 1 the trend lines show the raw data is decreasing whereas the adjusted average Min T is increasing. In this case, the adjustment has corrected the apparent, but artificial, cooling trend.

In Chart 2 the raw and adjusted data are identical (apart from isolated errors on individual days found during the quality control process), so no additional adjustments have been applied to Max T.

Chart 3 shows a comparison of minimum temperatures at Gatton (38 km west of Amberley) and Amberley in the years around 1980. Amberley is consistently warmer than Gatton prior to 1980 and consistently cooler after 1980. This, combined with similar results when Amberley's data are compared with other sites in the region, provides a very clear demonstration of the need to adjust the temperature data.

Chart 1: Amberley annual average minimum temperatures (1942–2013)

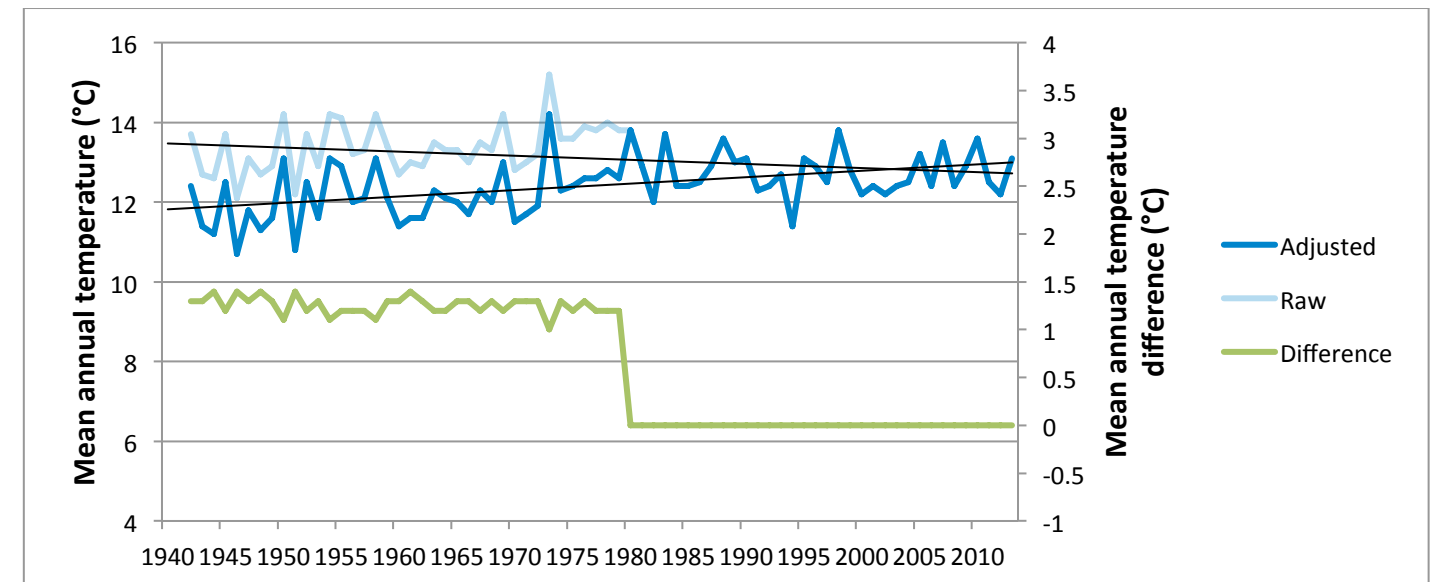


Chart 2: Amberley annual average maximum temperatures (1942–2013)

