Overview of dendro-archaeological studies in the French Alps: assessing montainous silvicultural practices changes over the last millenium

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Overview of dendro-archaeological studies in the French Alps: assessing mountainous silvicultural practices changes over the last millenium

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How do dendro-archaeological studies contribute to improve knowledge about ancient forestry practices in the Alps ?

State of the art

Dendrochronological studies have been developed in the French Alps since the late 1970s. Initially, master chronologies were built for climate reconstructions purpose. Later on (last two decades), they made it possible to carry out new chronological work on building heritage (rural buildings, churches, mining structures etc.) **(Fig. 1, 2, 3)** and finally better understand human–environment interactions at high elevation.

Fig. 1. Barn in the Northern Alps (Modane, Savoie)

Fig. 2. Farm in the Southern Alps (Cervières, Hautes-Alpes)

Fig. 3. Barn in the Southern Alps (Saint-Etienne-de-Tinée, Alpes-Maritimes)

Material and methods

1672 Larch (*Larix decidua* Mill.), Fir (*Abies alba* Mill.), Scots pine (*Pinus sylvestris* L.), Spruce (*Picea abies* L.) and Oak (*Quercus* sp.) timbers were tree ring dated at 112 sites (isolated or grouped buildings) located between 790 and 2356 m a.s.l in the French Alps **(Fig. 4)**.

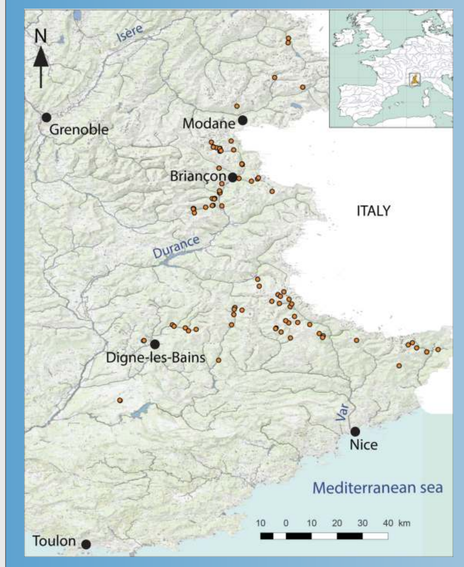

Fig. 4. Location of the 112 studied sites in the French Alps.

After wood species identification (Schweingruber, 1990), ring-widths were measured using the incremental measuring table LINTAB with 0.01 mm accuracy and TSAP-Win software (Rinntech, 2014).
Tree-ring series were then indexed and cross-dated using the Student test (*t*) with different softwares (TSAP-Win, Dendron IV) (Lambert, 2006),.
For this study, we consider the age of the trees, their diameter and their felling dates.

Results

Numerous felling dates clusters were identified, from the 11th to the 20th c. Apart from the second half of the 14th century, trees were felled during all periods **(Fig. 5)**, which testifies to an almost continuous activity of buildings' repairs maintenance, and transformation over the last millenium **(Fig. 6)**.

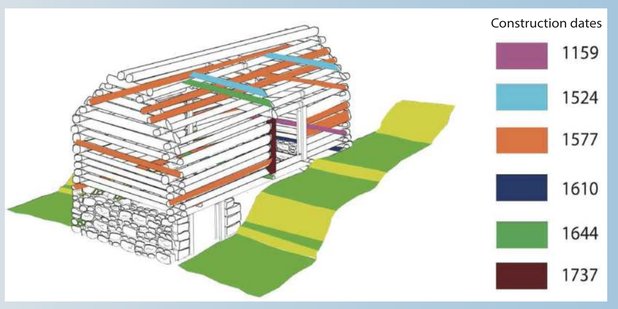

Fig. 6. Axonometric view of a barn studied in the southern French Alps (Mercantour). Each color indicates a maintenance or a repair. Timbers not colored are still undated.

