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Recent climate trends and multisecular climate variability: temperature and precipitation during the cold season (October-March) in the Ebro Basin (NE of Spain) betrween 1500 and 2008

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One of the goals of Paleoclimatology is to assess the importance and the exceptional nature of recent climate trends related to the anthropogenic climate change. Instrumental data enable the analysis of last century's climate, but do not give any information on previous periods' precipitation and temperature, during which there was no anthropic intervention on the climate system. Dendroclimatology is one of the paleoclimatic reconstruction sources giving best results when it comes to reconstructing the climate of the time before instruments could be used. This work presents the reconstructed series of precipitation and temperature of the cold season (October-March) In the central sector of the Ebro Valley (NE of Spain). The chronologies used for the reconstruction come on the one hand from the International Tree-Ring Data Bank (ITRDB) and on the other hand from the dendrochronological information bank created in the northern half of the Iberian Peninsula within the framework of the Spanish Interministerial Commission for Science and Technology (CICYT) CLI96-1862 project. The climate data used for chronology calibration and the reconstruction of the temperature and precipitation values are those of the instrumental observatory number 9910 (Pallaruelo) belonging to the Spanish State Meteorological Agency (Agencia Estatal de Meteorología or AEMET), located in the central sector of the Ebro Valley. The reconstruction obtained covers the 1500-1990 period. In order to extend the series up to 2008, instrumental information has been used. Thanks to data from a set of AEMET instrumental observatories close to the one used for chronology calibration, a regional series of temperatures as well as a precipitation one were generated. The series reconstructed through dendroclimatic methods and the regional series do not show statistically significant differences in their mean and variance values. R values between both series exceed 0.85. Taking these statistical characteristics into account, with both series "hybrid series" of temperature and precipitation were created, in which the data reconstructed from 1955 on were replaced by those of the regional instrumental series. The resulting series were tested by means of the Standard Normal Homogeneity Test (SNHT) with the aim of assessing their homogeneity; the presence of inhomogeneities around the joining point between both series being undetected. The results stress the exceptional nature of the climate in the central sector of the Ebro Valley during the second half of the 20th century. The 1958-2007 period appears as the warmest since the 16th century, with an average temperature exceeding in 0.42 ºC that of the reference 1850-1950 period. The two warmest decades take place from 1980 on. As for precipitations, they show a negative trend since the first third of the 20th century. The 1957-2006 period is the 50-year interval with the lowest average total precipitation, lower in 24.2 % to the reference period precipitation.