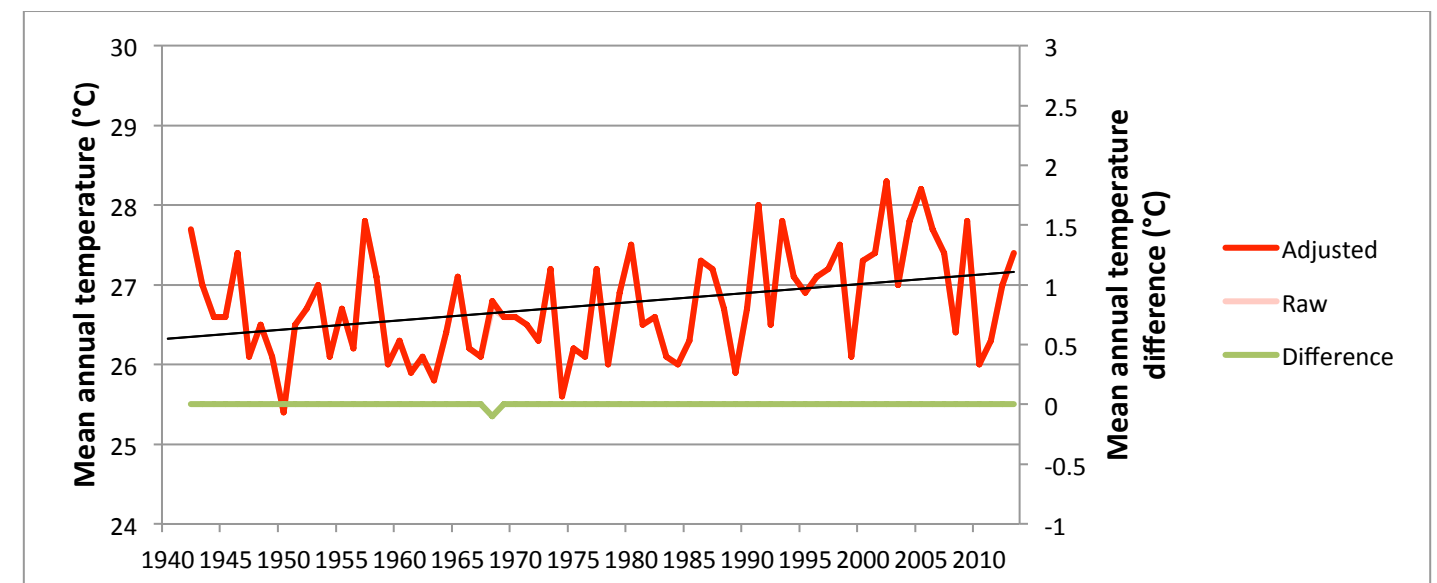
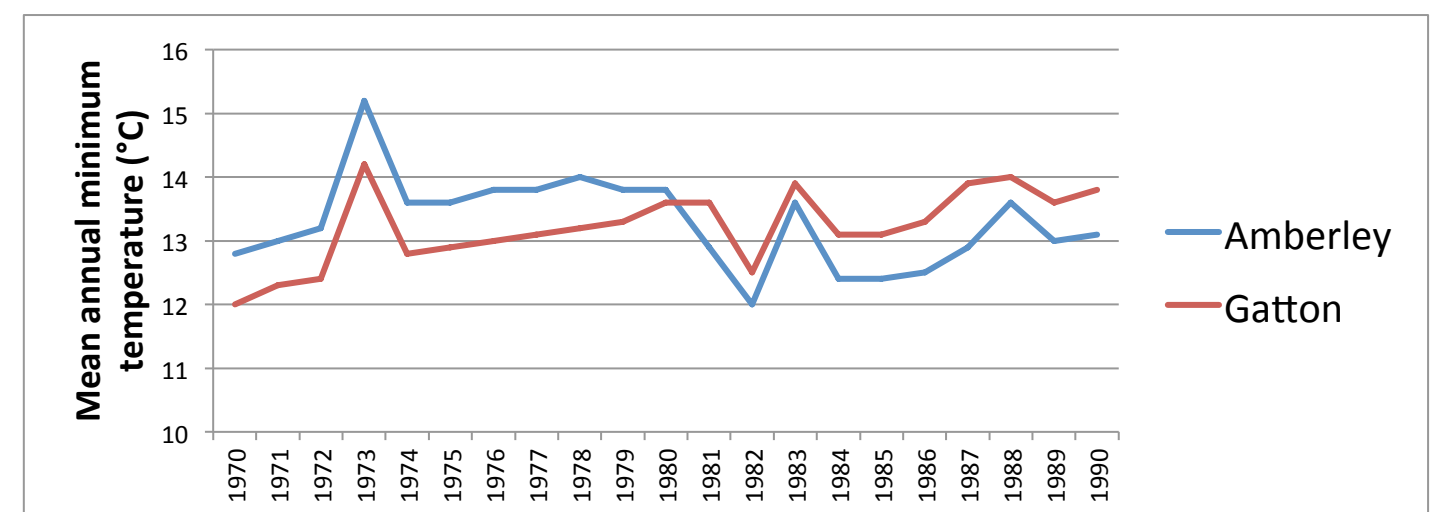


