Depth to water table correction for initial carbon-14 activities in groundwater mean residence time estimation

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# Supporting information

This document contains three data tables (Tables S1, S2 and S3) and one figure (Fig. S1). Table S1 includes collated unsaturated zone carbon-14 data (14Cuz) from 13 studies. Table S2 includes collated groundwater 14C data (14Cgw) from the Limestone Coast region of South Australia and the Overs/ Goulburn-Broken catchments in Victoria, Australia. Table S3 includes calculated Mean Residence Times (MRTs) of groundwater using the Eqs. 1-4 of the main document. Fig. S1 shows time series of atmospheric activities of 14C and tritium (3H).

Table S1: Unsaturated zone Carbon-14 (14Cuz) activities.

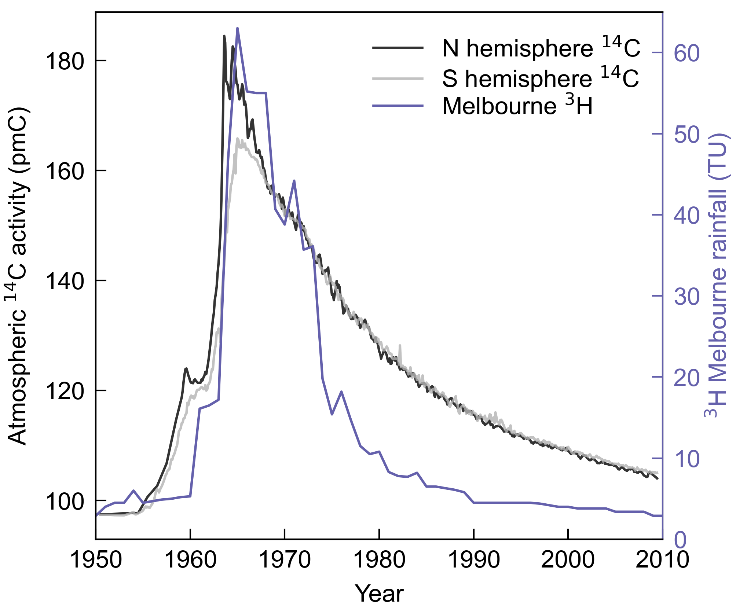
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample location ID** | **Depth (mbg)** | **14Cuz (pmC)** | **14Cuz error (±pmC)** | **δ13C (‰)** | **Sample Year** | **Reason if sample was excluded from data fitting process (Eqs. 2-4)** |
| Bacon and Keller (1998) | | | | | | |
| - | 0.2 | 72.90 | - | -23.90 | 1994 | Organic matter present |
| - | 0.7 | 27.30 | - | -25.00 | 1994 | Organic matter present |
| - | 1.2 | 3.70 | - | -25.70 | 1994 | Organic matter present |
| - | 1.5 | 5.20 | - | -25.80 | 1994 | Organic matter present |
| - | 2.0 | 6.10 | - | -25.70 | 1994 | Organic matter present |
| - | 3.1 | 2.20 | - | -26.00 | 1994 | Organic matter present |
| - | 4.1 | 1.60 | - | -26.00 | 1994 | Organic matter present |
| - | 4.9 | 1.40 | - | -25.90 | 1994 | Organic matter present |
| - | 5.6 | 1.60 | - | -26.20 | 1994 | Organic matter present |
| - | 6.4 | 2.30 | - | -25.80 | 1994 | Organic matter present |
| - | 7.1 | 2.60 | - | -25.50 | 1994 | Organic matter present |
| Carmi et al. (2009) | | | | | | |
| 5166.3 | 2.5 | 32.60 | 0.50 | -10.00 | 2005 | Organic matter present |
| 5168.3 | 6.0 | 31.70 | 0.20 | -10.00 | 2005 | Organic matter present |
| 5159.3 | 4.5 | 16.90 | 0.20 | -7.70 | 2005 | Organic matter present |
| 4964.3 | 6.8 | 14.80 | 0.20 | -10.40 | 2005 | Organic matter present |
| 5169.3 | 7.5 | 8.80 | 0.10 | -11.70 | 2005 | Organic matter present |
| 4963 | 10.5 | 6.60 | 0.10 | -11.80 | 2005 | Organic matter present |
| 6028 | 12.0 | 1.50 | 0.10 | -11.50 | 2005 | Organic matter present |
| 5144.3 | 13.5 | 2.60 | 0.10 | -10.40 | 2005 | Organic matter present |
| Fritz et al. (1978) | | | | | | |
| Station 1 | 1.0 | 130.00 | 3.00 | -21.00 | 1975 | - |
| Station 1 | 1.0 | 137.00 | 9.00 | -21.00 | 1975 | - |
| Station 1 | 1.0 | 141.00 | 10.00 | -21.00 | 1975 | - |
| Station 7 | 1.0 | 136.00 | 7.00 | -23.40 | 1975 | - |
| Station 7 | 1.0 | 126.00 | 14.00 | -23.40 | 1975 | - |
| Piezometer 19-17 | 7.3 | 142.00 | 8.00 | -21.10 | 1975 | - |
| Gillon et al. (2009) | | | | | | |
| FS-1 | 3.0 | 109.00 | 1.00 | -25.50 | 2004 | - |
| FS-1 | 4.5 | 109.00 | 1.00 | -25.00 | 2004 | - |
| FS-1 | 3.0 | 110.00 | 1.00 | -25.50 | 2004 | - |
| FS-1 | 4.5 | 112.00 | 1.00 | -25.00 | 2004 | - |
| FS-2 | 1.2 | 111.00 | 1.00 | -24.60 | 2006 | - |
| AS | 0.8 | 90.00 | 1.00 | -15.70 | 2006 | - |
| AS | 4.8 | 95.00 | 1.00 | -13.80 | 2006 | - |
| AS | 7.8 | 85.00 | 1.00 | -13.20 | 2006 | - |
| AS | 10.8 | 83.00 | 1.00 | -12.90 | 2006 | - |
| AS | 15.8 | 80.00 | 1.00 | -13.80 | 2006 | - |
| AS | 2.3 | 84.00 | 1.00 | -13.90 | 2005 | - |
| AS | 7.8 | 84.00 | 1.00 | -13.80 | 2005 | - |
