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Seasonal and vertical changes in leaf angle distribution for selected deciduous broadleaf tree species common to Europe

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Leaf inclination angle distribution is a key parameter in determining the transmission and reflection of radiation by vegetation canopies. It has been previously observed that leaf inclination angle might change gradually from more vertical in the upper canopy and in high light habitats to more horizontal in the lower canopy and in low light habitats [1]. Despite its importance, relatively few measurements on actual leaf angle distributions have been reported for different tree species. Even smaller number of studies have dealt with the possible seasonal changes in leaf angle distribution [2].
In this study the variation of leaf inclination angle distributions was examined both temporally throughout the growing season and vertically at different heights of trees. We report on leaf inclination angle distributions for five deciduous broadleaf species found commonly in several parts of Europe: grey alder (Alnus incana), Silver birch (Betula pendula Roth), chestnut (Castanea), Norway maple (Acer platanoides), and aspen (Populus tremula). The angles were measured using the leveled camera method [3], with the data collected at several separate heights and four times during the period of May–September 2013. The results generally indicate the greatest change in leaf inclination angles for spring, with the changes usually being the most pronounced at the top of the canopy. It should also be noted, however, that whereas the temporal variation proved to be rather consistent for different species, the vertical variation differed more between species.
The leveled camera method was additionally tested in terms of sensitivity to different users. Ten people were asked to measure the leaf angles for four different species. The results indicate the method is quite robust in providing coinciding distributions irrespective of the user and level of previous experience with the method. However, certain caution must be exercised when measuring long narrow leaves.

References
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