Chart 3: Comparison between Amberley and Gatton



Amberley station temperature adjustments

Station name	Station number	Temperatures adjusted	Date (adjustment applied to all data prior to this date)	Cause	Impact of adjustment (°C)	Seasonal (if applicable)	Comparative stations									Notes	
							40454	40211	40101	40223	40436	40082	40214	41176	40241		58037
Amberley	40004	Min	1/1/1980	Statistical	-1.28		40454	40211	40101	40223	40436	40082	40214	41176	40241	58037	
Amberley	40004	Min	1/1/1964	Obs time	-0.02		40211	40189	58037	40112	40190	57021	41023	39039	41095	40197	

Comparative stations

Station number	Station name
39039	Gayndah Post Office
40082	Gatton (University of Queensland)
40101	Ipswich
40112	Kingaroy
40189	Somerset Dam
40190	Southport
40197	Mount Tamborine
40211	Archerfield Airport
40214	Brisbane Regional Office
40223	Brisbane Airport
40241	Samford CSIRO
40436	Gatton (DAFF Research Station)
40454	Glenlogan
41023	Dalby Post Office
41095	Stanthorpe
41176	Warwick (Dragon St)
57021	Urbenville State Forest
58037	Lismore (Centre Street)

Station temperature adjustment table legend

- Station name: name used in the national climate record
- Station number: the active ACORN-SAT station number as at 31 December 2011.
- Temperatures adjusted: this describes which aspect of the temperature record was adjusted—Max for daily maximum temperature; Min for daily minimum temperature.
- Date: all data prior to this date was adjusted for the reason (cause) cited.
- Cause: this describes why an adjustment was required.
 - Merge: data from two different station numbers are being merged, with overlap.
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 - Move: a documented site move.
 - Move (n): a documented site move, together with a change of station number.
 - Screen: indicates a change or repair to the Stevenson screen.
 - Obs time: indicates a change in observation time (most often the 1964 change at some stations from a midnight to 9 am observation time).
 - Site env: a change has occurred in the local site environment (e.g. addition/removal of building nearby, change in vegetation).
 - Statistical: a change found by statistical methods without specific documentary support.
 - Statistical*: indicates some kind of documentary support which may be imprecise or subject to interpretation. This is further explained in the notes field.
 - AWS: installation of an automatic weather station; if there was an associated site move this is shown as 'move'.
- Impact of adjustment: the overall impact of the daily adjustments made for the particular reason (cause) cited.
- Seasonal (if applicable): this applies where the adjustment was made on the basis of seasonal, rather than annual, criteria. In general the minimum threshold for adjustment is a 0.3 °C difference in the annual mean. Exceptions include:
 - where seasonal criteria are met (0.3 °C in two seasons, or 0.5 °C in a single season), in which case details are given; or
 - for the 1964 observation time change, which standardised the time for taking all observations at 9.00 am.
- Comparative stations: stations against which the station's data was compared statistically.
- Notes: provides additional explanatory information.