

Abstract Submitted
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Wind-Induced Reconfigurations in Flexible Branched Trees.

OLUWAFEMI OJO, KOUROSH SHOELE, Florida State University — Wind induced stresses are the major mechanical cause of failure in trees. We know that the branching mechanism has an important effect on the stress distribution and stability of a tree in the wind. Eloy in PRL 2011, showed that Leonardo da Vinci's original observation which states the total cross section of branches is conserved across branching nodes is the best configuration for resisting wind-induced fracture in rigid trees. However, prediction of the fracture risk and pattern of a tree is also a function of their reconfiguration capabilities and how they mitigate large wind-induced stresses. In this studies through developing an efficient numerical simulation of flexible branched trees, we explore the role of the tree flexibility on the optimal branching. Our results show that the probability of a tree breaking at any point depends on both the cross-section changes in the branching nodes and the level of tree flexibility. It is found that the branching mechanism based on Leonardo da Vinci's original observation leads to a uniform stress distribution over a wide range of flexibilities but the pattern changes for more flexible systems.

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