| AS | 10.8 | 84.00 | 1.00 | -13.80 | 2005 | - |
| AS | 12.8 | 84.00 | 1.00 | -13.40 | 2005 | - |
| AS | 19.8 | 82.00 | 1.00 | -13.80 | 2005 | - |
| AS | 22.8 | 83.00 | 1.00 | -14.20 | 2005 | - |
| AS | 0.8 | 106.00 | 1.00 | -14.20 | 2006 | - |
| AS | 2.3 | 99.00 | 1.00 | -15.20 | 2006 | - |
| AS | 4.8 | 95.00 | 1.00 | -14.40 | 2006 | - |
| AS | 7.8 | 78.00 | 1.00 | -13.60 | 2006 | - |
| AS | 10.8 | 77.00 | 1.00 | -13.50 | 2006 | - |
| AS | 15.8 | 76.00 | 1.00 | -15.20 | 2006 | - |
| AS | 22.8 | 76.00 | 1.00 | -13.00 | 2006 | - |
| Haas et al. (1983) | | | | | | |
| No. 4 | 9.1 | 1.75 | - | - | 1979 | Organic matter present |
| No. 4 | 9.1 | 1.43 | - | - | 1980 | Organic matter present |
| No. 4 | 9.1 | 2.35 | - | - | 1980 | Organic matter present |
| No. 4 | 9.1 | 2.72 | - | - | 1981 | Organic matter present |
| No. 4 | 9.1 | 2.22 | - | - | 1981 | Organic matter present |
| No. 4 | 9.1 | 1.81 | - | - | 1981 | Organic matter present |
| No. 4 | 12.8 | 2.09 | - | - | 1979 | Organic matter present |
| No. 4 | 12.8 | 2.08 | - | - | 1980 | Organic matter present |
| No. 4 | 12.8 | 2.32 | - | - | 1980 | Organic matter present |
| No. 4 | 12.8 | 2.82 | - | - | 1981 | Organic matter present |
| No. 4 | 12.8 | 2.40 | - | - | 1981 | Organic matter present |
| No. 1 | 3.0 | 3.21 | - | - | 1981 | Organic matter present |
| No. 1 | 3.0 | 2.99 | - | - | 1981 | Organic matter present |
| No. 1 | 3.0 | 5.46 | - | - | 1981 | Organic matter present |
| No. 1 | 5.2 | 6.03 | - | - | 1981 | Organic matter present |
| No. 1 | 10.9 | 1.85 | - | - | 1980 | Organic matter present |
| No. 1 | 10.9 | 1.81 | - | - | 1980 | Organic matter present |
| No. 1 | 10.9 | 2.06 | - | - | 1981 | Organic matter present |
| No. 1 | 10.9 | 1.57 | - | - | 1981 | Organic matter present |
| No. 1 | 10.9 | 1.45 | - | - | 1981 | Organic matter present |
| No. 6 | 3.0 | 114.16 | - | - | 1979 | - |
| No. 6 | 3.0 | 113.26 | - | - | 1980 | - |
| No. 6 | 3.0 | 112.79 | - | - | 1980 | - |
| No. 6 | 3.0 | 112.18 | - | - | 1981 | - |
| No. 6 | 3.0 | 112.52 | - | - | 1981 | - |
| No. 6 | 3.0 | 112.33 | - | - | 1981 | - |
| No. 6 | 5.8 | 90.90 | - | - | 1979 | - |
| No. 6 | 5.8 | 86.24 | - | - | 1980 | - |
| No. 6 | 5.8 | 86.29 | - | - | 1980 | - |
| No. 6 | 5.8 | 86.02 | - | - | 1981 | - |
| No. 6 | 5.8 | 85.47 | - | - | 1981 | - |
| No. 6 | 5.8 | 86.84 | - | - | 1981 | - |
| No. 6 | 8.5 | 51.16 | - | - | 1979 | - |
| No. 6 | 8.5 | 53.07 | - | - | 1980 | - |
| No. 6 | 8.5 | 51.28 | - | - | 1980 | - |
| No. 6 | 8.5 | 52.45 | - | - | 1981 | - |
| No. 6 | 8.5 | 52.30 | - | - | 1981 | - |
| No. 6 | 8.5 | 52.96 | - | - | 1981 | - |
| No. 4 | 2.7 | 103.00 | - | - | 1979 | - |
| No. 4 | 2.7 | 95.13 | - | - | 1980 | - |
| No. 4 | 2.7 | 83.72 | - | - | 1980 | - |
| No. 4 | 2.7 | 81.52 | - | - | 1981 | - |
| No. 4 | 2.7 | 87.38 | - | - | 1981 | - |
| No. 4 | 2.7 | 91.70 | - | - | 1981 | - |
| No. 4 | 5.8 | 10.00 | - | - | 1979 | Organic matter present |
| No. 4 | 5.8 | 10.92 | - | - | 1980 | Organic matter present |
| No. 4 | 5.8 | 8.79 | - | - | 1980 | Organic matter present |
| No. 4 | 5.8 | 8.82 | - | - | 1981 | Organic matter present |
| No. 4 | 5.8 | 9.29 | - | - | 1981 | Organic matter present |
| No. 4 | 5.8 | 10.71 | - | - | 1981 | Organic matter present |
| No. 1 | 13.7 | 20.35 | - | - | 1980 | Organic matter present |
| No. 1 | 13.7 | 9.04 | - | - | 1980 | Organic matter present |
| No. 1 | 13.7 | 3.65 | - | - | 1981 | Organic matter present |
| No. 1 | 13.7 | 3.12 | - | - | 1981 | Organic matter present |
