



0.1 Contribution of dendrochronology to the study of droughts in northwestern France (late XIX-XXth century)

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A dendrochronological analysis was carried out using data from oak trees in northwestern France, over the Armorican massif and a large part of the Paris basin. The data were selected for the period 1880-1980, because the highest number of synchronous tree ring series was recorded during that period. The synchronization of the tree ring series was based on the identification of *characteristic years*, which showed the same growth variations. The climatic interpretation was only based on the *negative characteristic years* (showing a growth drop of the studied oaks). The comparison between the results of the dendroclimatological analysis and the available climatic data for the period 1880-1980 allowed to identify the prevailing climatic features which caused the growth drop of the oaks. During the studied period, 19 *negative characteristic years* were identified and all these years were subjected to drought events. Among these 19 years, four types of years were identified, depending on the characteristics of the drought:

1. Continuous and intense drought during all the vegetative period (spring and summer) ;
2. Summer drought ;
3. Winter drought ;
4. Discontinuous periods of negative precipitation anomalies.

Precipitation anomalies were calculated using monthly data of 20 meteorological stations of the *Météo-France* network over the studied area, for the period of December-August 1880-1980 at monthly and seasonal timescales. The results confirmed the classification of the 19 *negative characteristic years* based on the duration and the intensity of the drought, and also based on the seasons most affected by the drought. Maps of the precipitation anomalies showed different spatial patterns based on the strength of the negative anomalies and on the seasons affected by the precipitation deficit. A long, intense and continuous period of precipitation deficit involved a spatial homogeneity in the tree-ring records over the studied area, which was also clearly shown on the maps of precipitation anomalies. The hydrological balance for the station of Rennes (Brittany) also showed a hierarchy among the years with drought periods. The cause of the different drought patterns was also studied in order to show the linkage between the circulation types (identified using the Hess-Brezowsky classification) and the space-time variability of the precipitation anomalies for the 19 *characteristic years*.