

CASE STUDY: Global Warming - the forest from the trees

APPENDIX 7: Calculation of 11-year running means

A running means trendline (also known as a 'moving average') smoothes out fluctuations in data to aid identification of patterns, cycles or trends in a time-series. The number of data points used in the averages is chosen according to the purpose. The choice of a decade of values enables **medium term trends** to be spotted. Because 10 is an even number it is less convenient than a period of 11 years if the aim is to relate the series of calculated means directly to each year. The moving average based on a period of 11 years uses the series of successive 11-year calculated averages as the points for graphing the running mean trendline.

The table below demonstrates the procedure for calculating the 11-year running averages for the Sydney annual minimum temperature anomalies. The trendline of these calculated 11-year running average values is graphed on page 13 of the Case Study document.

| Year | Annual minimum anomalies (°C) | | Formulae for calculating the the 11-year running means | 11-year running anomalies values (°C) |
|------|-------------------------------|------|--|---------------------------------------|
| 1910 | a1 | -0.3 | - | - |
| 1911 | a2 | -0.4 | - | - |
| 1912 | a3 | -0.2 | - | - |
| 1913 | a4 | 0.0 | - | - |
| 1914 | a5 | 0.8 | - | - |
| 1915 | a6 | -0.1 | $(a1 + a2 + a3 + a4 + a5 + a6 + a7 + a8 + a9 + a10 + a11) / 11$ | -0.2 |
| 1916 | a7 | -0.1 | $(a2 + a3 + a4 + a5 + a6 + a7 + a8 + a9 + a10 + a11 + a12) / 11$ | -0.2 |
| 1917 | a8 | -0.4 | $(a3 + a4 + a5 + a6 + a7 + a8 + a9 + a10 + a11 + a12 + a13) / 11$ | -0.2 |
| 1918 | a9 | -0.9 | $(a4 + a5 + a6 + a7 + a8 + a9 + a10 + a11 + a12 + a13 + a14) / 11$ | -0.2 |
| 1919 | a10 | 0.1 | $(a5 + a6 + a7 + a8 + a9 + a10 + a11 + a12 + a13 + a14 + a15) / 11$ | -0.2 |
| 1920 | a11 | -0.8 | $(a6 + a7 + a8 + a9 + a10 + a11 + a12 + a13 + a14 + a15 + a16) / 11$ | -0.4 |
| 1921 | a12 | -0.1 | $(a7 + a8 + a9 + a10 + a11 + a12 + a13 + a14 + a15 + a16 + a17) / 11$ | -0.4 |
| 1922 | a13 | -0.2 | $(a8 + a9 + a10 + a11 + a12 + a13 + a14 + a15 + a16 + a17 + a18) / 11$ | -0.5 |
| 1923 | a14 | -0.2 | $(a9 + a10 + a11 + a12 + a13 + a14 + a15 + a16 + a17 + a18 + a19) / 11$ | -0.4 |
| 1924 | a15 | -0.8 | $(a10 + a11 + a12 + a13 + a14 + a15 + a16 + a17 + a18 + a19 + a20) / 11$ | -0.4 |
| 1925 | a16 | -0.6 | $(a11 + a12 + a13 + a14 + a15 + a16 + a17 + a18 + a19 + a20 + a21) / 11$ | -0.4 |
| etc. | etc. | etc. | etc. | etc. |
| ... | ... | ... | ... | ... |
| 1958 | a49 | 0.2 | $(a44 + a45 + a46 + a47 + a48 + a49 + a50 + a51 + a52 + a53 + a54) / 11$ | -0.4 |
| 1959 | a50 | 0.0 | $(a45 + a46 + a47 + a48 + a49 + a50 + a51 + a52 + a53 + a54 + a55) / 11$ | -0.3 |
| 1960 | a51 | -0.6 | $(a46 + a47 + a48 + a49 + a50 + a51 + a52 + a53 + a54 + a55 + a56) / 11$ | -0.3 |
| etc. | etc. | etc. | etc. | etc. |
| ... | ... | ... | ... | ... |
| 1995 | a86 | -0.2 | $(a81 + a82 + a83 + a84 + a85 + a86 + a87 + a88 + a89 + a90 + a91) / 11$ | 0.2 |
| 1996 | a87 | -0.2 | $(a82 + a83 + a84 + a85 + a86 + a87 + a88 + a89 + a90 + a91 + a92) / 11$ | 0.2 |
| 1997 | a88 | 0.2 | $(a83 + a84 + a85 + a86 + a87 + a88 + a89 + a90 + a91 + a92 + a93) / 11$ | 0.2 |
| 1998 | a89 | 0.8 | $(a84 + a85 + a86 + a87 + a88 + a89 + a90 + a91 + a92 + a93 + a94) / 11$ | 0.2 |
| 1999 | a90 | 0.4 | $(a85 + a86 + a87 + a88 + a89 + a90 + a91 + a92 + a93 + a94 + a95) / 11$ | 0.3 |
| 2000 | a91 | 0.3 | $(a86 + a87 + a88 + a89 + a90 + a91 + a92 + a93 + a94 + a95 + a96) / 11$ | 0.3 |
| 2001 | a92 | 0.5 | $(a87 + a88 + a89 + a90 + a91 + a92 + a93 + a94 + a95 + a96 + a97) / 11$ | 0.4 |
| 2002 | a93 | 0.4 | $(a88 + a89 + a90 + a91 + a92 + a93 + a94 + a95 + a96 + a97 + a98) / 11$ | 0.5 |
| 2003 | a94 | 0.3 | $(a89 + a90 + a91 + a92 + a93 + a94 + a95 + a96 + a97 + a98 + a99) / 11$ | 0.5 |
| 2004 | a95 | 0.5 | - | - |
| 2005 | a96 | 0.6 | - | - |
| 2006 | a97 | 0.5 | - | - |
| 2007 | a98 | 1.0 | - | - |
| 2008 | a99 | 0.1 | - | - |
| 2009 | ---- | ---- | | |
| 2010 | ---- | ---- | | |