

The sound of cavitation in tree

Under hydric stress, in dry weather conditions, the sap within trees can cavitate: bubbles appear, which eventually causes an embolism in the circulation. The origin of cavitation is that water can achieve negative pressures in hydraulic vessels.

We will focus here on the dynamics of the cavitation bubble, which is of primary importance to explain embolism in trees. We use the recently developed method of artificial trees, using transparent hydrogels as the porous medium. Our experiments, on water confined in micrometric hydrogel cavities, show an extremely fast dynamics: bubbles are nucleated at the microsecond timescale, and then ring at MHz frequency for a few periods. The tension in water before cavitation is of the order of several hundred atmospheres. In a second step, bubbles grow slowly by diffusion, filling the entire available space.

In conclusion, these oscillations may be at the origin of the short acoustic emissions that were recorded by other authors in real trees undergoing cavitation.

