

## **The sound of cavitation in trees**

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### **Abstract**

The sap within tree circulates in tiny microfluidic wood vessels. Under hydric stress, in dry weather conditions, the sap can cavitate. Bubbles appear, which eventually causes an embolism in the circulation. The origin of cavitation is that water can achieve negative (tension) under evaporation. We will focus here on the dynamics of the cavitation bubble, which is of primary importance to understand the resistance of trees. We use the recently developed method of artificial trees, building stiff transparent hydrogels to mimic wood channels. Our experiments on water confined in micrometric channels show an extremely fast dynamics: bubbles are nucleated within a microsecond timescale. The bubble pulsates with transient oscillations at very high frequencies in the MHz range. This rich dynamics can be accounted for by a model we developed, leading to a modified Rayleigh-Plesset equation. The oscillations may be at the origin of the short acoustic emissions that are recorded in real trees under hydric stress