## Supplemental material



S1. Mean age-aligned (a)  $\delta^{13}C_{cell}$  and (b)  $\delta^{18}O_{cell}$  chronologies of the decadal (black line) and annual (colored lines) relict wood series. (c) Linear slopes of the mean z-transformed  $\delta^{13}C_{cell}$  and  $\delta^{18}O_{cell}$  series at annual resolution. White bars represent non-significant (p > 0.01) and coloured bars significant slopes at p < 0.01.



S2. Linear slopes (unit per decade) of the raw, cambial-age aligned (a) TRW, (b) MXD, (c)  $\delta^{13}C_{cell}$ , (d)  $\delta^{13}C_{meth}$ , (e)  $\delta^{18}O_{cell}$ , and (f)  $\delta^{2}H_{meth}$  series. Horizontal black lines represent the median (50<sup>th</sup> percentile), boxes represent the 25<sup>th</sup> and 75<sup>th</sup> percentiles and whiskers represent the 95% confidence interval.



S3. Distribution and range of (a)  $\delta^{13}C_{cell}$ , (b)  $\delta^{13}C_{meth}$ , (c)  $\delta^{18}O_{cell}$ , and (c)  $\delta^{2}H_{meth}$  values over the common period of living and relict wood (1641-1820 CE). Green boxes correspond to the living trees, while other colours represent the proxy-specific relict wood. Vertical black lines represent the median (50<sup>th</sup> percentile), boxes represent the 25<sup>th</sup> and 75<sup>th</sup> percentiles, whiskers represent the 95% confidence interval, and points denote outliers.



S4. Relative cambial age aligned  $\delta^{13}C_{cell}$ ,  $\delta^{13}C_{meth}$ ,  $\delta^{18}O_{cell}$ , and  $\delta^{2}H_{meth}$  relict wood series. Relative TRSI values of individual series were calculated by subtracting the mean of the common period 202 - 238 years. Colored lines represent the arithmetic mean of the relative series.



S5. Linear slopes (unit per decade) of mean relative (a)  $\delta^{13}C_{cell}$ , (b)  $\delta^{13}C_{meth}$ , (c)  $\delta^{18}O_{cell}$ , and (d)  $\delta^{2}H_{meth}$  series. White bars represent non-significant slopes (p > 0.01) and colored bars represent significant slopes at p < 0.01.



S6. Linear slopes of the mean z-transformed TRW (orange), MXD (yellow),  $\delta^{13}C_{cell}$  (light red),  $\delta^{13}C_{meth}$  (dark red),  $\delta^{18}O_{cell}$  (light blue), and  $\delta^{2}H_{meth}$  (dark blue) series. White bars represent non-significant (p > 0.01) and coloured bars significant slopes at p < 0.01.



S7. Example of a relict wood fragment where a disc sample was taken from unknown tree height.