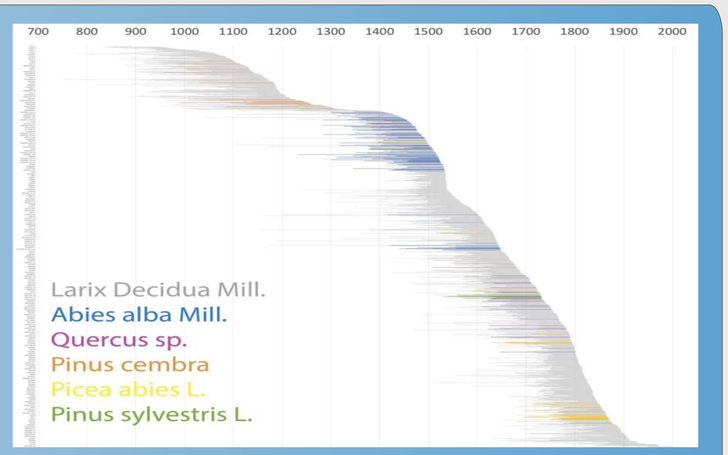

Fig. 5 : Gantt chart representing the 1672 dated timbers sorted according to the date of the last measured ring

Discussion

While the diameter of the woods remains constant over the the last ten centuries, we show an increase in the age of the trees felled from the 11th to the beginning of the 14th century, up to ca. 250 years old (**Fig. 7**). From the end of the 14th to the beginning of the 20th century, the trees were felled at a median age of 100 years. A change in logging at the end of the 14th century seems most likely. From the 11th to the 14th c., the progressive aging of the exploited forests could indicate an increasing pressure on the high forests. The second period, from the 14th to the beginning of the 20th c. would reveal a new management of the forest, induced to face the demographic pressure and the necessity to maintain the production of timber. Future research will allow to highlight this type of management : simple coppice, coppice with standards, spacing of trees between them?
In addition, this research leads to a deeper understanding of the relationship between rural and urban societies, the latter being major consumer of timbers. It would be also interesting to extend the analysis to the entire alpine region through collaborations with researchers who have gathered a rich corpus in the central and eastern Alps.

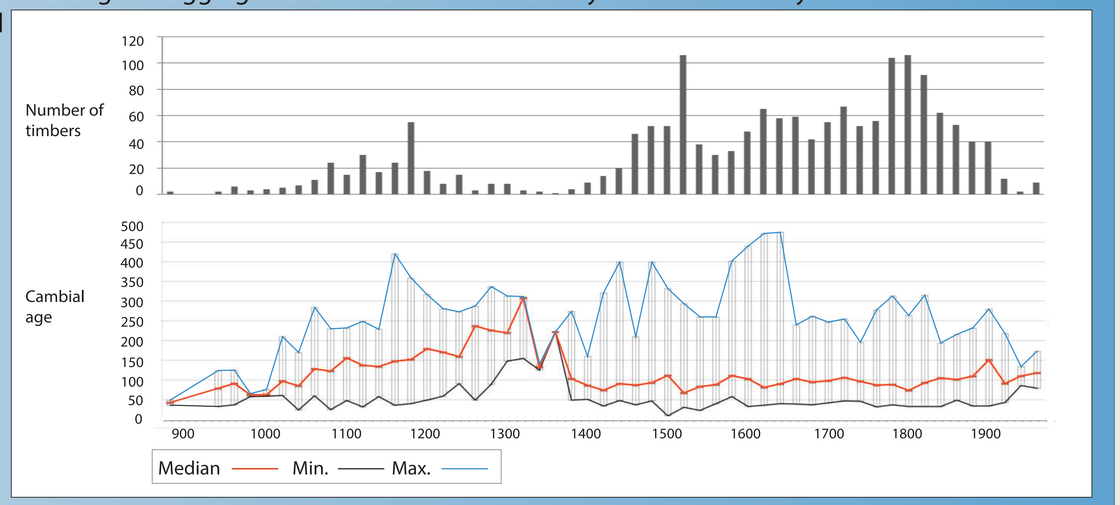

Fig. 7 : Evolution of cambial age from 10th. to 20th century. Timber are displayed in 20 year time windows.

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