| Kunkler (1969) | | | | | | |
| TA-52-22 | 85.9 | 101.0 | - | -18.5 | 1967 | Samples influenced by modern gas |
| TA-52-23 | 24.6 | 115.0 | - | -17.9 | 1967 | Samples influenced by modern gas |
| Leaney and Allison (1986) | | | | | | |
| - | 5.0 | 84.86 | - | - | 1984 | Deep rooted vegetation |
| - | 16.2 | 95.59 | - | - | 1984 | Deep rooted vegetation |
| - | 24.1 | 95.63 | - | - | 1984 | Deep rooted vegetation |
| - | 34.5 | 93.86 | - | - | 1984 | Deep rooted vegetation |
| - | 15.1 | 94.41 | - | - | 1984 | Deep rooted vegetation |
| - | 25.3 | 93.26 | - | - | 1984 | Deep rooted vegetation |
| - | 34.2 | 90.15 | - | - | 1984 | Deep rooted vegetation |
| - | 38.3 | 90.28 | - | - | 1984 | Deep rooted vegetation |
| Reardon et al. (1979) | | | | | | |
| - | 5.0 | 110.00 | - | - | 1980 | - |
| Thornstenson et al. (1983) | | | | | | |
| Lamb Site #5 | 5.8 | 113.1 | - | -20.6 | 1979 | - |
| Lamb Site #4 | 11.0 | 111.5 | - | -22.9 | 1979 | - |
| Lamb Site #3 | 17.1 | 108.4 | - | -18.7 | 1979 | - |
| Lamb Site #2 | 21.4 | 108.6 | - | -21.2 | 1979 | - |
| Glenn Site #6 | 7.0 | 91.2 | - | -16.03 | 1979 | - |
| Glenn Site #5 | 13.4 | 62.9 | - | -25.3 | 1979 | - |
| Glenn Site #4 | 19.8 | 60.2 | - | -17.3 | 1979 | - |
| Glenn Site #3 | 25.3 | 63.7 | - | -23.1 | 1979 | - |
| Glenn Site #2 | 36.3 | 62.5 | - | -27.7 | 1979 | - |
| Glenn Site #1 | 44.5 | 56.2 | - | -25.9 | 1979 | - |
| Thornstenson et al. (1998) | | | | | | |
| - | 0.3 | 113.10 | - | -17.45 | 1992 | - |
| - | 1.0 | 114.30 | - | -12.85 | 1992 | - |
| - | 2.1 | 108.60 | - | -18.54 | 1992 | - |
| - | 2.7 | 110.30 | - | -17.52 | 1992 | - |
| - | 8.2 | 98.70 | - | -15.75 | 1992 | - |
| - | 10.1 | 95.20 | - | -15.66 | 1992 | - |
| Walvoord et al. (2005) | | | | | | |
| - | 0.2 | 113.49 | - | - | 1992 | - |
| - | 0.8 | 115.19 | - | - | 1992 | - |
| - | 1.8 | 109.22 | - | - | 1992 | - |
| - | 2.3 | 110.92 | - | - | 1992 | - |
| - | 7.6 | 99.27 | - | - | 1992 | - |
| - | 9.9 | 98.41 | - | - | 1992 | - |
| - | 9.6 | 95.57 | - | - | 1992 | - |
| - | 11.7 | 88.47 | - | - | 1992 | - |
| - | 17.8 | 76.81 | - | - | 1992 | - |
| - | 27.5 | 54.35 | - | - | 1992 | - |
| - | 56.4 | 28.15 | - | - | 1992 | - |
| - | 92.4 | 16.70 | - | - | 1992 | - |
| - | 104.2 | 17.52 | - | - | 1992 | - |
| - | 104.4 | 21.49 | - | - | 1992 | - |
| - | 106.9 | 20.07 | - | - | 1992 | - |
| Wood et al. (2014) | | | | | | |
| 18611-5 | 5.0 | 105.26 | 0.44 | -15.70 | 2011 | - |
| 18611-8 | 8.0 | 106.84 | 0.48 | -17.10 | 2011 | - |
| 18611-11 | 11.0 | 104.26 | 0.42 | -16.80 | 2011 | - |
| 18611-16 | 16.0 | 94.61 | 0.39 | -15.90 | 2011 | - |
| 18611-21 | 21.0 | 80.30 | 0.39 | -16.00 | 2011 | - |
| 18611-26 | 26.0 | 72.63 | 0.33 | -15.90 | 2011 | - |
| 18779-5 | 5.0 | 107.39 | 0.55 | -14.30 | 2011 | - |
| 18779-8 | 8.0 | 107.95 | 0.48 | -15.60 | 2011 | - |
| 18779-11 | 11.0 | 107.03 | 0.42 | -15.20 | 2011 | - |
| 18779-16 | 16.0 | 92.91 | 0.38 | -15.80 | 2011 | - |
| 18779-21 | 21.0 | 79.14 | 0.36 | -16.00 | 2011 | - |
| 18781-5 | 5.0 | 107.34 | 0.53 | -15.10 | 2011 | - |
| 18781-8 | 8.0 | 104.73 |  | -14.80 | 2011 | - |
| 18781-11 | 11.0 | 89.49 | 0.38 | -13.90 | 2011 | - |
| 18781-16 | 16.0 | 54.55 | 0.28 | -14.20 | 2011 | - |
| 18893-3 | 3.0 | 108.00 | 0.44 | -15.40 | 2012 | - |
| 18893-5 | 5.0 | 104.99 | 0.37 | -15.10 | 2012 | - |
| 18893-10 | 10.0 | 104.31 | 0.33 | -16.80 | 2012 | - |
| 18893-12 | 12.0 | 101.32 | 0.31 | -16.60 | 2012 | - |
