

Supplementary Materials:

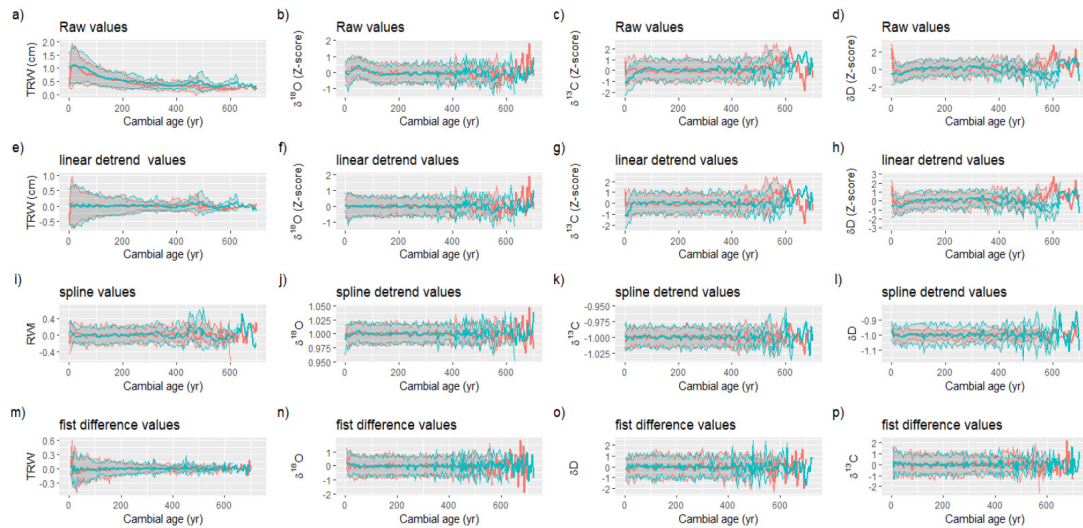
