



A 550-year long bi-proxy reconstruction of western Europe growing season maximum temperature

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A new methodology was developed to estimate past changes of growing season temperature at Fontainebleau (northern France) (Etien et al, Climatic Change, in press). Northern France temperature fluctuations have been documented by homogenised instrumental temperature records (at most 140 year long) and by grape harvest dates (GHD) series. We have produced a new proxy record with 18O of latewood cellulose of living trees and timbers from Fontainebleau Forest and Castle. 18O and Burgundy GHD series exhibit strong links with Fontainebleau growing season maximum temperature. Each of these records can be influenced by other factors such as vine growing practices, local isolation, or moisture availability. A linear combination was used to reduce the influences of potential biases on the individual records in order to reconstruct inter-annual fluctuations of Fontainebleau growing season temperature from 1448 to 2000 (therefore 150 years older than published in Etien et al, Climate of the Past, 2008). Over the instrumental period, the reconstruction is well correlated with the temperature data ($R^2=0.60$). This reconstruction is associated with an uncertainty of $\sim 1.1^\circ\text{C}$ (1.5 standard deviation), and is expected to provide a reference series for the variability of growing season maximum temperature in Western Europe. Our reconstruction suggests a warm interval in the late 17th century, with the 1680s as warm as the 1940s, followed by a prolonged cool period from the 1690s to the 1850s culminating in the 1770s. The persistency of the late 20th century warming trend appears unprecedented.