| 18893-15 | 15.0 | 95.38 | 0.36 | -16.60 | 2012 | - |
| 18893-18 | 18.0 | 86.20 | 0.32 | -15.10 | 2012 | - |
| 18897-5 | 5.0 | 102.61 | 0.44 | -13.50 | 2012 | - |
| 18897-6 | 6.0 | 108.69 | 0.35 | -15.10 | 2012 | - |
| 18897-7 | 7.0 | 107.05 | 0.40 | -14.70 | 2012 | - |
| 18897-8 | 8.0 | 106.42 | 0.36 | -14.30 | 2012 | - |
| Yang et al. (1985) | | | | | | |
| 1 | 12.8 | 120.55 | 0.66 | -25.68 | 1984 | Samples influenced by modern gas |
| 2 | 20.3 | 67.42 | 0.87 | -14.58 | 1984 | Samples influenced by modern gas |
| 3 | 28.3 | 62.57 | 1.95 | -11.70 | 1984 | Samples influenced by modern gas |
| 3 | 28.3 | 79.96 | 1.45 | -17.68 | 1985 | Samples influenced by modern gas |
| 4 | 39.9 | 77.37 | 1.52 | -19.96 | 1984 | Samples influenced by modern gas |
| 4 | 39.9 | 87.57 | 1.08 | -20.79 | 1985 | Samples influenced by modern gas |
| 5 | 61.3 | 77.35 | 0.79 | -15.68 | 1984 | Samples influenced by modern gas |
| 5 | 61.3 | 72.15 | 0.88 | -17.87 | 1985 | Samples influenced by modern gas |
| 6 | 81.1 | 77.24 | 1.48 | -15.27 | 1984 | Samples influenced by modern gas |
| 7 | 106.1 | 76.98 | 0.90 | -14.79 | 1984 | Samples influenced by modern gas |
| 7 | 106.1 | 72.88 | 0.74 | -16.59 | 1985 | Samples influenced by modern gas |
| 8 | 128.3 | 74.62 | 0.67 | -15.18 | 1984 | Samples influenced by modern gas |

Table S2: Groundwater chemistry data from the Limestone Coast and the Ovens/ Goulburn-Broken catchments. Sample ID is used as the *y*-axis on Fig. 4 in the main document. Well ID numbers from original publications.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample ID | Well ID | Sample year | Longitude | Latitude | Depth to water (mbg) | Sample depth (mbg) | 14Cgw (pmC) | 3H (TU) |
| Limestone Coast | | | | | | | | |
| 0 | 6923-3682 | 1989 | 140.487 | -37.068 | 1.6 | 25.0 | 54.4 | - |
| 1 | 7021-1043 | 2009 | 140.791 | -38.026 | 0.5 | - | 66.1 | - |
| 2 | 7022-128 | 2012 | 140.931 | -37.848 | 27.8 | 24.4 | 62.4 | - |
| 3 | 7022-139 | 2012 | 140.922 | -37.896 | 26.4 | 25.8 | 48.8 | - |
| 4 | 7022-837 | 1988-1990 | 140.882 | -37.771 | 5.4 | 8.9 | 27.0 | - |
| 5 | 7022-1042 | 1988-1990 | 140.941 | -37.552 | 2.0 | 6.2 | 78.2 | - |
| 6 | 7022-1094 | 1988-1990 | 140.839 | -37.585 | 7.2 | 9.5 | 77.1 | - |
| 7 | 7022-1863 | 1988-1990 | 140.816 | -37.546 | 12.2 | 22.0 | 62.5 | - |
| 8 | 7022-8517 | 2000 | 140.858 | -37.604 | 6.1 | 22.6 | 14.1 | - |
| 9 | 7022-8518 | 2000 | 140.858 | -37.604 | 5.3 | 15.8 | 19.3 | - |
| 10 | 7022-8519 | 36678 | 140.858 | -37.604 | 6.0 | 10.0 | 59.2 | - |
| 11 | 7022-8520 | 2000 | 140.858 | -37.604 | 6.0 | 5.3 | 83.0 | - |
| 12 | 7022-8522 | 2000 | 140.944 | -37.551 | 8.5 | 37.0 | 48.8 | - |
| 13 | 7022-8523 | 2000 | 140.944 | -37.551 | 10.1 | 29.0 | 56.8 | - |
| 14 | 7022-8524 | 2000 | 140.944 | -37.551 | 10.0 | 18.5 | 64.7 | - |
| 15 | 7022-8525 | 2000 | 140.944 | -37.551 | 8.0 | 7.5 | 72.8 | - |
| 16 | 7022-10572 | 2012 | 140.931 | -37.842 | 27.5 | 83.5 | 13.4 | - |
| 17 | 7022-10573 | 2012 | 140.931 | -37.833 | 18.5 | 76.0 | 69.6 | - |
| 18 | 7022-10574 | 2012 | 140.934 | -37.822 | 10.3 | 56.3 | 77.3 | - |
| 19 | 7022-10687 | 2012 | 140.929 | -37.859 | 26.9 | 140.0 | 6.7 | - |
| 20 | 7022-10688 | 2012 | 140.928 | -37.861 | 25.8 | 37.0 | 5.2 | - |
| 21 | 7022-10776 | 1905 | 140.883 | -37.545 | 5.6 | 44.0 | 84.7 | - |
| 22 | 7022-10778 | 1905 | 140.858 | -37.603 | 25.7 | 63.5 | 57.2 | - |
| 23 | 7022-10781 | 2011 | 140.942 | -37.549 | 22.7 | 60.5 | 44.5 | - |
| 24 | 7023-5280 | 2012 | 140.841 | -37.367 | 6.5 | 62.5 | 9.7 | - |