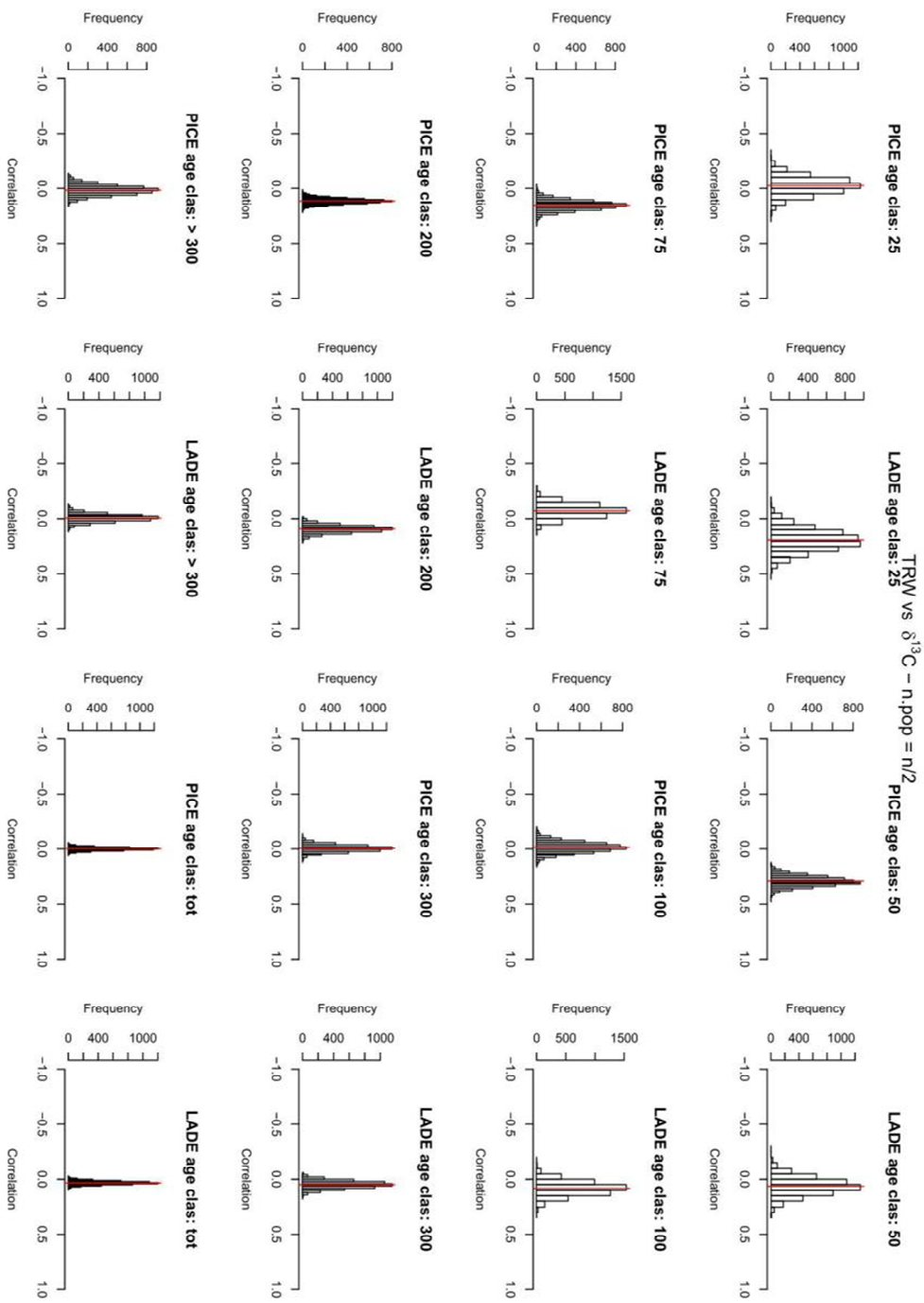
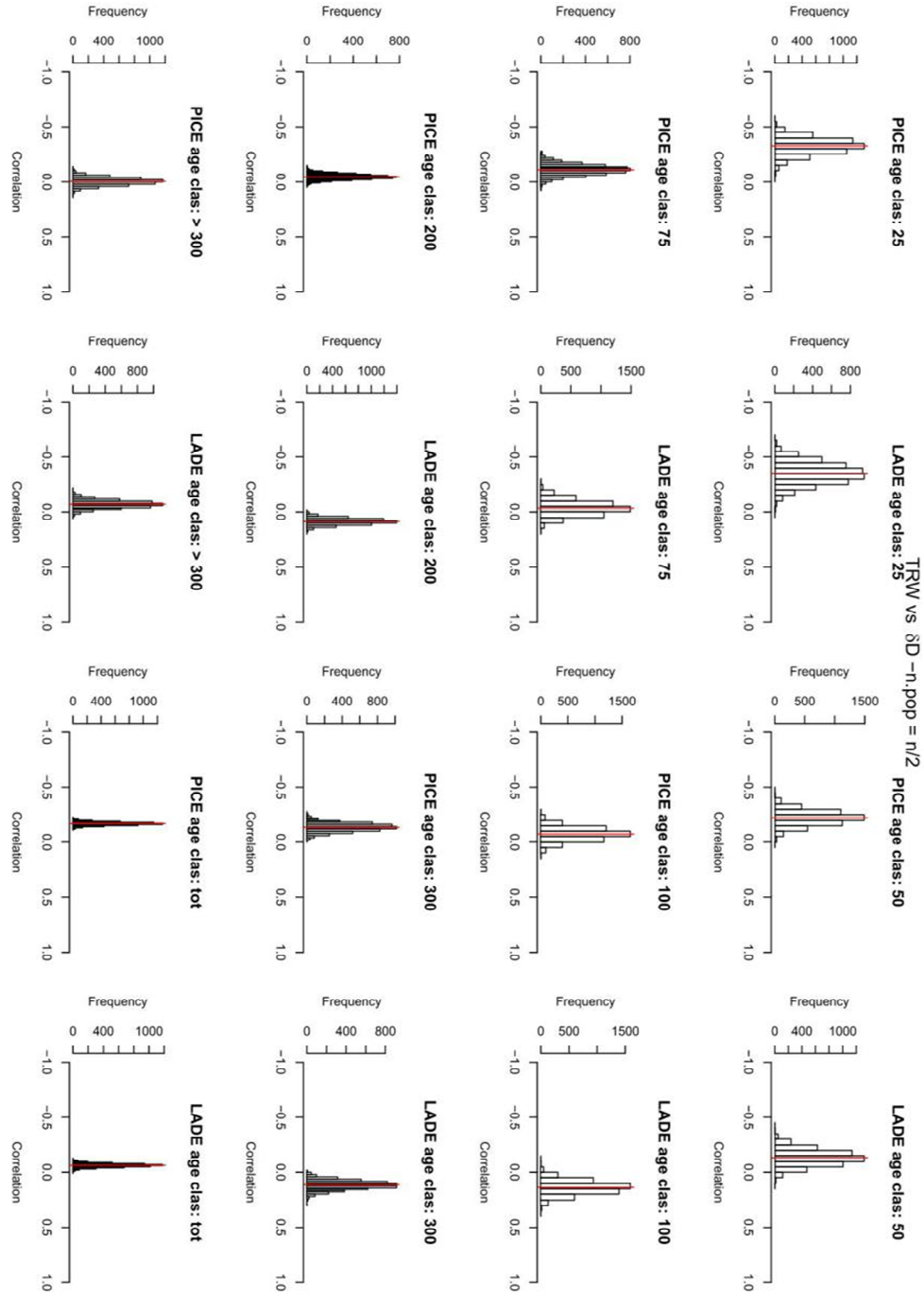


