

Publication

Do trees have constant branch divergence angles?

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Many herbaceous plants feature remarkably regular arrangements of lateral organs along the central axis. These phyllotactic patterns are generated by a constant divergence angle between successive buds (or whorls thereof) that first appears at the shoot apical meristem and is maintained across later ontogenic stages when it can be observed at the macroscopic scale. Do the branches along a tree trunk exhibit similar patterns? Here we use branch skeleton data derived from terrestrial laser scans to empirically estimate the distributions of the divergence angles between successive branches along the trunks of mature European beech, Norway spruce, and Scots pine trees. We find that rather than clustering around a particular value, species-specific branch divergence angles feature statistical properties characteristic of a uniform distribution. We hypothesise this to be the result of the stochasticity in bud development and branch shedding, and provide a rigorous mathematical proof that even when the divergence angle between successive lateral buds is constant, the observed distribution of branch divergence angles will approximate a uniform distribution if bud mortality and branch shedding rates are high. Copyright © 2020 Elsevier Ltd. All rights reserved.

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