| 25 | 7023-7133 | 2012 | 140.942 | -37.269 | 7.2 | 15.0 | 64.5 | - |
| 26 | 7023-7134 | 2012 | 140.962 | -37.257 | 17.5 | 45.5 | 68.5 | - |
| 27 | 7023-7135 | 2012 | 140.929 | -37.284 | 6.6 | 40.0 | 44.3 | - |
| 28 | 7024-2960 | 1989 | 140.923 | -36.871 | 10.6 | 15.0 | 63.6 | - |
| 29 | 7024-5457 | 2003 | 140.585 | -36.642 | 5.3 | 10.5 | 82.9 | - |
| 30 | 7024-5458 | 2003 | 140.592 | -36.655 | 5.8 | 12.3 | 71.0 | - |
| 31 | 7024-5459 | 2005 | 140.565 | -36.668 | 12.4 | 41.0 | 36.5 | - |
| 32 | 7024-5460 | 2005 | 140.579 | -36.661 | 15.3 | 44.5 | 11.8 | - |
| 33 | 7024-5462 | 2005 | 140.542 | -36.650 | 22.5 | 19.7 | 54.1 | - |
| 34 | 7024-5463 | 2005 | 140.578 | -36.661 | 14.7 | 47.0 | 5.2 | - |
| 35 | 7024-5464 | 2005 | 140.579 | -36.661 | 15.6 | 18.0 | 70.1 | - |
| 36 | 7024-5465 | 2005 | 140.579 | -36.661 | 15.6 | 21.5 | 61.4 | - |
| 37 | 7024-5466 | 2005 | 140.579 | -36.661 | 16.2 | 32.3 | 43.3 | - |
| 38 | 7024-5468 | 2005 | 140.559 | -36.671 | 11.4 | 15.3 | 55.5 | - |
| 39 | 7024-5470 | 2005 | 140.561 | -36.640 | 7.5 | 26.0 | 73.8 | - |
| 40 | 7024-5471 | 2005 | 140.576 | -36.642 | 7.5 | 12.1 | 73.5 | - |
| 41 | 7025-865 | 2015 | 140.663 | -36.303 | 16.5 | 32.7 | 67.6 | - |
| 42 | 7025-868 | 2015 | 140.655 | -36.300 | 10.7 | 32.0 | 60.8 | - |
| 43 | 7025-2615 | 2015 | 140.661 | -36.299 | 9.4 | 21.2 | 62.0 | - |
| 44 | 7025-3222 | 2015 | 140.658 | -36.299 | 11.5 | 32.5 | 61.0 | - |
| 45 | 7025-3875 | 2015 | 140.668 | -36.298 | 16.7 | 28.0 | 46.1 | - |
| 46 | 7025-3876 | 2015 | 140.663 | -36.302 | 15.5 | 31.0 | 55.6 | - |
| 47 | 7025-3877 | 2015 | 140.663 | -36.302 | 15.4 | 31.0 | 49.2 | - |
| 48 | 7025-4030 | 2015 | 140.663 | -36.307 | 16.1 | 28.0 | 56.9 | - |
| 49 | 7025-4031 | 2015 | 140.663 | -36.291 | 15.4 | 28.0 | 61.1 | - |
| 50 | 7026-113 | 1998 | 140.796 | -35.817 | 68.8 | 100.2 | 3.6 | - |
| Ovens/ Goulburn-Broken | | | | | | | | |
| 51 | 51743 | 2009 | 146.992 | -36.726 | 1.36 | 8.0 | 92.81 | 1.27 |
| 52 | 51744 | 2009 | 146.988 | -36.732 | 2.5 | 9.0 | 99.9 | 3.62 |
| 53 | 51737 | 2009 | 146.983 | -36.725 | 5.25 | 39.0 | 88.6 | 1.21 |
| 54 | 51738 | 2009 | 146.982 | -36.727 | -0.07 | 60.5 | 73.9 | 0.84 |
| 55 | 51735 | 2009 | 146.982 | -36.728 | 5.69 | 36.0 | 99.0 | 1.39 |
| 56 | 51736 | 2009 | 146.982 | -36.728 | 4.99 | 23.0 | 105.5 | 1.81 |
| 57 | 109462 | 2009 | 146.976 | -36.728 | 3.6 | 48.0 | 94.1 | 1.42 |
| 58 | 88274 | 2009 | 146.924 | -36.703 | 1.4 | 44.0 | 77.0 | 0.07 |
| 59 | 48069 | 2009 | 146.864 | -36.643 | 2.03 | 6.5 | 76.1 | 1.70 |
| 60 | 48068 | 2009 | 146.862 | -36.644 | 3.04 | 10.0 | 106.6 | 2.34 |
| 61 | 48067 | 2009 | 146.860 | -36.644 | 2.73 | 12.0 | 104.2 | 2.69 |
| 62 | 48066 | 2009 | 146.859 | -36.645 | 3.96 | 12.0 | 100.8 | 2.29 |
| 63 | 83232 | 2009 | 146.719 | -36.566 | 3.23 | 9.0 | 101.8 | 1.82 |
| 64 | 83231 | 2009 | 146.717 | -36.568 | 3.7 | 11.0 | 96.5 | 2.13 |
| 65 | 83229 | 2009 | 146.716 | -36.569 | 3.08 | 11.0 | 100.4 | 2.25 |
| 66 | 83230 | 2009 | 146.716 | -36.569 | 3.3 | 11.0 | 99.8 | 2.62 |
| 67 | 50788 | 2009 | 146.330 | -36.298 | 14.75 | 66.0 | 30.3 | 0.16 |
| 68 | 50789 | 2009 | 146.325 | -36.303 | 14.25 | 24.0 | 88.8 | 0.04 |
| 69 | 11326 | 2009 | 146.309 | -36.206 | 12.83 | 23.7 | 93.9 | 0.30 |
| 70 | 302296 | 2009 | 146.356 | -36.151 | 11.99 | 73.8 | 75.3 | 0.02 |
| 71 | 11323 | 2009 | 146.356 | -36.151 | 11.65 | 17.4 | 91.2 | 0.94 |
| 72 | 11306 | 2009 | 146.251 | -36.191 | 3.89 | 15.8 | 103.3 | 0.26 |
