**Supplementary Table 1.** Statistical data for individual tree-ring δ18O series that were used for the Chōkai master chronology.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Start year | End year | Mean | Median | SD | Skew | Kurtosis | AC1 |
| Ck-W09 | -1412 | -1072 | 26.58 | 26.66 | 0.70 | -0.18 | 0.04 | 0.34 |
| Ck-W14 | -1258 | -1045 | 26.31 | 26.32 | 0.66 | -0.16 | 0.63 | 0.15 |
| Ck-W15 | -1158 | -979 | 26.79 | 26.80 | 0.63 | 0.02 | 0.73 | 0.31 |
| Ck-W16 | -1061 | -951 | 26.49 | 26.51 | 0.49 | -0.11 | -0.03 | 0.27 |
| Ck-W12 | -988 | -466 | 26.70 | 26.65 | 0.58 | 0.19 | -0.15 | 0.18 |
| Ck-W13 | -965 | -608 | 26.52 | 26.48 | 0.61 | 0.31 | 0.54 | 0.32 |
| Ck-W05 | -962 | -466 | 27.72 | 27.73 | 0.88 | 0.04 | 0.58 | 0.41 |
| Ck-KE44 | -858 | -615 | 23.75 | 23.77 | 0.75 | 0.31 | 1.17 | 0.15 |
| Ck-KE01\* | -825 | -590 | 24.58 | 24.57 | 0.81 | -0.04 | -0.10 | -0.01 |
| Ck-KE06\* | -790 | -524 | 23.66 | 23.64 | 0.79 | 0.20 | -0.04 | 0.20 |
| Ck-B01 | -784 | -732 | 26.01 | 26.03 | 0.55 | -0.15 | 0.93 | 0.06 |
| Ck-KE39\* | -773 | -565 | 24.45 | 24.51 | 0.73 | 0.18 | 1.69 | 0.11 |
| Ck-B02 | -741 | -653 | 23.67 | 23.65 | 0.52 | 0.34 | 0.32 | 0.25 |
| Ck-KZ1\* | -677 | -479 | 24.77 | 24.81 | 0.64 | 0.16 | 1.67 | 0.33 |
| Ck-B04 | -647 | -519 | 26.65 | 26.64 | 0.60 | 0.48 | 1.49 | 0.22 |
| Ck-K02\* | -613 | -475 | 24.64 | 24.64 | 0.52 | 0.08 | -0.06 | 0.22 |
| Ck-KE28\*\* | -563 | -489 | 24.64 | 24.68 | 0.53 | -0.50 | 0.50 | 0.23 |

SD: Standard deviation

AC1: First-order autocorrelation

\*: *Zelkova serrata*

*\*\**: *Quercus* sp.

**Supplementary Table 2.** Same as Supplementary Table 1, but for the Kurota master chronology.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ID | Start year | End year | Mean | Median | SD | Skew | Kurtosis | AC1 |
| Mkt64 | -2349 | -2229 | 27.80 | 27.77 | 0.71 | -0.11 | 0.20 | 0.14 |
| Mkt11 | -2314 | -1768 | 27.54 | 27.51 | 0.74 | 0.26 | 0.31 | 0.42 |
| Mkt77 | -2307 | -2150 | 27.67 | 27.72 | 0.77 | -0.23 | -0.10 | 0.34 |
| Mkt49 | -2235 | -1855 | 27.51 | 27.50 | 0.88 | 0.10 | -0.14 | 0.30 |
| Mkt15 | -2207 | -1985 | 28.02 | 28.00 | 0.74 | 0.23 | 0.11 | 0.45 |
| Mkt50 | -2039 | -1766 | 27.39 | 27.40 | 0.58 | 0.15 | 0.02 | 0.32 |
| Mkt74 | -1893 | -1432 | 27.64 | 27.67 | 0.74 | -0.06 | 0.35 | 0.45 |
| Mkt111 | -1887 | -1518 | 27.76 | 27.71 | 0.70 | 0.40 | 0.60 | 0.37 |
| Mkt25 | -1876 | -1701 | 27.44 | 27.34 | 0.67 | 0.38 | -0.19 | 0.30 |
| Mkt1 | -1792 | -1517 | 28.36 | 28.29 | 0.75 | 0.21 | -0.25 | 0.18 |
| Mkt107 | -1699 | -1576 | 28.07 | 28.05 | 0.61 | 0.06 | -0.09 | 0.22 |
| Mkt62 | -1677 | -1509 | 27.86 | 27.85 | 0.65 | 0.77 | 1.77 | 0.25 |
| Mkt105 | -1573 | -1285 | 27.06 | 27.13 | 0.78 | -0.55 | 0.16 | 0.44 |
| Mkt48 | -1559 | -1264 | 27.51 | 27.51 | 0.64 | 0.06 | -0.04 | 0.07 |
| Mkt112 | -1546 | -1361 | 27.97 | 27.91 | 0.64 | 0.29 | 0.30 | 0.28 |
| Mkt72 | -1475 | -1176 | 27.42 | 27.43 | 0.65 | -0.22 | 0.64 | 0.36 |
| Mkt63 | -1425 | -1201 | 27.58 | 27.63 | 0.68 | -0.02 | -0.34 | 0.37 |
| Mkt90 | -1323 | -1009 | 28.03 | 28.03 | 0.77 | 0.08 | 0.18 | 0.39 |
| Mkt108 | -1319 | -1117 | 27.71 | 27.72 | 0.72 | -0.24 | -0.32 | 0.32 |
| Mkt109 | -1314 | -1057 | 27.85 | 27.89 | 0.59 | 0.06 | 0.62 | 0.22 |
| Mkt88 | -1274 | -1028 | 28.28 | 28.29 | 0.75 | 0.26 | 1.69 | 0.35 |
| Mkt73 | -1272 | -1025 | 26.95 | 26.95 | 0.68 | 0.16 | 0.81 | 0.38 |

SD: Standard deviation

AC1: First-order autocorrelation



**Supplementary Figure 1.** Plots of the cross-dated, tree-ring width series for the Chōkai site. Note that the tree-ring width series were standardized to extract the high-frequency component (see the text for more details).



**Supplementary Figure 2.** Plots of the cross-dated, tree-ring δ18O series for the Chōkai site. Note that the tree-ring δ18O series were standardized to extract the high-frequency component (see the text for more details).



**Supplementary Figure 3.** Same as Supplementary Fig. 1, but for the Kurota site.



**Supplementary Figure 4.** Same as Supplementary Fig. 2, but for the Kurota site.