# Ecophysiological response to high frost pressure for five tree species in the Lautaret alpine garden

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Acoufollow

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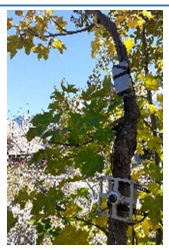
Frost stress is the main factor determining the distribution of plants at high latitude and elevation. Although species are currently adapted to their highest location, climate change is likely to modify their adaptation strategies in the face of climatic stress. This is particularly true for trees at their altitudinal limit, where the number of freeze-thaw episodes is likely to increase.

*Betula pendula*

*Larix decidua*

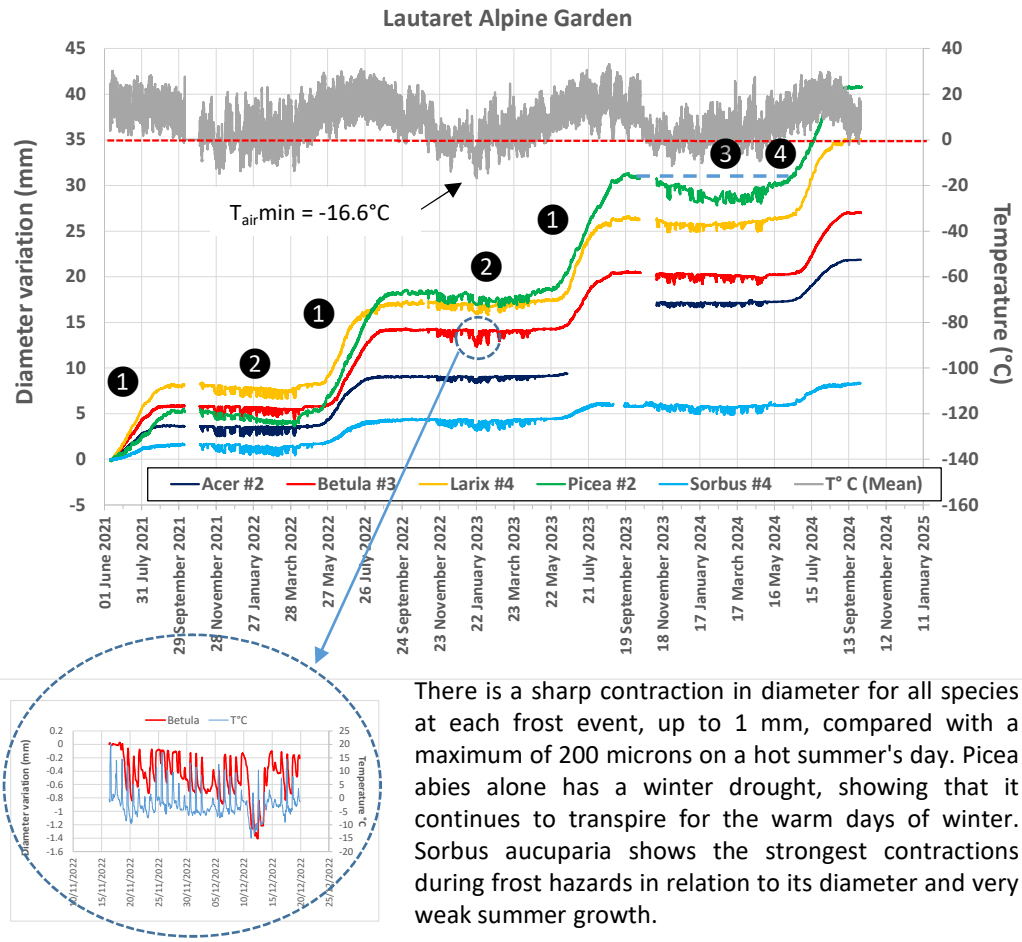


*Acer pseudoplatanus*

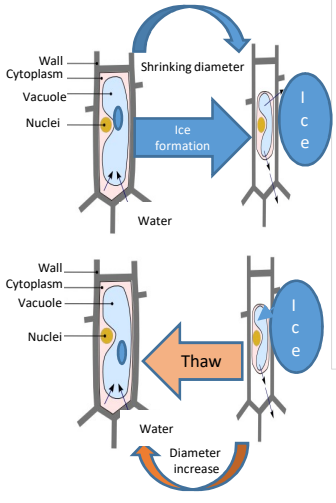
*Sorbus aucuparia*

*Picea abies*

To monitor the exposure to frost stress and its impact on tree growth, we monitored five contrasted species (*Acer pseudoplatanus, Betula pendula, Larix decidua, Picea abies* and *Sorbus* aucuparia) over a 3-year period in the Lautaret alpine garden (2100 m asl) by using an automatic, autonomous, connected micro-dendrometer. These systems continuously measured (every 30 minutes or 1 hour) both (e-PépiPIAF; Capt-connect) variations in trunk diameter and air temperature in the vicinity of the measurement, making it possible to determine the number (>100) and duration of frost cycles, growth periods and ecophysiological functioning of the species monitored in these extreme conditions.




1: Summer growth
2: Frost resistance
3: Winter drought
4: Springtime rehydration




Frost resistance = Bark deshydration and shrinkage




There is a sharp contraction in diameter for all species at each frost event, up to 1 mm, compared with a maximum of 200 microns on a hot summer's day. Picea abies alone has a winter drought, showing that it continues to transpire for the warm days of winter. Sorbus aucuparia shows the strongest contractions during frost hazards in relation to its diameter and very weak summer growth.

**In conclusion**, our study demonstrates the **capacity of continuous micro-dendrometer measures** to assess the response of tree growth to (micro)climatic variability in alpine environments. We observed specific responses of the trees, in relation to their wood anatomy and leaf phenology.

[1] INRAE la science pour la vie, l'humain, la terre
[1] PIAF
[2] LECA
[2,4,6] UGA Université Grenoble Alpes
[3] OSUG
[4] cnrs
[1,3] UCA Université Clermont Auvergne
[5] BONN
[6] Jardin du Lautaret