| 73 | 11311 | 2009 | 146.192 | -36.092 | 3.01 | 16.2 | 97.2 | 0.60 |
| 74 | 11310 | 2009 | 146.189 | -36.092 | 9.45 | 13.9 | 95.9 | 0.49 |
| 75 | 117 | 1985-1994 | 145.663 | -36.540 | 4.1 | 50.0 | 49.4 | 0.43 |
| 76 | 119 | 1987-2004 | 145.680 | -36.540 | 7.9 | 53.0 | 75.5 | 0.79 |
| 77 | 120 | 1987-2004 | 145.676 | -36.523 | 11.4 | 76.0 | 41.6 | 1.45 |
| 78 | 121 | 1987-2004 | 145.630 | -36.477 | 4.0 | 76.0 | 5.2 | 0.47 |
| 79 | 124 | 1987-2004 | 145.666 | -36.485 | 27.2 | 81.5 | 65.6 | 0.40 |
| 80 | 125 | 1987-2004 | 145.680 | -36.487 | 41.3 | 78.0 | 17.7 | 0.63 |
| 81 | 130 | 1987-2004 | 145.636 | -36.498 | 25.7 | 94.5 | 74.5 | 0.74 |
| 82 | 132 | 1987-2004 | 145.630 | -36.520 | 2.3 | 76.0 | 43.2 | 0.95 |
| 83 | 133 | 1987-2004 | 145.612 | -36.539 | 12.5 | 76.0 | 41.0 | 0.75 |
| 84 | 143 | 1987-2004 | 145.651 | -36.466 | 3.6 | 61.0 | 28.0 | 0.61 |
| 85 | 8113 | 1980-2004 | 145.630 | -36.557 | 2.6 | 19.7 | 51.6 | 0.24 |
| 86 | 8121 | 1980-2004 | 145.594 | -36.489 | 3.2 | 16.6 | 97.9 | 2.44 |
| 87 | 8124 | 1980-2004 | 145.705 | -36.459 | 2.0 | 13.0 | 47.1 | 0.93 |
| 88 | 8127 | 1980-2004 | 145.711 | -36.447 | 2.8 | 19.7 | 54.1 | 0.48 |
| 89 | 8130 | 1980-2004 | 145.711 | -36.436 | 3.1 | 16.6 | 65.9 | 0.28 |
| 90 | 8142 | 1983-2004 | 145.649 | -36.489 | 13.0 | 19.8 | 85.9 | 1.55 |
| 91 | 8143 | 1983-2004 | 145.648 | -36.484 | 8.2 | 18.1 | 83.6 | 0.98 |
| 92 | 8145 | 1983-2004 | 145.634 | -36.485 | 3.2 | 20.3 | 86.3 | 0.62 |
| 93 | 8126\* | 1980-2004 | 145.705 | -36.459 | 0.4 | 3.1 | 100.1 | 1.70 |
| 94 | 8131\* | 1980-2004 | 145.712 | -36.436 | 3.3 | 4.9 | 94.7 | 1.01 |
| 95 | 8135\* | 1983-2004 | 145.627 | -36.565 | 7.5 | 7.3 | 103.2 | 1.90 |
| 96 | 8144\* | 1983-2004 | 145.648 | -36.484 | 8.2 | 11.0 | 92.4 | 0.52 |
| 97 | 153 | 1984-2004 | 145.933 | -36.674 | 2.1 | 100.0 | 77.5 | 0.67 |
| 98 | 155 | 1984-2004 | 145.937 | -36.675 | 4.2 | 30.0 | 91.3 | 3.34 |
| 99 | 8402 | 1982-2005 | 145.933 | -36.674 | 4.7 | 15.4 | 88.3 | 2.53 |
| 100 | 8403 | 1982-2005 | 145.933 | -36.676 | 2.9 | 19.4 | 84.3 | 1.56 |
| 101 | 8416 | 1982-2005 | 145.924 | -36.663 | 3.0 | 15.8 | 97.5 | 1.63 |
| 102 | 8420 | 1982-2005 | 145.932 | -36.681 | 2.3 | 18.0 | 99.2 | 0.80 |
| 103 | 8404\* | 1982-2005 | 145.933 | -36.676 | 3.2 | 7.5 | 96.4 | 1.46 |
| 104 | 8412\* | 1982-2005 | 145.931 | -36.662 | 1.5 | 5.1 | 105.1 | 1.80 |
| 105 | 8415\* | 1982-2005 | 145.932 | -36.664 | 8.2 | 6.1 | 102.9 | 1.94 |
| 106 | 8421\* | 1983-2005 | 145.932 | -36.681 | 1.5 | 5.3 | 97.9 | 1.89 |
| 107 | 11203\* | 1989-1998 | 146.523 | -36.395 | 3.2 | 9.3 | 94.5 | 2.09 |
| 108 | 11205\* | 1989-1998 | 146.525 | -36.398 | 2.2 | 2.9 | 90.3 | 0.81 |
| 109 | 11206 | 1989-1999 | 146.526 | -36.400 | 2.4 | 9.5 | 94.5 | 1.69 |
| 110 | 11207 | 1989-2000 | 146.526 | -36.403 | 8.5 | 17.7 | 93.4 | 1.02 |
| 111 | 11451 | 1999-2000 | 146.526 | -36.378 | 2.3 | 11.0 | 61.5 | 0.14 |
| 112 | 11452 | 1999-2000 | 146.526 | -36.378 | 0.3 | 12.9 | 92.5 | 3.31 |

Table S3: Calculated MRTs using Eqs. 2-4. MRTs calculated from 14C are typically rounded to the nearest 5 to 100 years (e.g., Fontes and Garnier, 1979; Plummer and Sprinkle, 2001; Carmi et al., 2009). Here the MRTs are rounded to the nearest 10 years. Well ID numbers from original publications. Note, DTW and 14Cgw values are rounded in Table S3 relative to values used to calculate MRTs.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sample ID | Well ID | Depth to Water (mbg) | 14Cgw (pmC) | Uncorrected MRT (y) | DTW-corrected MRT, lower (y) (Eq, 4) | DTW-corrected, MRT, best (y) (Eq, 2) | DTW-corrected MRT, upper (y) (Eq, 3) |
