

Dendroecology suggests that not everything is caused by climate change

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Samples of 'Pulsatilla alpina subsp. Apiifolia' in the Hoyocasero pine forest and a flowered 'Rhaponticum exaltatu', one of the taxa described for the first time in this pine forest. Credit: Agustín Rubio Sánchez

A research team has assessed the causes of growth decline of a pine forest of great ecological interest in Spain.

Researchers from Universidad Politécnica de Madrid (UPM), INIA and Aix-Marseille Université studied the irreversible changes in the structure of the Hoyocasero <u>pine forest</u> by using techniques of dendroecological



analysis. Results suggest that the lack of pine regeneration does not stem from <u>climate change</u>, but from the actions of man on the forest stand; therefore, it is possible to establish protecting measures to guarantee its survival.

As in many other locations of the Iberian Peninsula, the valuable natural heritage of Hoyocasero Pine forest is in danger. The richness of the ecosystem in this forest located in Ávila has attracted national and international naturalists since the <u>19th century</u>. In fact, various new species have been described here. Additionally, some Mediterranean species are preserved due to their rarity in this area of the Central System.

Professor Agustin Rubio Sánchez from School of Forestry Engineering and Natural Resources of UPM, along with a multidisciplinary team of researchers, has assessed this pinewood and compared it to more droughttolerant tree species such as rebollo. This study has combined dendrochronology, climate and dasometric data.

The age patterns observed on the trees suggest a natural origin for the two species present in the forest, pine and rebollo. According to age structure and historical references, it is likely that this pine is the last vestige of a large pine forest that once occupied this region. However, while natural regeneration has been constant since 1950 for rebollos, there has hardly been natural regeneration of pines since 1870.





Stand dominated by 'rebollo' (foreground) at a clear place by forest management in the mature pine forest (background). Credit: Agustín Rubio Sánchez

The analysis techniques have allowed researchers to identify effects of high temperatures from spring to autumn as well as increased pine sensitivity to drought in recent years. Nonetheless, the pinewood structure established in the 19th century does not show yet symptoms of decline attributable to climate change.

As lack of pine regeneration is not a new process and has existed since before evidence of climate change, this situation can have direct or indirect effects on management of forest stand. The growth of rebollos seems to be linked to an intensity reduction of anthropic management since the mid-20th century. This is likely related to the decline of the local population and the abandonment of firewood as the main source of



energy in rural areas.

The action of man on forest stands with modifications on vegetation and soil properties (changes in pH and nutrients) could be playing an important role in forest dynamics.

More information: "Is this the end? Dynamics of a relict stand from pervasively deforested ancient Iberian pine forests." *European Journal of Forest Research*, 134: 525-536. DOI: 10.1007/s10342-015-0869-z

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