Figure S1. Cambial-age aligned and averaged tree-ring parameters (TRW, $\delta^{18}\text{O}$, δD , $\delta^{13}\text{C}$); without/after detrending. The upper panels show non-detrended (ND) data of TRW (a), $\delta^{18}\text{O}$ (b), $\delta^{13}\text{C}$ (c); δD (d); the panels below show linear detrended (LD) (e, f, g, h); then the panels show linear spline detrended data (SD) (i, j, k, l), the lowermost panels show time-series of the first-differences (FD) (m, n, o, p). The values of larch trees are in red, those of cembran pine are in turquoise. The thick line represents the average, the two thinner lines are for the standard deviations.

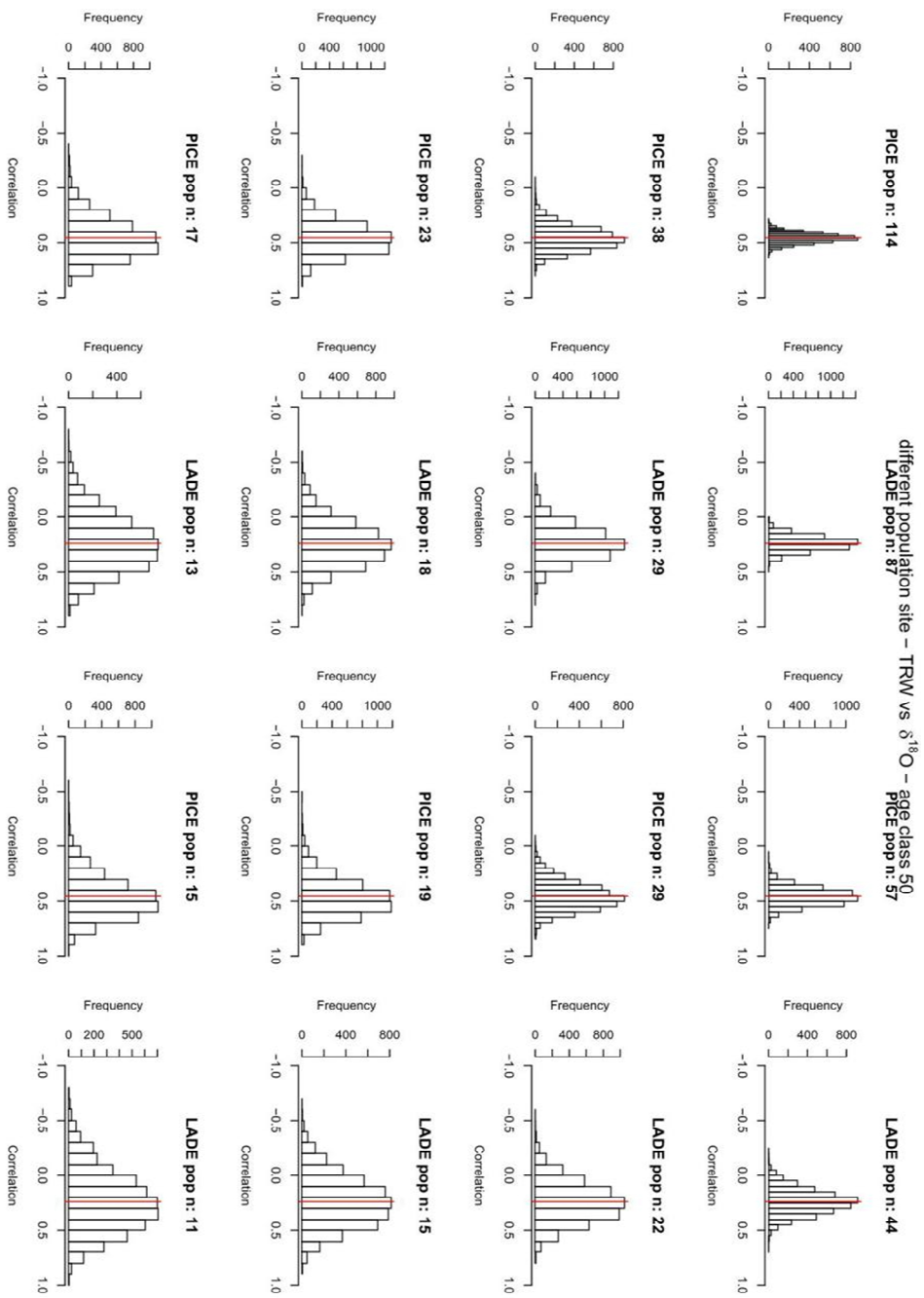


(A)