| Limestone Coast | | | | | | | |
| 0 | 6923-3682 | 1.6 | 54.4 | 5030 | 3230 | 5180 | 7200 |
| 1 | 7021-1043 | 0.5 | 66.1 | 3420 | 1770 | 3730 | 5740 |
| 2 | 7022-128 | 27.8 | 62.4 | 3900 | 500 | 500 | 2460 |
| 3 | 7022-139 | 26.4 | 48.8 | 5940 | 610 | 2620 | 4690 |
| 4 | 7022-837 | 5.4 | 27.0 | 10820 | 8480 | 10450 | 12470 |
| 5 | 7022-1042 | 2.0 | 78.2 | 2030 | 500 | 2130 | 4140 |
| 6 | 7022-1094 | 7.2 | 77.1 | 2150 | 500 | 1520 | 3540 |
| 7 | 7022-1863 | 12.2 | 62.5 | 3890 | 570 | 2550 | 4590 |
| 8 | 7022-8517 | 6.1 | 14.1 | 16200 | 13750 | 15720 | 17740 |
| 9 | 7022-8518 | 5.3 | 19.3 | 13600 | 11260 | 13230 | 15250 |
| 10 | 7022-8519 | 6.0 | 59.2 | 4330 | 1900 | 3870 | 5890 |
| 11 | 7022-8520 | 6.0 | 83.0 | 1540 | 500 | 1070 | 3100 |
| 12 | 7022-8522 | 8.5 | 48.8 | 5930 | 3140 | 5110 | 7140 |
| 13 | 7022-8523 | 10.1 | 56.8 | 4680 | 1660 | 3630 | 5660 |
| 14 | 7022-8524 | 10.0 | 64.7 | 3600 | 600 | 2580 | 4610 |
| 15 | 7022-8525 | 8.0 | 72.8 | 2620 | 500 | 1880 | 3910 |
| 16 | 7022-10572 | 27.5 | 13.4 | 16650 | 11160 | 13180 | 15250 |
| 17 | 7022-10573 | 18.5 | 69.6 | 2990 | 500 | 780 | 2830 |
| 18 | 7022-10574 | 10.3 | 77.3 | 2130 | 500 | 1070 | 3100 |
| 19 | 7022-10687 | 26.9 | 6.7 | 22310 | 16900 | 18920 | 20990 |
| 20 | 7022-10688 | 25.8 | 5.2 | 24430 | 19170 | 21180 | 23250 |
| 21 | 7022-10776 | 5.6 | 84.7 | 1370 | 500 | 960 | 2980 |
| 22 | 7022-10778 | 25.7 | 57.2 | 4620 | 500 | 1390 | 3460 |
| 23 | 7022-10781 | 22.7 | 44.5 | 6690 | 1880 | 3890 | 5950 |
| 24 | 7023-5280 | 6.5 | 9.7 | 19250 | 16750 | 18720 | 20740 |
| 25 | 7023-7133 | 7.2 | 64.5 | 3620 | 1020 | 2990 | 5010 |
| 26 | 7023-7134 | 17.5 | 68.5 | 3130 | 500 | 1060 | 3110 |
| 27 | 7023-7135 | 6.6 | 44.3 | 6730 | 4200 | 6170 | 8200 |
| 28 | 7024-2960 | 10.6 | 63.6 | 3740 | 650 | 2630 | 4660 |
| 29 | 7024-5457 | 5.3 | 82.9 | 1550 | 500 | 1180 | 3200 |
| 30 | 7024-5458 | 5.8 | 71.0 | 2830 | 500 | 2390 | 4420 |
| 31 | 7024-5459 | 12.4 | 36.5 | 8330 | 4990 | 6970 | 9010 |
| 32 | 7024-5460 | 15.3 | 11.8 | 17670 | 13910 | 15900 | 17950 |
| 33 | 7024-5462 | 22.5 | 54.1 | 5080 | 500 | 2300 | 4360 |
| 34 | 7024-5463 | 14.7 | 5.2 | 24440 | 20770 | 22760 | 24800 |
| 35 | 7024-5464 | 15.6 | 70.1 | 2940 | 500 | 1130 | 3170 |
| 36 | 7024-5465 | 15.6 | 61.4 | 4030 | 500 | 2220 | 4260 |
| 37 | 7024-5466 | 16.2 | 43.3 | 6920 | 3030 | 5020 | 7070 |
| 38 | 7024-5468 | 11.4 | 55.5 | 4870 | 1670 | 3650 | 5680 |
| 39 | 7024-5470 | 7.5 | 73.8 | 2510 | 500 | 1840 | 3860 |
| 40 | 7024-5471 | 7.5 | 73.5 | 2550 | 500 | 1870 | 3900 |
| 41 | 7025-865 | 16.5 | 67.6 | 3240 | 500 | 1310 | 3360 |
| 42 | 7025-868 | 10.7 | 60.8 | 4120 | 1020 | 2990 | 5030 |
| 43 | 7025-2615 | 9.4 | 62.0 | 3950 | 1040 | 3020 | 5050 |
| 44 | 7025-3222 | 11.5 | 61.0 | 4090 | 880 | 2860 | 4890 |
| 45 | 7025-3875 | 16.7 | 46.1 | 6400 | 2440 | 4440 | 6480 |
| 46 | 7025-3876 | 15.5 | 55.6 | 4850 | 1070 | 3050 | 5100 |
| 47 | 7025-3877 | 15.4 | 49.2 | 5860 | 2090 | 4080 | 6130 |
| 48 | 7025-4030 | 16.1 | 56.9 | 4660 | 790 | 2780 | 4830 |
| 49 | 7025-4031 | 15.4 | 61.1 | 4080 | 500 | 2290 | 4330 |
| 50 | 7026-113 | 68.8 | 3.6 | 27480 | 16130 | 18230 | 20400 |
| Ovens/ Goulburn-Broken | | | | | | | |
| 51 | 51743 | 1.4 | 92.8 | 620 | 500 | 800 | 2810 |
| 52 | 51744 | 2.5 | 99.9 | 500 | 500 | 500 | 2050 |
| 53 | 51737 | 5.3 | 88.6 | 1000 | 500 | 640 | 2660 |
| 54 | 51738 | -0.1 | 73.9 | 2500 | 930 | 2890 | 4900 |
