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Dynamic analysis on cavitation and embolization in vascular plants under tension[1] JEONGEUN RYU, BAE GEUN HWANG, YANGMIN KIM, SANG JOON LEE, Department of Mechanical Engineering, POSTECH — Plants can transport sap water from the soil to the tip of their leaves using the tensile forces created by leaf transpiration without any mechanical pumps. However, the high tension adversely induces a thermodynamically metastable state in sap water with negative pressure and gas bubbles are prone to be formed in xylem vessels. Cavitation easily breaks down continuous water columns and grows into embolization, which limits water transport through xylem vessels. Meanwhile, the repair process of embolization is closely related to water management and regulation of sap flow in plants. In this study, the cavitation and embolization phenomena of liquid water in vascular plants and a physical model system are experimentally and theoretically investigated in detail under in vivo and in vitro conditions. This study will not only shed light on the understanding of these multiphase flows under tension but also provide a clue to solve cavitation problems in micro-scale conduits and microfluidic network systems.

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