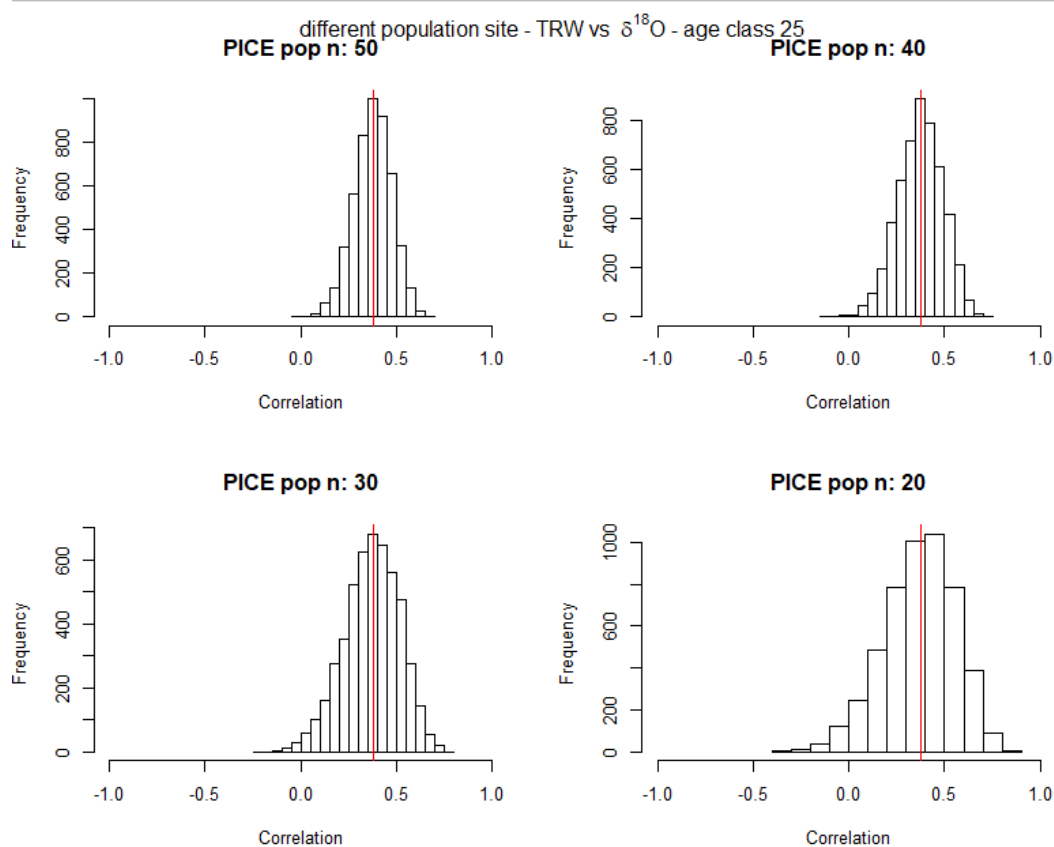


(B)

Figure S2. Monte Carlo simulation tests between TRW and isotopes. First a random sub-sampling covering half of the populations was made, then the correlations were recalculated in a loop of 5000 iterations to obtain the frequency of the correlations. The histograms show the distribution of the frequency values around the correlation values for each age class and for the two species. The vertical red lines indicate the correlation factors of fig 1. Panel A: Monte Carlo simulation for the correlations between TRW and $\delta^{13}\text{C}$ for the two species (larch and cembran pine) and for the 7 age classes and total number of samples. Panel B: as above, for the correlations between TRW and δD . All the plots show a normal distribution around the observed r values, confirming the results shown in Figure 2.



(A)



(B)

Figure S3. Monte Carlo simulation to retrieve a minimal threshold value to be representative of the complete population. A Monte Carlo simulation was run to study the influence of the population size on the correlation test, to establish the minimum threshold of sample number to be used. We gradually decreased the population of random sub-samples used as indicated in the plots. Panel A: Monte Carlo simulation for the correlation between TRW and oxygen isotope in the age class 50 for both species. Panel B: Monte Carlo simulation for the correlation between TRW and oxygen isotope in the age class 25. The plots maintain a normal distribution only for a population size of 30 or above.