| 55 | 51735 | 5.7 | 99.0 | 500 | 500 | 500 | 1680 |
| 56 | 51736 | 5.0 | 105.5 | 500 | 500 | 500 | 1260 |
| 57 | 109462 | 3.6 | 94.1 | 500 | 500 | 500 | 2390 |
| 58 | 88274 | 1.4 | 77.0 | 2160 | 500 | 2340 | 4350 |
| 59 | 48069 | 2.0 | 76.1 | 2260 | 500 | 2350 | 4370 |
| 60 | 48068 | 3.0 | 106.6 | 500 | 500 | 500 | 1430 |
| 61 | 48067 | 2.7 | 104.2 | 500 | 500 | 500 | 1670 |
| 62 | 48066 | 4.0 | 100.8 | 500 | 500 | 500 | 1770 |
| 63 | 83232 | 3.2 | 101.8 | 500 | 500 | 500 | 1790 |
| 64 | 83231 | 3.7 | 96.5 | 500 | 500 | 500 | 2170 |
| 65 | 83229 | 3.1 | 100.4 | 500 | 500 | 500 | 1920 |
| 66 | 83230 | 3.3 | 99.8 | 500 | 500 | 500 | 1950 |
| 67 | 50788 | 14.8 | 30.3 | 9880 | 6200 | 8190 | 10230 |
| 68 | 50789 | 14.3 | 88.8 | 980 | 500 | 500 | 1400 |
| 69 | 11326 | 12.8 | 93.9 | 520 | 500 | 500 | 1140 |
| 70 | 302296 | 12.0 | 75.3 | 2340 | 500 | 1040 | 3080 |
| 71 | 11323 | 11.7 | 91.2 | 760 | 500 | 500 | 1540 |
| 72 | 11306 | 3.9 | 103.3 | 500 | 500 | 500 | 1580 |
| 73 | 11311 | 3.0 | 97.2 | 500 | 500 | 500 | 2210 |
| 74 | 11310 | 9.5 | 95.9 | 500 | 500 | 500 | 1430 |
| 75 | 117 | 4.1 | 49.4 | 5830 | 3670 | 5630 | 7650 |
| 76 | 119 | 7.9 | 75.5 | 2320 | 500 | 1600 | 3620 |
| 77 | 120 | 11.4 | 41.6 | 7250 | 4060 | 6040 | 8070 |
| 78 | 121 | 4.0 | 5.2 | 24440 | 22300 | 24260 | 26280 |
| 79 | 124 | 27.2 | 65.6 | 3490 | 500 | 500 | 2120 |
| 80 | 125 | 41.3 | 17.7 | 14320 | 6860 | 8910 | 11010 |
| 81 | 130 | 25.7 | 74.5 | 2430 | 500 | 500 | 1280 |
| 82 | 132 | 2.3 | 43.2 | 6940 | 5030 | 6990 | 9000 |
| 83 | 133 | 12.5 | 41.0 | 7370 | 4010 | 6000 | 8030 |
| 84 | 143 | 3.6 | 28.0 | 10520 | 8430 | 10390 | 12410 |
| 85 | 8113 | 2.6 | 51.6 | 5470 | 3520 | 5480 | 7490 |
| 86 | 8121 | 3.2 | 97.9 | 500 | 500 | 500 | 2120 |
| 87 | 8124 | 2.0 | 47.1 | 6220 | 4360 | 6320 | 8340 |
| 88 | 8127 | 2.8 | 54.1 | 5080 | 3100 | 5060 | 7080 |
| 89 | 8130 | 3.1 | 65.9 | 3450 | 1430 | 3390 | 5400 |
| 90 | 8142 | 13.0 | 85.9 | 1260 | 500 | 500 | 1850 |
| 91 | 8143 | 8.2 | 83.6 | 1480 | 500 | 700 | 2730 |
| 92 | 8145 | 3.2 | 86.3 | 1220 | 500 | 1150 | 3160 |
| 93 | 8126\* | 0.4 | 100.1 | 500 | 500 | 500 | 2320 |
| 94 | 8131\* | 3.3 | 94.7 | 500 | 500 | 500 | 2380 |
| 95 | 8135\* | 7.5 | 103.2 | 500 | 500 | 500 | 1100 |
| 96 | 8144\* | 8.2 | 92.4 | 650 | 500 | 500 | 1910 |
| 97 | 153 | 2.1 | 77.5 | 2110 | 500 | 2190 | 4200 |
| 98 | 155 | 4.2 | 91.3 | 750 | 500 | 540 | 2560 |
| 99 | 8402 | 4.7 | 88.3 | 1030 | 500 | 740 | 2760 |
| 100 | 8403 | 2.9 | 84.3 | 1410 | 500 | 1380 | 3390 |
| 101 | 8416 | 3.0 | 97.5 | 500 | 500 | 500 | 2180 |
| 102 | 8420 | 2.3 | 99.2 | 500 | 500 | 500 | 2130 |
| 103 | 8404\* | 3.2 | 96.4 | 500 | 500 | 500 | 2250 |
| 104 | 8412\* | 1.5 | 105.1 | 500 | 500 | 500 | 1770 |
| 105 | 8415\* | 8.2 | 102.9 | 500 | 500 | 500 | 1020 |
| 106 | 8421\* | 1.5 | 97.9 | 500 | 500 | 500 | 2350 |
| 107 | 11203\* | 3.2 | 94.5 | 500 | 500 | 500 | 2410 |
| 108 | 11205\* | 2.2 | 90.3 | 840 | 500 | 920 | 2930 |
| 109 | 11206 | 2.4 | 94.5 | 500 | 500 | 510 | 2530 |
| 110 | 11207 | 8.5 | 93.4 | 560 | 500 | 500 | 1770 |
| 111 | 11451 | 2.3 | 61.5 | 4020 | 2110 | 4070 | 6080 |
| 112 | 11452 | 0.3 | 92.5 | 640 | 500 | 970 | 2980 |



# Figure S1: Atmospheric 14C activities (pmC) for the northern (black) and southern (grey) hemispheres and 3H activities (TU) for Melbourne in Australia (purple). 14C data from Hua et al. (2013). 3H data from Cartwright et al. (2018).

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